CARDIGAN TIDAL FLOOD RISK MANAGEMENT SCHEME

Volume 1: Environmental Statement

Prepared for:

Natural Resources Wales

Date: March 2026

ISEP EIA QUALITY MARK

Cyfoeth Naturiol Cymru
Natural Resources Wales

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Enhancing lives, communities and the environment

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EIA Quality Mark

This Environmental Statement, and the Environmental Impact Assessment (EIA) carried out to identify the significant environmental effects of the proposed development, was undertaken in line with the EIA Quality Mark Commitments.

The EIA Quality Mark is a voluntary scheme, operated by ISEP, through which EIA activity is independently reviewed, on an annual basis, to ensure it delivers excellence in the following areas:

- *EIA Management*
- *EIA Team Capabilities*
- *EIA Regulatory Compliance*
- *EIA Context & Influence*
- *EIA Content*
- *EIA Presentation*
- *Improving EIA practice*

To find out more about the EIA Quality Mark please visit:
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Statement of Competence

In 2017, the UK government transposed changes to the Environmental Impact Assessment (EIA) Directive (85/337/EEC) into UK law through the Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017. The regulations state:

"17(4)(a) An Environmental Statement must be prepared by persons who in the opinion of the relevant planning authority or Welsh Ministers, as appropriate, have sufficient expertise to ensure the completeness and quality of the statement

17(4)(b) contain a statement on or behalf of the applicant or appellant describing the expertise of the person(s) who prepared the environmental statement"

There is not currently an industry-wide accepted definition of 'competence'; however, it is considered to comprise a combination of the length and relevance of experience of individuals and the level and relevance of their qualifications.

Table 1 outlines the competent experts who have contributed to the production of this Environmental Statement (ES). Their qualifications and experience are provided in order to show competency. Further details of competency including relevant experience for each topic specialist are provided in their respective chapters (Chapters 5-13).

Technical Director and Senior Reviewer: Andrew Burwood is a Chartered Environmentalist with over 20 years' experience in environmental consultancy. He is a specialist in EIA and Appropriate Assessments. He is experienced in preparing and technically reviewing environmental assessments for complex projects across a range of sectors including many flood risk management projects requiring Environmental Statements, such as the Donna Nook Managed Realignment Scheme, Bridgwater Tidal Barrier, Northwich FRMS, Our City Our River (Derby), Somerset Levels (Rivers Parrett and Tone) Dredge, River Thames Scheme, and Llyn Tegid Reservoir Safety Project.

EIA Coordinator: David Johnson is a Chartered Environmentalist and Registered EIA Practitioner with over 14 years' experience in environmental consultancy specialising in EIA and allied activities. He is has successfully coordinated and completed environmental assessments including EIA for a range of projects in the energy, infrastructure and water sectors, including several flood risk management schemes such as River Thames Scheme, Kendal FRMS Phase 1 and Bridgwater Tidal Barrier.

EIA Coordination Support: Myles Harding is an experienced EIA practitioner having worked in environmental consultancy for 4 years. Myles has experience of supporting the production of environmental documentation to support environmental assessments including all stages of EIA. He has supported on a range of water sector and flood risk management schemes including Pontaryscir Gauging Station, Pen Yr Englyn Tip Remediation, Cwm Penamnen River Restoration and Tidal Dyfi Flood Risk Appraisal.

Table 1 Statement of competence

Chapter title	Competent expert(s)
Chapter 1: Introduction	Myles Harding, BSc (Hons), MSc, PISEP David Johnson, BSc (Hons), MSc, CEnv Andrew Burwood, BSc (Hons), MSc, CEnv
Chapter 2: Project Description	
Chapter 3: Alternatives	
Chapter 4: EIA Methodology	
Chapter 5: Population and Human Health	Myles Harding, BSc (Hons), MSc, PISEP David Johnson, BSc (Hons), MSc, CEnv
Chapter 6: Biodiversity and Nature Conservation	Jon Goodrick, BSc, CEcol Owen Peat BA (Hons), MSc, CEnv
Chapter 7: Historic Environment	Philip Poucher, BA (Hons), MCIfA
Chapter 8: Landscape and Visual	Theresa Dendy, BA, MA, CMLI Heather Goodrick, BSc (Hons), MLA, CMLI Mark Boothroyd, BA (Hons), MA, CMLI
Chapter 9: Traffic and Transport	Jacob Clegg, GradCIHT Ciaran Conlon, MCIHT William Tong, MCIHT Ian Wickett, FCIHT
Chapter 10: Water Environment	Jenny Marshall-Evans, BSc (Hons), MSc, CEnv, MCIWEM C.WEM Nick Hill, BSc, MSc
Chapter 11: Land Use and Soils	Ben Tucker, BSc (Hons), FGS Stephanie Rebours-Smith, BS, MSc, FGS
Chapter 12: Cumulative Effects	Myles Harding, BSc (Hons), MSc, PISEP David Johnson, BSc (Hons), MSc, CEnv
Chapter 13: Summary and Conclusions	Myles Harding, BSc (Hons), MSc, PISEP David Johnson, BSc (Hons), MSc, CEnv
All chapters	Natural Resources Wales project team completed a full review of the content of the Environmental Statement (ES): Paul Isaac (NRW Project Executive) Bethan Hill (NRW Project Manager) Heilyn Williams (NRW Environmental Assessment Team) Candida Diamond (NRW Landscape Architect)

1. Introduction

1.1 Purpose of Environmental Statement

This Environmental Statement (ES) presents the findings of the Environmental Impact Assessment (EIA) that has been undertaken for the Cardigan Tidal Flood Risk Management Scheme (TFRMS), hereafter referred to as 'the Scheme'. This ES has been prepared by Binnies UK Ltd (BUKL) on behalf of Natural Resources Wales (NRW).

The purpose of the ES is to identify, assess, and report on potential environmental effects of the Scheme. The ES outlines strategies to mitigate any adverse effects and serves as a tool to inform decision makers, stakeholders and the public. The EIA process ensures that potential environmental effects are given due consideration within the decision-making.

This ES has been prepared to support an application for Planning Approval from Ceredigion County Council under the Town and Country Planning Act 1990, and an application for a Marine Licence from Natural Resources Wales under the Marine and Coastal Access Act 2009.

1.2 Need for the Scheme

Cardigan is located on the River Teifi (Afon Teifi) in Ceredigion, west Wales (see Plate 1-1), Figure 1.1 shows the Scheme Area including the proposed construction compound locations. The Strand area of Cardigan on the north bank of the Afon Teifi, which includes residential and commercial properties, is vulnerable to flooding. Flood events occurred in 2007, 2008, 2012 and 2014. In 2007 the lower quayside, including Strand and Cattle Market flooded with flood depths exceeding 0.5m. A tidal flood on 3 January 2014 inundated 29 properties on St Mary's Street. This area will become increasingly vulnerable with predicted future sea levels rise.

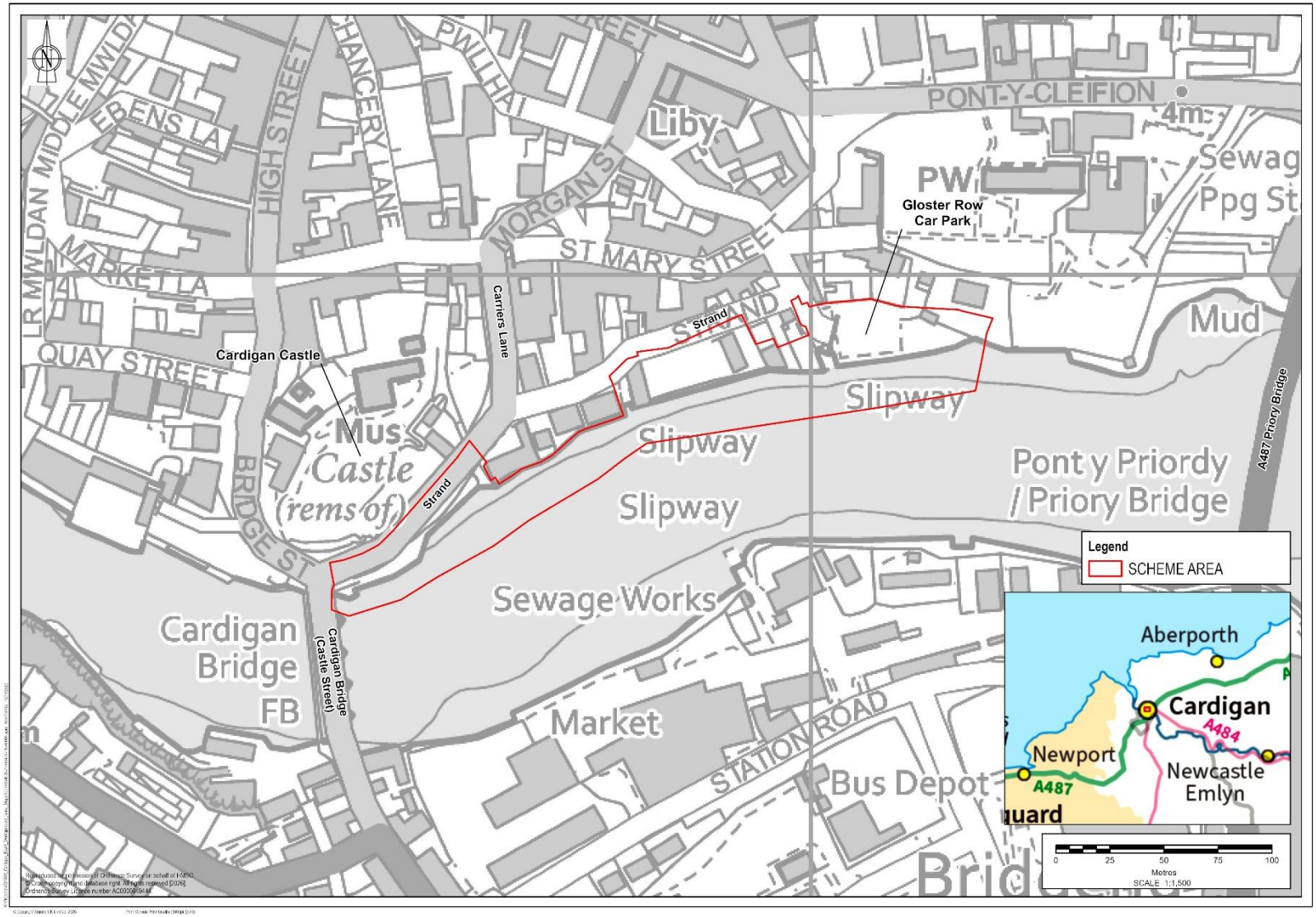

Plate 1-1 – Location of Scheme within Cardigan

1.3 Project aims and objectives

The overall aim of the Scheme is to reduce tidal flood risk to approximately 90 properties on the north bank of the Afon Teifi in the Strand area, east of Cardigan bridge, providing protection from floods of up to a 1 in 200 (0.5%) annual chance of occurrence including an allowance for 100 years of climate change.

The specific objectives of the Scheme are to:

1. Reduce the risk of tidal flooding to the town and community of Cardigan, taking account of predicted sea level rise.

2. Maintain and enhance the natural environment, and the well-being of the community, helping to achieve NRW's Well-Being Objectives and satisfy Environment (Wales) Act duties.

3. Provide a solution that is sensitive to Cardigan's important historic and landscape interest.

4. Apply green-grey estuarine infrastructure to deliver a multi-functional Flood and Coastal Erosion Risk Management (FCERM) asset.

5. Engage the community and deliver a publicly acceptable solution.

6. Provide a solution that is cost beneficial.

7. Work with Dŵr Cymru Welsh Water (DCWW) and Ceredigion Council to discuss their responsibilities, in terms of different types of flooding within the area.

NRW are working collaboratively with Ceredigion County Council (CCC) as the Lead Local Flood Authority (LLFA) towards achieving the objectives outlined in the Local Flood Risk Management Strategy for Ceredigion (1), complementary to the National Strategy launched by the Welsh Government in 2011 and updated in 2020 (2).

1.4 Compliance with EIA regulations

The EIA Regulations relevant to the Scheme are:

- The Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017 as amended; and

- The Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended) .

The Scheme constitutes a Schedule 2 development under the Town and Country Planning EIA Regulations under Paragraph 10(h) *'Inland-waterway construction not included in Schedule 1, canalisation and flood-relief works'*. The applicable threshold is if the area of the works exceeds 1 hectare.

The Scheme constitutes a Schedule A2 development under the Marine Works EIA Regulations under Paragraph 64 *'Inland-waterway construction not included in Schedule A1, canalisation and flood relief works'*.

As the Scheme constitutes Schedule 2 / Schedule A2 development an EIA would be required if the Scheme is likely; because of its size, nature or location; to have significant effects on the environment. A Screening Opinion was requested from CCC and the NRW Marine Licencing Team. Both CCC (Ref. Q230180, 14/11/2023) and the Marine Licencing Team (Ref. SC2303, 14/12/2023) have confirmed that the Scheme comprises EIA development and therefore requires a statutory EIA.

The Scheme has been assessed in relation to the requirements of both sets of EIA regulations. Further details of the EIA process are provided in Chapter 4: EIA Methodology.

1.5 Structure of the Environmental Statement

This ES structure is outlined within Table 1-1.

Table 1-1 – Structure of the Environmental Statement

Volume 1 - Environmental Statement Chapters	
Chapter	**Content**
-	Statement of competence
1	Introduction - this chapter
2	Project Development – outlines the strategic context for the Scheme, provides an overview of the Scheme's design evolution to date and discusses the alternatives that have been considered throughout the process, and a summary of consultation.
3	Project Description - outlines the Scheme and associated works.
4	EIA Methodology - outlines the EIA methodology used throughout the ES and describes the outcomes of the EIA Scoping stage.
5 to 12	The main content of the impact assessment which will cover the following topics: Population and Human Health Biodiversity and Nature Conservation Historic Environment Landscape and Visual Traffic and Transport Water Environment Land Use and Soils Cumulative Effects
13 to 15	Summary and Conclusions Glossary Abbreviations

Volume 2 – Figures
This includes all figures referenced in the Environmental Statement Chapters.
Volume 3 – Appendices
Appendices include technical reports produced to inform the assessment of effects. An Environmental Action Plan (EAP) is included, which provides a record of the actions identified for the purpose of managing environmental impacts prior to, during, and after construction. The project Environmental Clerk of Works (EnvCoW) will monitor compliance against the EAP and the contractor will utilise the EAP in developing the Construction Environmental Management Plan (CEMP) prior to construction.
Volume 4 - Non-technical summary
This presents a concise summary of the key information contained within the Environmental Impact Assessment Report in non-technical language.

1.6 Availability of the Environmental Statement

The ES and all supporting information will be available for review during the planning and marine licencing determination periods. The following supporting information will be provided:

- Habitat Regulations Assessment
- Design and Access Statement
- Planning Statement
- Green Infrastructure Statement
- Scaled plans and drawings.

The ES will be available on the NRW website (https://bit.ly/CardiganTidalFloodRiskManagementScheme / https://bit.ly/CynllunRheoliPeryglLlifogyddLlanwolAberteifi) and physical copies will be provided at Cardigan Library, Council Offices, Morgan St, Cardigan SA43 1DG.

1.7 References

Ceredigion County Council, 2014. *Local Flood Risk Management Strategy,* s.l.: s.n.

Welsh Government, 2020. *The National Strategy for Flood and Coastla Erosion Risk Management in Wales,* s.l.: s.n.

2. Project Development

2.1 Strategic context

2.1.1 National Strategy for Flood and Coastal Erosion Risk Management in Wales (2020)

The Welsh Government National Flood and Coastal Erosion Risk Management Strategy (3) sets out how the Welsh Government intends to manage the risks from flooding and coastal erosion across Wales. The national strategy objectives set the framework for flood and coastal erosion risk management work within Wales:

A. Improving our understanding and communication of risk
B. Preparedness and building resilience
C. Prioritising investment to the most at risk communities
D. Preventing more people becoming exposed to risk
E. Providing an effective and sustained response to events.

Every flood risk management action undertaken in Wales must aim to fit with overarching National Flood and Coastal Erosion Risk Management strategy objectives. The Cardigan Tidal Flood Risk Management Scheme ('the Scheme') directly achieves three of these objectives by providing an effective and sustained response; prioritising investment to the more at risk communities; and preparedness and building resilience.

2.1.2 Natural Resources Wales Flood Risk Management Plan 2023 to 2029

National Overview

The first section of the Natural Resources Wales (NRW) Flood Risk Management Plan (FRMP) (4) provides a national overview of where is at risk of flooding in Wales and sets out NRWs Wales-wide Objective, Priorities and Measures for managing the risk of flooding from 2023 to 2029.

The FRMP Objective is to 'Reduce the risk to people and communities from flooding from main rivers, reservoirs and the sea'. The FRMP identifies 14 priorities:

Priority 1: Respond to the climate and nature emergencies by seeking innovative practices, promoting adaptation and preparing for future change.

Priority 2: Develop and deliver catchment approaches to reduce flooding and contribute to ecosystem resilience, working with partners and stakeholders where possible and appropriate.

Priority 3: Improve community resilience to current and future flood risk. Work with partners to support communities to become more aware and take action to mitigate their own flood risk.

Priority 4: Seek and take opportunities for enhancement to the health and wellbeing of communities, biodiversity and the environment, and the wider benefits they provide, to support NRW's response to the Nature Emergency.

Priority 5: Increase resilience of flood risk management assets, to reduce the impacts of current and future flood risk

Priority 6: Improve effectiveness of our key products and services, including our digital services, to provide improved services to the public.

Priority 7: Continuously improve our understanding and communication of current and future flood risk (including climate change) so that decisions are based upon the best available evidence and information.

Priority 8: Provide an effective and sustained response to flood events, working in collaboration with Risk Management Authorities and Professional Partners where required.

Priority 9: Continually improve our flood warning service to enable people to take effective action in response to flooding.

Priority 10: Provide effective planning advice on flood risks and consequences to reduce inappropriate development in areas at risk of flooding.

Priority 11: Prioritise our work on a risk basis in alignment with Welsh Government's National FCERM Strategy and develop our evidence base to secure future investment in flood risk management.

Priority 12: Promote, support and implement nature-based solutions where appropriate to reduce the risk and impacts of flooding and to deliver wider ecosystem benefits.

Priority 13: Undertake our strategic oversight role to understand all sources of flood risk on a national basis to inform investment and optimise how we plan work including with other partners.

Priority 14: Ensure we have an FCERM workforce with the appropriate capabilities and skills required to meet our priorities and respond to future challenges.

The FRMP National Overview section provides further information on the level of risk, including what NRW have planned for the communities with the greatest flood risks. By taking an all-Wales approach to the FRMP, NRW can ensure that they prioritise directing efforts to where is at greatest risk of flooding. This is possible through the use of the Wales wide Communities at Risk Register (CaRR) that considers a number of factors to identify the locations (communities) at greatest risk of flooding. Cardigan is identified by the CaRR as a community at risk of flooding.

Mid Wales Place

The second section of the NRW Flood Risk Management Plan is split according to NRW Operational areas, also known as NRW Places. Cardigan is located within the Mid Wales Place. The Mid Wales Place section of the FRMP (5) provides information about the level of risk at a

local scale and describes what is planned for the communities that NRW are most concerned about. The FRMP identifies Cardigan as one of the five communities in Mid Wales Place that are projected to experience the biggest change in danger from the risk of flooding from the sea by 2120.

Measure M8 of the Delivery Plan for the Mid Wales Place is 'Design and construction of flood alleviation scheme' for Cardigan, to be delivered in the short term. This links to FRMP Priority 1.

Overall, the Scheme is in accordance with and is part of delivering the NRW Flood Risk Management Plan.

2.1.3 West of Wales Shoreline Management Plan 2

Shoreline Management Plans (SMPs) set out a shared strategic approach for managing the coastline from coastal flooding and erosion risks. Their aim is to reduce the risks to people, the developed, historic and natural environments over the next century. SMPs are not statutory documents, but the Welsh Government want to see them considered both in local decision-making and strategic planning.

Cardigan is on the shoreline covered by the West of Wales Shoreline Management Plan 2 (SMP2) (6). SMP2 divides the coastline into Policy Development Zones (PDZs), within are further split into small sections called policy units. SMP2 describes how these sections will be managed over the:

- short-term (2005-2025)
- medium-term (2025-2055)
- long-term (2055-2105).

There are four approaches that can be applied to each policy unit, for each period of time, based on coastal characteristics, flood risk, and socio-environmental priorities:

- **Hold the line (HTL)** by maintaining or changing the existing standard of protection
- **Advance the line (ATL)** by building new defences on the seaward side of the original defences (although none applied in Wales)
- **Managed realignment (MR)** which allows the shoreline to move backwards and forwards, with management to control or limit the movement
- **No active intervention (NAI)** where there is no investment in coastal defences and natural processes are allowed to continue to create an evolving coastline

Cardigan is within PDZ 5 and the Strand area of Cardigan on the north bank of the River Teifi (Afon Teifi) is within Policy Unit 5.11, Cardigan North. The SMP2 policy for Policy Unit 5.11 is Hold the line in the short, medium and long term. SMP2 includes a preferred policy to implement the plan for PDZ 5, which includes 'Maintain and improve defence to north and south Cardigan' in the medium-term.

The Scheme is in accordance with SMP2 policy to Hold the line for Policy Unit 5.11, but the design does require installing a new flood defence on seawards side of the existing sea wall in some areas: the need for this is set out in Chapter 1: Introduction. When considering compliance

with a Hold the line policy, section 5.7.8 of the Shoreline Management Plans: Supplementary guidance for their ongoing maintenance and delivery – Wales (NRW, 2021) states:

"The definitions set out in the 2006 Guidance (volume 1, section 2.3) clearly state that use of the Advance the Line policy should be 'limited to those policy units where significant land reclamation is considered'. This descriptor should not be used for areas where there are already defences but works might encroach seaward to enable the same assets to be protected. This is also covered by the 2006 Guidance, which further states that a Hold the Line policy covers 'those situations where work or operations are carried out in front of the existing defences …. to improve or maintain the Standard of Protection provided by the existing defence line'."

One of the examples given in the Supplementary Guidance of Hold the Line (Maintain / Replace) is "*Rebuilding with a new line of sheet piling in front of the existing toe to sustain that existing defence line*". The Scheme accords with this example and is therefore considered to be compliant with the Hold the line policy.

2.1.4 Surface water and foul water flood risk

As well as tidal flood risk, Cardigan is affected by surface water, foul water, and fluvial sources of flood risk. A flood event in 2014 was attributed to surface water as it occurred during low tide.

Previously some flooding in the Strand area was caused by surface water and sewer network capacity issues. Recent investment by Dŵr Cymru Welsh Water (DCWW) in the area has delivered a foul water scheme that includes a new pumping station to re-direct water away from the area, particularly at high tide, and an upgraded outfall structure on Strand. NRW worked closely with DCWW to ensure that their outfall structure could be incorporated into a tidal flood defence scheme.

2.1.5 Environment Act (Wales) 2016

The Environment Act (Wales) 2016 sets out the requirement for the 'sustainable management of natural resources' together with new ways to achieve this. It outlines 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.

The Act provides an iterative framework that ensures that sustainability is at the core of decision making. NRW is required to deliver environmental enhancements through Section 4 (Sustainable Management of Natural Resources) and Section 6 (Biodiversity Duty) of the Act.

Mid Wales Area Statement

As part of the delivery framework for the sustainable management of natural resources established by the Environment (Wales) Act, NRW has developed area statements which outline the key challenges facing that particular locality, what can be done to meet those challenges, and how natural resources can be managed for the benefit of future generations.

The Mid Wales Area Statement covers the following themes:

- Improving biodiversity - responding to the nature emergency

- Sustainable land, water and air
- Reconnecting people and places - improving health, well-being and the economy
- Forest resources - managing timber resources effectively
- Climate emergency – adaptation and mitigation across four themes

Of particular relevance to the development of the Scheme are improving biodiversity, reconnecting people and places, and climate emergency.

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

NRW is required to deliver enhancements/benefits under the Well-being of Future Generations Act.

NRWs well-being objectives are to:

- Champion the Welsh environment and the sustainable management of Wales' natural resources
- Ensure land and water in Wales is managed sustainably and in an integrated way
- Improve the resilience and quality of our ecosystems
- Reduce the risk to people and communities from environmental hazards such as flooding and pollution
- Help people live healthier and more fulfilled lives
- Promote successful and responsible business, using natural resources without damaging them
- Develop NRW into an excellent organisation, delivering first-class customer service.

The Scheme seeks to achieve these objectives wherever possible.

2.1.7 Nature conservation legislation

European sites

The Conservation of Habitats and Species Regulations 2017 (as amended), commonly referred to as the Habitats Regulations, provide for the designation and protection of 'European sites', i.e. Special Protection Areas (SPA) and Special Areas of Conservation (SAC), the protection of European protected species, and the adaption of planning and other controls for the protection of European Sites.

Planning and other consents can only be given if there will be no negative effects on the integrity of any European Site (unless there are reasons of over-riding public interest).

The Cardigan Tidal Flood Risk Management Scheme (TFRMS) is located on the north shore of the tidal section of the Afon Teifi / River Teifi SAC. The Afon Teifi is designated for certain fish species, otter, and certain types of freshwater vegetation. This designation has influenced the

Scheme options development, and the Scheme has been designed to avoid having a negative effect on the integrity of the SAC.

A Habitats Regulations Assessment (HRA) has been carried out in accordance with the Habitats Regulations (7). The HRA report details the potential effects to the qualifying features of the SAC that may be affected by the Scheme and required mitigation measures. It concludes that the Scheme is not expected to negatively affect the integrity of the SAC either alone or in-combination with other plans or projects.

Nationally Important Sites and Habitats of Principal Importance

The Afon Teifi is also designated as a Site of Special Scientific Interest (SSSI) under the Wildlife and Countryside Act 1980. It is of special interest for a range of river types and associated riverside habitats, otter, fish species, and a range of plant, invertebrate and bird species.

Existing habitats in front of the current river wall include intertidal mudflats and saltmarsh, which are defined as Habitats of Principle Importance (HPI) under Section 7 of the Environment (Wales) Act 2016.

Under Planning Policy Wales 12, there is a presumption against development in a SSSI which is not necessary for the management of the site. Approval for development in or affecting a SSSI should only be given where the development is considered to be appropriate, is not likely to damage a SSSI, and where there is agreement for mitigation and enhancement as part of a development.

Under the Stepwise approach set out in Planning Policy Wales 12, developments should maintain the largest possible area of existing habitat supporting biodiversity and functioning ecosystems, particularly HPI.

Section 6 of Part 1 of the Environment (Wales) Act 2016 (Biodiversity and resilience of ecosystems duty) requires that public authorities must seek to maintain and enhance biodiversity so far as consist with the proper exercise of their functions and in so doing promote the resilience of ecosystems.

These designations and associated planning policy and legislation have influenced the Scheme options and design development, and the Scheme has been designed to avoid having a negative effect on the SSSI and to maintain the area of intertidal habitat.

2.1.8 Historic environment legislation

Cardigan contains a rich concentration of heritage assets, reflecting Cardigan's long and complex history, these include three Scheduled Monuments (Cardigan Bridge, Cardigan Castle and Cardigan Town Walls), listed buildings and the Grade II registered historic park and garden at Cardigan Castle. The Cardigan Conservation Area covers much of the core of the town and is a highly valued historic townscape recognised for its medieval origins, Georgian and Victorian architecture, riverside setting and strong cultural associations.

The Historic Environment (Wales) Act 2023 provides a legal framework for the management and protection of the historic environment in Wales, including Scheduled Monuments, listed buildings and conservation areas.

These designations and legislative requirements have influenced the Scheme design, with the Scheme being designed to avoid direct impacts with any Scheduled Monuments or listed buildings such that specific consents for works affecting these are not required. For further details on the effects of the Scheme on the historic environment see Chapter 7: Historic Environment.

2.2 Design development and consideration of alternatives

2.2.1 Alternatives in EIA

In accordance with the Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017 (as amended) and the Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended), this section outlines the main alternatives which have been considered through the development of the Scheme, as required by Schedule 4, paragraph 2 and Part 3, paragraph 2 (iv) of the respective EIA Regulations:

> *"A description of the reasonable alternatives (for example in terms of development design, technology, location, size and scale) studied by the applicant or appellant which are relevant to the proposed development and its specific characteristics and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects."*[1]

This section therefore provides a transparent account of the decision-making process and demonstrates how environmental considerations have influenced the evolution of Scheme design. By outlining the key constraints and opportunities, this section illustrates how the Scheme has been shaped to align with the principles of sustainable development and regulatory compliance.

An options appraisal process was undertaken in two stages prior to the preferred solution being selected.

2.2.2 Long list appraisal

The flooding mechanism to be addressed by this Scheme is tidal. Dredging of the channel was discounted at an early stage, as it would make minimal difference, with the tide just bringing in extra water to reach the same flood height. Likewise upstream flood storage would have minimal impact on tidal flood level and was also discounted.

[1] This is taken from the Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017 (as amended), very similar wording is used in the Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended).

The 2021 Outline Business Case (OBC) report presented the following long list options considered at this preliminary stage:

- Walk Away – assumes no change to the current scenario with the ongoing risk of flowing.
- Do Minimum - There are currently no formal flood defences in the area. However, in the event of a tidal flood warning NRW will provide support for the community. The flood risk will continue to increase over time without formal defences in place.
- Do Something – Improved property resilience. Individual Property Flood Resilience (PFR) measures have been provided for 60 properties to improve resilience and to reduce the impact of flooding. However, the community has experienced flood depths in excess of 1.5m in recent years, which exceeds the effectiveness of property flood resilience measures.
- Do Something - New defences. New raised defences consisting of walls along both banks of the Teifi and the Lower Mwldan, to include floodgates at slipway access routes.

Following this preliminary stage, the Do Nothing/Do Minimum and Property Flood Resilience options were rejected due to the increasing flood frequency in Cardigan, posing a risk to life. Further consideration was not given to the PFR scenario as whilst it would offer improved resilience to some properties, it would not reduce the risk of life or injury resulting from flooding or reduce the disruption caused by flooding. Therefore, the preferred option of 'do something, new defences' was carried forward.

2.2.3 Short list appraisal

Following the selection of the preferred long list option, short list options of new linear defences were considered within the Options Appraisal Report (Short-list) (8). Binnies UK Ltd (BUK) developed and appraised three linear defence (short-list) options:

1. Flood wall that is offset to the Afon Teifi – This option offers the advantage of preserving existing heritage aspects by creating sufficient space for defence construction without excavation. It involves backfilling behind the proposed wall and burying the existing revetment and wall. However, this option presents environmental risks due to encroachment on the Afon Teifi Site of Specific Scientific Interest (SSSI) and Special Area of Conservation (SAC).

2. New flood wall following the alignment of the existing riverbank/wall (where possible) – This solution aims to balance impacts by maintaining the alignment with the river (i.e. minimising encroachment into the designated site), preserving heritage aspects, and avoiding negative impacts on adjacent properties.

3. Managed realignment – This option involves a setback wall, providing additional space for water, environmental enhancements and habitat creation opportunities. However, it includes the demolition of some properties to implement the scheme.

The option designs presented split the Scheme into four areas (Areas 1, 2, 3 and 4), with Area 1 at the downstream end of the Scheme next to Cardigan Bridge and Area 4 at the upstream end of the Scheme at Gloster Row car park.

A multi-criteria analysis was undertaken to identify the preferred option alignment. This concluded that Option 2 – provide a flood defence wall along the general alignment of the existing river wall – was the preferred alignment. The reasons for its selection are:

- It minimises incursion upon the Afon Teifi and therefore has reduced effects on the Afon Teifi SSSI and SAC and associated in-river habitats
- It comprises minimum land take, thereby minimising the potential disruption to buried archaeology or historical artefacts
- It achieves the required flood risk mitigation objective
- It presents opportunities to provide environmental enhancements, including developing vertical habitats and habitats on the landward side of the defence.

A public consultation event and feedback period followed the development of the short list options, see section 2.3.1 for details. Feedback from this, where there was a desire by the public to include public realm enhancements, has been incorporated into the design taken forward as combining elements from Option 1 into Option 2.

2.2.4 Design development

Since the identification of the shortlisted option further design development has continued to identify the most effective design to be taken forward for planning. The following environmental, construction and other infrastructural constraints have influenced this design.

Alignment of the flood defence

During the design development process, consideration was given to the alignment of the flood defences to limit associated intertidal habitat losses along the banks of the Afon Teifi. The final alignment selection (Plate 2-1) was informed by habitat loss calculations which calculated the total existing habitat and estimated losses associated with the design. This data was used to inform the total area of mitigatory habitat which would be required to account for losses associated with the design.

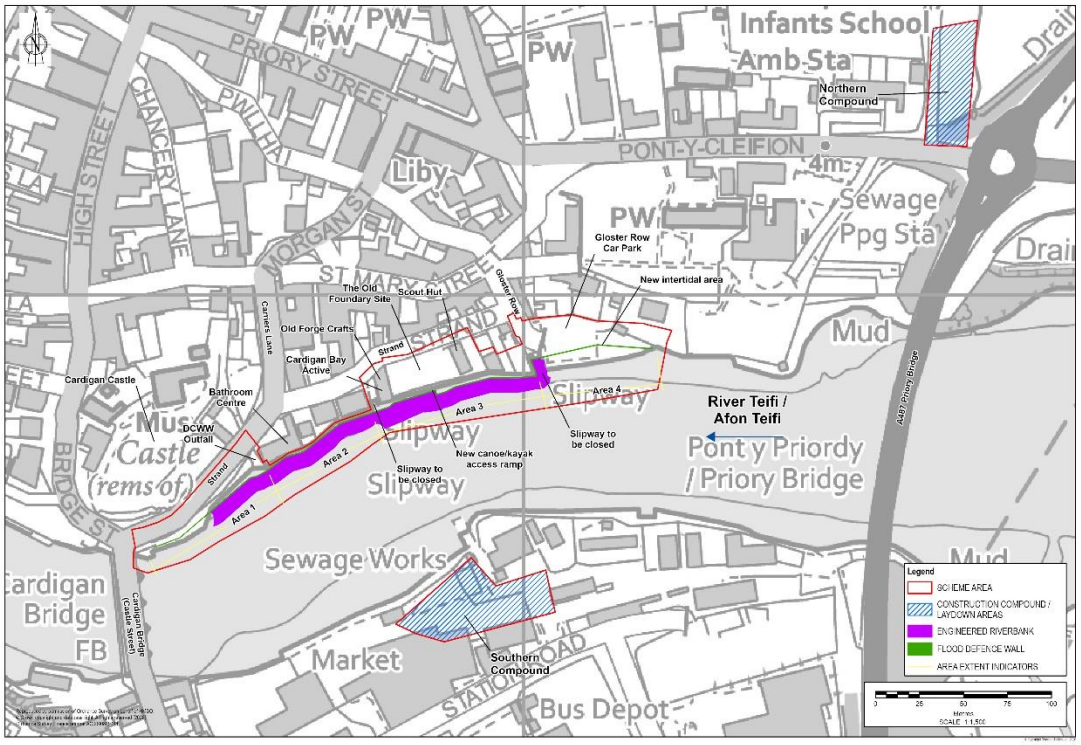

Plate 2-1 – Scheme Layout

Within Area 3 there is a small area of open land at the Old Foundry Site and thereby an opportunity to set back the defence reducing loss of intertidal habitat. It was considered that the construction risk, loss of amenity land for the Sea Scouts, and cost associated with this option outweighed the minimal habitat benefits. Therefore, it was decided that the piles would be installed on the riverwards side of the existing wall, with the offset between the existing wall and new piles as small as possible.

As a consequence of changing the alignment of the flood defence wall in Area 3 the alignment of the flood defence wall in Area 4 was set back to establish an area of intertidal habitat. The alignment of the flood defence wall in Area 4 was constrained by the presence of a Dwr Cymru Welsh Water (DCWW) rising main. To avoid any potential interactions with this utility service, while ensuring the flood defence wall was set back sufficiently to mitigate for the loss of intertidal habitat along the rest of the Scheme, the alignment of the flood defence wall in Area 4 was altered such that it would bisect the Gloster Row car park leading to a reduction in space for car parking.

These changes to alignment ensure that the total area of intertidal habitat permanently lost from the footprint of the flood defence wall in Area 3 are mitigated for through the setting back of the flood defence wall in Area 4. For further discussion on the effects of the Scheme on intertidal habitats see Chapter 6: Biodiversity and Nature Conservation.

Engineered riverbank finish

The introduction of an engineered riverbank in front of the sheet-piled flood defence was included to help support the reduction of the overall length of sheet piles required, thereby minimising construction impacts such as reduction in the scale of heavy plant use and disturbance to bedrock and less disturbance of properties on the dry side of the wall. This approach also provided the opportunity to soften the appearance of the defence, providing a more natural frontage compared with the harsher aesthetic of an exposed hard-engineered cladded wall, thereby reducing the Scheme's overall visual impact, and allowing for the opportunity for a range of intertidal habitats to establish on the engineered riverbank.

As part of the design process, the alignment and finish of the engineered riverbank was considered to deliver a range of intertidal habitats, increase the likelihood of their success and reduce maintenance requirements. Harder engineered finishes such as concrete revetment blocks were discounted due to carbon cost and their limited value to biodiversity. Development of options for the engineered riverbank finish involved undertaking investigations into bioengineering solutions which identified and appraised three main options:

- rip rap or rocks rolls only
- rip rap or rock rolls with a seeded growing medium on upper sections and crest
- rip rap or rock rolls with planted coir matting on upper sections and crest.

When considering the design options, different tidal events were considered to determine the frequency with which the amount of the engineered riverbank would be under water and therefore how quickly the new riverbank would accrete sediment. Plate 2-2 indicates the Mean High Water Spring (MHWS) level whereby the riverbank at this level would be under water approximately every two weeks. Below the MHWS level the riverbank would be inundated by normal tidal conditions more regularly, with the toe being inundated daily. The Highest Astronomical Tide (HAT) level would be reached approximately twice a year.

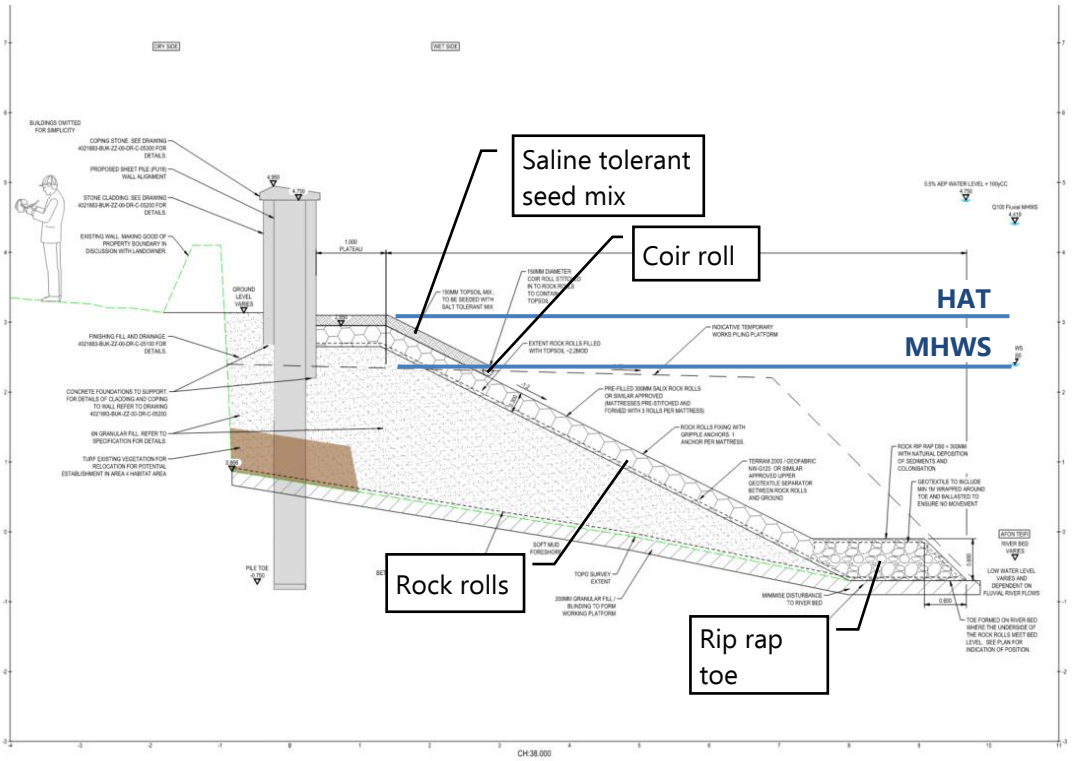

Plate 2-2 – Typical engineered riverbank section showing approximate level MHWS and HAT lines to indicate frequency of tidal inundation

The conclusion to this investigation was to use rock rolls on the lower slope of the new riverbank to approximately two thirds of the height (up to the MHWS level). The remaining upper third of the slope and crest of the new riverbank, which would be inundated by the tide very infrequently, would incorporate a saline tolerant seed mix and imported soil to promote a more natural finish. This would be placed over the rock rolls which would extend up the upper third of the slope and crest providing the required engineered scour protection to protect the new riverbank. To hold soil in a place while the seeded vegetation establishes on the upper slope a single line of coir rolls would be installed, this coir roll would not be planted. A rip rap toe using larger stones than used in the rock rolls is included to ensure the rock rolls remain in position.

As sea level rises in the future more of the engineered riverbank would be inundated by the tide more regularly. The slope of the new riverbank would allow for habitats established on it to migrate upwards as sea level rises, which would increase the length of the time that intertidal habitats are present than without the engineered riverbank.

The use of rock rolls would provide multiple small crevices into which sediment would naturally be deposited by the river, and from which the mud would be less likely to wash away than if a flat surface or larger rocks (i.e. rip rap) were used. This would enable intertidal habitats to remain present, although the type of intertidal habitat would change from mudflats to a habitat of seaweeds and lichen on eulittoral rock and transitioning up the slope to include saltmarsh species. The change from a relatively flat shoreline to a engineered riverbank with gradient of 1V in 2H allows for the progression of intertidal habitats up the new riverbank as sea level rises in the future. This allows for intertidal habitats to be present for longer. For further discussion

on the effects of the Scheme on intertidal habitats see Chapter 6: Biodiversity and Nature Conservation.

Planted coir matting was not favoured due to concerns that the matting would be pulled away during flooding events causing damage to the scour protection beneath, leading to increased maintenance requirements.

While it was considered that over time the entirety of the new riverbank would accrete with sediment from the river and naturally colonise, due to the infrequency with which the upper third of the new riverbank and crest would be covered with water it was considered that a seeded growing medium would provide the opportunity for the new riverbank to vegetate more quickly than the use of rip rap or rock rolls only.

It was also considered whether additional items could be incorporated into the engineered riverbank finish (e.g. living boulders) which would generate some additional benefits, without the difficulties encountered by the alternative options presented. However, it was considered that these options would not make a material difference to the establishment of intertidal habitats on the engineered riverbank.

To provide greater assurance of the success of the engineered riverbank finish a review of other similar projects was undertaken. One example of a similar scenario was the Environment Agency project Railway Lane Lewes, which used prefilled rock roll mattresses produced by Salix. The use of bio-engineered rock mattresses here (see Plate 2-3), demonstrates the successful slope stabilisation in a high energy tidal environment. The design captures accreting sediment, enabling vegetation to grow on the slope. This example shows how erosion control and long-term habitat enhancements, can both be achieved.

Plate 2-3 – Rock roll mattresses at Railway Lane, Lewes showing development of intertidal habitat over time (images courtesy of Salix)

For further details of the design of the engineered riverbank taken forwards see Chapter 3: Project Description.

Landscape design

Public realm enhancements are proposed in Area 1 along Strand, between Cardigan Bridge and the Bathroom Centre, aimed at improving the experience of pedestrians and bus stop users, benefitting wildlife, and responding to the historic location of the site.

Two options for this public realm enhancement were initially developed:

- Option 1 – included for an alignment of the flood defence wall closer to the river to allow for a wider pavement, tree planting along Strand and a planting area for biodiversity on the wet side of the defences which would be inaccessible to the public.

- Option 2 – included for an alignment of the flood defence wall closer to Strand to allow for a wider planting area for biodiversity on the wet side of the defences compared to Option 1 but a narrower pavement and less tree planting.

Public consultation for these options was undertaken by NRW in June 2025. This indicated that residents were in favour of a widened pavement and addition of trees and planting to create a 'greener' environment, as well as use of natural stone including slate to tie the area into its surroundings. Several respondents who are parents or carers noted that the existing pavement is too narrow. Option 1 was therefore taken forward and the design for this was developed further. Following consultation with Cadw and Ceredigion County Council, street trees in front of the defensive part of Cardigan Castle which were present in Option 1 were removed, in order to maintain visibility of and significant views from this Scheduled Monument. For further details of the design of the public realm enhancements see Chapter 3: Project Description and Area 1 Landscape Planning drawings (4021883-BUK-ZZ-00-DR-L-01002 and 4021883-BUK-ZZ-00-DR-L-01522).

The changes to the street scene in Area 1 have identified the need to relocate lighting columns which would otherwise be located within the middle of the new wider pavement. It is proposed to relocate the lighting columns towards the river and adjacent to the new flood defence wall. A lighting design would be developed to ensure that sufficient light is provided for road traffic and pedestrian safety and would include for a change in light fixtures which are more suitable for bat species foraging in this area.

The flood defence wall throughout the Scheme would be clad with stone to reflect the existing river side walls and complement the Cardigan Bridge and Cardigan Castle. To minimise impact due to the height of the flood defence wall the coping stone is incorporated into the flood defence level and is therefore of precast concrete, as opposed to natural stone which would not provide a watertight connection to wall below.

2.2.5 Alternative options for compounds, construction access and other ancillary works

The temporary compound locations were selected based upon ease of access for construction traffic, proximity to the area of works, existing hard standing surface and distance from sensitive receptors.

There are two proposed temporary compound areas which would be used for plant/material storage and housing welfare units during construction works. The proposed Northern Compound would be located on the northern side of the Afon Teifi, just to the north of the Pont-y-Cleifion Road (SN 18239 46106). This compound area would be used as the main compound and laydown area for the works. This area has been proposed as it is close to the A487 turn off, which would allow access for large vehicles, and has previously been used as a construction compound for other infrastructure projects in Cardigan.

The proposed Southern Compound would be located on the southern side of the Afon Teifi (SN 17973 45829), within industrial land off Station Road. The use of the existing slipway to transport materials across the river was considered but was discounted as it was considered that construction from the north bank only would be simpler and safer.

The proposed access route to the construction site would follow Pont-y-Cleifion and down Morgan Street and Carrier's Lane to reach Strand. This route has been selected as it passes the Northern Compound and allows for transit towards a laydown area located in Area 1. Construction traffic exiting the site would continue across Cardigan Bridge (Castle Street) onto the B4546 before either turning onto Station Road for the Southern Compound or rejoining the A487. This route would avoid the need for construction traffic to traverse up the High Street through the town centre.

Alternatively, instead of entering the town centre via Pont-y-Cleifion, construction traffic bound for the Southern Compound can continue along the A487 before turning off on the B4546.

2.2.6 Carbon reduction during design process

To minimise embedded carbon and emissions associated with the production of construction materials and energy usage during construction, alternative designs and construction methodologies have been considered through the design development.

Carbon emissions have been assessed during the design of the Scheme with a carbon calculator. The highest carbon cost in terms of materials is expected from the sheet piles, concrete infill and rock rolls used to form the flood defence, with smaller carbon costs from granular fill and aggregates, stone facing and copings.

Decisions made during design development which have reduced the embedded carbon of the Scheme are:

- Aligning the flood defence wall as close to the existing river wall reduces the need for significant quantities of material to fill the gap between the existing river wall and the proposed flood defence wall.
- Reducing the length of sheet piles by supporting shorter piles with an engineered riverbank. Additionally, this would require smaller plant to install.
- Incorporating the engineered granular fill, used to construct the temporary construction haul route on the river side, into the engineered riverbank.
- By designing the flood defence to a design standard of 1 in 200 annual exceedance probability (AEP) with allowance for climate change with a design life of 100 years reduces the need for future upgrades or rebuilding.
- Trees and planting proposed as part of the Scheme would absorb some carbon.

During construction actions would be taken to reduce emissions from vehicles and plant, with all vehicles to be European Emissions Standard Euro VI compliant and plant to be Stage V compliant where feasible.

2.2.7 Mitigation and enhancements incorporated into the design

As the design of the Scheme has been developed the mitigation measures and enhancements have been incorporated. Environmental enhancements are discussed in detail within the Green Infrastructure Statement (9) and a full description of the Scheme included these embedded mitigation and enhancements is provided in Chapter 3: Project Description.

Embedded mitigation and enhancements incorporated into the Scheme design are:

- Enhanced public realm within Area 1, including widening of pavements and provision of tree planting
- Use of rock rolls for the scour protection for the new riverbank which would include a seeded growing medium on the upper third of the new riverbank allowing for the adaptation of intertidal habitats
- Setting back the flood defence wall in Area 4 and lowering existing ground levels to create an area for the establishment of intertidal habitats
- Use of suitable stone cladding for the finish of the flood defence wall
- Inclusion of a new boat ramp within Area 3 to enable canoe/kayak access to the water for the Sea Scouts and other permitted organisations.

2.3 Summary of consultation during design development

NRW has carried out consultation throughout the development of the Scheme. Consultations have aimed to provide an opportunity for key organisations and stakeholders, including landowners, members of the public and other interested parties to inform the design of the project, and to consider what they regard as key issues and priorities. In turn, consultation has allowed NRW to gain a clearer understanding of the main issues to be considered at an early stage.

This section summarises the consultation undertaken to date which has informed the Scheme design. Topic specific consultation which has taken place over the course of preparing this Environmental Statement are detailed in their respective chapters.

2.3.1 Public consultation

Through the course of the Scheme development NRW have sought to engage with the local community. Two public consultation events have taken place which have informed the Scheme design:

- A public consultation event took place on 23rd November 2022 at Cardigan Castle to present the options appraisal process and seek the views of the local community on their preferred option from the short-listed options. Information was also available to view online between 11th November and 22nd December 2022. Respondents generally preferred Option 1 due to the improved public realm features. This informed the design through the development of the public realm enhancement in Area 1.

- An online public consultation period between 3rd and 23rd June 2025 sought views from the public and other stakeholders on options for the public realm enhancements in Area 1. There was a general preference towards the provision of wider pavements for accessibility purposes and undertaking tree planting to provide amenity value and shade during warm weather. Additionally, Cadw voiced their preference to not plant trees in front of the main walls of Cardigan Castle as this would affect views of the castle. As detailed in section 2.2.4 (landscape design), these preferences have been incorporated into the Scheme design.

2.3.2 Habitats Regulations Assessment consultation with NRW

A consultation meeting was held on 19th October 2023 with terrestrial and marine fisheries specialists at NRW where the scope of the HRA and proposed mitigation requirements regarding disturbance to various migratory fish species were agreed.

The feedback received during this meeting was included in the production of the HRA (7), which accompanies this Environmental Statement.

2.3.3 Consultation with Ceredigion County Council and NRW

A consultation workshop with environmental, ecological geomorphological specialists at Ceredigion County Council and NRW took place on 18th November 2025. The purpose of this workshop was to present the Scheme design with a focus on how the design has been influenced by environmental conditions and a need to mitigate environmental impacts (see section 2.2.4 for details of this).

Attendants at the workshop had the opportunity to ask questions following a presentation by the project team. In general, attendees were supportive of the measures taken to mitigate the environmental impacts and deliver a Scheme which reduces flood risk to properties while minimising effects to the environment.

Following the workshop presentation slides and meeting minutes were issued to all attendees, no further follow up questions or responses were received.

2.3.4 Formal pre-application consultation

The Planning (Wales) Act 2015 places a requirement upon the developer to undertake a 28 day consultation before applying for planning permission for all Major developments, as defined by Article 2 of the Town and Country Planning (Development Management Procedure) (Wales) Order 2012 (as amended by the 2016 Order). Pre-application consultation for Cardigan TFRMS was undertaken from 7 April 2026 through to 18 May 2026. As part of this consultation process, notices were placed on site, and notice was served on relevant consultees, including all known affected landowners and occupiers.

The pre-application consultation submission included the Environmental Statement, Habitat Regulations Assessment, Design and Access Statement, Planning Statement, Green Infrastructure Statement, scaled plans and drawings as well as several other technical documents. These were made available to view online and at Cardigan Library.

Following completion of the 28 day consultation period a Pre-Application Consultation Report was prepared to document the responses received, issues raised and how these have affected the Scheme design and planning application. The Pre-Application Consultation Report will be submitted along with the other application documentation in support of the planning application.

2.4 References

APEM, 2025. *Cardigan Tidal Flood Risk Management Scheme - Habitats Regulation Assessment,* APEM Report P00016173: December 2025.

Binnies, 2024. *Options Appraisal Report (Short-list),* s.l.: s.n.

Binnies, 2026. *Cardigan Tidal Flood Risk Management Scheme: Green Infrastructure Statement,* s.l.: s.n.

Natural Resources Wales, 2023a. *Natural Resources Wales Flood Risk Management Plan: National Overview,* Available at: https://naturalresources.wales/evidence-and-data/research-and-reports/flooding-reports-evidence-and-data/flood-risk-management-plans/?lang=en.

Natural Resources Wales, 2023b. *Natural Resources Wales Flood Risk Management Plan: Mid Wales Place,* Available at: https://cdn.cyfoethnaturiol.cymru/3hwgt4vp/frmp-cycle-2-place-section-mid.pdf .

Welsh Government, 2020. *The National Strategy for Flood and Coastal Erosion Risk Management in Wales,* October 2020: WG40996.

West of Wales Coastal Group, 2012. *West of Wales Shoreline Management Plan 2: Cardigan Bay and Ynys Enlli to the Great Orme Coastal Groups.,* June 2012: Final.

3. Project Description

3.1 Introduction

The Cardigan Tidal Flood Risk Management Scheme (TFRMS), hereafter referred to as the 'Scheme', is located towards the centre of Cardigan town, Ceredigion, in west Wales. The nearest postcode is SA43 1EX. The Scheme is positioned along the right bank (northern bank) of the River Teifi (Afon Teifi), which flows east to west. The Scheme covers an approximate distance of 327m length of the right bank on the Afon Teifi, upstream of Cardigan Bridge, and is located to the south east of Cardigan Castle. The Scheme is divided into four areas (1-4). The location of the Scheme is shown on the Location Plan provided in Figure 1.1 and the extent of the Scheme Area and layout of the Scheme is shown on the Layout Plan provided in Figure 3.1 and reproduced in Plate 3-2.

The permanent works are bound to the west by Castle Street (SN 177 458) and to the east by Gloster Row car park (SN 180 459) to the east as seen in Plate 3-1.

Plate 3-1 – Western extent of the Scheme (left) and Eastern extent of the Scheme (right)

Existing infrastructure in the area includes the current flood defences, residential and commercial buildings along the northern riverbank, Gloster Row car park and the existing slipway/river access point at Gloster Row car park. Strand and Castle Street are roads located within the Scheme Area which provide access for local traffic to the town centre. Strand is a one-way road constrained by Cardigan Castle Scheduled Monument and the Afon Teifi. Perpendicular to Strand is Castle Street / Cardigan Bridge which is a narrow two-way road crossing the Afon Teifi.

The purpose of this Project Description Chapter is to outline the proposed elements of the Scheme, construction methodology and operational requirements. Chapter 1: Introduction and Chapter 2: Project Development provide detailed descriptions of the Scheme background, including alternatives which have been considered for the Scheme throughout the design process.

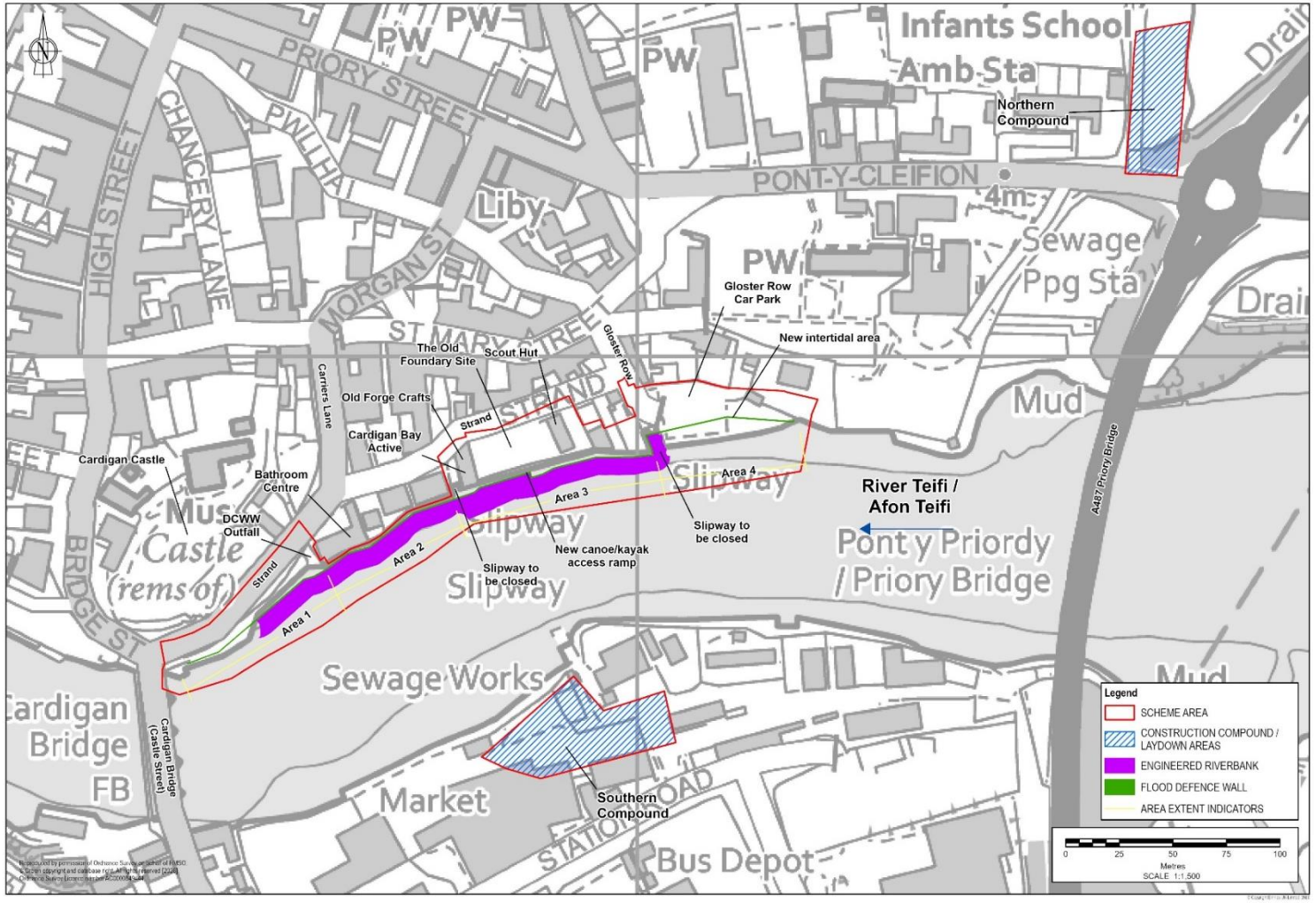

Plate 3-2 – Scheme Layout

3.2 Proposed development

3.2.1 Scheme overview

The Scheme would comprise a continuous flood defence structure designed to fit within the various constraints along the Afon Teifi frontage between Cardigan Bridge (Castle Street) and Gloster Row car park. The flood defences need to achieve a consistent level of 4.95mAOD to provide the scheme design standard of 1 in 200 annual exceedance probability (AEP) with allowance for climate change, which would make the structures up to approximately 2m tall above general ground level (though lower in some sections). The Scheme would have a design life of 100 years.

The proposed flood defence would be composed of sheet piles, with a reinforced concrete wall for a section in Area 1. The sheet piles would be supported on the riverside by an engineered riverbank. Within the central area there is a proposed boat ramp to enable canoe/kayak access to the water for the Sea Scouts and other permitted organisations. The existing slipway/river access points at (SN179459) and Gloster Row car park would be removed. Towards Cardigan Bridge (Castle Street) there would be further improvements to the street scene.

The Scheme has been split into Areas 1, 2, 3 and 4. The construction of the flood defence wall in Areas 1-3 would lead to the permanent loss of approximately 489m^2 of intertidal habitat as the wall must encroach into the river channel to avoid existing buildings. This would be mitigated through the setting back of flood defences in Area 4 to create an equal area for the establishment of intertidal habitats. The construction of the new riverbank would lead to an adaptation of approximately 1,946m^2 of existing habitats.

The Scheme elements associated with each area are outlined within the following sections.

3.2.2 Area 1

Area 1 is located on the north bank of the Afon Teifi and is immediately upstream of Cardigan Bridge, and adjacent to Strand. This is a walled-off roadside area extending between the bridge and an existing bathroom centre showroom (see Plate 3-3).

Plate 3-3 – Aerial images of Area 1

Existing structures within Area 1 include a Welsh Water (DCWW) (The Mart SPS) discharge chamber at the east end, adjacent the bathroom centre, masonry walls and access steps, roadside and plateau area.

The Scheme elements within Area 1 would include a new flood defence wall section which would be on average approximately 1.4m in height relative to the existing ground level on the dry side of the wall and 76m in length. The alignment of this would start from approximately 10m east of the bridge parapet where the wall would be approximately 1.1m high, continuing between the existing roadside wall and the river side wall. Where the existing river side wall curves inland the proposed flood wall would cross to the river side and continue through to the river side of the existing bathroom centre retaining wall where the wall will have risen to approximately 2m high.

The first 34m of flood defence wall east of the bridge parapet, between the existing roadside wall and the river side wall, would comprise a reinforced concrete wall and foundation. The flood defence wall would be clad with stone (approximately 150mm on each side).

The remaining 42m of flood defence wall in Area 1 would be formed out of steel sheet piles (approximately 5.5m long) sunk into the riverbed by approximately 0.55m. The flood defence wall would be capped and clad with stone (approximately 150mm on each side) and would be in keeping with the materials used within the nearby Cardigan Bridge Scheduled Monument.

To support the 42m long sheet pile wall an engineered riverbank would be constructed on the riverside of the proposed flood defence wall within Area 1.

The engineered riverbank has been designed to achieve a consistent profile, helping to reduce sheet pile requirements along the Scheme. The engineered riverbank also provides the opportunity for a range of intertidal habitats to establish on the banks. Further detail of the design development and reasoning is described in Chapter 2: Project Development. As illustrated in Plate 3-4, the riverbank across the majority of the Scheme is a uniform profile with a 1m wide crest at a height of approximately 2.95mAOD and a gradient of 1V in 2H down to the riverbed with a rip rap toe, extending approximately 10m into the estuary.

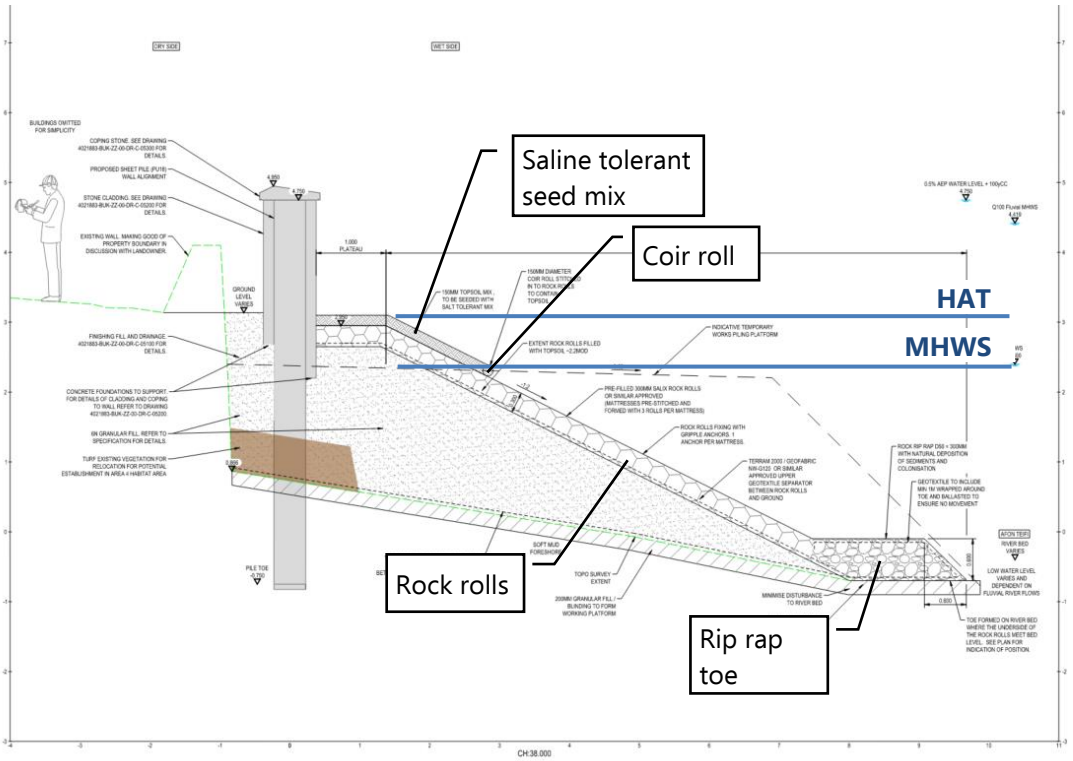

Plate 3-4 – Typical engineered riverbank section

The existing riverbank wall would be removed or buried to enable the construction of the new flood defence. The new engineered riverbank would involve the use of granular fill, a permeable geo-textile membrane and rip rap (large durable stones to prevent erosion and scouring) at the bottom of the engineered riverbank slope. Rock rolls (to prevent erosion and scouring) would be placed on the lower slope to approximately two thirds of the height, this section of the new riverbank would be regularly inundated by the tide and accrete with sediment with intertidal habitats establishing over time. The remaining upper third of the slope and crest of the engineered riverbank would incorporate a seed mix and imported soil to promote a more natural finish as this section of the new riverbank would be inundated by the tide infrequently. This seeded soil would be placed over the rock rolls which would extend up the upper third of the slope and crest providing the required engineered scour protection to protect the new riverbank. As vegetation develops on the rock rolls this would further enhance the scour protection. To hold soil in a place while the seeded vegetation establishes on the upper slope a single line of coir rolls would be installed, this coir roll would not be planted.

Public realm enhancements

The space landside of the flood defence wall would be backfilled and would provide a new public amenity area. The pavement along Strand would be widened by removing the existing roadside wall and from setting the flood defence wall away from the road. The new footway would be at least 3m wide and finished in riven slate to reduce slip risk and visually link Strand with Prince Charles Quay and the Cardigan Castle entrance. The slate surface would continue to the Strand–Cardigan Bridge junction.

A linear planting bed would be created alongside the road to separate pedestrians from traffic, this would be planted with small shrub and herbaceous species and street trees. A raised planting bed would also be created near the Bathroom Centre planted with taller species. The retaining wall containing the raised planting bed is parallel to Cardigan Castle walls and incorporates integrated seating facing the castle. Three seats are proposed with a combination of backrests, armrests and at different seat heights to facilitate use by users with differing accessibility needs.

A small plateau would remain on the riverward side of the proposed flood defence wall. This would be inaccessible to the public but visible from Strand. This would be seeded with the same salt tolerant seed mix as used on the upper section of the engineered riverbank. A gate and steps to allow maintenance access to the plateau would be installed between the western end of the flood defence wall and the existing wall to the west of the Scheme.

For further details of the design of the public realm enhancements see Area 1 Landscape Planning drawings (4021883-BUK-ZZ-00-DR-L-01002 and 4021883-BUK-ZZ-00-DR-L-01522).

3.2.3 Area 2

Area 2 extends east along the riverside from the bathroom centre showroom to the east end of the Bathroom Centre warehouse. A number of commercial units are located directly north of Area 2 which are directly adjacent to Strand.

Within Area 2, existing structures include masonry river walls retaining the raised ground in which the bathroom centre showroom, offices and warehouse are located (see Plate 3-5).

Plate 3-5 – Aerial images of Area 2

The Scheme elements within Area 2 would include a new section of flood defence wall which continues from Area 1. This would be approximately 1.6m in height relative to the existing ground level on the dry side of the wall and approximately 70m in length. This would be offset from the riverside of the existing wall. The proposed flood defence wall would be capped and the exposed faces would be stone clad (approximately 150mm on each side). The space behind the flood defence wall would be backfilled, burying the existing wall, and would provide an access corridor (approximately 0.5-1.66m wide) to enable future access to the neighbouring commercial properties.

The flood defence wall would be formed out of steel sheet piles (approximately 5.5m long) sunk into the riverbed by approximately 0.55m. The lower 3m of the sheet pile above the riverbed would be supported and buried by a new engineered riverbank section (extending approximately 10m into the estuary at a gradient of 1V in 2H) and the rip rap toe extending a further 2-3m, however these figures are subject to vary depending on riverbed levels, which would replace the existing riverbed profile. The new riverbank would involve the use of granular fill, a permeable geo-textile membrane and rip rap at the toe of the engineered riverbank slope. Rock rolls would be placed on the lower slope to approximately two thirds of the height. The remaining upper third of the slope and crest of the engineered riverbank would incorporate a seed mix and growing medium to promote a more natural finish, and an engineered scour protection to protect the engineered riverbank.

3.2.4 Area 3

Area 3 is located between the slipway adjacent to the Sea Scouts boat house and the slipway at Gloster Row car park. This area spans the Old Forge Crafts, Cardigan Bay Active, Scout field/ the old foundry site, the Scout hut, Teifi House, garage/office building, and the Gloster Row slipway, which are all located along Strand (see **Plate 3-**).

Plate 3-6 – Aerial images of Area 3

Similar to Area 2, there is a masonry river wall retaining the ground which includes the properties above. The Scheme elements within Area 3 would include a new section of flood defence wall which continues from Area 2, approximately 106m long and varying between approximately 1.7-1.9m high relative to the existing ground level on the dry side of the wall. The flood defence wall would be formed out of steel sheet piles (approximately 5.5-12.5m long) sunk into the riverbed by approximately 0.55-7.5m. The lower 3m of the sheet pile above the riverbed would be supported and buried by a new engineered riverbank section (extending approximately 10-13m into the estuary at a gradient of 1V in 2H) which would replace the existing riverbed profile. The new riverbank would involve the use of granular fill, a permeable geo-textile membrane and rip rap at the toe of the engineered riverbank slope. Rock rolls would be placed on the lower slope to approximately two thirds of the height. The remaining upper third of the slope and crest of the engineered riverbank would incorporate a seed mix and growing medium to promote a more natural finish, and an engineered scour protection to protect the engineered riverbank. The engineered riverbank would tie into the regraded ground at the existing Gloster Row car park where the defence is set back inland from the water's edge.

The alignment of the wall would be offset towards the riverside of the existing walls to minimise damage to existing structures in the area. This may temporarily affect the existing Scout hut.

Further east there is a structure that overhangs the existing river wall which is understood not to have proper planning permission, and a planning enforcement notice has not been issued for the removal this structure. The potential demolition and associated dust management mitigation measures for this structure are outlined within Chapter 5: Population and Human Health. Towards the Gloster Row slipway Teifi house is further set back from the defence works.

Due to the alignment of the proposed flood defence wall, the existing slipway used by the Sea Scouts and other permitted organisations would need to be closed. To ensure that access to the Afon Teifi would be retained for these groups, the Scheme would provide a new up and over canoe/kayak access ramp to the south of the Old Foundry site.

3.2.5 Area 4

Area 4 extends between the Gloster Row slipway and the property boundary wall at the eastern end of the Gloster Row car park. Area 4 includes the car park and a small area of grassland to the east of the car park (see Plate 3-7).

Plate 3-7 – Aerial images of Area 4

Existing structures within Area 4 include a two-level gabion wall retaining ground at Gloster Row car park, the Gloster Row slipway and the existing DCWW pumping station (Cardigan No. 2) infrastructure.

The Scheme elements within Area 4 would include a new set back flood defence wall section (approximately 1.3m high and 75m in length). The wall would be formed out of steel sheet piles (between approximately 5.5m and 13m long) sunk into the riverbed by between 0.55m and 7.95m. Exposed faces of the flood defence wall would be clad with stone (approximately 150mm on each side). The existing public slipway at Gloster Row car park would also be permanently closed, however it is understood that this is not regularly used and is not required for emergency services to access the river.

It is necessary to set this section back to mitigate the loss of intertidal habitat within Areas 1-3. To facilitate the establishment of intertidal habitat the existing upper gabion wall would be removed and the ground levels lowered to levels suitable for regular tidal inundation with swales, shallow ditches and low mounds incorporated to further enhance habitat diversity. This lowered area would include scour protection to ensure that it continues to provide support to the piles. The lower gabion wall would be retained with existing habitat that has formed on them. See Plate 3-8 for a cross sectional view of this set back area and Plate 3-9 for locations of the upper and lower gabion walls in Area 4.

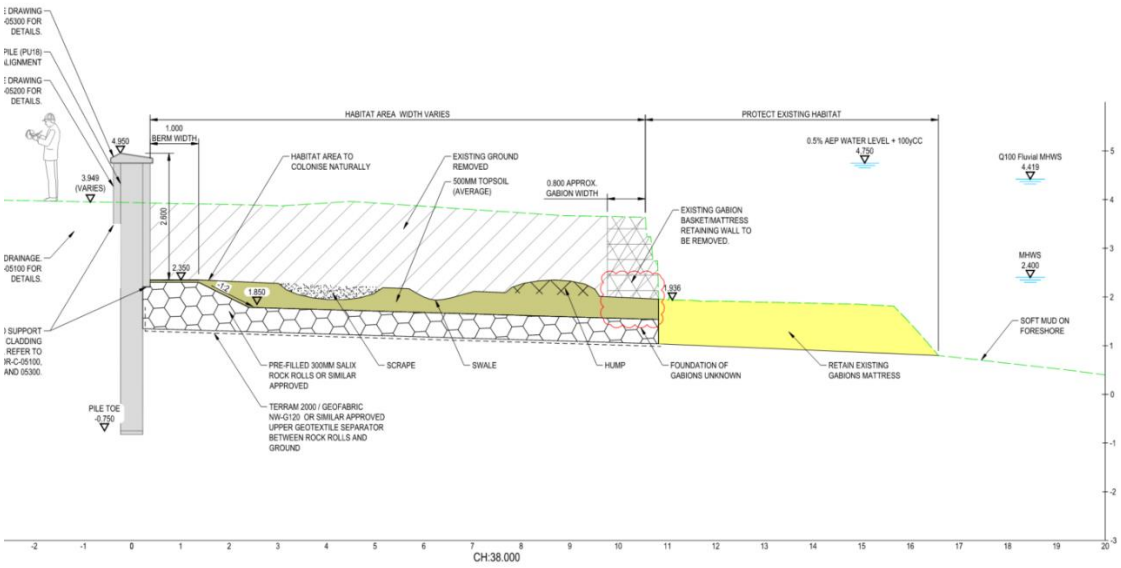

Plate 3-8 – Cross section view of area set back for intertidal habitat creation in Area 4

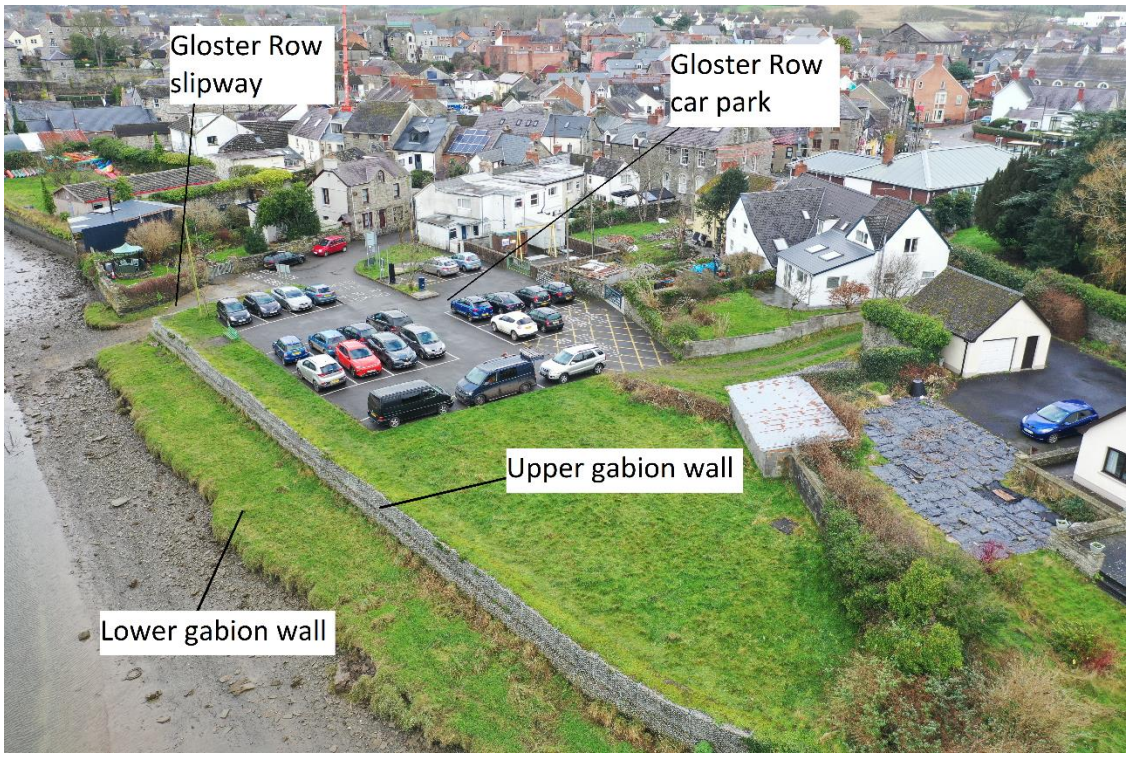

Plate 3-9 Location of upper and lower gabion walls in Area 4

A portion of the Gloster Row car park would be lost through the setting back of defences. The remaining car park area has been redesigned to reduce the number of car parking spaces lost to a minimum. The car park currently consists of 22 spaces and one disabled space, this would reduce to 14 spaces and one disabled space, a loss of 8 car parking spaces.

It is anticipated that setting back the proposed flood defence wall would allow for the creation of approximately 489m^2 of new intertidal habitat within Area 4, mitigating for the losses within Areas 1-3 where the wall alignment encroaches out into the estuary.

3.3 Construction programme and working hours

It is expected that the proposed construction works would start in early 2027, once all approvals have been attained, and take approximately 18 months to complete. Construction durations are estimates and are dependent on the appointed contractor and their detailed construction method statement.

The proposed construction working hours would be governed by Ceredigion County Council (CCC) and are typically expected to be limited to daytime on weekdays between 0730 and 1800 during the summer and 0800 and 1630 during winter months due to decreased daylight hours. If weekend working is permitted, this would likely take place on Saturdays between 0730 and 1300. Activities within the compounds may continue outside of the main construction activity hours. Riverside works would have to take place during suitable tide conditions for the specific task and so may need to be programmed for outside of normal working hours. No piling would take place outside of normal working hours. Out of hours works, if required, would be agreed in advance with the Local Authority Environmental Health Officer.

A summary of the main works components in consecutive order and their approximate durations is detailed within Table 3-1. Construction activities would overlap, for example completion of sheet pile installation in one area would be followed by concrete pours and stonework cladding while sheet pile installation continues in subsequent areas. It is anticipated that the flood defence/new riverbank works would begin within Area 4, working back towards Area 1 to allow for access along the haul route throughout the works.

Table 3-1– Works components and their approximate durations

Element	Duration
Mobilisation / demobilisation	2 weeks
Installation of haul roads / temporary piling platform	6 months
Sheet pile installation	2 months
Concrete pours	2 months
Stonework cladding	4 months
Copings	1 month
Remove/regrade piling platform	3 months
Rip rap	1 month

Element	Duration
Landscaping	1 month
Various reinstatements	2 weeks

3.4 Construction compounds and access

As shown on the Location Plan (Figure 1.1), there are two proposed temporary compound areas which would be used for plant/material storage and housing welfare units during construction works.

The proposed northern compound would be located on the northern side of the Afon Teifi, just to the north of the Pont-y-Cleifion Road (SN 18239 46106). This compound area would be used as the main compound and laydown area for the works on the northern bank of the Afon Teifi. This area has been proposed as it is close to the A487 turn off, which would allow access for large vehicles. This site has previously been used as a construction compound for other infrastructure projects in Cardigan and therefore comprises an existing hard standing area.

The proposed southern compound would be located on the southern side of the Afon Teifi (SN 17973 45829), adjacent to an existing slipway which could be used to access the river.

The proposed access route to the northern side of the Afon Teifi would follow Pont-y-Cleifion and down Morgan Street and Carrier's Lane to reach Strand. This route has been selected as it passes the northern compound area and allows for transit towards a laydown area located in Area 1. Construction traffic bound for the southern compound area would continue across Cardigan Bridge (Castle Street) onto the B4546 before turning onto Station Road. Alternatively, instead of entering the town centre via Pont-y-Cleifion, construction traffic bound for the southern compound area can continue along the A487 before turning off on the B4546. The proposed access routes are shown within Plates 9-4, 9-5 and 9-6 of Chapter 9: Traffic and Transport.

Temporary traffic management measures would be in place during the works to ensure safe access. Measures would include:

- Temporary lane closures on Strand during key delivery or mobilisation activities.
- Suspension of on-street parking to allow the safe passage and turning of delivery vehicles.
- Use of banksmen and traffic marshals to manage vehicle movements and pedestrian safety.
- Time-restricted deliveries to avoid peak pedestrian and traffic periods.
- Advance notification to local residents and businesses to inform of potential disruption.
- A construction delivery management system would be necessary to coordinate vehicle movements and ensure that access conflicts are avoided in the town centre. This may

involve the use of a remote holding area outside of Cardigan to manage arrival timings and reduce queuing on approach roads.

Approximate material volumes and vehicle movements for the construction phase of the Scheme are detailed within Table 3-2.

Table 3-2 – Approximate material volumes and vehicle movements

Works element	Quantity	Vehicle Movements	Comments/assumptions
Sheet piling	1,806m^2	8 articulated wagons (40t)	Could depend on size loads to site and potential for efficiencies such as double handling etc.
Granular fill / piling platform	1,1763t	655 tipper wagons (20t)	Based on piling platform for full length. Single access.
Granular fill (removal)	8,853t	492 tipper wagons (20t)	Overburden for piling matt and over dig for granular base. Could reduce but no allowance made for other disposal.
Rip rap	2,450t	137 tipper waggons (20t)	-
Stone facing	1,062t	59 tipper wagons (20t)	Based on 300mm thickness as per drawings (150mm per side).
Copings	163t	5 artic wagons (40t)	Based on thickness as per drawings.
Concrete	793m^3	133 concrete wagons	Assumes concrete fill to piles down to foundation level.
Other disposal	Unknown	Potential need for 20 tipper waggons (20t)	May be some disposal but it is assumed based on the current design this would be fairly minimal.
Other vehicles	N/A	12-18 light vehicles	Peak numbers likely to increase towards 18 when works overlap.

Prior to the works, a Construction Environmental Management Plan (CEMP) would be developed, embedding mitigation recorded within this ES and the EAP (see Appendix 13.1) to ensure that environmental impacts are avoided and minimised during construction. The CEMP would detail mitigation measures specific to the construction phase and help to demonstrate the Scheme's commitment to environmental protection and sustainability. The CEMP would include various management plans which contain specific guidance and mitigation measures for certain environmental topics.

3.5 Construction methodology

The construction methodology for each component of the proposed works is outlined below in the proposed order of construction. All works components below would be constructed once compounds have been established.

3.5.1 Installation of temporary haul roads / temporary piling platform

Engineered granular fill haul routes on the river side of the existing walls in Areas 1–4 would be constructed to provide access to the construction area for the proposed flood defences. The haul road would allow for access to the narrow working area without the need to transport materials and plant across the Afon Teifi, which would reduce the potential risk of disturbance and pollution to the river. Materials and plant would be transported directly to the installation locations using this methodology which would simplify the construction logistics.

Compacted granular fill would be used to create a haul road and working platform along the foreshore, providing access for construction and forming part of the permanent works. A geotextile separator would first be laid over the foreshore to protect underlying soft materials and reduce migration of fine sediment. The granular material would be placed in compacted layers by a 13–20 t tracked excavator, beginning in Area 1 and progressing upstream to Area 4. Compaction would be subject to vibration monitoring. The working width of the platform would generally be 7m wide to accommodate piling rigs and material transport vehicles and the full width of the platform at around 9-10m , shown in red on Plate 3-10. The working platform would act as the primary haul route for plant and materials during construction and would later be incorporated into the engineered riverbank.

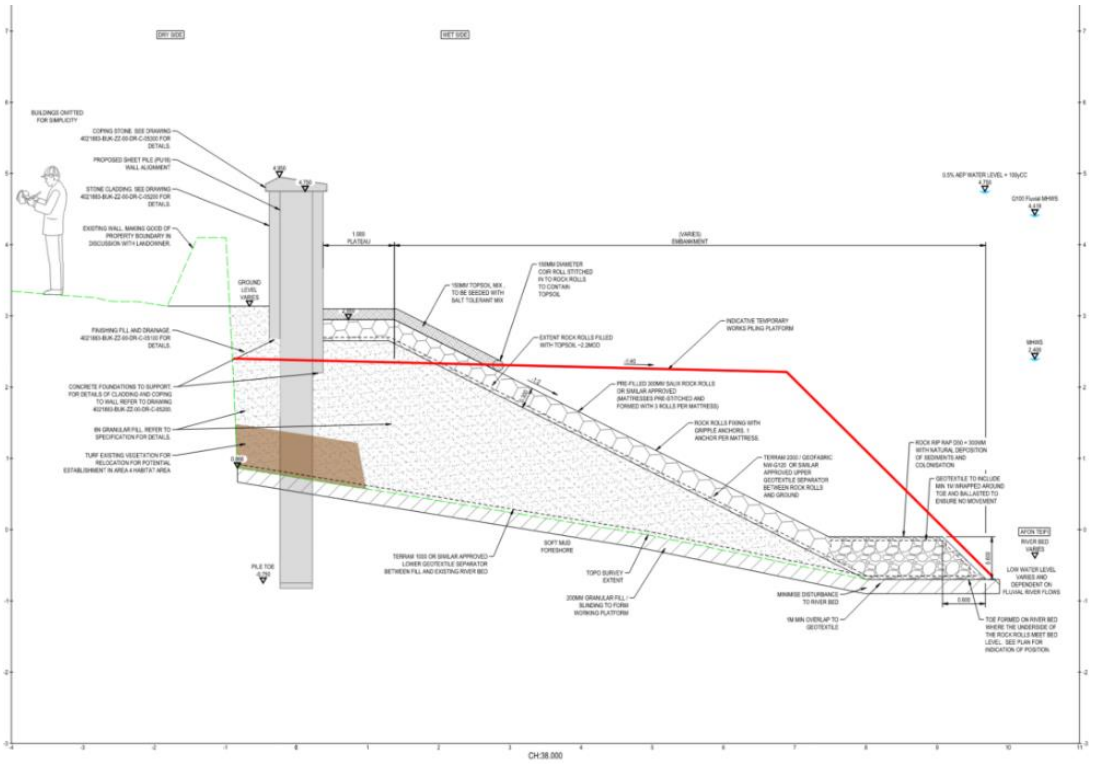

Plate 3-10 – Typical cross section of the engineered riverbank with red line showing the indicative extent of the proposed temporary piling platform

Key considerations for implementing granular fill on the foreshore and haul routes include:

- Detailed temporary works design, confirming platform stability under tidal inundation, bearing capacity for haulage vehicles, and integration with obstruction removal and piling operations.
- Flood risk management planning, maintaining existing masonry walls as flood protection during haul route construction and sequencing wall removal with immediate pile installation supported by temporary barriers or cofferdams.
- Environmental approvals and marine licensing, demonstrating no negative impacts on river hydraulics, sediment dynamics, water quality, or ecology.

These works are expected to be tide-dependent and would need to be scheduled around low-tide windows for safe placement.

3.5.2 Sheet pile installation

To facilitate the construction of the Scheme elements, the existing river walls in Areas 1-2 would need to be removed where they conflict with the new pile line. The removal of existing stone filled gabions would also be required. The existing wall would be removed using excavators with hydraulic breakers from the granular fill platform. These proposed works would occur immediately ahead of piling in small sections to maintain stability. Fill and retained ground behind the walls would be trimmed back or battered locally to enable access to the pile face

and subsequent cladding. Removed materials would be either stockpiled for reuse (if suitable) or loaded directly into wagons for off-site disposal.

Ground investigation data for the Scheme indicates that the made ground along the north bank of the Afon Teifi is highly variable and contains sandy/silty gravels, frequent cobbles and boulders and occasional buried construction debris / fill materials.

This variability poses a high risk of pile refusal, misalignment, or damage during installation if obstructions are not adequately identified and managed. Effective obstruction management is therefore a critical enabler for successful piling installation.

To undertake piling within the Scheme area, proof digging and pre-auguring may need to take place in accordance with the contractors' Obstruction Management Strategy. Proof digging would involve excavation along the proposed pile line to expose and remove obstructions before piling works can commence. Pre-auguring would involve drilling along the pile line to loosen dense soil strata, penetrate cobbles, and reduce pile driving resistance. This Obstruction Management Strategy would:

- Reduce refusal risk for hydraulic driving.
- Maintain pile alignment and clutch integrity, critical for seepage cut-off performance.
- Improve construction safety and programme certainty by minimising unforeseen refusal delays.

This Obstruction Management Strategy was provided as advisory guidance to support detailed construction planning, risk assessments, and contractor method development during the next design stage. Final approaches should be confirmed through contractor input, temporary works design, and environmental approvals.

Piling would be undertaken starting within Area 4, working back towards Area 1 to retain access.

A combination of a Movax side-grip rig and leader rig would be utilised depending on the ground conditions encountered on site. For example, if a side grip rig proves to not have sufficient power or counterweight to push piles into the ground, a leader rig would be required.

Movax Vibro-driving (Side-grip Rig)

A Movax side grip piling rig uses a hydraulic hammer mounted on an excavator to drive sheet piles into the ground. Vibro-driving using Movax side-grip piling rigs mounted on excavators could be feasible in the following areas due to access restrictions and limited working space:

- The castle slipway and public car park, where open working platforms and haul routes are available.
- Locations where vibration impacts are acceptable and structural receptors are less sensitive.

Movax Vibro-driving (Leader Rig)

Vibro-driving uses a vibratory hammer to install sheet piles by reducing friction along the pile shaft, allowing penetration under self-weight and vibration-induced settlement. Movax side-grip rigs mount the vibro hammer on an excavator arm, providing a compact, flexible setup suitable for constrained sites.

A Movax vibro piling rig is considered to be the most practical installation method for the Scheme Area due to the following reasons:

- Flexibility to install piles individually, without needing reaction piles, enabling installation along complex alignments with bends or split lines.
- Suitability for operation in restricted working widths typical of Strand frontage, supporting efficient installation in narrow riverbank areas.
- Faster installation rates, improving programme certainty and reducing the duration of works in sensitive public and heritage environments.

3.5.3 Concrete pours

Following installation of the sheet piles and prior to cladding works, a reinforced concrete toe would be cast at the base of the new wall to provide structural support and protection against scour. The toe would also form the foundation for the stone cladding and would improve durability at the tidal interface.

The concrete toe would be pumped in sequential sections, typically 6–8 m in length, to suit tidal working windows and formwork logistics. Localised excavation would be required at the toe of the pile wall, particularly where the toe would be recessed into the foreshore or behind the removed river wall (e.g. in Areas 1 and 3).

3.5.4 Stone

The cladding would be installed following completion of the concrete toe. Each cladding panel or unit would be fixed to the pile face using brackets, ties, or adhesive systems.

3.5.5 Copings

Coping stones would form the uppermost element of the wall, capping the new sheet piles and providing a durable and visually appropriate edge finish. These would be pre-cast concrete, installed with mechanical dowels or fixings and bedded on mortar or high-strength adhesive. The installation would be carried out from the temporary foreshore haul route rather than the landside, due to access constraints.

As the wall spans approximately 323m, coping works would progress in sections following cladding completion and full cure of the concrete toe. Interface with hard landscaping or fencing would be completed afterward from the landside, where access permits.

3.5.6 Remove / regrade piling platform

The piling platform and haul road would be re-profiled to form the base of the engineered riverbank. Excess granular fill would be removed and recycled or re-used elsewhere within the Scheme.

3.5.7 Engineered riverbank finish

A permeable geotextile membrane would be placed onto the graded granular fill. Rip rap would be placed at the toe of the new riverbank slope. Rock rolls would be placed on the slope and crest of the new riverbank. Imported soil would be placed on the upper third of the slope and crest of the new riverbank and the seed mix for an estuarine/salt-tolerant environment would be sown to aid vegetation growth on these upper areas which are inundated less frequently by the tides. To hold the soil in a place on the upper slope a single line of coir rolls would be installed, this coir roll would not be planted.

The seed mix for an estuarine/salt-tolerant environment would comprise of grasses (*Festuca rubra* (Red fescue), *Puccinellia maritima* (Common saltmarsh-grass), *Agrostis stolonifera* (Creeping bent) and *Artemisia maritima* (Sea wormwood)) and flowering plants (*Atriplex portulacoides* (Sea-purslane), *Limonium vulgare* (common sea lavender), *Armeria maritima* (thrift), *Tripolium pannonicum* (Sea aster), *Juncus gerardii* (saltmarsh rush), *Suaeda vera* (shrubby sea-blite), *Plantago coronopus* (Buck's-horn plantain), *Cochlearia officinalis* (Common scurvygrass), *Juncus maritimus* (sea rush), *Carex flacca* (glaucous sedge), *Oenanthe lachenalii* (Parsley water-dropwort) and *Vicia cracca* (Tufted vetch)).

These works are expected to be tide-dependent and would need to be scheduled around low-tide windows for safe placement.

3.5.8 Various reinstatements and landscaping

Upon completion of construction reinstatement, landscaping works for Area 1 and the redesign of Gloster Row car park would take place. Reinstatement of temporary works areas would return the site to the same or better condition than before construction and would be completed in accordance with landowner agreement. The landscaping works at Area 1 would be an improvement on existing conditions.

3.5.9 Riverbank regrading (Area 4)

At Area 4, the upper gabion wall would be removed and the ground, including a portion of the car park, reprofiled to create an area for tidal inundation, allowing for intertidal habitats to establish. The lower gabion wall would be retained as the gabion baskets contain saltmarsh species. Stripping of topsoil would occur first, followed by excavation to formation level using an excavator working from the land side. Rock rolls would be placed to form a mattress across the area which would then be covered by approximately 0.5m of imported soil. Localised changes in topography across the area would be created to facilitate the establishment of intertidal habitat. Selected materials may be reused as fill in other areas or spread on site subject to environmental approval.

3.6 Operation and maintenance

The scheme requires routine visual inspections, vegetation management and periodic repairs to ensure long-term performance.

The engineered riverbank, including wet-side habitats, scour protection (rip rap), rock rolls, geotextiles and granular sub-bases, would require occasional vegetation removal, debris clearance and monitoring for erosion or profile changes, with inspection frequencies ranging from monthly to annually, depending on the asset types.

Landscaping features such as riverside planting, grassed areas and hard landscaping elements require routine vegetation control and grass cutting usually every 12 weeks or 6 months.

These activities, together with management of the wall and flood gate components of the design, would form a structured maintenance regime.

4. EIA Methodology

4.1 Introduction

This chapter describes the general Environmental Impact Assessment (EIA) methodology applied throughout this Environmental Statement (ES).

Sections 4.4 and 4.5 outline the EIA Screening and Scoping approach for the Scheme. Where relevant legislation, planning policy or guidance applies to a specific chapter of the EIA, it has been discussed in full within the topic chapter.

Section 4.6 details the general impact assessment methodology applied throughout this ES. Where relevant guidance for individual topics stipulates a change to this methodology this is described in full within that chapter. Clearly outlining the methodology ensures consistency across the report and promotes transparency in how decisions are made. The EIA process involves a systematic procedure that assures the identified possible effects (positive or negative) are completely understood before a project development progresses.

Consultation with the public, statutory bodies and other relevant groups is an integral part of EIA. Chapter 2: Project Development provides a summary of the consultation undertaken to inform the design and content of this ES.

4.2 Legislative Context

The EIA Regulations relevant to the Scheme are:

- The Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017 as amended; and
- The Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended).

4.3 EIA Process

The EIA process enables the early identification of potential environmental effects during the design development process and enables those effects to be avoided where possible through alternative design or construction methodologies. The EIA is a systematic process, including the following four principal stages:

- Screening: this involves identifying whether the project should be subject to an EIA.
- Scoping: this involves identifying the environmental receptors that may be subject to significant effects resulting from the project.
- Impact assessment: undertaking an assessment to identify the likely effects of the proposals and using set criteria to assess the significance of those effects. This allows the significance of the effects to be described, suitable mitigation to be developed and the resulting residual effects to be identified.
- Implementation: ensuring that essential mitigation identified through the impact assessment process is carried through to the construction and/or operational stages of the development.

The method for each of these stages, and where relevant the outcomes for the Scheme, are described in greater detail below.

4.4 Screening

The Scheme constitutes a Schedule 2 development under the Town and Country Planning EIA Regulations under Paragraph 10(h) '*Inland-waterway construction not included in Schedule 1, canalisation and flood-relief works'*.

Developments listed in Schedule 2 of the EIA Regulations, and that exceed a specified threshold, must be assessed to determine whether EIA is need based on whether a proposed development is likely, because of its size, nature or location, to have significant effects on the environment.

The applicable threshold for *Inland-waterway construction* is if the area of the works, including construction working areas, exceeds 1 hectare.

The Scheme constitutes a Schedule A2 development under the Marine Works EIA Regulations under Paragraph 64 '*Inland-waterway construction not included in Schedule A1, canalisation and flood relief works*'.

A Screening Opinion was requested from Ceredigion County Council (CCC) and the NRW Marine Licencing Team. Both CCC (Ref. Q230180, 14/11/2023) and the Marine Licencing Team (Ref. SC2303, 14/12/2023) confirmed that the Scheme comprises EIA development and therefore requires a statutory EIA.

4.5 Scoping

4.5.1 Scoping Process

Scoping is the second key stage of the EIA process. It is carried out to identify all potential environmental issues, and to determine those that are likely to result in significant effects and therefore require further detailed assessment in the Impact Assessment stage.

As part of the scoping process, an applicant has the option of seeking a Scoping Opinion from the competent authority (CA) to identify the information to be provided within the ES.

Where the CA has given a scoping opinion in relation to a project, the ES for that project need only address the matters specified in the scoping opinion. The aim is therefore to 'scope in' only those issues considered to have potential to give rise to likely significant effects either during construction or operation. Where suitable mitigation to avoid, reduce or remediate negative effects through construction are identified, that will reduce potentially significant effects to non-significant, these measures have been included in the Scheme design and have been scoped out of further assessment.

The scoping process for the Scheme involved multiple stages of correspondence with Ceredigion County Council and the NRW Marine Licencing team prior to reaching the final scoping opinion. The most recent scoping letter issued in August 2025 requested an update to the previous scoping opinions provided in December 2023.

A record of relevant correspondence during this process is outlined below.

4.5.2 Initial Scoping Opinion Request

- September 2023 – Combined screening and scoping request issued to Ceredigion County Council and the NRW Marine Licencing team.
- Response provided by Ceredigion County Council in December 2023 providing a scoping opinion.
- Response provided by the NRW Marine Licencing Team in December 2023 providing a scoping opinion.

4.5.3 Final Scoping Opinion Request

- July 2025 – Scoping letter issued to Ceredigion County Council and the NRW Marine Licensing Team requesting an update to the previous scoping opinions.
  - Requested that certain topics could be scoped out of the assessment on the basis of further information which was provided.
- October 2025 – Ceredigion County Council – Updated Scoping Response
  - Contained the final scoping opinion of the Local Planning Authority (LPA) in response to design changes and requests to scope out topics.
  - Provided responses as outlined within Table 4-1 commenting on whether certain effects and topics could be scoped out of the assessment.
  - Requested that a Land Use and Soils Chapter was also included within the ES.

Table 4-1 – Summary of October 2025 Scoping Response

Topic	Effect	Justification/decision	Removed from scope
Population and Human Health (Construction)	Potential for permanent negative effects due to the demolition of buildings	No negative effects expected – CCC agreed that no further assessment was required.	Yes
Population and Human Health (Operation)	Potential for negative effects to PRoW due to flood detriment	Evidence provided by hydraulic modelling demonstrated that the proposed defences would cause no detriment to existing PRoW routes – CCC agreed that no further assessment was required.	Yes
	Potential for permanent effects to river navigation from the sections of the Scheme encroaching into the river	No negative effects expected – CCC agreed that no further assessment was required, provided that the ES/CEMP contains sufficient detail to demonstrate how potential effects will be managed, as supported by the Navigational Risk Assessment.	Yes

Topic	Effect	Justification/decision	Removed from scope
Water Environment (Construction)	Impacts to water quality from construction related impacts (e.g., pollution, siltation)	Only negligible potential effects upon water quality based upon the construction methodology and assessment of the WFD Scoping report – CCC advised that scoping out water related effects may be premature and advised that a full WFD Compliance Assessment would be required, informed by a robust evidence-based physical processes assessment.	No
Water Environment (Operation)	Changes in flood risk	Only positive effects anticipated due to the nature of the development and evidence provided by the Hydraulic Modelling Report - CCC advised that scoping out water related effects may be premature and advised that a full WFD Compliance Assessment would be required, informed by a robust evidence-based physical processes assessment.	No
Land Use and Soil (Construction)	Potential impact due to mobilisation of existing contamination, including asbestos	Conclusions from the Contaminated Land Report highlighted that the possibility of significant harm to the identified receptors has not been proven at the site and is not likely to occur as a direct result of the construction of the Scheme – CCC requested the inclusion of a Land Use and Soil Chapter within the ES.	No
Air Quality (Construction)	Impact of dust generation	Considered that subject to implementation of dust prevention and mitigation measures as per the IAQM guidance through the CEMP and Dust Management Plan (DMP), further assessment would not be required – CCC welcomed the implementation of IAQM mitigation measures and agreed that scoping out may be acceptable subject to the DMP being enforceable.	Yes
	Impact of vehicular emissions on local air quality	Considered that construction of the Scheme would not generate sufficient HDV flows to warrant the need for further assessment – CCC	Yes

Topic	Effect	Justification/decision	Removed from scope
		agreed that scoping out may be acceptable but advised that the mitigation should not be considered sufficient until linked to the final design.	
Climate (Construction)	Construction of the flood defences will require use of natural resources i.e. construction material production and energy, which will result in the release of carbon emissions.	Considered that due to the relatively small scale of the Scheme and that it's construction would be unlikely to significantly contribute to climate change through the generation of emissions or use of natural resources. Sustainable material selection will be utilised to minimise embedded carbon and emissions. – CCC agreed that scoping out may be acceptable provided that the ES contains sufficient detail on design evolution and carbon reduction measures.	Yes
	Construction plant will result in carbon emissions	Considered that plant emissions will be minimised through the selection of sustainable, efficient plant – CCC agreed that scoping out may be acceptable provided that emission reduction measures are detailed within the ES.	Yes
Material Assets (Construction)	Installation of the proposed flood defences could have a temporary effect on utilities infrastructure.	The presence of utilities has been considered throughout the design development. Any impacts to utilities in the area are expected to be temporary and negligible as any disruptions will be limited – CCC accepted that impacts to utilities and demolition of one non-residential building are unlikely to result in significant effects. However, CCC requested that the ES should demonstrate how these matters have been considered in the final design and how any mitigation will be delivered through the CEMP.	Yes
	Potential demolition of buildings	No negative effects expected – CCC agreed that no further assessment was required.	Yes

A further scoping opinion was not received from NRW Marine Licencing Team following the July 2025 scoping letter, rather they referred back to their December 2023 scoping opinion. The October 2025 scoping opinion received from Ceredigion County Council aligns with that received from NRW Marine Licencing Team but requested some additional topics and effects be scoped in.

4.5.4 Topics Scoped In to the EIA

Following the scoping process, it is considered that the project has the potential to give rise to significant effects upon the following topics. These have therefore been assessed within this ES:

- Population and Human Health
- Biodiversity and Nature Conservation
- Historic Environment
- Landscape and Visual
- Traffic and Transport
- Water Environment
- Cumulative Effects.

Table 4-2 summarises the justification for topics which were scoped out of the EIA as a result of the scoping process. Whilst the project is not anticipated to give rise to significant effect upon these topics, where residual environmental risks have been identified appropriate mitigation has been incorporated into the Environmental Action Plan (EAP) (see Appendix 13.1).

Table 4-2 – Topics scoped out of EIA

Topic	Justification
Air Quality	Scoped out subject to enforceable Dust Management Plan.
Climate	Scoped out with sufficient detail on design evolution and carbon reduction.
Material Assets / Utilities / Demolition	Scoped out with mitigation secured via CEMP.
Population and Human Health (partial)	Demolition and PRoW impacts scoped out.
Major Accidents and Disasters	Not considered likely to result in significant effects.

4.6 Impact Assessment

4.6.1 Scheme Area and Study Areas

The Scheme Area is defined by the area shown within Figure 1.1 of this ES. Study Areas are specific to the assessment methodology used within each topic chapter and are therefore defined within each chapter where necessary.

4.6.2 Description of Baseline and Future Baseline

The baseline is defined as the existing environmental, social and economic conditions of an area prior to the implementation of a development. The baseline serves as a reference point against which all potential effects of a proposed development will be measured.

The evolution of the future baseline section describes the likely natural evolution of the existing environment under baseline conditions (i.e. in the absence of the proposed development) and is used to provide context for the assessment of a proposed development.

The baseline environment and likely future evolution are described within each topic chapter.

4.6.3 Description of Effects and Embedded Mitigation

This ES reports the Likely Significant Effects of the Scheme and assesses their potential effect upon the environmental receptors identified in the baseline and which have been 'scoped in' to the assessment.

The description of effects provides a description of the Likely Significant Effects of the Scheme, taking account of mitigation measures that are inherent to, or embedded within, the Scheme design. The identification and description of effects at this stage reflects the evolution of the Scheme and the influence of design-led environmental considerations.

4.6.4 Assessment of Effects

The following general process has been followed to assess the significance of effects:

i) Determine the sensitivity of the environmental receptor / resource:

The sensitivity of the environmental receptor / resource is identified with consideration of its quality, relative abundance and/or level of statutory protection within the context of the existing baseline conditions in the defined Study Area. This process has been guided through ongoing consultation with stakeholders, where necessary.

ii) Determine the magnitude of the impact:

The magnitude of the impact considers the scale of the (physical) change that would arise from the effect.

iii) Assess the significance of the effects:

Professional judgement is typically used to assess the significance of the environmental effect based on a combination of the sensitivity of the receptor and the magnitude of the impact. For the purpose of this ES, 'significant' effects are classified as those identified as 'moderate' or 'major', whether positive or negative. Effects have been classified according to whether they are positive or negative, and whether they are temporary (short, medium, or long-term) or permanent. Effects are also classified as either direct or indirect.

iv) Identify additional mitigation measures to prevent or reduce negative effects:

Where negative effects are predicted, additional measures to avoid (for example, via changes to the design of the project), mitigate (for example, reduce the effects on site) or remedy (which could include compensation), those effects are identified. These mitigation measures are additional to those inherent to, or embedded within, the Scheme design.

Mitigation within the EIA is typically described in a hierarchical manner, reflecting best practice and the mitigation hierarchy. This is in accordance with the Stepwise approach set out in Planning Policy Wales (10).

- **Avoidance:** Measures that prevent environmental effects from occurring altogether by removing the source of impact or altering the project design or location. Examples include the selection of alternative sites, micro-siting of infrastructure to avoid sensitive receptors, or timing works to avoid sensitive seasonal periods.
- **Reduction (or minimisation):** Measures that reduce the magnitude, extent or duration of an effect that cannot be entirely avoided. This may include the adoption of best practice construction methods, use of quieter or lower-emission plant, implementation of pollution control measures, or application of design standards that limit environmental disturbance.
- **Compensation (or offset):** Measures that seek to compensate for residual negative effects that remain after avoidance and reduction measures have been applied. Compensation does not reduce the impact itself but provides an alternative environmental benefit, for example through habitat creation, restoration or enhancement elsewhere. Where relevant, the topic chapters within the ES explain how compensatory measures are considered and the extent to which they influence the overall assessment of significance.

v) Assess the residual effect following mitigation:

The significance of residual effects after the proposed mitigation measures are incorporated is assessed. For the purpose of this ES, residual effects considered to have a 'moderate' or 'major' effect have been classified as 'significant'.

4.6.5 Assessment Criteria Definitions

General criteria used for classifying the sensitivity of the receptor is outlined within Table 4-3 based on standard EIA practice and professional judgement. However, ES topic chapters may use slightly different criteria or terminology for sensitivity depending on the industry best practice guidance utilised. Where criteria and terminology do vary, this is outlined within the topic chapter.

Table 4-3 – General criteria for classifying the sensitivity of environmental receptors

Sensitivity	Criteria
High	Highly sensitive sites can include sites that are designated of national or international importance or large numbers of people. Generally, highly sensitive sites are those of high quality / in good condition or highly regarded by people.

Sensitivity	Criteria
Moderate	Sites of moderate sensitivity can include sites of regional or local interest or importance, or a small number of people. Generally moderate sensitive sites are in moderate condition or locally regarded in value or quality.
Low	Sites of low sensitivity are unlikely to be designated. They are unlikely to be considered of value by either the local population or stakeholders.

General criteria used for classifying the magnitude of change arising from an effect is outlined within Table 4-4. However, ES topic chapters may use slightly different criteria or terminology for magnitude depending on the industry best practice guidance utilised. Where criteria and terminology do vary, this is outlined within the topic chapter. Typical descriptions of duration are outlined within Table 4-5.

Table 4-4 – General criteria for classifying the magnitude of change

Magnitude	Criteria
High	More than 50% of a site, area or population affected.
Moderate	Between 20% and 50% of a site, area or population affected.
Low	Between 5% and 20% of a site, area or population affected.
Very Low	Less than 5% of a site, area or population affected.
None	No change from existing baseline.

Table 4-5 – General criteria for classifying the duration of effects

Duration	Definition / Description
Short-term	Effect continues during construction (1 to 2 years) including up to 1 year following construction.
Medium-term	Effect continues 1 to 5 years following construction.
Long-term	Effect continues 5 to 10 years following construction.
Permanent	Due to the subjectivity of human perception of timeframes, those effects that continue for greater than 10 years following construction can be defined as permanent.

Table **4**-6.

Table 4-6 – Significance of environmental effects matrix

		Sensitivity of Receptor		
		High	**Moderate**	**Low**
Magnitude of Effect	**High**	Major (Significant)	Major (Significant)	Moderate (Significant)
	Moderate	Major (Significant)	Moderate (Significant)	Minor
	Low	Moderate (Significant)	Minor	Negligible
	Very Low	Minor	Negligible	Negligible

	None	None	None	None

Table 4-7 sets out the general definitions of significance.

Table 4-7 Definitions of Significance

Significance	Criteria
Major (Significant)	Significant change in environmental conditions causing breaches of legislation or the exceeding of statutory objectives. Likely to have an effect on sites designated for national or international importance. Likely to affect a large-scale area or a large number of people on frequent or permanent basis. May be an irreversible decline.
Moderate (Significant)	Unlikely to cause a breach of legislation but likely to have an effect on a site of regional or local environmental importance. Likely to affect a small number of people on a permanent basis.
Minor	Likely to have an effect on an area or feature of local interest or importance. Likely to have a temporary effect on a small number of people, or be a recoverable effect.
Negligible	No or indiscernible effect predicted.

4.6.6 Consideration of Cumulative Effects

Cumulative effects comprise both intra-project and inter-project cumulative effects. Intra-project effects occur where an environmental resource or receptor is affected by more than one impact from the same development and the impacts act together. Intra-project cumulative effects are assessed within Chapter 12: Cumulative Effects of the ES. Inter-project cumulative effects arise when the predicted residual effects of a project act in combination with the effects of other proposed developments to produce a new or greater magnitude of effect. Inter-project cumulative effects related to existing developments (considered part of the current baseline conditions) are assessed within the topic chapters of the ES. Inter-project cumulative effects related to other planned future developments are considered within Chapter 12: Cumulative Effects of this ES.

4.7 Implementation

This is the final stage in the EIA process, ensuring that essential mitigation identified through the impact assessment process to prevent or reduce environmental effects is carried through to the construction and/or operational stages of the development.

An EAP has been prepared as part of the ES, and this is provided as Appendix 13.1 along with an Environmental Constraints and Opportunities Plan (ECOP). The EAP will be used to implement, manage and monitor the environmental mitigation measures proposed in the EIA prior to, during and after construction, and to help deliver environmental opportunities. Mitigation measures are considered in detail within individual topic chapters.

A Construction Environmental Management Plan (CEMP) will be produced to outline how the construction phase will minimise environmental impacts and ensure compliance with environmental regulations and commitments. The CEMP will be informed by the EAP and include various effect specific management plans which contain specific guidance along with allowing for record keeping and auditing.

4.8 Difficulties and Uncertainties

The environmental assessments within the ES topic chapters are based on the project proposals outlined within Chapter 3: Project Description. This section identifies the project assumptions and exclusions that have been followed in the assessment to manage any remaining uncertainty. Topic-specific difficulties and uncertainties and details regarding how these are managed are reported in the topic chapters (Chapters 5 to 12).

The main uncertainty associated with the works relates of the proposed construction methodology and programme to be implemented. A contractor has not yet been appointed by NRW to construct the Scheme. Reasonable worst-case assumptions have therefore been made throughout this ES following preliminary advice from NRW's construction consultant. The approach is consistent with the precautionary principal.

4.9 References

Welsh Government, 2024. Planning Policy Wales. Volume Edition 12.

5. Population and Human Health

5.1 Introduction

This chapter assesses the Likely Significant Effects from construction and operation of the Scheme, with respect to Population and Human Health. This chapter details the baseline environment, assessment of Likely Significant Effects, and where necessary, mitigation measures to avoid, reduce or minimise significant effects are proposed.

This chapter is not intended to be read as a standalone assessment, and references should be made to Chapters 1-4. In addition, this chapter should also be read in the context of the following topic chapters due to interactions between topics:

- Chapter 8: Landscape and Visual
- Chapter 9: Traffic and Transport.

The assessment within this chapter is informed by the following supporting information:

- Construction traffic noise and vibration assessment technical note (Appendix 5.1).
- 2021 Census Data from the Office for National Statistics (ONS).
- Public consultation responses.
- Navigational Risk Assessment (Appendix 5.2).

5.2 Competent expert evidence

Myles Harding (BSc (Hons), MSc, PISEP) has over 4 years' experience coordinating and working on technical and non-technical Environmental Statement (ES) chapters. Myles has experience working on a broad range projects at Binnies including multiple flood defence projects.

David Johnson (BSc (Hons), MSc, CEnv) has over 14 years' experience coordinating and producing technical and non-technical Environmental Statement (ES) chapters, including on Population and Human Health, Land Use and Cumulative Effects. David authored the Socio-Economic chapter for the River Thames Scheme and the Land Use chapter for Bridgwater Tidal Barrier ESs.

The Noise and Vibration Impact Assessment has been prepared by suitably qualified acousticians with extensive experience in environmental noise and vibration assessments of construction. The lead author, Sarah Barnes, holds an MSc degree in Acoustics and is a corporate member of the Institute of Acoustics (IOA).

5.3 Planning policy and legislative context

This section describes the relevant legislation, policy and guidance that has been considered in developing the Scheme design, and in the assessment of effects with respect to Population and

Human Health. This legislation, policy and guidance has been reviewed and where applicable has informed the assessment through the identification and categorisation of sensitive receptors, requirements for mitigation, and the scope and/or method of assessment.

5.3.1 International and national policy

The Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017

The Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017 require Environmental Statements (ES) to consider Population and Human Health, where applicable.

- Regulation 4 & Schedule 4 (Information for Environmental Statements): Requires ES to include a description of the likely significant effects of the development on the environment, specifically listing Population and Human Health.

Planning Policy Wales (Edition 12, February 2024)

Planning Policy Wales (PPW) sets out the national land use planning policies of the Welsh Government. Its overarching purpose is to provide a policy framework which informs how planning decisions are made with regard to sustainable development, social well-being and the health of communities. The following principles are most relevant to Population and Human Health:

- **People and Places (Chapter 2)** – Introduces placemaking as a key concept for planning in Wales and highlights that the national sustainable placemaking outcomes should be used to inform the assessment of development proposals. The outcomes are key to assessing how a development may influence factors such as community health, access to services, active travel, environmental protection and general quality of life. Policy within this chapter directly promotes healthy, safe and inclusive communities which support physical and mental health.
- **Strategic and Spatial Choices (Chapter 3)** – Policy focusses on addressing strategic considerations and emphasises that the natural environment is a key determinant of health and well-being within communities. This principle draws attention to the need to focus on proactive and preventative action, reduction of community exposure to environmental hazards, and ensuring that developments likely to have significant effects on human health are properly assessed.
- **Active and Social Places (Chapter 4)** – Explores the themes of transport, housing, retail, commercial development, community facilities and recreational spaces. The policies around these themes focus on seeking opportunities to promote sustainable modes of active travel such as walking and cycling, reducing vehicle dependency, ensuring access to essential services is retained, and providing adequate access to recreational spaces which support physical and mental health.
- **Productive and Enterprising Places (Chapter 5)** – Covers policy which focusses upon the importance of economic development, employment, transport infrastructure, energy and the rural economy. The chapter explores links between economic opportunity and social and health inequality. Policies on energy and

infrastructure highlight the importance of considering environmental health factors such as air quality and noise and encourage supporting local employment, delivering clean low carbon energy, and the provision of efficient infrastructure which can minimise adverse effects upon human health.

- **Distinctive and Natural Places (Chapter 6) -** Policy within this chapter links the natural environment (green infrastructure, biodiversity, landscape, flood risk and other environmental factors) and human health outcomes and explores how the enhancement of the natural environment can provide opportunities to improve health. Key policies within this chapter highlight the importance of flood resilience infrastructure, clean air and promoting green infrastructure.

Well-being of Future Generations (Wales) Act 2015

The Act establishes legally binding duties on public bodies to improve social, economic, environmental, and cultural well-being. The following provisions are most relevant to Population and Human Health:

- The seven well-being goals (Section 4 of the Act) set a framework for achieving sustainable development. The assessment of Likely Significant Effects for Population and Human health incorporates well-being goals by considering health, equality and community cohesion.
- Sections 5, 6 and 7 highlight the responsibilities of public bodies to act in a way which ensures that the sustainable development principles and well-being goals are met and published.
- Section 11 requires the consideration of long-term trends in population, health and social change. Assessments should align with these projections to ensure resilience.

Natural Resources Wales' Well-being statement (11) sets out how NRW's Well-being objectives meet their statutory duty under the Well-being of Future Generations (Wales) Act 2015. The well-being objectives to 2030 are listed below and are intended to provide wider opportunities and benefits for mental and physical well-being, lifelong learning and creativity and job creation and skills. By focusing on these three well-being objectives together, NRW will protect and enhance the wider well-being of people and communities:

- Nature is recovering;
- Communities are resilient to climate change; and
- Pollution is minimised.

Future Wales – The National Plan 2040

Future Wales: The National Plan 2040 serves as Wales' overarching national development framework, guiding spatial planning and land use decisions by establishing a strategic vision for addressing key national challenges through the planning system. Policies aligning with Population and Human Health are outlined below.

Policy 1 – Where Wales Will Grow

National Growth Areas are complemented by Regional Growth Areas which will grow, develop and offer a variety of public and commercial services at regional scale. Mid Wales is listed as a regional growth area, and Cardigan is listed within the Teifi Valley region.

Policy 1 drives the delivery of the Future Wales Outcomes and ensures Future Wales' policies and the planning system in general are committed to their achievement. Key issues, including decarbonisation, health, prosperity and the Welsh language, are core elements of policy 1.

Policy 8 - Flooding

Policy 8 is a national approach to managing flood risk, emphasising the need to avoid development in flood-prone areas unless clearly justified. Where development is necessary, it must be resilient to flooding and informed by robust evidence. The Scheme supports this policy by delivering essential protection infrastructure to an existing community at high risk of tidal flooding as identified by the Wales wide Communities at Risk Register. The Scheme is justified by its public safety and climate adaption benefits and is informed by Flood Consequence Assessments, NRW flood mapping, and Shoreline Management Plan guidance.

Policy 9 – Resilient Ecological Networks and Green Infrastructure

Encourages the identification of opportunities where existing and potential green infrastructure could be maximised as part of placemaking, requiring the use of nature-based solutions as a key mechanism for securing sustainable growth, ecological connectivity, social equality and well-being. The Plan promotes access to green and blue spaces as vital for health and well-being.

Active Travel (Wales) Act 2013

The Active Travel (Wales) Act 2013 is a key piece of legislation supporting the protection and enhancement of walking routes in Wales. It requires local authorities to plan for, maintain, and upgrade active travel networks, including footpaths used for everyday journeys. As a result, footpaths form part of a strategically important network that underpins population connectivity, accessibility, and health. Any scheme affecting footpaths must therefore be assessed in the context of the Act's duties to promote and improve walking infrastructure, making the policy an important material consideration in evaluating significance of effects on public access and human health.

In the context of this assessment, footpaths designated as 'active travel routes' may carry greater sensitivity to change. Any scheme affecting footpaths should consider whether it aligns with the Act's objectives to deliver safe, comfortable, direct, and continuous walking routes, and whether mitigation or enhancement measures can be integrated.

5.3.2 Local policy

Ceredigion County Council Local Development Plan 2007-2022

The Ceredigion County Council Local Development Plan 2007-2022 (LDP) contains strategies, objectives and policies that are relevant to Population and Human Health, particularly those which address community safety, housing protection, health and well-being, and safeguarding vulnerable groups, these are summarised below:

- Objective 6 - To sustain and enhance a high-quality built environment which; allows for innovative design, reflects a sense of place, is easily accessible, useable, safe to live in and helps improve the health and well-being of its communities.
- Objective 7 - To enhance and help ensure the provision and protection of an appropriate level of and access to education, health, cultural, social, recreational, community, sport and leisure facilities and services.
- Objective 8 - To support the development of the Welsh language and promote inclusive bilingual communities within Ceredigion.
- Objective 16 - To assist in improving the potential for sustainable travel; equality of access; and the connectivity of the county for the sake of its economy, its communities and their health and well-being.
- Policy LU22: Community Provision - 2. Resisting the loss or change of use of an existing community provision unless: i: Alternative provision of at least equivalent local community value can be provided either within or adjoining the settlement or other settlements which are part of the Settlement Group. In relation to open space specifically, the alternative should be an enhanced provision which is preferably located.

5.4 Assessment guidance

Guidance utilised which is specific to the assessment of Population and Human Health is listed below:

- Institute of Sustainability and Environmental Professionals (ISEP) Social Impact Assessment in Environmental Impact Assessment in the UK and Ireland (12).
- Institute of Environmental Management and Assessment (IEMA) (Now ISEP) Determining Significance For Human Health In Environmental Impact Assessment (13).

5.5 Consultation

A meeting took place with Afon Teifi Fairways Ltd (ATFL), who operate the river, on Thursday 23rd October 2025, to provide input to the Navigational Risk Assessment. The primary outcome of the meeting was that there is very little activity on the stretch of the River Teifi (Afon Teifi) between Cardigan Bridge and the A487 bridge. AFTL advised that the only recreational activity on the river comprises use by canoes/kayaks and an occasional boat tour.

The 23rd December Scoping opinion included a response from Public Health Wales (PHW) which stated that no opinion on the need for EIA was held. However, it was noted that the potential for asbestos has been identified within the vicinity of the works. PHW advised that areas of land contamination resulting from historical deposits should be appropriately risk assessed and measures identified to control any potential public exposure. In addition, PHW recommended that a construction environmental management plan should be formulated to identify and mitigate any short-term nuisances (dust, odour, noise etc) that could occur during the construction phase.

Two public consultation events have been held by NRW in December 2022 and June 2025. The event in June 2025 aimed to gauge public opinion on the landscape design for Area 1 of the Scheme (Cardigan Bridge to Cardigan Bathroom Centre showroom). The general sentiments conveyed within the responses from the June 2025 event included a general preference towards the provision of wider pavements for accessibility purposes, and undertaking tree planting to provide amenity value and shade during warm weather. These preferences have since been incorporated into the Scheme landscape design to align with the desires of the local community.

5.6 Scoped in receptors and potential effects

The Population and Human Health topic was scoped into the EIA due to the potential for Likely Significant Effects during the construction and operational phases of the Scheme. Table 5-2 and Table 5-3 outline the Likely Significant Effects which are to be assessed within this chapter.

Table 5-2 – Scoped in Likely Significant Effects (construction)

Environmental Effect	Receptor
Potential for negative temporary construction effects relating to noise, vibration, pollution, dust, footpath closure and diversions, traffic disruption, reduced amenity access, reduced recreational capacity, and changes to water navigation.	Local residents, businesses, recreational users and all river users
Potential for positive effects on the local economy during construction through employment of a local contractor or contractors and an increase in trade for local shops and businesses.	Local residents and businesses.

Table 5-3 - Scoped in Likely Significant Effects (operation)

Environmental Effect	Receptor
Potential for permanent positive effects due to the reduction in flood risk.	Residential and business properties which are currently at risk of flooding.
Potential for permanent positive effects due to the provision of an area of public open space.	Public users.
Potential for permanent negative effects due to the changes in existing public amenity space.	Public users.

Environmental Effect	Receptor
(Note: This effect has been added after EIA Scoping due to the need for the flood defence to be set back in Area 4)	

Sub-headings for the Assessment of Likely Significant Effects are derived from the scoped-in effects above. The sub-headings are split between construction and operation effects. The potential negative construction effects will be assessed under separate sub-headings which correspond to the relevant environmental factor for clarity.

Construction

- Noise and Vibration
- Pollution and Dust
- Footpath Closure/Diversion
- Traffic Disruption
- Amenity Access and Water Navigation
- Local Economy

Operation

- Reduction in Flood Risk
- Provision of Public Amenity Space.

5.7 Methodology

The purpose of this section is to describe how potential effects relating to Population and Human Health have been assessed. A more general explanation of assessment methodology used throughout the ES is provided in Chapter 2: EIA Methodology. The Population and Human Health assessment primarily relies upon the sources listed within Section 5.1.

There is no single widely accepted guidance document available for the assessment of Population and Human Health in the UK. However, guidance on determining significance for human health for EIA (13) and social impact assessment in EIA (12) have been consulted. The assessment within this chapter primarily utilises general EIA guidance alongside the guidance listed within Section 5.4. The assessment of Likely Significant Effects within this chapter relies upon the use of professional judgement. Within EIA, the use of professional judgement is always required. However, this is substantiated wherever possible with evidence which informs the opinion of the competent expert.

The terminology and definitions used to describe noise and vibration effects are as per the Noise and Vibration Impact Assessment, rather than the definitions given in the following sections.

5.7.1 Definition of study area

The study area is centred on the town of Cardigan and has been defined with reference to the potential for impact from the Scheme using professional judgement and available information. For Population and Human Health, the study area needs to be specific to the communities within the town of Cardigan as the town is the primary receptor for Population and Human Health effects.

Demographic data has been sourced from the Cardigan Teifi, Cardigan Rhyd-y-Fuwch and Cardigan Mwldan Lower Super Output Areas (LSOA) which combined, are representative of the wider Cardigan Town region. The entirety of the Scheme Area falls within the Cardigan Teifi LSOA, and the Cardigan Mwldan LSOA is located approximately 100m north of the Scheme Area, to the north of the Pont-Y Cleifion road.

Therefore, the three LSOA's define the study area for the assessment, and this area is shown within Figure 5.1.

5.7.2 Baseline information

The assessment of Population and Human Health requires an understanding of the community and characteristics of the town of Cardigan. Data sources that have been used comprise:

- Consultation Feedback
- Office for National Statistics Census Data
- Equality Impact Assessment (EqIA)
- Population profile and Health Impact Appraisal completed by NRW in 2023
- Navigational Risk Assessment (NRA)
- Ceredigion Local Development Plan 2007 – 2022 (14)
- Construction traffic noise and vibration assessment technical note
- Chapter 8: Landscape and Visual
- Chapter 9: Traffic and Transport.
- Green Infrastructure Statement (15)

5.7.3 Significance

Significance is determined using a combination of sensitivity of the receptor and magnitude of change. When describing significance, effects have also been classified according to whether they are positive or negative, and whether they are temporary (short, medium, or long-term) or permanent. Effects are also classified as either direct or indirect. The terms and classifications used to determine and describe significance are outlined within Chapter 4: EIA Methodology. Table 5-4 outlines the criteria which have been used to classify the sensitivity of receptors, whilst

Table 5-5 outlines the criteria which have been used to determine magnitude in relation to Population and Human Health. The criteria used to classify sensitivity and magnitude have been selected based on professional judgement, which has been informed by ISEP (formerly IEMA) guidance (13), (12) and standard practice.

Sensitivity criteria for Traffic and Transport and Noise and Vibration are outlined within Chapter 9: Traffic and Transport and Appendix 5.1 respectively.

For pollution and dust effects, the Institute of Air Quality Management (IAQM) 'Guidance of the assessment of dust from demolition and construction' (IAQM, 2024) document was used to gauge the sensitivity of the study area to increased dust generation.

Table 5-4 – Criteria used for classifying the sensitivity of Population and Human Health receptors

Sensitivity	Criteria
High	The residential receptors within the study area are classified as high sensitivity if the baseline data exceeds the given values for vulnerable groups which correspond to the capacity of a receptor to respond to change: Elderly (Over 65) - >20% Young children (0-4) - >20% Bad or very bad health - >5% Welsh Index of Multiple Deprivation (WIMD) - >10% most deprived areas in Wales. Receptors where people spend long periods, sleep (residential), or where high levels of concentration and speech intelligibility are essential. Disruption here causes significant impact on health and quality of life (residential dwellings, healthcare facilities, schools and educational facilities and places of worship). Communities with high unemployment rates (>5%), economic deprivation, or strong reliance on local contracting opportunities and trade. PRoW's or footpaths which regularly support high foot traffic or are key commuting routes or key to accessing certain areas of the town. Regular recreational/commercial users of the Afon Teifi who rely on a single location and are unable to relocate.
Moderate	The residential receptors within the study area are classified as moderate sensitivity if the baseline data exceeds the given values for vulnerable groups which correspond to the capacity of a receptor to respond to change: Elderly (Over 65) - >15% to <20% Young children (0-4) - >15% to <20% Bad or very bad health - >3% to <5% Welsh Index of Multiple Deprivation (WIMD) – >10% -<20% most deprived areas in Wales

Sensitivity	Criteria
	Receptors with a reasonable expectation of amenity, but where occupation is transient (Hotels/PRoW) or where the environment is less sensitive to external noise than a residential dwelling (Offices). Communities which do not have high unemployment rates (<5%), economic deprivation, or have a mixed economic base with some reliance on local contracting opportunities and trade. PRoW's or footpaths which regularly support moderate foot traffic but are not key routes used for commuting. Regular recreational/commercial users of the Afon Teifi who use a specific location but are able to reasonably re-locate to another area.
Low	The residential receptors within the study area are classified as low sensitivity if the baseline data exceeds the given values for vulnerable groups which correspond to the capacity of a receptor to respond to change: Elderly (Over 65) - <15% Young children (0-4) - <15% Bad or very bad health - >3% Welsh Index of Multiple Deprivation (WIMD) - >20% most deprived areas in Wales. Receptors where the ambient noise level is often higher, occupancy is transient, or the activity (e.g., shopping, manual work, restaurants and pubs) is not significantly disrupted by external construction noise. Economically resilient areas with diverse employment options. PRoW's or footpaths which are rarely used and do not provide key access routes within the town. Regular recreational or commercial users of the Afon Teifi, who do not rely on a specific location and can easily re-locate.

Table 5-5 – Criteria used for classifying the magnitude of change

Magnitude	Criteria
High	Where an effect has the potential to result in a substantial change (either negative or positive) to a receptor or resource. May include negative effects which result in fatality or serious physical/mental harm, closure or severe effect upon the viability of businesses and community facilities, the recreational/commercial use of the Afon Teifi or access to PRoW/footpath networks. Substantial increase in local employment (>100 jobs) or a long-term benefit (>5 years) to employment and trade.
Moderate	Where the effect has the potential to result in a noticeable change (negative or positive) to a receptor or resource.

Magnitude	Criteria
	May include negative effects which result in minor physical/mental harm, temporary closure or tangible effect upon the viability of businesses and community facilities, the recreational/commercial use of the Afon Teifi or access to PRoW/footpath networks. Moderate increase in employment (20–100 jobs) or a medium-term benefit (1–5 years) to employment and trade.
Low	Where the effect has the potential to result in a barely perceptible change (negative or positive) to a receptor or resource. May include negative effects which result in temporary disturbance and nuisance, temporary disruption but no change to the viability of businesses and community facilities, the recreational/commercial use of the Afon Teifi or access to PRoW/footpath networks. Minor increase in employment (<20 jobs) or a short-term benefit (<1 year) to employment and trade.
Very Low	Where the effect has the potential to result in no discernible change (negative or positive) to a receptor or resource. May include negative effects which result in temporary minor nuisance, no disruption or change to the viability of businesses and community facilities, the recreational/commercial use of the Afon Teifi or access to PRoW/footpath networks. Minimal or no measurable benefit to local workforce or economy.

5.8 Baseline environment and likely future evolution

This section describes the baseline environment and its likely future evolution. The current baseline environment scenario refers to the current state of environmental characteristics within the study area. The description of the baseline environment relies on secondary data gathered from the sources listed in section 5.7.2. The description of the likely future baseline explains how the current baseline is expected to evolve naturally without the Scheme, based on the available environmental information and scientific knowledge. It reflects changes that can be reasonably predicted with the data available.

5.8.1 Scheme Area overview

The town of Cardigan is located on the southwestern edge of Ceredigion County, with Pembrokeshire being located to the south of the town. Existing infrastructure in the Scheme Area includes the current flood defences, residential and commercial buildings along the northern riverbank, Gloster Row car park and the existing slipway/river access point at Gloster Row car park. Strand and Castle Street are roads located within the Scheme Area which provide access for local traffic to the town centre. Strand is a one-way road constrained by Cardigan Castle Scheduled Monument and the Afon Teifi. Perpendicular to Strand is Castle Street / Cardigan Bridge which is a narrow two-way road crossing the Afon Teifi.

These following sections describe the multiple environmental factors relevant to the effects which have been scoped into the assessment, as outlined within Table 5-2 and Table 5-3.

5.8.2 Flood risk

The Strand area of Cardigan on the north bank of the Afon Teifi, which includes residential and commercial properties, is vulnerable to flooding. Flood events occurred in 2007, 2008, 2012 and 2014. In 2007 the lower quayside, including Strand and Cattle Market flooded with flood depths exceeding 0.5m. A tidal flood on 3 January 2014 inundated 29 properties on St Mary's Street. Low-lying residential and commercial properties, particularly along Strand, are highly vulnerable, with thresholds below 3.1m AOD and exposure to annual tidal flooding. The Scheme Area would become increasingly vulnerable with predicted future sea levels rise.

Community concern is high: the 2021 Populations and Communities report (16) found that around 45% of Ceredigion residents worried about flooding to their local area, and around 32% had investigated risks to their homes. National Survey for Wales data from 2022-2023 indicates that the proportion of residents worried about flooding to their local area has not changed significantly and there is no more recent data for those who had investigated the risk to their homes.

5.8.3 Population

2021 Census data (Table 5-6) indicates that the population of Cardigan Teifi LSOA remained broadly stable between 2011 and 2021, while Cardigan Mwldan LSOA recorded a 4% increase and the Cardigan Rhyd-y-Fuwch LSOA recorded a 3.6% decrease. In contrast, the wider Ceredigion population declined by 5.8% over the same period. The total population in Cardigan Mwldan is consistently higher than in Cardigan Teifi and Cardigan Rhyd-y-Fuwch, reflecting greater population density in the northern part of the town.

Age structure data within Table 5-7 shows broadly comparable profiles between the three LSOAs, with the exception of older age groups. Cardigan Mwldan has a higher proportion of residents aged 65–74 and 75+, with the proportion of over-75s exceeding the Ceredigion average.

Within Cardigan Teifi, which encompasses the Scheme Area, 6% of residents are aged 0–4 and 14.8% are aged 65+. In Cardigan Rhyd-y-Fuwch 4.7% of residents are aged 0-4 and 25.4% are aged 65+. In Cardigan Mwldan, 3.8% are aged 0–4, while 34.7% are aged 65+, highlighting a markedly older population to the north of the town.

Based upon past population change data, the population of Cardigan is likely to either remain stable or decrease slightly.

Table 5-6 – Total population and % change between 2011 – 2021

Area	2011	2021	% Change
Cardigan Teifi LSOA	1,174	1,174	0

Cardigan Rhyd-y-Fuwch LSOA	1,226	1,182	-3.6
Cardigan Mwldan LSOA	1,784	1,862	+4
Ceredigion	75,922	71,475	-5.8

Table 5-7 – Age structure 2021

Age groups	Cardigan Teifi (%)	Cardigan Rhyd-y-Fuwch (%)	Cardigan Mwldan (%)	Ceredigion (%)
0-4	6.0	4.7	4.3	3.8
5-19	20.9	15.0	15.4	16.1
20-29	14.1	12.5	7.5	14.0
30-44	18.5	17.0	12.9	13.8
45-59	19.6	18.8	17.7	19.3
60-64	6.0	6.7	7.5	7.2
65-74	8.2	12.1	15.6	13.9
75 and over	6.6	13.3	19.1	11.8

5.8.4 Employment and economic status

Table 5-8 presents the economic activity status within the three LSOA's, alongside Ceredigion. 2021 Census data shows that, including those unemployed, 51.7% of residents in Cardigan Teifi, 47.7% in Cardigan Rhyd-y-Fuwch and 42.7% in Cardigan Mwldan were economically active. These figures are broadly consistent with Ceredigion overall, though they indicate higher economic activity in the southern part of the town which may be a result of the greater proportion of residents aged 65+ in the northern Mwldan region.

The dominant employment sectors only differ slightly between the three LSOA's. In Cardigan Teifi, the largest industries are hotels and restaurants (28.9%), public administration, education and health (26.4%), and finance, real estate, professional and administrative activities (11.6%). In Cardigan Rhyd-y-Fuwch the top three industries are hotels and restaurants (29.5%) followed by public administration, education and health (25.5%) and finance, real estate, professional and administrative activities (12%). In Cardigan Mwldan, public administration, education and health is the largest sector (33.2%), followed by hotels and restaurants (24.7%) and finance, real estate, professional and administrative activities (11.4%). This would not be expected to change significantly in the future.

The 2021 Populations and Communities Report (16) noted that Ceredigion has higher proportions of small employers, own-account workers, and full-time students compared with Wales as a whole, and lower proportions of residents who have never worked or are long-term unemployed.

2021 Census data indicates that 64.3% of households in Cardigan Teifi experience deprivation in at least one dimension, compared with 65.7% in Cardigan Rhyd-y-Fuwch, 57.6% in Cardigan Mwldan and 52.9% across Ceredigion.

The Welsh Index of Multiple Deprivation (17) identifies Cardigan Teifi LSOA, which contains the Scheme Area, as being ranked 125 out of 1,909 LSOA's in Wales, placing it within the 10% most deprived nationally. Table 5-9 shows that Cardigan Teifi is more deprived in almost every multiple deprivation category compared to the other two LSOA's, with particularly high levels of income deprivation, employment deprivation, and community safety and housing concerns. The only multiple deprivation category which is not ranked the highest in Cardigan Teifi is employment deprivation as Cardigan Rhyd-y-Fuwch has greater employment deprivation. In comparison to Cardigan Teifi, Cardigan Rhyd-y-Fuwch and Cardigan Mwldan fall within the 11–20% most deprived areas in Wales.

In November 2025, the latest WIMD became available as shown within Table 5-9. Cardigan Teifi's is now ranked as having greater multiple deprivation compared to 2019 with an overall ranking of 90. In contrast, multiple deprivation within Cardigan Rhyd-y-Fuwch and Mwldan has decreased, with updated rankings of 427 and 827 respectively. The new data indicates that deprivation is increasing within Cardigan Teifi and Mwldan whilst decreasing within Cardigan Rhyd-y-Fuwch. It is unclear whether these recent trends will continue in the future. However, in the absence of the Scheme, certain categories such as community safety and physical environment could decline further if flood events become more prevalent.

Table 5-8 – Economic activity status

Economic activity status	Cardigan Teifi		Cardigan Rhyd-y-Fuwch		Cardigan Mwldan		Ceredigion
Unit	**No.**	**%**	**No.**	**%**	**No.**	**%**	**%**
Economically active (in employment)	437	46.9	446	45.1	637	40.7	46.8
Economically active (unemployed)	44	4.7	26	2.6	32	2.0	1.8
Economically inactive	434	46.6	499	50.4	877	56.0	47.9
Retired	154	16.5	258	26.1	616	39.3	27.7
Student	61	6.6	40	4.0	62	4.0	10.0
Caretaker	74	7.9	48	4.8	64	4.1	3.5
Long term sick/disabled	95	10.2	131	13.2	109	7.0	4.4

Table 5-9 – Welsh Index of Multiple Deprivation rankings

Category	Cardigan Teifi		Cardigan Rhyd-y-Fuwch		Cardigan Mwldan	
Year	**2019**	**2025**	**2019**	**2025**	**2019**	**2025**
Overall deprivation	125	90	370	427	899	827
Income deprivation	66	59	340	264	756	634
Employment deprivation	117	65	101	234	601	653
Health deprivation	383	256	641	401	1,007	1,012
Education deprivation	663	471	1,046	881	886	635
Access to services	333	523	1167	1397	483	463
Community safety	127	54	321	417	1,163	1,223
Physical environment	683	148	1,708	1,225	1,770	1,474
Housing	115	253	393	1,222	1,585	1,599

5.8.5 Homes and land use

2021 Census data shows notable variation in housing tenure across Cardigan. In Cardigan Teifi LSOA, 39.1% of homes are privately owned, with private rentals accounting for 34.9% and social rentals 25.3%. Within Cardigan Rhyd-y-Fuwch LSOA 69.4% of homes are privately owned, with private rentals accounting for 12.3% and social rentals accounting for 18.2% of properties. Similarly, within Cardigan Mwldan LSOA private ownership at 69.4% also accounts for a much higher percentage of properties, with private rentals at 12.3% and social rentals at 18.2%. At the county level, Ceredigion reports 68.6% private ownership, 20.6% private rentals, and 10.5% social rentals. These figures highlight that private home ownership is significantly lower in Cardigan Teifi compared to the other two LSOA's and Ceredigion overall.

Cardigan contains three educational facilities: Ysgol Uwchradd Aberteifi (primary and secondary), Ysgol Gynradd Aberteifi (primary), and Coleg Ceredigion – Cardigan Campus. All are located in the northern half of the town and lie more than 300m from the main works area on the northern bank of the Afon Teifi.

Land use within the town comprises a mix of residential, commercial, and mixed-use allocations. The Ceredigion Local Development Plan (CCC, 2013) identifies four housing allocations within Cardigan (H0201, H0202, H0203 and H0204), totalling 5.19 ha gross area and 146 residential

units. Allocations H0203 and H0204, located south of the Afon Teifi, remain undeveloped as of November 2025. Allocations H0201 and H0202 are situated to the northwest of the town; development has commenced only within H0201. None of the current residential allocations fall within the Scheme Area.

It is likely that new housing will continue to be developed gradually in the future within Cardigan to meet housing demands. There is no data which indicates that the type of housing tenure would be likely to change in the future. There is one known mixed-use development (Application number: A240176) which will contain residential units and is located at the site of the former Cardigan and District Hospital. The development includes office workspace, café, residential development, storage building, was approved in 2024 and must begin by September 2029.

5.8.6 Human health

Human health effects within Cardigan, in relation to the Scheme, are primarily influenced by environmental factors including air quality, noise, vibration, water quality, and access to recreation and amenity areas. Potential health effects arising from these factors are assessed within the relevant topic chapters and appendices as listed below, with cross-referencing provided where interactions occur:

- Noise and Vibration - Construction noise and vibration assessment (Appendix 5.1)
- Local Amenity – Chapter 8: Landscape and Visual
- Construction Traffic – Chapter 9: Traffic and Transport.

This chapter focuses specifically on potential significant effects to vulnerable groups within Cardigan.

2021 Census data indicates that in Cardigan Teifi LSOA, 27.4% of residents are classed as disabled under the Equality Act, and 13.4% report that their day-to-day activities are limited by health. Overall, 74.2% of the population reported being in good or very good health, while 8.1% reported being in bad or very bad health. In Cardigan Rhyd-y-Fuwch LSOA, 29.7% of residents are classed as being disabled under the Equality Act, and 16.2% report that their day-to-day activities are limited by health. Overall, 69% of the population reported being in good or very good health, while 12.3% reported being in bad or very bad health. In Cardigan Mwldan LSOA, 25.7% of residents are classed as disabled, 12.4% report activity limitations, 74% report good or very good health, and 7.6% report bad or very bad health.

The 2021 Populations and Communities Report (16) highlights that physical activity levels in Ceredigion (58.2%) are higher than the Welsh average (53.1%), although 26.6% of adults remain inactive. Rates of mental health conditions and self-declared disabilities are slightly lower in Ceredigion compared to Wales overall; however, 19.9% of adults have a GP-recorded mental health condition and 17.8% report a self-declared disability.

Healthcare provision in Cardigan is limited. One GP surgery is located in the northwest of the town, with several pharmacies in the central area. No GP surgeries or pharmacies are present

south of the Afon Teifi. There is no evidence of any plans for additional GP capacity in the near future.

5.8.7 Footpaths, recreation and local amenity access

Cardigan offers a range of natural recreational facilities, including the Afon Teifi and its frontage, alongside numerous footpath routes throughout the town. The 2021 Populations and Communities Report (16) noted that access to green space in Ceredigion is relatively limited, with only 55% of households located near accessible green space compared to 77% nationally. Despite this, local attitudes towards green space are positive and slightly more favourable than the Welsh average. Green space provision in Cardigan correlates with the WIMD. Cardigan Teifi, with the highest levels of deprivation, is also the ward with the poorest access to green space.

Cardigan benefits from 40ha of sports grounds, 6ha of playing fields and 9ha of village green. Whilst this is a comparatively high proportion of sports grounds, it is a low quantity of playing fields per population compared to other major towns in Ceredigion (15). When compared to other major towns in Ceredigion, Cardigan is noted as having a high proportion of coastal paths and active travel routes, but poor provision of accessible greenspace, and a lack of connectivity between greenspaces.

Tree Cover in Wales' Towns and Cities (18) notes that towns in Ceredigion have an urban tree canopy cover of 15.7%, and Cardigan town of 15.5%. Both are slightly below the Welsh national average of 16.3%, which itself has decreased from 17.0% recorded in 2009. Canopy cover in Ceredigion and Cardigan are both also noted as having decreased; county canopy cover fell by 1.5% between 2009-2013, and 0.8ha of woodland appeared to have been lost in Cardigan between 2011-2014.

The majority of recreational facilities and footpaths within Cardigan are considered to be amenity features which provide benefits to the general public and local community. The availability and access to amenity features contributes to the social well-being, public health and economic prosperity of a town. As noted within Chapter 8: Landscape and Visual, the sense of place in Cardigan is strongly influenced by views of the Afon Teifi and various heritage assets, including Cardigan Castle, Cardigan Bridge and the town walls. As such, it is important that access to these views is retained.

Figure 5.2 shows the Public Rights of Way (PRoW), pedestrian footpaths, active travel routes and cycleways in Cardigan which are popular with walkers, runners and cyclists. No PRoW fall within the Scheme Area, though several notable routes are located nearby:

- National Cycle Network Route 82 runs along a section of the Afon Teifi at Cardigan on the southern landward bank, before heading southwest towards Fishguard.
- The Wales Coastal Path runs along the right bank of the Afon Teifi before crossing Cardigan Bridge (Castle Street) and moving in land before heading west towards the coast.
- There are a number of PRoW located within Cardigan with the following routes located near the Scheme Area:

- Route 78/23 (coastal path) runs along the southern landward bank for approximately 930m before joining St Dogmaels Road to the west of Castle Street bridge. This also links to Route 78/27 (bridleway) which runs for 1,020m and connects to other public rights of way to the southwest of Cardigan.

- Route 78/49/C (footpath) runs for approximately 100m in the southeast corner of the High Street, off Quay Street on the northern landward bank.

- Route 78/16 (footpath) runs for approximately 100m off Middle Mwldan, across the River Mwldan, to the north of Route 78/49/C.

- Route 78/48 (footpath) runs for approximately 26m between Priory Street and Pwlhai.

- Route 78/17 (footpath) runs along the northern landward bank for approximately 790m to link up with Route 78/16/C.

Ceredigion County Council have defined a number of active travel routes and there are existing routes located along Strand (CCC-CAR10-FW, walking route) and along the southern bank of the Afon Teifi (CCC-CAR02-SUP, walking and cycling routes). There are also aspirational routes in the same locations to include a cycle route on Strand (CER-FR-CA-021) and upgrade the route on the southern bank of the Afon Teifi.

The Afon Teifi supports a variety of recreational activities such as sailing, canoeing, power boating, and yacht racing. Local recreational groups include the Cardigan and District Ramblers, Sea Scouts, Teifi Boating Club, and Llandysul Angling Association. Outdoor activity providers such as Cardigan Bay Active and Adventure Beyond also operate in the area and utilise the scout hut buildings. The Old Forge Crafts shop is located within the Scheme Area.

Access to the Afon Teifi from within the Scheme Area is currently facilitated by the two slipways located near to the Cardigan Bay Active (Sea Scouts Slipway) and Gloster Row car park (Gloster Row / St Mary's Street Slipway). There are also other slipways within Cardigan as shown on Figure 5.2. Slipways as well as mooring points and other river access points are listed below:

- Netpool Road Slipway (use requires permission from mooring master)
- Quay Street car park Slipway (use requires permission from ATFL)
- Prince Charles Quay (public access but not a slipway – embarking/disembarking only)
- Sea Scouts Slipway (private use only)
- Glouster Row / St Mary's Street Slipway (publicly accessible)
- ATFL Mooring Area (not a slipway, mooring only with ATFL permission)
- Ynys Marine Slipway (not publicly accessible).

The Navigational Risk Assessment (Appendix 5.2) highlights that as the Afon Teifi is primarily used for tourism and leisure, it is mostly used for recreation during the summer months. Larger

vessels including those used for tourist boat trips depart from the Prince Charles Quay. These usually travel downstream towards the bay, but there is a tour operator whose preferred route is upstream and past the works area. Vessels are a mix of powered and non-powered. During the summer months, it is estimated that there are approximately 50 vessels per week using the river, although this is mainly downstream of Cardigan Bridge. ATFL have confirmed the Gloster Row Slipway is not used by emergency services, who instead use the slipway at Quay Street car park to launch when necessary.

There are two local events which are held in the vicinity of the works. The annual Cardigan River and Food festival takes place in and around the Quay Street car park to the west of the works area in August. This includes the following river activities:

- Boat Trips
- Coracle Demonstrations
- RNLI Rescue Demonstration
- Duck Race.

The second local event is the Mermaid Race, which is a rowing race involving approximately 80 boats. The race launches at the Ynys Marine Slipway on the southern bank of the Afon Teifi, opposite the Scheme construction works area, and the route continues downstream through Cardigan Bridge to Cardigan Island and back again. This event is held annually, usually in June or July.

There are no known future changes relating to the provision of footpaths, recreation and amenity areas in the absence of the Scheme.

5.9 Assessment of effects

The following sections contain assessments of the Likely Significant Effects which were scoped into the Population and Human Health assessment.

5.9.1 Construction effects

Sub-topics for the Assessment of Likely Significant Construction Effects are derived from the scoped-in effects listed within section 5.6. The potential negative construction effects have been assessed under separate sub-headings which correspond to the relevant environmental factor for clarity:

- Noise and vibration
- Pollution and dust
- Footpath Closure / Diversion
- Traffic Disruption
- Amenity Access and Water navigation.

A summary of the combined potential negative construction effects is provided following the 'Amenity Access and Water Navigation' section to provide assessment of the scoped-in effect as a whole.

Potential positive effects on the local economy are then assessed as a separate sub-topic.

Mitigation for negative effects and residual effects are set out within each sub-topic. All mitigation for negative effects to Population and Human Health are summarised in section 5.10, with all residual effects summarised in section 5.11.

Noise and vibration

Construction impacts related to Noise and Vibration have been assessed in full within the Noise and Vibration Impact Assessment (Appendix 5.1). This section provides a summary of the assessment outcomes but it should be read in conjunction with the full assessment.

Construction noise impacts have been assessed in accordance with BS 5228: Part 1. As a baseline noise survey has not been carried out, a worst-case baseline scenario has been assumed for all receptors. The specific criteria applied differ for residential and non-residential properties.

Description of effect and embedded mitigation

Methodology for receptor selection

Sensitive receptors have been identified based on their proximity to the works and their potential to be affected by noise and vibration. An initial set of all receptors at all dwellings within 300m was used to understand the screening distance where effects would be minor / negligible. Properties further back from the riverfront, which are screened from the works by other buildings (e.g., rows of houses behind the front row), will experience significantly lower noise levels. Therefore, once a row is negligible, all other rows behind will also be negligible.

The receptor dataset was reduced in size to those receptors closest to the works or within the zone of influence from construction. The remaining receptors have been grouped by their use and location. Each receptor group represents a cluster of properties, with the assessment point placed at the façade of the dwelling or building closest to the construction works (the 'worst-case' location).

In total, 33 residential receptor groups (representing approximately 170 individual dwellings) and 14 non-residential receptor groups (including pubs, hotels, restaurants, retail, offices, a school, and a church) have been identified.

A description of the methodology and receptor selection was sent to Ceredigion County Council by email for comment in October 2025 but no response was received. The EIA scoping opinion in October 2025 confirmed that "the proposed qualitative assessment of temporary construction effects … is appropriate" for the Population and Human Health topic which includes noise and vibration. It should be noted that due to the nature of the construction noise and vibration assessment where noise impact is assessed based on predicted levels exceeding fixed thresholds, it was considered that baseline measurements would be unlikely to change the outcome of the assessment and therefore were not required.

Assessment of predicted construction activity noise levels

Table 11 within the Noise and Vibration Assessment report (Appendix 5.1) highlights the significance of the 'worst' activity in relation to predicted noise levels in relation to each receptor group. The prediction methodology, when applied to the 47 identified sensitive receptor groups, indicates that significant negative effects (major or moderate effect) from construction noise are likely at several locations (Table 5-10). Receptors which may experience significant effects are shown to be located on the northern side of Areas 3 and 4, as shown within Figure 2 of the Noise and Vibration Assessment report.

Table 5-10 – Predicted noise levels for receptor groups subject to moderate or major noise effects

Group ID	Location name	Type	No.	Max construction level at façade (LAeq,T dB)	Duration above moderate threshold (weeks)	Significance	Worst activity
R23	Rear of 1-3 Riverside Mews	Residential	4	77	7	**Moderate**	Pre-auguring, removal of existing walls & sheet piling
R25	Rear of 26 - 32 St. Mary Street	Residential	7	73	4	**Moderate**	As per R23
R26	Teifi House, Gloster Row	Residential	1	78	13	**Major**	As per R23
R27	1-5 Gloster Row	Residential	5	77	10	**Moderate**	As per R23
R28	4 - 6 Church Street	Residential	3	76	8	**Moderate**	As per R23
R29	Caerhuan (adj. to St Mary's Church)	Residential	1	81	19	**Major**	As per R23

Major negative effects of construction noise (significant)

Two residential groups, representing 2 dwellings, where direct temporary (short-term) Major (significant) negative effects are predicted are:

- R26 (Teifi House, Gloster Row) representing 1 dwelling - A maximum construction noise level of 78 dB LAeq,T is predicted, exceeding the Moderate impact threshold for 13 weeks and the Major threshold for 5 weeks.

- R29 (Caerhuan (adj. to St Mary's Church)) representing approx. 1 dwelling - A maximum construction noise level of 81 dB LAeq,T is predicted, exceeding the Moderate impact threshold for 19 weeks and the Major threshold for 7 weeks.

Moderate negative effects of construction noise (significant)

Four direct temporary (short-term) Moderate (significant) negative effects are predicted at four residential receptor groups representing approximately 19 dwellings:

- R23 (Rear of 1-3 Riverside Mews) representing approx. 4 dwellings – exceeding the Moderate impact threshold for 7 weeks with the highest predicted noise level peaking at 77 dB LAeq,T. (reduced from Major due to duration).

- R25 (26 – 32 St. Mary's Street) representing approx. 7 dwellings - exceeding the Moderate impact threshold for 4 weeks with the highest predicted noise level peaking at 73 dB LAeq,T. (reduced from Major due to duration).

- R27 (1-5 Gloster Row) representing approx. 5 dwellings - A maximum construction noise level of 77 dB LAeq,T is predicted, exceeding the Moderate impact threshold for 10 weeks. (reduced from Major due to duration).

- R28 (4 – 6 Church Street) representing approx. 3 dwellings - A maximum construction noise level of 76 dB LAeq,T is predicted, exceeding the Moderate impact threshold for 8 weeks. (reduced from Major due to duration).

Minor and negligible negative effects of construction noise (not significant)

A total of 13 residential (representing 62 dwellings) and 4 non-residential receptor groups (representing 13 commercial properties) are predicted to experience direct temporary (short-term) Minor (non-significant) negative effects.

All other effects at the remaining receptors are predicted to be Negligible. These effects are not considered significant.

Negligible adverse effects due to construction traffic noise (not significant)

Construction traffic noise impacts were assessed by calculating the noise change between the baseline traffic flows and the worst-case peak weekly construction traffic flows. Table 14 within Appendix 5.1 shows the predicted calculated noise change due to the Scheme and concludes that construction traffic will result in direct temporary (short-term) Negligible (non-significant) effects on all road links.

Negative effects upon human receptors due to construction vibration (significant)

Calculations for vibratory piling were carried out in accordance with BS 5228 Part 2 to predict Peak Particle Velocity (PPV) levels at various distances. The sheet piling activity is expected to last for approximately seven weeks.

The predictions establish key screening distances for human perception:

- Receptors within 30m of piling may experience vibration levels above the 1.0 mm/s moderate impact threshold.
- Receptors within 5m of piling may experience levels above the 10 mm/s 'intolerable' threshold.

Based on these findings, direct temporary (short-term) Moderate (significant) negative effects are predicted for several residential groups located within the 30m screening distance. These receptors are likely to experience vibration exceeding the 1.0 mm/s moderate impact threshold for a duration of approximately one to four weeks (depending on how quickly piling moves across the site). The affected groups are:

- R18 – Castle View and 1-3 Carrier's Lane
- R21 – 13 Strand
- R23 – Rear of 1-3 Riverside Mews
- R25 – approx. 5 dwellings at 26 – 31 St. Mary's Street
- R26 & 27 – 6 dwellings on Gloster Row, including Teifi House
- R28 & 29 –4-6 Church Street and Caerhuan.

Two non-residential groups (R17 and R22) are located within the 5m screening distance. However, due to the lower sensitivity of these commercial uses and the transient nature of the piling works as they pass these specific locations, the effect on human receptors here is not considered to be significant.

Negative effects upon buildings due to construction vibration (significant)

The two non-residential groups R17 (Cardigan Bathroom Centre) and R22 (Old Forge Crafts / Cardigan Bay Active) include buildings in very close proximity to the proposed vibratory piling works.

Predictions indicated that these buildings may experience PPV levels exceeding the guideline values for assessing risk of cosmetic building damage (per BS 7385). Therefore, it is recommended that a vibration risk assessment be undertaken for these specific buildings prior to piling works commencing.

All other receptor groups are located at a sufficient distance and predicted vibration levels are not expected to exceed the building cosmetic damage thresholds.

Incorporated Mitigation Measures

As part of the works, a Construction Environmental Management Plan (CEMP) will be developed to ensure that environmental impacts are avoided and minimised during construction, Best Practicable Means (BPM) mitigation measures for noise and vibration will be included in the CEMP.

Throughout the construction programme, the primary strategy for managing noise and vibration will be the application of BPM, as set out in section 5 of the Noise and Vibration Assessment (Appendix 5.1). BPM involves minimising site noise levels at all times, whilst having due regard to the practicability and economic implications of any mitigation measure. Examples of BPM measures include suitable plant selection, selection of appropriate working hours, site layout which minimises impacts from directional noise sources and shutting down plant when not in use.

BS 5228 does not set specific criteria for acceptable construction noise. The preferred approach is therefore to reduce noise at the source where possible. In some cases, a higher noise level may be acceptable if it significantly reduces the overall construction time and, consequently, the long-term duration of the disturbance.

Additional Mitigation Measures

Where significant effects are predicted after the application of standard BPM, additional mitigation measures should be adopted to reduce effects as far as practicable. The specific details of these measures will be finalised by the Principal Contractor and approved via the CEMP, or a specific Noise and Vibration Management Plan prior to works commencing. Any additional mitigation measures should also be detailed within any future Section 61 Consent.

The mitigation strategy follows a hierarchy of control, prioritising mitigation and management at the source before considering receptor-based measures. Further details of additional mitigation measures can be found within section 9 of the Noise and Vibration Assessment (Appendix 5.1).

Procedural and on-site measures

The following measures should be applied on-site prior to any receptor-based mitigation in order to reduce noise levels as far as practicable:

- **Community Liaison:** Proactive communication is essential. This includes notifying residents in advance of specific noisy and high-vibration activities (such as piling) and providing a dedicated point of contact for complaints or queries.

- **Localised Screening:** The contractor should install temporary noise barriers or enclosures around significant stationary noise sources, or at specific work areas close to dwellings.

- **Noise and Vibration Monitoring:** Implementation of attended or unattended monitoring at locations with the greatest potential for disturbance. This verifies that levels against predictions, allows for the use of trigger thresholds to help manage site noise and shows a proactive approach to noise management. Further information on

the monitoring scope is outlined within section 9.3 of the Noise and Vibration Assessment (Appendix 5.1).

- **Piling and Vibration Management:** A vibration risk assessment for all piling and ground compaction activities should be undertaken prior to works commencing. This assessment should determine the need for continuous vibration monitoring at the closest buildings (e.g., R17 and R22) and worst-affected residential receptors and inform the selection of specific mitigation techniques (see section 9) of the Noise and Vibration Assessment (Appendix 5.1).

- **Section 61 Consent:** While planning permission grants consent for the development, the Contractor should apply for a Section 61 Consent under the Control of Pollution Act 1974. This voluntary process formally agrees on working methods, mitigation, BPM, predicted noise levels and site action triggers with the Local Authority Environmental Health Officer in advance. Obtaining this consent provides the project with protection against Section 60 Abatement Notices, provided the agreed conditions are met.

Receptor-based mitigation (Noise)

If on-site mitigation is insufficient to reduce noise levels below significant thresholds and noise levels remain high for long periods, off-site mitigation should be considered in the following order of preference:

- **Noise Insulation:** Where noise levels above 75 dB during the day persist at residential receptors for a prolonged period (typically defined as exceeding triggers for 10 or more days of working in any 15 consecutive days, or for a total number of days exceeding 40 in any 6 consecutive months), the project should offer noise insulation to affected qualifying properties. A noise insulation assessment should be undertaken once final plant and methodologies are known to determine whether any properties qualify.

- **Temporary Re-housing:** This is considered a measure of last resort. It should only be offered in exceptional circumstances where construction noise levels are predicted to be intolerable for a sustained period, and where neither BPM nor noise insulation can provide adequate mitigation.

Note that there are no receptors that would currently qualify for noise insulation or temporary re-housing based on the predicted levels. Whilst levels are above the noise insulation trigger level, the durations are not such that they would qualify based on the temporal requirements.

Receptor-based mitigation (Vibration)

Given that on-site mitigation (source control) is the primary method for reducing vibration, receptor-based measures focus on managing the human response to residual effects.

The assessment predicts 'Moderate' vibration effects (between 1.0 mm/s and 10 mm/s) at the closest receptors. While significant, BS 5228-2 states that vibration of this magnitude *"can be tolerated if early warning and explanation has been given to residents"*. Therefore, the primary mitigation will be a proactive notification strategy, ensuring residents are informed of the piling

schedule and reassured that levels remain well below the thresholds for cosmetic building damage.

To further ease concerns, the Contractor may offer to undertake specific attended measurements or install long-term vibration monitors at individual properties where residents express particular anxiety or concern with vibration. Determining actual levels in the presence of the resident (or providing them with visible data) is often an effective way to demonstrate that vibration, while perceptible, is well below damage thresholds.

Temporary re-housing is considered a measure of last resort. It would generally only be offered if vibration levels are predicted to be 'Intolerable' (typically exceeding 10 mm/s) for a sustained period. As current predictions show levels remaining below this Major threshold, re-housing is not anticipated. However, it remains a residual option to be assessed on a case-by-case basis.

Conclusion of residual effects

Construction noise

Following the implementation of BPM measures and additional mitigation measures, assuming a conservative 5dB decrease in noise level is achieved, the remaining Major negative effects (R26 & R29) will likely reduce to Moderate negative as the duration above the Major threshold would reduce to under a month.

The reported Moderate negative effects (R23, R25, R27 & R28) would likely remain as moderate negative effects despite a reduction in absolute noise levels.

If the more typical 10 dB reduction is achieved on site, it is likely that the residual effects at several of these locations would be further reduced to Minor negative (not significant).

Construction vibration

The quantitative assessment presents a conservative 'worst-case' scenario assuming standard vibratory piling methods. Under these conditions, vibration levels at the closest residential receptors (R18, R21, R23, R25, R26, R27, R28 & R29) are predicted to exceed the moderate negative threshold.

However, the implementation of the piling and vibration management measures outlined in Section 9.1 (Appendix 5.1) (specifically the use of resonance-free rigs and pre-auguring) is expected to reduce vibration generation at the source. While these reductions cannot be accurately quantified prior to the contractor's final plant selection, it is anticipated that the effective application of these measures could reduce vibration levels below the moderate threshold at several locations.

Where the moderate threshold is still exceeded at residential receptors, levels will remain an order of magnitude below the criteria for cosmetic damage. In these instances, the residual effect is characterised by potential annoyance rather than physical impact. This will be managed through community liaison, monitoring and timing restrictions.

As stated previously, the two non-residential groups R17 and R22 include buildings which may experience PPV levels exceeding the guideline values for assessing risk of cosmetic building

damage (per BS 7385). Therefore, it is recommended that a vibration risk assessment be undertaken for these specific buildings prior to piling works commencing. The measures described in section 9.1 of the Noise and Vibration Assessment (Appendix 5.1) are expected to reduce vibration generation at the source which would help minimise this risk.

Construction traffic

No significant effects are reported as a result of construction traffic, however, the use of a construction logistics plan can help ease local concerns and potentially reduce complaints.

Pollution and dust

Construction effects related to construction emissions have were scoped out of the assessment as in accordance with EPUK/IAQM Land-Use Planning and Development Control: Planning for Air Quality guidance, an air quality assessment is required where there is a change of Heavy-Duty Vehicle (HDV) flows of more than 100 per day measured as an annual average daily traffic flow (AADT), or more than 25 within an Air Quality Management Area (AQMA). There are no AQMAs within 1km of the Scheme Area and therefore the 100 per day change in HDV flow threshold applies. The construction of the Scheme would not generate sufficient HDV flows to warrant the need for further assessment.

Effects related to dust pollution have been scoped out of the assessment as appropriate mitigation has been derived from the recommended mitigation detailed within section 8 of the IAQM guidance document (19). The selection of appropriate dust mitigation measures utilised a precautionary approach which involved the adoption of high-risk mitigation measures where appropriate, due to the scale of the works and sensitivity of receptors. All dust management mitigation measures are outlined in full within the EAP (Appendix 13.1) and will also be referenced within the CEMP and accompanying Dust Management Plan (DMP).

Footpath closure/diversion

Sensitivity

Existing PRoW, active travel routes, the Wales Coastal Path and other footpaths throughout the town are used by local residents and tourists primarily for commuting or leisure. Users of these routes may include school children, the elderly and people with disabilities.

The PRoW throughout the town are likely to only be used for leisure and commuting. There are no PRoW which will be affected by the works due to distance from the Scheme Area, and therefore, PRoW are not considered further in this assessment. Whilst there are no other routes located adjacent to the main Scheme area, there are active travel routes and a national cycle route which are adjacent to the Northern and Southern compounds.

An active travel route for walking is located along Pont-Y-Cleifion, which passes the entrance to the proposed Northern compound. However, this route is likely to experience low foot traffic and access will not be restricted due to the presence the Northern compound. Signage and traffic management measures will be used to minimise disturbance to footpath users. Route 82 of the national cycle network and a shared use active travel route are located to the north of

the Southern compound. However, there will be no loss of access to either of these routes as there is an existing fence separating to two areas.

Other footpaths throughout the town likely experience high foot traffic and provide key commuting routes, particularly for those who commute via Cardigan Bridge. Due to the location of the Scheme Area, the only footpath which is likely to be sensitive to the works are the pedestrian footways along Strand as construction activity will take place within this area. Whilst the footways along Strand are likely to experience moderate foot traffic, there are alternative routes in the area which will not be impacted by the works, and it is not considered that the footways will be particularly sensitive to change. Therefore, sensitivity is considered to be moderate.

Description of effect and embedded mitigation

There are a number of footpaths throughout the town which are used for commuting, accessing social infrastructure and recreational areas. During construction, access to pedestrian footways along Strand will be temporarily partially limited to facilitate the safe undertaking of works.

The following temporary footpath closures/diversions are planned:

- Part of the pedestrian footway on the riverward side of Strand will be temporarily closed between Cardigan Bridge and the Cardigan Bathroom Centre for the duration of the works for health and safety reasons. The opposite side of Strand will remain open to foot traffic throughout the works and crossing points will be provided.

All footpath closures required will be temporary in nature and there are no plans for permanent closures or diversions.

No footpath closures or major disruptions are associated with the proposed Northern or Southern compounds.

Magnitude

Partial temporary loss of the footpath on the riverward side of Strand will be limited in extent and duration. Throughout the remainder of the town, footpath closures are not expected and therefore, the extent and duration of the loss of access during construction will be low. Where temporary loss of footpaths are required along Strand, there is expected to be limited loss of access as diverted routes will be established.

The overall magnitude of change associated with the temporary (short-term) loss of public access to footpaths during construction will be low and limited to the construction phase.

Significance

Overall, there are likely to be limited effects related to footpath closures and diversions and a temporary (short-term) low magnitude of change resulting from the construction phase of the Scheme. Any negative effects will be temporary (short-term); however, the footpath improvements in Area 1 delivered through the Scheme would provide a permanent benefit to the town.

Based upon the moderate sensitivity of receptors and an overall low magnitude of temporary (short-term) negative change, it is the opinion of the competent expert that the Scheme would result in a direct temporary (short-term) minor (non-significant) negative effect.

Additional mitigation to reduce magnitude

No further mitigation is required as the effect is not significant.

Conclusion on residual effect

Assessment of residual effects is not required as no further mitigation is proposed. The effect remains minor and not significant.

Traffic disruption

Construction effects related to traffic disruption have been assessed in full within Chapter 9: Traffic and Transport. Table 9-14 from the Traffic and Transport assessment provides a summary of all likely traffic and transport effects and concludes that there are no likely significant effects. All effects were considered negligible and non-significant.

Amenity access and water navigation

Sensitivity

Public amenity areas include the Afon Teifi frontage, and the river itself which is used occasionally for recreational and commercial purposes and the publicly accessible areas of Strand and Gloster Row car park provide views to the river. Access to the Afon Teifi from within the Scheme Area is currently facilitated by the Gloster Row / St Mary's Street and Sea Scouts slipways. There are other slipways within Cardigan which are either publicly accessible or can be used with permission. Downstream of the town bridge, the mooring area south of Netpool Road is the only deep water mooring for the whole of the river.

There is on street parking along Strand and at parking space Gloster Row car park which may be used for amenity access, but other parking is available throughout the town, including the Quay Street car park which is also used for hosting local events.

Whilst access to green space in Ceredigion is relatively limited, with only 55% of households located near accessible green space compared to 77% nationally, access to green space in Cardigan is not considered to be particularly sensitive to change as Cardigan benefits from 40ha of sports grounds, 6ha of playing fields and 9ha of village green. Additionally, local attitudes towards green space are positive and slightly more favourable than the Welsh average indicating that this is not a major issue for local residents.

The slipway at Gloster Row is confirmed not to be used by the emergency services. The Sea Scouts Slipway is privately owned and unlikely to be used for emergency access due to the narrow roads and limited access behind the slipway itself. Access for emergency services is provided from the Quay Street car park slipway, which will remain unaffected by the works.

Being able to access the river and its frontage is important for some members of the community (e.g. Sea Scouts, individual river users) and businesses (e.g. Cardigan Bay Active and Adventure Beyond). However, there are multiple access points to the river and its frontage and multiple areas of greenspace throughout the town. Due to the proportions of vulnerable, disabled and elderly residents who may rely on existing on street parking and other car parking space close to facilities and amenity areas, sensitivity to change may be greater. Overall, the sensitivity of receptors is considered to be moderate.

Description of effect and embedded mitigation

The Afon Teifi is used for multiple recreational and commercial activities throughout the year, which primarily take place within the warmer summer months. The Scheme would require the temporary/permanent closure of the following amenity assets which may influence amenity access within the town:

- Suspension of on-street parking along construction access routes (Strand) to allow the safe passage and turning of delivery vehicles for the duration of the works. However, only one lane would be closed, allowing traffic to use the road.

- Gloster Row car park will be closed during construction. Site fencing will be erected to ensure the separation of the public and the ongoing works.

- Access to the Afon Teifi from the Scheme Area will not be possible during construction due to closure of Gloster Row / St Mary's Street slipway and the Sea Scouts slipway. Alternative slipways and river access points within Cardigan will remain accessible during the construction phase.

- Access to views of the Afon Teifi from Strand and Gloster row car park will be restricted during construction.

Within the Afon Teifi, exclusion zones will be established to ensure the safety of users during construction and the northern most arch of the bridge to prevent canoes and kayaks from entering the exclusion zone (see Navigational Risk Assessment, Appendix 5.2). The footprint of the exclusion zones will be minimal in comparison to the total width of the river, and therefore, it is not anticipated that the navigation of the river will be impacted by the works.

The Navigational Risk Assessment, included within Appendix 5.2, highlights the risks to vessels and mariners imposed by the Scheme during the construction phase and outlines appropriate mitigation measures to minimise risk.

Access to amenity areas will not be impacted by the proposed Northern or Southern compounds as they are both located on existing hardstanding.

Magnitude

Loss of access to the Afon Teifi due to the closure of the two slipways in the Scheme Area will be limited as access will still be possible through the use of alternate access points along the river. Businesses and local events which utilise the river are not anticipated to be restricted in their use of the river by the construction phase of the works and are only likely to experience minor inconvenience due to the establishment of exclusion zones. Similarly, whilst the number

of parking spaces in the town will temporarily be reduced, alternative parking will still be available. Views of Afon Teifi from the Strand and Gloster Row car park will be obstructed during construction, but alternative viewpoints of the river through Cardigan will remain available.

The overall magnitude of change associated with the temporary (short-term) effects to amenity access and water navigation during construction will be low and limited to the construction phase.

Significance

Based upon the moderate sensitivity of receptors and an overall low magnitude of temporary (short-term) negative change associated with the loss of slipway and car park access during construction, it is the opinion of the competent expert that the Scheme would result in a direct temporary (short-term) minor (non-significant) negative effect due to the availability of access points, parking and amenity areas located elsewhere within the town.

Additional mitigation to reduce magnitude

A community liaison strategy will be implemented during construction which will include liaison with users of the existing slipways in the Scheme Area. Where necessary, measures to help current users use alternative slipways will be agreed and put in place.

Engagement with ATFL will be continued throughout the construction phase of the works, to ensure that the mitigation measures noted within the Navigational Risk Assessment are implemented effectively, in particular with regard to local events, such as the Cardigan River and Food Festival and Mermaid Race. This will include issuing a notice to mariners, warning of the works and the temporary exclusion zone.

Conclusion on residual effect

Community liaison will help manage the temporary reduction in amenity access, but there will still be a low magnitude of change during works and so the residual effects remain minor (non-significant).

Summary of potential negative temporary construction effects

Table 5-11 provides a summary of all potential negative construction effects prior to the consideration of additional mitigation. Pollution and dust were scoped out of the assessment and so are not considered in the table. Traffic disruption and traffic noise were assessed as negligible so are not considered in the table.

Considering the combined effects to local residents, businesses, recreational users and all river users, the only negative significant effects are derived from construction noise and construction vibration (human receptors and buildings). All other effects have been assessed as non-significant. Based upon the assessment of potential for temporary negative construction effects relating to the environmental factors in Table 5-11, there would be a combined short-term negative significant effect upon receptors.

Mitigation and residual effects related to these significant negative effects derived from construction noise and construction vibration are summarised within section 5.10 and 5.11.

Table 5-11 – Summary of negative temporary construction effects

Environmental Factor	Effect	Significance of Effect
Noise and Vibration	Construction noise	• Direct temporary (short-term) major (significant) negative effects upon two residential receptor groups (4 dwellings); • Direct temporary (short-term) moderate (significant) negative effects upon four residential receptor groups (19 dwellings); • Direct temporary (short-term) minor (non-significant) negative effects upon 13 residential receptor groups (62 dwellings); and • Direct temporary (short-term) negligible (non-significant) negative effects upon all other receptor groups.
Noise and Vibration	Construction traffic noise	Direct temporary (short-term) negligible (non-significant) negative effects on all road links.
Noise and Vibration	Construction vibration (human receptors)	Direct temporary (short-term) moderate (significant) negative effects upon six residential receptor groups (22 dwellings) within the 30m screening distance).
Noise and Vibration	Construction vibration (buildings)	Two non-residential receptor groups R17 and R22 include buildings in very close proximity to the proposed vibratory piling works. Predictions indicated that these buildings may experience PPV levels exceeding the guideline values for assessing risk of cosmetic building damage (per BS 7385). Therefore, it is recommended that a vibration risk assessment be undertaken for these specific buildings prior to piling works commencing.
Footpath closure/diversion	Loss off access footways on Strand	Direct temporary (short-term) minor (non-significant) effect.
Amenity Access and Water Navigation	Loss of access to amenity and water navigation from Strand	Direct temporary (short-term) minor (non-significant) effect.

Local economy

Sensitivity

Within the context of Population and Human Health, the receptors for effects related to the local economy are the businesses and employment within Cardigan. Unemployment rates within the Cardigan Teifi LSOA are higher than the average for Ceredigion and above the national average for Wales. Additionally, both LSOA's are subject to high multiple deprivation compared to other areas in Wales. Primary employment within Cardigan includes hotels and restaurants, public administration, education and health, and finance/real estate, professional and administrative activities and it was noted that there were greater percentages of small employers, own account workers and full-time students in Ceredigion compared to Wales nationally.

Due to the high levels of multiple deprivation in parts of Cardigan along with above average unemployment rates, the sensitivity of the receptors is considered to be high as there is greater potential for the town to benefit from positive change.

Description of effect and embedded mitigation

The construction phase of the Scheme would require an average workforce of approximately 6-10 workers, rising to an approximate peak workforce of 14-18 during overlapping activities. Whilst the proposed will provide employment opportunities, direct employment within the local area is expected to be minimal and therefore has not been subject to further assessment. During the construction phase, small local businesses will likely benefit from increased trade, supported by the additional workers in the town. This includes hotels and other accommodation, cafes and convenience stores which will be likely to experience an increase in business during the construction phase.

The appointed contractor for the Scheme would utilise, where possible, local businesses in the supply chain to support the local area.

Magnitude

The construction workforce will likely lead to increased trade for local businesses, however given the relatively low number of construction workers required, it is considered that the magnitude of positive change within the town would be a low.

Significance

Based upon the high sensitivity to change, and an overall low magnitude of positive temporary (short-term) change, it is the opinion of the competent expert that the Scheme would result in an indirect temporary (short-term) moderate (significant) positive effect upon the local economy.

Additional mitigation to reduce magnitude

No mitigation is required as the effect is positive.

Conclusion on residual effect

Assessment of residual effects is not required as no further mitigation is proposed due to the effect being positive.

5.9.2 Operation effects

Reduction in flood risk

Sensitivity

During past flood events, properties have flooded which has caused damage and impacted the mental well-being of residents. The WIMD indicates that some areas of Cardigan (Cardigan Teifi LSOA) are among the 10% most deprived areas in Wales. Therefore, receptors are likely to be more sensitive due to a greater level of deprivation and a lower capacity to adapt to change. Additionally, there are greater percentages of small employers and vulnerable groups within the town which are also sensitive to change.

The sensitivity of these receptors is considered to be high primarily due to the number of small businesses, vulnerable groups and existing levels of deprivation in the area.

Description of effect and embedded mitigation

The main objective of the Scheme is to reduce the risk of tidal flooding to the town and community of Cardigan, taking account of predicted sea level rise. As described within Chapter 4: Project Description, the Scheme would comprise a series of flood defence structures designed to fit within the various constraints along the Afon Teifi frontage between Cardigan Bridge and Gloster Row car park. To provide the Scheme design standard of 1 in 200 AEP with allowance for climate change, the flood defences include structures up to approximately 2m above general ground level.

During operation, the Scheme would have a long-term positive effect to the identified receptors by reducing flood risk.

Magnitude

The Scheme would provide protection from up to 1 in 200 AEP flood events, thus reducing flood risk to approximately 90 properties currently at risk. This standard of protection accounts for future climate change to extend the length of protection into the future. Due to the standard of protection which would be provided, the future frequency of flooding for these affected properties and businesses will be reduced and can be considered to be very low as these properties would only be expected to flood during > 1 in 200 AEP flood event.

Based on the description of magnitude in relation to the influence of the Scheme, the magnitude of change from baseline conditions is considered to be high as there will be a substantial positive change to receptors.

Significance

The Scheme would deliver a positive high magnitude of change for receptors of high sensitivity. The Scheme would provide long-term protection from flood events up to 1 in 200 AEP which could otherwise result in property damage, displacement of residents, health risks and socio-economic impacts. By reducing flood risk for receptors, the Scheme enhances the resilience and quality of life within Cardigan.

Based upon the high sensitivity of receptors and an overall high magnitude of positive permanent change, it is the opinion of the competent expert that the Scheme would result in a direct permanent major (significant) effect.

Additional mitigation to reduce magnitude

No additional mitigation is required due to the positive nature of the effect.

Conclusion on residual effect

Assessment of residual effects is not required as no further mitigation is proposed due to the effect being positive.

Provision of public amenity space

Sensitivity

There are multiple areas of existing public amenity space within Cardigan which include the Afon Teifi frontage, the river itself, parks and other green spaces, footpaths and car parks. Whilst access to green space in Ceredigion is relatively limited, with only 55% of households located near accessible green space compared to 77% nationally, green space is relatively common throughout Cardigan. Cardigan is not considered to be particularly sensitive to change as Cardigan benefits from 40ha of sports grounds, 6ha of playing fields and 9ha of village green. Additionally, local attitudes towards green space are positive and slightly more favourable than the Welsh average indicating that this is not a major issue for local residents.

The Gloster Row and Sea Scouts slipways located within the Scheme Area are not the only slipways which provide river access in Cardigan. However, the Gloster Row slipway does permit public access, which will be lost. It is understood that the public use of this slipway is limited. Furthermore, these slipways are unlikely to be used by emergency services as access for emergency services is provided from the Quay Street car park slipway.

Parking space throughout the town is provided by on street parking and car parks. However, public consultation indicated that local residents feel that there is a lack of parking availability within the town. Therefore, receptors may be sensitive to changes in parking spaces.

Being able to access the river is important for some members of the community (e.g. Sea Scouts, individual river users) and businesses (e.g. Cardigan Bay Active and Adventure Beyond). However, as there are multiple access points to the river and its frontage and multiple areas of greenspace throughout the town for the community, the sensitivity of receptors is considered to be low.

Public amenity areas are common throughout Cardigan and there will be limited loss of river access. Therefore, sensitivity for these receptors is considered to be low. Due to the public sentiment that parking is limited within the town, sensitivity to change regarding car parking space is considered to be moderate.

Description of effect and embedded mitigation

Due to the alignment of the Scheme defences, the existing footpath along Strand in Area 1 would be widened once the existing highway wall is removed. This existing footpath is a publicly accessible amenity area which would be made more accessible due to the increased width, likely benefiting wheelchair users and carers with push chairs. The alignment of the flood defence has been designed to be further away from Strand, create a more open space to maximise visibility of Cardigan castle and bridge. This approach aligns with public consultation responses which highlighted that respondents favoured tree planting and wider pavements to improve accessibility in the area and enhance public amenity areas alongside the river.

This area will be enhanced with ornamental planting. Planting design minimises separation from the river, by continuity through planting design. Some species from the planting palette used for the riverside plateau and upper engineered riverbank slope are brought into the roadside planting bed, to provide a link with the riverside setting.

In order to set the wall alignment back at Gloster Row, a small area of grassland will be partially lost which is currently accessible to the public and known to be incidentally used by dog walkers. Approximately half of this area will be lost due to setting back of the flood wall to facilitate intertidal habitat creation.

Due to the alignment of the flood defences which encroach on Gloster Row car park, the car park has been re-designed to limit the permanent loss of parking spaces. A total of 8 parking spaces will be lost, and the exiting disabled parking space will be retained.

The Gloster Row and Sea Scouts slipways will be permanently closed and will be replaced by a new up and over kayak/canoe ramp at the Old Foundry site. The new canoe ramp has been designed to be accessible with suitable gradients and rest platforms incorporated into the design. Whilst this will ensure access is retained for recreational groups, the closure of the Gloster Row slipway will lead to a loss of a publicly accessible slipway. However, other slipways in Cardigan will still permit public access to the river. It should be noted that it has been noted that the existing public use of the Gloster Row slipway is limited and it is not relied upon by emergency services.

Magnitude

Positive change associated with the enhancement of public amenity areas is expected to be beneficial to the local community. Due to its central location in a high foot traffic area, it is considered likely that accessibility and amenity improvements within Area 1 area would provide a tangible positive impact to the area. Overall, as these changes are considered to result in noticeable benefits to mental health and accessibility, the magnitude of positive change is considered to be moderate.

The loss of existing amenity space from the grass area adjacent to Gloster Row car park will likely be a noticeable change for dog walkers and other existing users of this space. However, this space will be partially retained and remain accessible during the operational phase of the Scheme, which will limit the perceived magnitude of change. The new up and over boat ramp will allow the Scheme to retain existing access for recreational groups but will not replace the lost public access point at Gloster Row. As the public use of Gloster Row slipway is understood to be limited, it is considered that the changes to river access points will result in barely perceptible change. Whilst the Gloster Row car park will be reduced in size due to the flood

defence alignment, the car park has been redesigned to minimise the loss of parking spaces. As a result of the redesign, only 8 parking spaces will be lost.

Overall, the magnitude of negative change associated with the provision of public amenity spaces is considered to be low.

Significance

Based upon the low sensitivity of receptors for changes to public amenity areas and river access, and an overall moderate magnitude of permanent positive change, it is the opinion of the competent expert that the Scheme would result in a direct permanent minor (non-significant) positive effect.

Based upon the moderate sensitivity of receptors for changes to parking availability, and an overall low magnitude of permanent negative change, it is the opinion of the competent expert that the Scheme would result in a direct permanent minor (non-significant) negative effect.

Based upon the low sensitivity of receptors for changes to other public areas of public open space, and an overall low magnitude of permanent negative change, it is the opinion of the competent expert that the Scheme would result in a direct permanent negligible (non-significant) negative effect.

Additional mitigation to reduce magnitude

No additional mitigation is required due to the positive nature of the effect and minor/negligible negative effects.

Conclusion on residual effect

Assessment of residual effects is not required as no further mitigation is proposed due to the effects being positive/minor/negligible.

5.10 Mitigation measures

A summary of mitigation required and applied by the assessment is provided below. Mitigation which is considered additional is described in full within section 9 of the Noise and Vibration Assessment (Appendix 5.1).

- Noise and Vibration – Throughout the construction programme, the primary strategy for managing noise and vibration will be the application of BPM, as set out in section 5 of the Noise and Vibration Assessment (Appendix 5.1). BPM involves minimising site noise levels at all times, whilst having due regard to the practicability and economic implications of any mitigation measure. The scope of noise and vibration monitoring can be found within Section 9 of the Noise and Vibration Assessment (Appendix 5.1).

- The community liaison strategy will include liaison with users of the existing slipways in the Scheme Area.

- Engagement with ATFL will be continued throughout the construction phase of the works, to ensure that the mitigation measures noted within the Navigational Risk Assessment are implemented effectively.

5.11 Significance and duration of residual effects

Table 5-12 summarises the significance and duration of residual effects for each scoped in effect. Pollution and dust were scoped out of the assessment and so are not included in the table. Traffic disruption and traffic noise were assessed as negligible and so are not included in the table.

Table 5-12 – Summary of significance and duration of residual effects

Scoped in Effect	Significance	Duration
Potential for negative temporary construction effects relating to noise, vibration, pollution, dust, footpath closure and diversions, traffic disruption, reduced amenity access, reduced recreational capacity, and changes to water navigation.	**Construction Noise** Direct temporary (short-term) moderate (significant) negative residual noise effects are predicted at approximately 21 dwellings (within receptor groups R23, R25, R26, R27, R28, and R29) during the most intensive works. **Construction Vibration** Direct temporary (short-term) moderate (significant) negative residual vibration effects are predicted at approximately 22 dwellings. However, these predictions assume standard impact/vibratory piling. The adoption of modern "resonance-free" piling rigs and pre-augering is expected to significantly reduce these levels in practice, potentially reducing the impact from 'Moderate' to 'Minor' at several locations. Two non-residential receptor groups may experience vibration levels exceeding the guideline values for assessing risk of cosmetic building damage. A vibration risk assessment should be undertaken for these specific buildings prior to piling works commencing. **Footpath closure and diversions** Direct temporary (short-term) minor (non-significant) negative effect from temporary closure of part of the Strand footway. **Amenity Access and Water Navigation**	Short-term (construction phase)

Scoped in Effect	Significance	Duration
	Direct temporary (short-term) minor (non-significant) negative effect from loss of slipway and car park access during construction.	
Potential for positive effects on the local economy during construction through employment of a local contractor or contractors and an increase in trade for local shops and businesses.	Indirect temporary (short-term) moderate (significant) positive effects upon the local economy due to increased trade during construction.	Short-term (construction phase)
Potential for permanent positive effects due to the reduction in flood risk.	Direct permanent major (significant) positive effect in reduction to flood risk.	Permanent (operation phase)
Potential for permanent positive effects due to the provision of an area of public open space.	Direct permanent minor (non-significant) positive effect upon the provision of public open space at Strand).	Permanent (operation phase)
Potential for permanent negative effects due to the changes in existing public amenity space.	Direct permanent minor (non-significant) negative effect upon the provision of parking space (Gloster Row car park). Direct permanent negligible (non-significant) negative effect upon the provision of public amenity space (area adjacent Gloster Row car park).	Permanent (operation phase)

5.12 Difficulties and uncertainties

The following limitations have been identified:

- There are inherent interfaces between the Population and Human Health assessment and other topics assessed within this ES, therefore any relevant limitations identified by those topics may have implications on the respective associated effects within this assessment.
- The assessment of Likely Significant Effects within this chapter relies upon the use of professional judgement. Within EIA, the use of professional judgement is always required. However, this is substantiated wherever possible with evidence which informs the opinion of the competent expert.
- Most demographic data sourced for the purposes of this assessment relies on the 2021 ONS census data which may not accurately represent current demographics at the time of writing. However, at the time of writing, all third-party data is complete and up to date.

- The understanding of the frequency of use of footpaths within Cardigan is not based on survey data and is based purely upon observation and general understanding of use.

5.13 Summary of assessment

Whilst temporary residual negative significant effects are predicted during the construction phase of the works due to construction noise and vibration, these effects can be managed. It should be noted that there is no absolute legal noise limit that prohibits work; rather, the legislative requirement is to demonstrate that best practicable means (BPM) are being implemented to minimise disturbance.

Teifi House is a receptor which is likely to experience multiple nuisances during the construction phase the works due to the residual effects. Through the implementation of the EAP, CEMP, adherence to Control of Pollution Act 1974 Section 61 protocols, and a robust community liaison and monitoring strategy, the residual effects of the Scheme can be effectively managed.

The Scheme would provide significant positive effects related to the reduction of flood risk and the local economy.

5.14 References

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6. Biodiversity and Nature Conservation

6.1 Introduction

This chapter assesses the likely significant effects from construction and operation of the Scheme, with respect to Biodiversity and Nature Conservation. This chapter details the baseline environment, assessment of Likely Significant Effects (LSE), and where necessary, mitigation measures to avoid, reduce or minimise significant effects are proposed.

This chapter should be read in conjunction with the following topic chapters due to potential interactions between topics:

- Chapter 3: Alternatives & Design Evolution
- Chapter 8: Landscape and Visual
- Chapter 10: Water Environment
- Chapter 11: Land Use and Soils
- Chapter 12: Cumulative Effects

6.2 Competent expert evidence

The following Assessment was authored and reviewed by the following competent individuals.

Author - Jonathan Goodrick BSc MCIEEM

Review - Owen Peat MSc MCIEEM CEnv C.WEM MCIWEM

The sections of this report relating to fish were taken from Cardigan Tidal Flood Risk Management Scheme – Fish Ecology Technical Note (20) Appendix 6.2 written by

Author - Edward Rickard - BSc. (Hons), MRes, MRSB

Review - Nick O'brien - BSc. (Hons), MSc., MCIEEM

6.3 Planning policy and legislative context

This section describes the relevant legislation, policy and guidance that has been considered in developing the Scheme design, and in the assessment of effects with respect to Biodiversity and Nature Conservation. This legislation, policy and guidance has been reviewed and where applicable has informed the assessment through the identification and categorisation of sensitive receptors, requirements for mitigation, and the scope and/or method of assessment.

6.3.1 International and national policy

- Infrastructure Planning (Environmental Impact Assessment (EIA)) Regulations 2017;
- Marine Coastal Access Act (MCAA) 2009;

- The Conservation of Habitats and Species Regulations 2017 (as amended);
- The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019;
- The Marine Strategy Regulations 2010;
- The Ramsar Convention;
- Convention on the Conservation of Migratory Species (CMS) of Wild Animals (Bonn Convention) 1979;
- Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) 1979;
- Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR Convention) 1992;
- The Wildlife and Countryside Act (WCA) 1981 (as amended);
- The Water Environment (WFD) (England and Wales) regulations 2017;
- The Environment Act 2021;
- Environment Act Wales 2016;
- Salmon and Freshwater Fisheries Act (SAFFA) 1975 (as amended);
- The Eels (England and Wales) Regulations 2009;
- Convention on the International Trade in Endangered Species of Wild Fauna and Flora (CITES) 1973;
- Invasive Alien Species (Enforcement and Permitting) Order 2019;
- Natural Resources Policy (21)
- Planning Policy Wales (Edition 12) (22);
- Planning Policy Wales Technical Advice Note 5: Nature Conservation and Planning (23)

6.3.2 Local policy

- NRW Mid Wales Area Statement (24); and
- The Ceredigion Local Development Plan (25).

6.4 Assessment guidance

The general guidance used in this assessment is described within Chapter 4: EIA Methodology.

Guidance utilised which is specific to the assessment of Biodiversity and Nature Conservation is listed below:

- Guidance for Ecological Impact Assessment in the UK and Ireland (26).

6.5 Consultation

The EIA scoping opinion process is described in Section 4.5, this identified Biodiversity and Nature Conservation as a topic requiring consideration as part of the EIA.

A consultation and design presentation meeting was held on 18th November 2025 with representatives of NRW (including representatives of its regulatory functions) and Ceredigion County Council (regulatory/planning functions). In this meeting, the context and need for the Scheme was presented, along with the design development and the decisions taking to balance the objectives of the Scheme with the sensitivity of the Scheme Area. The discussion and outcomes of this meeting identified the design solutions to be a pragmatic approach; that opportunities taken to integrate habitat development and opportunities for species were welcomed, and that marine site impacts were not anticipated. The route to predicting natural colonisation of specific habitat types – notably saltmarsh – was a point of discussion, noting the balance between working with natural processes and guaranteeing outcomes, however the discussion recognised the evidence available of habitats which have previously developed within and adjacent to the site, and relating to the predicted impacts of climate change, as being accounted for within the proposed approaches and range of acceptable outcomes.

6.6 Scoped in receptors and potential effects

The Biodiversity and Nature Conservation topic was scoped into the EIA due to the potential for LSE during the construction and operational phases of the Scheme. Table 6- and Table 6-2 outline the LSE which are to be assessed within this Chapter.

Table 6-1 – Scoped in Likely Significant Effects (construction)

Environmental Effect	Receptor
The site is partially within a sensitive location, with potential impacts on the following protected sites and associated features: Afon Teifi Special Area of Conservation (SAC) / Site of Special Scientific Interest (SSSI) Cardigan Bay and West Wales Marine SAC	Protected sites and their associated features
Potential impacts to protected habitats and species, both terrestrial and estuarine. Including direct impacts to intertidal habitats (e.g. habitat loss, impacts from vehicle movements on the foreshore), and potential impacts on migratory and non-migratory fish species.	Protected habitats and species including: Intertidal mudflats; Saltmarsh; Poor semi-improved neutral; grassland; Running water; Broadleaved scattered trees; Amenity grassland; Amphibians and reptiles; Bats; Birds; Fish; Invertebrates;

Environmental Effect	Receptor
	Otter; and West European hedgehog.
Potential spread of Invasive Non-Native Species (INNS).	Habitats and species
Potential negative effect on trees in the Scheme Area due to potential removal/felling and construction works.	Trees and Root Protection Areas (RPAs)

Table 6-2 - Scoped in Likely Significant Effects (operation)

Environmental Effect	Receptor
Reduced flood risk could result in reduced potential for environmental pollution during and following a flood event.	SAC and SSSI
Impacts to protected species from artificial lighting.	Nocturnal species

6.7 Methodology

The purpose of this section is to describe how Likely Significant Effects relating to Biodiversity and Nature Conservation have been assessed. A more general explanation of assessment methodology used throughout the EIA is provided in Chapter 4: EIA Methodology.

6.7.1 Definition of study area

The Zone of Influence (ZoI) is the area over which ecological features may be affected by biophysical changes as a result of the Scheme and associated activities. Zones of Influence vary for different ecological features depending on their sensitivity and connectivity to the Scheme Area. This approach is in line with good practice guidelines published by CIEEM (26).

The Zones of Influence for the Scheme were developed to include:

- Areas directly within the land take for the proposed permanent development including permanent access routes for future maintenance (not including adopted highways); this comprises the entire Scheme Area.
- Areas which could be temporarily affected during construction due to temporary access, working areas and noise and visual disturbance; this comprises the entire Scheme Area plus a 2km buffer for designated sites.
- Areas with potential to be impacted by potential hydrological disruption during construction and operation (e.g. within and downslope / downstream of the Scheme Area); this comprises the entire Scheme Area plus a 2km buffer.

When in operation, the Scheme would not generate any noise, vibration or air pollution apart from occasional maintenance visits.

6.7.2 Baseline information

Baseline data collection has been undertaken to obtain information over the study areas. This section provides the approach to collecting baseline data.

The following data sources have been accessed to inform the baseline with respect to Biodiversity and Nature Conservation:

- Natural Resources Wales Cardigan Tidal Flood Risk Management Scheme – Preliminary Ecological Appraisal Update (27) Appendix 6.1;
- Cardigan Tidal Flood Risk Management Scheme – Fish Ecology Technical Note (20) Appendix 6.2;
- Afon Teifi Saltmarsh – niche Assessment (28) Appendix 6.3;
- Bat Survey Report. Buildings and Structures at The Strand, Aberteifi. For Cyfoeth Naturiol Cymru/Natural Resources Wales (29) Appendix 6.4;
- Cardigan flood risk management. Otter survey report. June 2nd 2025 (updated 20/6/2025) (30) Appendix 6.5;
- Cardigan Tidal Flood Risk Management Scheme - Habitats Regulation Assessment (31);
- Cardigan TFRMS -Preliminary Ecological Appraisal (32);
- Wintering Bird Surveys Cardigan Tidal Flood Risk Management Scheme (33) Appendix 6.6;
- Breeding Bird Surveys Cardigan Tidal Flood Risk Management Scheme (34) Appendix 6.7;
- Afon Teifi / River Teifi Proposed Flood Defences Cardigan. A Preliminary Roost Assessment Report (35) Appendix 6.8
- Cardigan Flood Consequence Assessment (36)
- Cardigan Tidal Flood Risk Management Scheme Noise and Vibration Impact Assessment (37) Appendix 5.1
- Arboricultural Method Statement Cardigan Tidal FRMS (38)
- Statutory designated site information from the Joint Nature Conservation Committee (39);
- Data Map Wales Intertidal Phase 1 Habitat Survey (40);
- Habitat Regulations 9A Report for Wales 2019-2024: Habitats data (41)
- Light pollution mapping (42); and

- Publicly available Ordnance Survey maps and aerial imagery (2014-present).

Species records obtained from the various sources were limited to the last ten years to ensure validity.

Future baseline

The assessment has considered the likely evolution of the baseline without the implementation of the Scheme, presented in Section 6.8. The future baseline for the Terrestrial ecology assessment has been established in accordance with the Guidelines for Ecological Impact Assessment (26) and includes the following:

- Trends in species population and distribution;
- Rates of potential colonisation by new species and habitats;
- Ecological processes, such as succession;
- Likely changes in agricultural practice, including agri-environmental schemes;
- Expected outcomes from current and predicted management practices;
- Trends in habitat quality e.g. resulting from pollution or pollution control;
- Environmental trends e.g. climate change; and
- Management plans and conservation objectives for designated sites.

The following chapters will also be relevant to informing the future baseline with respect to Biodiversity and Nature Conservation:

- Refer to Chapter 8: Landscape and Visual assessment for additional description of the post construction landscape design;
- Refer to Chapter 10: Water environment for additional evaluation associated with the water environment and aquatic ecosystems; and
- Refer to Chapter 11: Land Use and Soils for additional information on Scheme Area soil composition.

6.7.3 Significance

The methodology for assessing effects is based on the principle that the environmental effects of the Scheme, in relation to a receptor, should be determined by identifying the receptor's sensitivity (importance), assessing the magnitude of impact the Scheme would have on the receptor and then combining these two elements to identify the significance of effect (using professional judgement where necessary). The Guidelines for Ecological Impact Assessment (26) uses the term 'importance' as opposed to 'sensitivity' in categorising ecological features; however, for consistency with other chapters reference has also been provided below to the corresponding sensitivity of each receptor.

Sensitivity

The sensitivity of each identified terrestrial ecology receptor has been assigned for the assessment based on criteria set out in Table 6-3.

The CIEEM (2024) guidelines recommend that the importance of each ecological feature is considered within a defined geographic reference. To align with the sensitivity categories used within other Environmental Statement chapters in this assessment, regional and county importance have been combined within the moderate sensitivity category, and district and local importance have been combined within the low sensitivity category. Table 6-3 provides further detail on the initial criteria for establishing the importance of ecological receptors comprising designated sites, habitats and species with reference to this geographic context, and the sensitivity attributed to each of these receptors. The descriptions within the table are based on the general weight of protection and scarcity applied to receptors at a theoretical level. To determine the final sensitivity of the receptor utilised for this assessment this has been combined with the contextual information about distribution and abundance within the locality of the Scheme as determined by baseline ecology surveys. If a receptor is later identified in the assessment as being of lower sensitivity in the context of the Scheme and location, it does not mean that it has not been considered as an Important Ecological Feature, and by default all scoped-in receptors are acknowledged as having been identified as Important or potentially important in those terms.

Table 6-3 Criteria for establishing the sensitivity (value) of ecological receptors

Sensitivity of receptor	Importance of receptor	Typical descriptors
Very high	International and European	An internationally designated site or candidate site, i.e. a Special Protection Area (SPA), provisional SPA, SAC, candidate SAC, Ramsar site, or area which would meet the published selection criteria for designation (e.g. SACs and SPA: site condition, citations and conservation objectives (43)) A viable area of a habitat type listed in Annex I of the Habitats Directive, or smaller areas of such habitat that is essential to maintain the viability of a larger whole Sites supporting populations of internationally or European (including Annex II) important species
High	National (UK)	A nationally designated site, i.e. SSSI, NNR, or discrete area which would meet the published selection criteria for national designation (e.g. SSSI selection guidelines (44). Viable populations of nationally important species that are of threatened or rare conservation status
Moderate	Regional / County	Regional: Sites that exceed the county-level designation but fall short of SSSI selection criteria Smaller areas of key habitat identified as a habitat of principal importance essential to maintain wider viability Viable populations of nationally scarce species identified in the regional biodiversity plans or strategies and/or regularly occurring populations of a regionally important species.

Sensitivity of receptor	Importance of receptor	Typical descriptors
		County: Wildlife/nature conservation sites designated at the county level, such as Local Wildlife Sites (LWS) and Local Nature Reserves (LNR). A viable area of habitat identified as a Habitat of Principal Importance or smaller areas of such habitat essential to maintain wider viability Areas of habitats and species identified in county or equivalent authority plans or strategies, such as areas of key habitat / Habitats of Principal Importance (HPI) identified in local plans and strategies. Viable populations of Species of Principle Importance Viable populations of species important at the county scale
Low	District / Local	District: Sites recognised by local authorities, e.g. sites of district importance or considered to meet published ecological selection criteria for such designation. Viable areas of habitat or populations/assemblages of species of district importance. Local: Areas of habitat or populations/assemblages of species that appreciably enrich the local habitat resource (e.g. ponds) Sites that retain other elements of semi-natural vegetation due to their size, quality or the wider distribution within the local area or identified in the local Biodiversity Action Plan (BAP). Viable populations of species identified in local plans and strategies and/or regularly occurring populations of species important at the local or district scale.
Negligible	Within the ZoI only	Sites that retain habitats and/or species of limited ecological importance due to their size, species composition or other factors.

Magnitude of impact

The approach used is based on professional judgment and experience with reference to defined criteria from the CIEEM Guidelines for Ecological Impact Assessment (26), with the starting point that all receptors scoped-in following the Scoping Opinion have been included for further assessment.

For this assessment the criteria for assessing magnitude of impact in Table 6-4 will be applied.

Table 6-4 Criteria for assessing the magnitude of impact

Magnitude of impact	Description and nature of impact
Large	The impact permanently (or over the long-term) negatively or positively affects the conservation status of a habitat/species, reducing or increasing the ability to sustain the habitat or the population level of the species within a given

Magnitude of impact	Description and nature of impact
	geographic area through environmental change. Relative to the wider habitat resource/species population, a large area of habitat or large proportion of the wider species population is affected. For designated sites, integrity is compromised.
Medium	The impact permanently (or over the long term) negatively or positively affects the conservation status of a habitat/species reducing or increasing the ability to sustain the habitat or the population level of the species within a given geographic area through environmental change. Relative to the wider habitat resource/species population, a small-medium area of habitat or small-medium proportion of the wider species population is affected.
Small	The quality or extent of designated sites or habitats or the sizes of species' populations, experience some small-scale reduction or increase. These impacts are likely to be within the range of natural variability and there is not expected to be any permanent change in the conservation status of the species/habitat or integrity of the designated site. The impact is unlikely to modify the evaluation of the ecological feature in terms of its importance.
Negligible	Although there may be some effects on individuals or parts of a habitat area or designated site, the quality or extent of sites and habitats, or the size of species populations would experience little or no change. Any impacts are likely to be within the range of natural variability and there would be no short-term or long-term change to conservation status of habitats/species or the integrity of designated sites.
Neutral	An impact, the level of which is so low, it is not discernible on designated sites or habitats or the size of species' populations, or changes that balance each other out over the lifespan of a project.

Significance of effect

Categories of significance will be applied to effects, based on the combination of magnitude of impact and sensitivity of receptor as shown in Table 6-5. Effects that are moderate or major are deemed to be significant. The resultant effects may be either negative, positive or neutral, depending on the nature of the impact.

Table 6-5 Significance matrix

Receptor Sensitivity	Magnitude of impact				
	Neutral	**Negligible**	**Small**	**Medium**	**Large**
Very high	None	Minor	Moderate (significant)	Major (significant)	Major (significant)
High	None	Minor	Moderate (significant)	Moderate (significant)	Major (significant)
Moderate	None	Neutral	Minor	Moderate (significant)	Major (significant)
Low	None	Neutral	Neutral	Minor	Moderate

					(significant)
Negligible	None	Neutral	Neutral	Neutral	Minor

6.8 Baseline environment and likely future evolution

The section below describes the baseline environment and its likely future evolution. The current baseline environment scenario refers to the current state of environmental characteristics within the Scheme Area.

6.8.1 Designated sites

Statutory designated sites

Three statutory designated sites were recorded within 2 km of the Scheme Area. Site specific details including distance and direction from the Scheme Area and reason for notification and integral value can be found in Table 6-.

The Teifi Estuary Woodlands & Marshes SSSI (including the Teifi Marshes Wildlife Trust of South and West Wales reserve) although hydrologically connected to the sites is upstream of the Scheme Area and therefore were scoped out of the EIA at scoping stage The The Teifi Estuary Woodlands & Marshes SSSI includes within its area the Coedmor National Nature Reserve (NNR) and this has also been scoped out as it is upstream of the proposed works.

Table 6-6 Designated statutory nature conservation sites within the Zone of Influence

Designated Site Name	Distance from Survey Area (approx.)	Reasons for Notification and Integral Value	Sensitivity of Receptor
Afon Teifi SSSI	Within the Scheme	The Afon Teifi is of special interest for a range of river types and associated riverside habitats; flowering plants; bryophytes; otter *Lutra lutra*; Cetti's warbler *Cettia cetti*; bottlenose dolphin *Tursiops truncates*; brown hairstreak *Thecla betulae*; fish; dragonflies and a variety of other invertebrates as well as both breeding and wintering bird communities and for geomorphological features at Cenarth and Cors Caron. This includes the Teifi Marshes Nature Reserve (approx.. 150m west of the Scheme Area east of the A487 road bridge)	High
Afon Teifi SAC	Within the Scheme	Designated for; Atlantic salmon *Salmo salar,* bullhead *Cottus gobio*, river lamprey *Lampetra planeri*, floating water-plantain *Luronium natans*, otter, clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels, rivers with floating vegetation often dominated by water crowfoots. This includes the Teifi Marshes	Very High

Designated Site Name	Distance from Survey Area (approx.)	Reasons for Notification and Integral Value	Sensitivity of Receptor
		Nature Reserve (Approx 150m west of the Scheme Area east of the A487 road bridge)	
Cardigan Bay SAC and West Wales Marine SAC	Immediately adjacent to the scheme (Downstream of Cardigan Bridge (Castle Street))	Designated for Bottlenose dolphin, Atlantic Grey Seal *Halichoerus grypus,* Sea Lamprey *Petromyzon marinus,* River Lamprey, Harbour porpoise *Phocoena Phocoena.* Designated habitats include Reefs, Sandbanks (slightly covered by seawater at all times) and Sea caves (submerged or partially submerged).	Very High

There are no other non-statutory sites within 2km of the Scheme area as such, no further consideration is given to non-statutory designated sites as part of this chapter.

6.8.2 Habitats

A Phase 1 Habitat map for the Survey Area is presented in Figure 6.1. The following habitats are considered within this Environmental Statement:

- Broadleaved scattered trees (A3.1)
- Running water (G2)
- Intertidal mudflats (H1.1)
- Saltmarsh (H2.6)
- Amenity grassland (J1.2)
- Poor semi-improved grassland (B6).

Where habitats were found likely to fit descriptions of those habitats included within The Conservation of Habitats and Species Regulations 2017 (as amended) (41) a description of their current national status is provided.

For information on other habitats recorded during the field surveys but scoped out at the EIA scoping stage please refer to Natural Resources Wales Cardigan Tidal Flood Risk Management Scheme – Preliminary Ecological Appraisal Update (27) Appendix 6.1. This report used the DAFOR scale as a semi quantitative means to define floral species abundance within habitats where required as shown within Table 6-.

Table 6-7 DAFOR Scale

DAFOR Scale			
D	Dominant	76-100% cover	The most common species, covering most of the area.

DAFOR Scale			
A	Abundant	51-75% cover	Very common across most of the area.
F	Frequent	26-56% cover	Present in many places but not dominant
O	Occasional	11-25% cover	Found in scattered patches
R	Rare	1-10% cover	Very few individuals or very limited coverage. This is a descriptor of abundance within the individual habitat and not an indicator of wider conservation status or importance.
Lx	Locally	Prefix	Used a prefix to Dominant, Abundant or Frequent to indicate where coverage of an individual species varies within a habitat area

Broadleaved scattered trees

Broadleaved scattered trees occur infrequently in the Scheme Area and its immediate surrounds the Scheme. Where it is available, the aboricultural tree category from Arboricultural Method Statement Cardigan Tidal FRMS (38) is also provided.

Table 6-8 Key to Arboricultural categorisations adapted from (38)

Category	Description
A	Tree / groups of high quality: with an estimated remaining life expectancy of at least 40 years
B	Tree / groups of moderate quality: with an estimated remaining life expectancy of at least 20 years
C	Tree / groups of low quality: with an estimated remaining life expectancy of at least 10 years, or young trees with a stem diameter below 150mm
U	Tree / groups: in such a condition that they cannot realistically be retained as living trees in the context of current land us for longer than ten years.

Two pear trees *Malus* sp. (T3 Category B and T9 Category C (38)) and a sycamore *Acer pseudoplatanus* (T10 Category B (38)) are located within the former foundry site in the centre of the Scheme, several mature yew *Taxus baccata* (outside of Arboricultural survey boundary (38) trees are present within land at the churchyard/ cemetery to the east of the Scheme. There are two planted laburnum *Laburnum anagyroides* (T4 and T6 both Category C ADAS Ltd, 2026) trees in the carpark in the east of the Scheme. Additionally, two young sycamore trees (T2 Category B and tree too small for classification (38)) are present along the edge of the embankment adjacent to the hardstanding paving in the western section of the Scheme (near to Cardigan Bridge (Castle Steet)).

Due to its limited area, limited species, age and structural diversity, this receptor is considered to be of negligible sensitivity.

Running water

One watercourse (River Teifi (Afon Teifi)) is present within the Scheme and forms part of the Afon Teifi SAC/ SSSI. Within the Scheme Area the Afon Teifi is tidally influenced with exposed

low tide mudflats and also saltmarsh habitat communities fringing the watercourse where habitat niches are available. Water flow varies with time of day, and no vegetation was observed growing within the watercourse below the intertidal range.

As the Afon Teifi forms the core component of the Afon Teifi SAC and SSSI this sensitivity and magnitude on this habitat type will be discussed in those sections and will not be assessed separately.

Intertidal mudflats and associated intertidal biotopes

The habitat is present within the Scheme Area on the Afon Teifi and forms the boundary between the watercourse and the saltmarsh habitats.

This broad habitat type is included within The Conservation of Habitats and Species Regulations 2017 (as amended), Regulation 9A report (41) under habitat type H1140 - Mudflats and sandflats not covered by seawater at low tide. The habitat type is considered to be in overall Unfavourable-bad condition in Wales, with habitat area (Unfavourable-inadequate), Structure and function (Unfavourable bad), and future prospects (Unfavourable bad) contributing to this national trend. The total surface area for this habitat within Wales is considered to be 419.12km^2 of which the habitat within the impact area of the project would be 1946m2 0.0005% of the total area. The Conservation of Habitats and Species Regulations 2017 (as amended), Regulation 9A report (41) lists a number of main pressures as contributing factors towards the habitats types national status, of these the following are considered to be highly relevant to the project:

- PF15: Modification of coastline, estuary and coastal conditions for built-up areas (High impact considered to be ongoing and likely in future)
- PJ10: Change of Habitat Location, size and / or quality due to climate change (medium impact only in future)

PJ04: Sea-level rise due to climate change (medium impact only in future)Intertidal Mudflats is listed as a Habitat of Principal Importance (HPI) under Environment (Wales) Act (2016), Section 7. This inclusion cites the habitats high biodiversity value as a result of it supporting large numbers of predatory birds and fish and their associated prey (aquatic and terrestrial invertebrates). The habitat type can provide feeding and resting areas for internationally important populations of migrant and wintering waterfowl; and as nursery areas for flatfish. This habitat type is maintained by a constant fluctuation of tide level and limited disturbance.

The habitat at Cardigan is dynamic, reliant on silt deposition as a result of river and tidal flow. The habitat is transitional with drier areas supporting transition to saltmarsh, whilst new areas of mudflat will be created by river silt deposition and scouring of the saltmarsh habitat by river or tidal action. No targeted Marine Intertidal Phase 1 Biotope Mapping Survey has been undertaken in support of this Scheme to identify the sub-biotopes and invertebrate species and the mudflat habitat was recorded to have been impacted by anthropogenic activities due to its urban / waterfront location, most notably through the introduction of deposits of ballast stone understood to have come from vessels which were moored on the habitat. However, the Afon Teifi downstream from Cardigan Bridge (Castle Street) has been previously fully mapped as part of the Welsh Intertidal Phase 1 Habitat survey (40). This found that the comparable muds immediately at the downstream boundary of the Scheme were composed of *Hediste*

diversicolor and oligochaetes in littoral mud (LS.LMu.UEst.Hed.Ol) (45) where there is mud. Where there is a greater component of rock /other substrate *Fucus ceranoides* on reduced salinity eulittoral rock (LR.LLR.FVS.Fcer) (46) is consistently present. The Scheme Area is also likely to be a composition of LMU.MU.HedOl, LR.LLR.FVS.Fcer based upon observed composition of habitats immediately downstream. This assumption is further backed up by the results of the geomorphological survey (See Chapter 10: Water Environment) that found that the habitat within the Scheme Area is composed of muds mixed with occasional rock debris from the boat ballast.

Despite the coastal processes being heavily influenced by the artificial sea wall which prevents the natural movement of sediment and water, the habitat was assessed as being in good condition, because there was:

- No evidence of Non-Native Invasive Species within the habitat.
- No noticeable signs or sources of water pollution.
- No litter was present within the Scheme Area.

The habitat is subject to a high level of anthropogenic disturbance due to its urban location and the presence of multiple slipways and boat access.

As the exact biotopes present within the Scheme Area have not been determined, for the purposes of this assessment a precautionary approach will be used, and therefore the habitat will be considered as a qualifying HPI habitat. As a result of this for the purpose of this assessment the receptor will be considered as of moderate sensitivity.

Saltmarsh

Saltmarsh is present along the northern and southern shoreline of the Afon Teifi. The 2021 (32) survey found that the dominant species present along the shoreline is sea club-rush *Bolboschoenus maritimus*, which forms a colonising band along the foreshore. Other plants indicative of saltmarsh such as saltmarsh grass *Pucinnella maritima*, sea purslane *Atriplex portulacoides*, and sea aster *Aster tripolium* are all frequent.

Within the project boundary (as shown within Figure 6.1) the habitat is fragmented and semi natural, having formed on top of rock gabions that form a flood defence to the Gloster Row car park and areas raised of imported stone (likely abandoned boat ballast) at the base of two slipways. This is likely typical for the habitat type within the estuary with salt tolerant plants exploiting niche's where the river gradient, tidal inundation, salt content and soil type are suitable. The saltmarsh strip is at its largest in the area east of the site adjacent to the Gloster Row car park where a strip of habitat on the gabions (approx. 10m wide) extends into the natural saltmarsh (outside of the project area). The saltmarsh habitat on the gabions varies likely as result of relative levels of inundation from pioneering saltmarsh to a grass dominant habitat by the existing retaining wall. This grass dominated strip contains saltmarsh species also, with sea aster being constant and other species such as sea couch *Elytrigia atherica* and sea milkwort *Lysimachia maritima* present but occasional. Tall fescue *Festuca arundinacea* and red fescue *Festuca rubra* are also present and frequent. The 2024 assessment (27) found that the habitat had increased in size, with the saltmarsh comprising a greater area than recorded in 2021 (32)

primarily with additional small areas of habitat visible on the foreshore in Area 1 and further expansion along the foreshore adjacent to the western slip way. Due to the time of year, a comprehensive species list could not be prepared. However, the species composition present indicate that no shift in vegetation composition has occurred since 2021. In the newly mapped sections of the expanded habitat, creeping bent *Agrostis stolonifera* is the dominant species. Sea couch, saltmarsh grass and sea club-rush are also present occasionally. No specific National Vegetation Classification Survey has been undertaken in support of this Scheme and therefore it is not possible to identify the specific saltmarsh habitat type within the Scheme Area.

The habitat within the project area was assessed as being in moderate condition. Reasons for the habitat failing to achieve good status included:

- Coastal processes being heavily influenced by the artificial sea wall which prevents the natural movement of sediment and water.
- A lack of transitional habitats and variance in vegetation.

The habitat was assessed as moderate for the following reasons:

- No evidence of Non-Native Invasive Species within the habitat.
- No noticeable signs or sources of water pollution.
- No litter present within the habitat.

The habitat is subject to a high level of anthropogenic disturbance due to its urban location and the presence of multiple slipways and boat access. There was evidence of dog walkers and fisherman using the semi natural saltmarsh habitat on the gabions in Area 4 to access the river foreshore, passing through the natural saltmarsh habitats adjacent to the project area to the east.

Saltmarsh habitat is identified as an interest feature of the Afon Teifi SSSI with Teifi marshes being specifically cited in the biological description:

"The Teifi Marshes support extensive Phragmites australis reedbeds and a mosaic of flood-plain fen, swamp, grassland and saltmarsh communities displaying transitions between freshwater and brackish communities. Woodland, scrub and hedgerows add to the diversity of the marshes. Estuarine alder Alnus glutinosa carr at Rosehill is of particular interest.

In the upper reaches of the Teifi Estuary intertidal flats are predominantly muddy. In the lower reaches sand flats, shingle with associated vegetation and saltmarsh occur." (47)

The Afon Teifi downstream from Cardigan bridge has been previously mapped (40) and the closest downstream saltmarsh habitat was at that time approximately 1.7km downstream (north of Old Castle Farm). The data was largely gathered in 2007 and as a result it is likely that the extent of habitats will have reduced in the interim as a result of wider pressures affecting the habitat nationally listed discussed below.

The Afon Teifi saltmarsh niche assessment (28) Appendix 6.3 identified natural saltmarsh habitats immediately adjacent to the Scheme Area to the east of the Gloster Row car park and

in an inlet immediately downstream of the A487 Pont Y Priordy Priory bridge, with more extensive saltmarsh recorded within the Teifi Marshes Nature reserve approximately 170m upstream of the Scheme Area.

Saltmarsh is designated as a HPI under Environment (Wales) Act (2016), Section 7. This designation cites the habitats high biodiversity value as a result of it supporting large numbers of predatory birds and fish and their associated prey (aquatic and terrestrial invertebrates). The habitat type can provide feeding and resting areas for internationally important populations of migrant and wintering waterfowl; and can be important nursery areas for flatfish. This habitat type is maintained by a constant fluctuation of tide level and limited disturbance.

As a result of its semi-natural status on a non-natural substrate the saltmarsh within the project area does not meet either description of saltmarsh habitats included within The Conservation of Habitats and Species Regulations 2017 (as amended), Regulation 9A report (41). Two saltmarsh habitats are included within this document H1310 *Salicornia* and other annuals colonizing mud and sand and H1330 Atlantic salt meadows.

Habitat type H1310 *Salicornia* and other annuals colonizing mud and sand is considered to be in overall Unfavourable-inadequate condition in Wales, with habitat area (Unfavourable-inadequate), Range status (Unknown), and future prospects (Unknown) contributing to this national trend. The total surface area for this habitat within Wales is considered to be 1.67km^2 The Conservation of Habitats and Species Regulations 2017 (as amended), Regulation 9A report (41) lists a number of main pressures as contributing factors towards the habitats types national status, of these the following are considered to be highly relevant to the project:

- PF15: Modification of coastline, estuary and coastal conditions for built-up areas (High impact likely in future)
- PJ04: Sea-level rise due to climate change (medium impact considered to be ongoing and likely in future)

Habitat type H1330 Atlantic salt meadows is considered to be in overall Unfavourable-bad condition in Wales, with habitat area (Unfavourable-inadequate), Structure and function (Unfavourable-bad) and future prospects (Unfavourable-bad) contributing to this national trend. The total surface area for this habitat within Wales is considered to be 74.82km^2 The Conservation of Habitats and Species Regulations 2017 (as amended), Regulation 9A report (41) lists a number of main pressures as contributing factors towards the habitats types national status, of these the following are considered to be highly relevant to the project:

- PF15: Modification of coastline, estuary and coastal conditions for built-up areas (Medium impact likely in future)
- PJ04: Sea-level rise due to climate change (High impact likely in future)

The project area does not include any areas of existing natural saltmarsh habitats that have been included as part of strategic mapping exercises, associated with a particular Annex I habitat type and as such included in the overall 'status' of that habitat type in Wales.

Annex I Saltmarsh has been identified down-stream of the site by Llywodraeth Cymru Welsh Government, 2026, and upstream within Teifi Marshes Wildlife Trust of South and West Wales reserve. Surveyors also noted existing natural saltmarsh habitats between the eastern boundary for the project area and Priory bridge however these have not been surveyed.

The habitat within the site is confirmed as semi-natural (saltmarsh species on a non-natural substrate) and is outside areas where saltmarsh habitat forms extensive or continuous habitats. On a precautionary basis for the purposes of this assessment, these have been classed as HPI, however this is not the same as concluding they represent a specific Annex I habitat type or a feature of any designation, in the context of the specific site. For the purpose of this assessment the receptor will be considered as of moderate sensitivity.

Amenity grassland

Amenity grassland is common across the Scheme at the Scout's hut, residential gardens, and by the Gloster Row car park at the eastern end of the Scheme Area.

The 2024 assessment found that the amenity grasslands have not changed in composition, with the exception being the grassland surrounding Gloster Row car park which has become Poor Semi-improved grassland (and is discussed further below). Perennial ryegrass *Lolium perenne* is the dominant species in the amenity grassland sward, with other species including Yorkshire fog *Holcus lanatus* F, red fescue F, dandelion sp *Taraxacum s*p O, creeping bent LO and common ragwort *Jacobaea vulgaris* R[2].

The habitat was assessed as being in poor condition. Reasons for the habitat failing to achieve good status included:

- Lack of species diversity.
- Intensive mowing which prevents variance in habitat structure.

Due to its limited area, limited species, age and structural diversity, this receptor is considered to be of negligible sensitivity.

Poor semi-improved neutral grassland

The grassland surrounding Gloster Row car park has changed in management since the 2021 Phase 1 habitat survey (32). Signs that have been placed in the grassland indicate that the grassland is being mowed infrequently to encourage wildflower growth. Species included perennial ryegrass A, cock's-foot *Dactylis glomerata* LA, red fescue F, ribwort plantain *Plantago lanceolata* R, common daisy *Bellis perennis* F, common mouse-ear *Cerastium fontanum* LF, thyme-leaved speedwell *Veronica serpyllifolia* O and common knapweed *Centaurea nigra* LO[2]. Along the edges of the grassland, on the stone walls, other species present include navelwort

[2] See Table 6- for description of DAFOR scale

Umbilicus rupestris LO, red valerian *Valeriana rubra* LO, biting stonecrop *Sedum acre* LR and Canadian fleabane *Erigeron canadensis* LR[2].

The habitat was assessed as being in moderate condition. Reasons for the habitat failing to achieve good status included:

- The habitat is an ecotone, transitioning from amenity grassland to semi-improved neutral grassland. As a result, the species composition is not varied enough to achieve good status.

Due to its limited area, limited species, age and structural diversity, this receptor is considered to be of negligible sensitivity.

6.8.3 Species and species groups

The following species or species groups are considered within this Environmental Statement.

- Amphibians and reptiles
- Bats
- Birds
- Fish
- Invertebrates (terrestrial and aquatic)
- Otters
- West European hedgehog

For information on other species or species groups considered during the field survey but scoped out at the EIA scoping stage please refer to Natural Resources Wales Cardigan Tidal Flood Risk Management Scheme – Preliminary Ecological Appraisal Update (27).

Amphibian and reptiles

The desk study returned records for three species of reptile; grass snake *Natrix helvetica*, slow worm *Anguis fragilis*, common lizard *Zootoca vivipara* and one species of amphibian, common toad *Buffo buffo*. No records of notable reptiles or amphibians were returned from within the Scheme Area (27).

The Scheme Area and its immediate surrounds provides some potential suitable habitat for amphibians and reptiles. These are in the gardens of residential properties, especially where compost heaps are present. In addition, natural saltmarsh habitat can support amphibians and reptiles.

No desk study records within 2km of the Scheme identify great crested newt *Triturus cristatus* and, given the lack of suitable nearby standing water, it is considered unlikely that the species is present within the Scheme Area.

The Scheme Area would not support important breeding populations of reptiles or amphibians, instead it is more likely to be used as a foraging resource for small numbers of common amphibian and reptile species from local populations. As a result of this this receptor is considered to be of negligible sensitivity.

Bats

The desk study returned twenty-five records of bats (as shown in Table 6-) from within 2km of the Scheme Area. The desk study identified a number of bat records pre 2014 from in and around the castle Grid Reference SN 17754 45924, approximately 0.06km north of the Scheme Area (27).

Table 6-9 Bat records within 2km of the Scheme Area

Scientific Name	Common name	Number of records	Date of most recent records	Distance and Direction
Plecotus auritus	Brown Long-eared Bat	3	30/07/2020	1.19km west
Myotis	Unidentified Bat	1	12/07/2014 - 18/07/2014	1.66km south
Pipistrellus	Pipistrelle	3	24/02/2019	0.3km north
Pipistrellus pygmaeus	Soprano Pipistrelle	5	30/07/2020	0.17km north
Rhinolophus ferrumequinum	Greater Horseshoe Bat	1	09/06/2015	1.21km west
Myotis nattereri	Natterer's Bat	1	12/07/2014 - 18/07/2014	1.67km south
Nyctalus noctula	Noctule Bat	4	09/09/2016	0.17km north
Eptesicus serotinus	Serotine	2	30/07/2020	1.31km west
Myotis mystacinus/brandtii	Whiskered/Brandt's Bat	1	12/07/2014 - 18/07/2014	1.66km south
Pipistrellus pipistrellus	Common Pipistrelle	8	30/07/2020	0.16km north

Specific roost data was not provided during the desk study however where records included comments containing the words roost, roosting or emerging, it was presumed that these were areas of confirmed roosts (as shown in Table 6-130).

Table 6-130 Bat roosts within 2km of the Scheme Area

Species Roosting	Grid Reference	Date	Description	Distance and direction
Brown long-eared bat, soprano pipistrelle, common pipistrelle	SN164458	30/07/2020	Roosting under south pitch; west end; also signs in bat loft,	1.33km west

			roosting under raised slate, Roosting at wall tops; various locations	
Brown long-eared bat, soprano pipistrelle, Natterer's, whiskered/Brandts, *Myotis* sp	SN1757444195	12/07/2014 - 18/07/2014	Possible maternity in barn; disperse along tree rich lanes and organic managed farmland	1.66km south
Common pipistrelle	SN1785646120	09/09/2016	Returned to roost beneath fascia of building	0.17km north
Common pipistrelle	SN1787146113	09/09/2016	Returned to roost beneath fascia of building	0.16km north

In addition to the records returned by the record search three other roosts are known to be in close proximity to the Scheme Area:

- Cardigan Castle (15m north of the Scheme Area) has been a long-term roost for greater horseshoe bats for at least the last 20 years as confirmed by the Cardigan Castle Estate Manager (48). The site was subject of a NRW licence to modify the roost in 2010 (49) and has been regularly monitored since. The roost regularly hosts hibernation for up to 5 bats within the winter (including winter 2024/25). The roost has also been known to be intermittently used by individual and small numbers of bats in the summer months, although this activity level had dropped in summer 2024. The lesser horseshoes roost within the basement of main castle building on its northern side (approx. 70m north of the Scheme Area). Limited survey information is available for how the bats enter and leave the castle grounds but is suspected that the bats follow the main drive from the house (located to the east of the main house) using the hedgerows walls and large ash, before crossing Strand between Cardigan Bridge and Cardigan Bathroom centre and joining the Afon Teifi before moving out into the wider countryside (50). The street lighting on Strand has been recently (within the last couple of years) changed to white LED and there may have had a detrimental influence on summer activity levels. This effect is likely to be exacerbated by the upcoming felling of the large mature ash tree on the castle walls (required due to safety concerns) (48).

- One of the outbuildings at Cardigan Castle is also suspected to be a pipistrelle maternity roost (48). This building is located approximately 70m north of the Scheme Area.

- The former hospital building approximately 80m northeast of the Scheme Area is a confirmed roost for individual brown long eared bat and low numbers of soprano pipistrelle bats (51).

Potential roost habitats and features across the Scheme include broadleaved scattered trees and buildings (residential properties, commercial buildings) and the sides and underside of the west and east bridges that bound the survey area and the stone-built wall of the existing flood defence which forms part of the Scheme.

The roost suitability for trees, buildings, and groups of buildings determined by the surveys in 2021, 2023 and 2024 features with suitability and that were likely to be affected by works are summarised Table 6-142 and should be read in conjunction with Figure 6.2. For a complete list of structures and trees surveyed please refer to Natural Resources Wales Cardigan Tidal Flood Risk Management Scheme – Preliminary Ecological Appraisal Update (27) Appendix 6.1.

Table 6-142 Bat Roost Potential of Structures/ Trees

Building ref (G=Group; B=single building; T=Tree)	**Description**	**Roost Potential in line with** (52)
T3	Pear *Malus* sp. tree within amenity grassland with limited bat roosting potential. There is a shallow gap that is open to the elements at 1m in height from the base of the tree, but this is exposed and therefore of low bat roost potential.	PRF-I
T4	Mature laburnum *Laburnum anagyroides* tree with shallow, exposed cavity 1m from the ground.	PRF-I
Existing river wall	Wall is constructed in stone, which in places is degraded with visible cavities. These will have limited value in winter (due to flood risk), but are likely to offer suitability for roosting bats in summer. At the time of the surveys (2021 and 2024) access was not available to inspect the structure thoroughly so provisionally placed as Moderate suitability for roosting bats.	Moderate
Cardigan Bridge (Castle Street)	18th Century stone-built road bridge, with multiple arches over the Afon Teifi. These will have limited value in winter (due to flood risk), but are likely to offer suitability for roosting bats in summer. At the time of the survey access was not available to inspect the structure thoroughly so provisionally placed as Moderate suitability for roosting bats. The bridge did show some potential cavities in the stonework of the bridge piers on the western side.	Moderate
B6	Outbuilding. Breeze blocks with wood cladding. Well-sealed. The structure was inaccessible at the time of the surveys. Pre-cautionary low as a result. The building is constructed above an areas of dilapidated river defense wall.	Low
B7	Scout hut, Strand. Gaps inside and on tiles outside. Concrete panel built with interlocking concrete ridge tiles.	Low
B8	The Smithy and Cardigan Bay Active. The Smithy is brick walls and tin roof (Moderate suitability). Cardigan Bay Active is a large corrugated metal shed (negligible). Some small gaps to underside of flashing and joins could allow summer roosting.	Moderate
B11:	Presbytery, Strand. detached, modern concrete blockwork structure with slate and composite tile roof.	Moderate

Building ref (G=Group; B=single building; T=Tree)	Description	Roost Potential in line with (52)
B12	Cardigan Bathroom Centre, Riverside Showrooms. Wood clad building with tight fitting soffits. Some loose flashing on seaward side but only in two places. Summer roosting potential.	Moderate

These structures were the subject of further survey (endoscopic inspections of T3 and T4, and Nocturnal emergence surveys of the structures) in summer 2025 by Terra Aqua Ecological Services. The surveys found no evidence of roosting bats, however the surveys did suggest the presence of roosts of soprano and common pipistrelle roosts in the general vicinity of Strand, St Mary Street and Church Street. For full details of the survey please refer to Bat Survey Report. Buildings and Structures at Strand, Aberteifi. For Cyfoeth Naturiol Cymru/Natural Resources Wales (29) Appendix 6.4.

The open habitats (such as running water, saltmarsh) were noted to provide suitable commuting and foraging opportunities for bats. The Afon Teifi is likely to provide an important connecting corridor of habitat into the wider area this assumption is demonstrated by the results of the nocturnal emergence surveys which found there to be high levels of activity in the vicinity of the river with seven species (Noctule, common pipistrelle, Daubenton's, soprano pipistrelle, brown long eared, lesser horseshoe, greater horseshoe) noted during the survey. This is a particularly diverse assemblage for what is a primarily urban site with rural/suburban transition levels of light pollution (42).

The Scheme Area does not support important breeding populations of bat and sufficient survey has been carried out to be reasonably confident of the absence of important summer non-breeding roosts. No hibernation surveys have been carried out, but the structures are not considered suitable for classic hibernation (they are unlikely to provide the stable cool and damp conditions required for this roost type) as the majority structures are occupied and likely to be heated during the winter period, whilst the crevices within flood defence wall and Cardigan Bridge (Castle Street) are likely to flood regularly during the winter period.

As a result of the importance of the Afon Teifi as a commuting and foraging corridor to local and district bat populations this receptor is considered to be of Low sensitivity.

Birds

Records for 41 species of protected and notable birds were returned from within the past 10 years within 2km of the Scheme Area during the desk study (27). Full details of species and designations can be found in Table 6-15. Records for 20 species protected under Schedule 1 of the Wildlife and Countryside Act were returned. These species, their nest and eggs are all provided legal protection and cannot be destroyed, damaged and/or disturbed.

Table 6-153 Protected and Notable Species of Birds within 2km of the Scheme Area

Scientific Name	Common Name	Number of records	Status[3]
Limosa lapponica	Bar-tailed Godwit	2	BDir1, BDir22, S7, WBR(RSPB), LBAP, UKBAm(RSPB)
Chroicocephalus ridibundus	Black-headed Gull	82	BDir22, WCA 7, WBR(RSPB), UKBAm(RSPB)
Limosa limosa	Black-tailed Godwit	25	BDir22, WCA1.1, WBAm(RSPB), UKBR(RSPB)
Luscinia svecica	Bluethroat	1	BDir1, WCA1.1, Bern
Cettia cetti	Cetti's Warbler	62	WCA1.1,
Regulus ignicapilla	Common Firecrest	1	WCA1.1, Bern WBAm(RSPB)
Emberiza schoeniclus	Common Reed Bunting	49	WCA7, Bern, LBAP, WBAm(RSPB), UKBAm(RSPB)
Cuculus canorus	Cuckoo	1	S7, WBR(RSPB),UKBR(RSPB)
Numenius arquata	Curlew	83	BDir22, S7, WBR(RSPB), , UKBR(RSPB)
Prunella modularis	Dunnock	86	S7, Bern, , UKBAm(RSPB)
Pyrrhula pyrrhula	Eurasian Bullfinch	72	S7, WBR(RSPB), LBAP UKBAm(RSPB)
Alauda arvensis	Eurasian Skylark	4	BDir22, S7, LBAP, WBAm(RSPB), UKBR(RSPB)
Numenius phaeopus	Eurasian Whimbrel	6	BDir22, WCA1.1, , WBAm(RSPB), UKBR(RSPB)

[3] **Key to Status**

BDir 1 - The Birds Directive Annex 1
BDir 22 - The Birds Directive Annex 22
WCA 1.1 - Wildlife and Countryside Act Schedule 1
WCA 9 - Wildlife and Countryside Act Schedule 9
S7 - Environment (Wales) Act Section 7
Bern - Bern Convention
CITES - Convention on International Trade in Endangered Species of Wild Fauna and Flora
LBAP - Local Biodiversity Action Plan
UKBR(RSPB) - UK Bird Red list Red
UKBAm (RSPB) - UK Bird Red list Amber
WBR(RSPB) - Welsh Bird Red list
WBAm(RSPB) - Welsh Bird list Amber

Scientific Name	Common Name	Number of records	Status[3]
Larus argentatus	European Herring Gull	103	BDir22, S7, WBR(RSPB), , UKBR(RSPB)
Ficedula hypoleuca	European Pied Flycatcher	1	S7, WBR(RSPB), , UKBR(RSPB)
Turdus pilaris	Fieldfare	4	BDir22, WCA1.1, , WBAm(RSPB), UKBR(RSPB)
Bucephala clangula	Goldeneye	23	BDir22, WCA1.2, , UKBAm(RSPB)
Locustella naevia	Grasshopper Warbler	2	S7, WBR(RSPB),, UKBR(RSPB)
Tringa ochropus	Green Sandpiper	4	WCA1.1, Bern, , WBAm(RSPB), UKBAm(RSPB)
Tringa nebularia	Greenshank	5	BDir22, WCA1.1, LBAP, UKBAm(RSPB)
Falco subbuteo	Hobby	1	WCA1.1, Bern, CITES,
Passer domesticus	House Sparrow	66	S7, , WBAm(RSPB), UKBR(RSPB)
Alcedo atthis	Kingfisher	57	BDir1, WCA1.1, Bern, , WBAm(RSPB), UKBAm(RSPB)
Vanellus vanellus	Lapwing	15	BDir22, S7, WBR(RSPB), UKBR(RSPB)
Acanthis cabaret	Lesser Redpoll	2	S7, LBAP (CON), , WBAm(RSPB), UKBR(RSPB)
Linaria cannabina	Linnet	4	S7, Bern, WBR(RSPB), LBAP UKBR(RSPB)
Poecile palustris	Marsh Tit	6	S7, Bern, WBR(RSPB), , UKBR(RSPB)
Ichthyaetus melanocephalus	Mediterranean Gull	2	BDir1, WCA1.1, Bern, WBAm(RSPB), UKBAm(RSPB)
Falco peregrinus	Peregrine	5	BDir1, WCA1.1, Bern, CITES, LI(VC43)
Anas acuta	Pintail	1	BDir21, WCA1.2, CITES, , WBAm(RSPB), UKBAm(RSPB)
Milvus milvus	Red Kite	18	BDir1, WCA1.1, WCA9, CITES, , WBAm(RSPB)
Turdus iliacus	Redwing	15	BDir22, WCA1.1, P, WBAm(RSPB), UKBR(RSPB)
Aythya marila	Scaup	1	BDir22, WCA1.1, , WBAm(RSPB), UKBR(RSPB)
Turdus philomelos	Song Thrush	63	BDir22, S7, Bern, LBAP, WBAm(RSPB), UKBR(RSPB)
Porzana porzana	Spotted Crake	2	BDir1, WCA1.1, Bern, , WBAm(RSPB), UKBAm(RSPB)

Scientific Name	Common Name	Number of records	Status[3]
Sturnus vulgaris	Starling	35	BDir22, S7, Bern, WBR(RSPB), , UKBR(RSPB)
Tyto alba	Western Barn Owl	2	WCA1.1, WCA9, Bern, CITES,
Circus aeruginosus	Western Marsh Harrier	1	BDir1, WCA1.1, CITES, , WBAm(RSPB), UKBR(RSPB), UKBAm(RSPB)
Cygnus cygnus	Whooper Swan	1	BDir1, WCA1.1, Bern, UKBAm(RSPB)
Poecile montanus	Willow Tit	1	S7, Bern, WBR(RSPB), UKBR(RSPB)

No bird records were returned from within the Scheme Area. Although records came from all around the Scheme Area, most records were concentrated to the saltmarsh habitats affiliated with the Afon Teifi (SSSI, SAC) to the southeast of the Scheme Area.

The wintering bird surveys conducted in winter 2022/23 (33) Appendix 6.6 covered a substantially larger study area than the Scheme Area and included habitats both downstream of Castle Street bridge (shore alongside Shampan restaurant and Lower Quay Street Car-Park) and upstream of the Pont y Priordy Priory Bridge (Wildlife Trust of South and West Wales WTSWW Reserve Teifi Marshes). These additional areas were included in order to provide contextual information for activity observed within the Scheme Area. The survey found the following:

"The section between the two bridges, and downstream to the Lower Quay car park, has limited exposed mud and this is reflected in the small number of birds recorded here. The muddy banks opposite and to the west of the (Gloster Row) *car park are used by small numbers of ducks, waders and gulls."*

"The site (Study Area) *is used by a small number of waders, mostly at low tide. The muddy shore alongside the Shampan restaurant to the west of Lower Quay Street Car-park* (downstream of Cardigan Bridge (Castle Street) and the Scheme Area) *was occasionally used by one or two redshank and curlew, and a small flock of dunlin on one occasion. The opposite shore here was also used by one or two redshank and curlew, as was the exposed shore just to the west of Priory Bridge. The north shore opposite the WTSWW reserve* (upstream of the Scheme Area) *held one or two redshank, curlew, black-tailed godwit and bar-tailed godwit. Very few waders were present on high-tide counts, and no significant roosts were present.*

Teal was the most numerous duck from November onwards, with the most significant flocks in the eastern part of the site (study area). *Smaller numbers were associated with the patch of reed just to the east of* Cardigan *Bridge (Castle Street)* (on the opposite bank to the project), *and the shore opposite Lower Quay Car-park. Mallard numbers were more constant, with flocks focussed on the northern shore at or beyond the eastern boundary of the survey site* (Study Area), *and on the southern shore opposite Lower Quay Car-park."*

"Flocks of herring and lesser black-backed gull were encountered in or alongside the channel by the WTSWW reserve, and in the channel downstream of Lower Quay Car-park. A single

greater black-backed gull was also recorded at the latter location on one occasion, whilst three common gulls were recorded once at the former location. Black-headed gulls were more widely distributed across the site (Study Area), but Lower Quay Car-park was a favoured location, as well as the channel to the east of Priory Bridge. A small number of Mediterranean gulls were associated with the black-headed gulls in the autumn months, but not later in the winter.

Other waterfowl seen included one or two kingfishers, grey herons, little egrets and a small number of cormorants."

*The lower reaches of the Teifi hold larger numbers of waterfowl, but annual Welsh Bird Reports compiled by the Welsh Ornithological Society, and recent records posted on the Teifi Birding and Wildlife Blog, indicate that these are still well below significance thresholds. However, the site (*Study Area) *does support small numbers of 6 species on the UK red-list, and 12 on the amber-list. The site* (Study Area) *can therefore be considered to be of local significance for its wintering bird populations. The eastern part of the site (Study Area), alongside the Teifi Marshes reserve* (Afon Teifi SAC and SSSI), *holds the greatest diversity and number of birds."*

The Breeding bird survey conducted in 2023 (34) Appendix 6.7 found:

"*There is very little potential for breeding birds in the constrained intertidal area between the bridges* (the Scheme Area)"

"*The section between the two bridges, and downstream to the Lower Quay* (Gloster Row) *car park, has limited exposed mud and this is reflected in the small number of birds recorded here. The muddy banks opposite and to the west of the* (Gloster Row) *car park are used by small numbers of ducks, waders and gulls."*

"*A single singing reed warbler was heard in the small reed area immediately west of Priory Bridge. Family parties of Canada goose, mute swan, mallard and blackbird with fledged young were noted here. Adjoining bushes or trees such as those to the south of the churchyard had territories of species such as greenfinch, goldfinch, song thrush and wren. House sparrow was associated with buildings here. Swifts and hirundines fed over the site (Study Area).*"

In summary breeding and wintering birds surveys carried out within the Scheme Area found that although the Scheme Area contains HPI habitats of interest for birds, the suitability is limited by their size and proximity to human disturbance and therefore it is unlikely to provide suitable conditions or supporting habitat of any significance for numbers of rare or notable birds.

For the purposes of this ES, the birds receptor will be split into two separate types as the sensitivity is considered to be different.

The species list of wintering birds found in close proximity to the Scheme Area is considered to be of local importance and therefore the receptor is considered to be of low sensitivity.

The species list of breeding birds found within and in close proximity to the Scheme Area is considered to be of site importance only and therefore the receptor is considered to be of negligible sensitivity.

Fish

Apem Ltd carried out a desk study of available information regarding fish in the Afon Teifi including the Scheme Area, immediately adjacent to the Scheme Area and extending to within 5 km of the Scheme. The full results of this study can be found in Cardigan Tidal Flood Risk Management Scheme – Fish Ecology Technical Note (20) Appendix 6.2. The reports states:

"Given the close locality to the marine environment, the areas adjacent to the Scheme are likely to experience variations in salinity levels. The width (wetted width) of the river at this location is approximately 50 to 100 m, likely varying based on tidal state and rainfall levels.

Fish communities, within estuarine environments, can broadly be categorised into the following functional groups

- *Diadromous species – Species which move between marine and freshwater environments at different stages of their life cycle;*
- *Marine species – Those typically found within marine environments, but may occur in estuarine environments in low numbers (marine stragglers) or high numbers during specific life stages (marine migrants);*
- *Estuarine species – Species well adapted to live their entire life cycle or large portions of within estuarine environments; and*
- *Freshwater species - Those typically found within freshwater environments, but may occur in estuarine environments in low numbers (freshwater migrants) or may be limited to the upper reaches of the estuary (freshwater stragglers).*

Given the location of the Scheme, the fish assemblage is likely to be characterised by marine migrants (i.e. herring Clupea harengus and European seabass Dicentrarchus labrax), estuarine species (i.e. common goby Pomatoschistus microps and sand goby Pomatoschistus minutus) and diadromous species (i.e. Atlantic salmon Salmo salar). (20) *".*

Of these species type the report identifies the key species as shown in Table 6-164. These have been grouped into two functional groups; Diadromous species and Marine and Estuarine species receptors for the purposes of this assessment.

- Diadromous species are considered to be a high sensitivity receptor due to their status as qualifying species for the River Teifi SAC and the key migratory route function that the river provides at this location.
- Marine and estuarine species are considered to be a low sensitivity receptor due to their lower conservation importance when compared against national and international targets.

Table 6-164 Key Fish species receptors taken forward for assessment adapted from (20)

Receptor Grouping	Species	Justification
Diadromous Fish	Atlantic salmon	Likely to migrate through the Study Area. Globally Near Threatened on IUCN Red list. Listed on Annex II and V of the Habitats Directive.

Receptor Grouping	Species	Justification
		Protected by Appendix III of the Bern Convention. Listed in Section 7 of the Environment (Wales) Act 2016. Protected under the Salmon and Freshwater Fisheries Act.
	Brown / sea trout	Likely to migrate through the Study Area. Listed in Section 42 of the NERC Act (Wales). Protected under the Salmon and Freshwater Fisheries Act.
	European eel	Likely to migrate through Study Area. Protected by the Eels regulations. Listed in Section 7 of the Environment (Wales) Act 2016. Protected under The Salmon and Freshwater Fisheries Act.
	River lamprey	Likely to migrate through Study Area. Listed on Annex II and V of the Habitats Directive. Protected by Appendix III of the Bern Convention. Listed in Section 7 of the Environment (Wales) Act 2016. Protected under the Salmon and Freshwater Fisheries Act.
	Sea lamprey	Likely to migrate through Study Area. Listed on Annex II and V of the Habitats Directive. Protected by Appendix III of the Bern Convention. Listed in Section 7 of the Environment (Wales) Act 2016. Protected under the Salmon and Freshwater Fisheries Act.
Marine and Estuarine Fish	Thick-lipped grey mullet	Likely to inhabit Study Area.
	Thin-lipped grey mullet	Likely to inhabit Study Area.
	European seabass	Likely to inhabit Study Area. Species of commercial value within UK waters.
	Common Goby	Likely to inhabit Study Area. Important prey species.
	Sand Goby	Likely to inhabit Study Area. Important prey species.
	Atlantic herring	Likely to inhabit Study Area.

Receptor Grouping	Species	Justification
		Listed in Section 7 of the Environment (Wales) Act 2016. Species of commercial value within UK waters.
	Sprat	Likely to inhabit Study Area. Species of commercial value within UK waters.
	Lesser sand-eel	Likely to inhabit Study Area. Important prey species.
	Greater sand-eel	Likely to inhabit Study Area. Important prey species.
	Flounder	Likely to inhabit Study Area. Species of commercial value within UK waters.
	Plaice	Likely to inhabit Study Area. Listed in Section 7 of the Environment (Wales) Act 2016. Species of commercial value within UK waters.

Invertebrates

No specific field surveys have been undertaken to determine the invertebrate assemblage present within the Scheme Area. The desk study returned records for 23 species of protected and notable species of moths and butterflies as shown in Table 6-175 (27). No other records protected, or notable species of invertebrates were returned. No records were returned from within the Scheme Area.

Of the species returned by the records search only large wainscot has a larval foodplant likely to be associated with river/tidal margin habitat common reed *Phragmites australis*. Common reed was not recorded within the Scheme Area and therefore the large wainscot is not considered likely to have a viable breeding population within the Scheme Area.

Table 6-175 Protected and notable species of Butterfly and Moth with 2km of the Scheme Area

Scientific Name	Common Name	No. of Records	Designations[4]
Eugnorisma glareosa	Autumnal Rustic	3	S7
Timandra comae	Blood-vein	2	S7

[4] **Key to Status**
S7 - Environment (Wales) Act Section 7
RDB1 (UK) – VU - British Red Data Book 1 -Vulnerable
RDB1 (UK) – NT - British Red Data Book 1 – Near Threatened

Scientific Name	Common Name	No. of Records	Designations[4]
Thecla betulae	Brown Hairstreak	23	WCA5, S7, RDB1 (UK) - VU
Agrochola litura	Brown-spot Pinion	6	S7
Spilosoma lutea	Buff Ermine	3	S7
Atethmia centrago	Centre-barred Sallow	2	S7
Tyria jacobaeae	Cinnabar	9	S7
Melanchra persicariae	Dot Moth	1	S7
Apamea remissa	Dusky Brocade	1	S7
Ennomos fuscantaria	Dusky Thorn	4	S7
Agrochola helvola	Flounced Chestnut	6	S7
Arctia caja	Garden Tiger	4	S7
Acronicta rumicis	Knot Grass	1	S7
Malacosoma neustria	Lackey	4	S7
Rhizedra lutosa	Large Wainscot	3	S7
Hydraecia micacea	Rosy Rustic	7	S7
Cirrhia icteritia	Sallow	2	S7
Scotopteryx chenopodiata	Shaded Broad-bar	3	S7
Coenonympha pamphilus	Small Heath	3	S7, RDB1 (UK) - NT
Ecliptopera silaceata	Small Phoenix	1	S7
Lasiommata megera	Wall	7	S7, RDB1 (UK) - NT
Spilosoma lubricipeda	White Ermine	6	S7
Diarsia rubi	Small Square-spot	2	S7

In addition to the above, the following species are all features associated with the Afon Teifi SSSI:

- Freshwater Pearl mussel *Margaritifera margaritifera;*
- Whorl snail *Vertigo lilljeborgi*;
- A caddis fly *Oecetis notata*;
- A caddis fly *Ylodes simulans;*
- Toadflax leaf beetle *Chrysolina sanguinolenta;*
- Club-tailed dragonfly *Gomphus vulgatissimus;*
- A blackfly: *Simulium morsitans; and*
- Brown hairstreak *Thecla betulae.*

These species are all species that are associated with freshwater, or non-salt tolerant foodplants as a result it is highly unlikely that viable breeding populations would be found within the

Scheme Area. The populations of aquatic-dependent species on the Afon Teifi are all likely to be above the tidal influence.

The running water, saltmarsh and intertidal mudflats within the Scheme Area and wider landscape are considered to provide suitable habitat for terrestrial and aquatic invertebrates and in the absence of a field survey, consideration has been given to the habitats present within the Scheme Area and the precautionary principle has been used to assess the receptor value as low sensitivity.

Otter

Seven records of otter were returned from within the 2km search radius of the Scheme Area with the most recent record occurring in 2018 0.94km southeast of the Scheme Area (27). No information regarding holts or resting places were provided with the records. All returned records occurred within the Afon Teifi and affiliated salt marshes. The SAC, which is located within the Scheme Area, is designated for otter.

There is a regular otter breeding on the Teifi Marshes upstream of the Scheme. During an inspection of the scout's boat shed in 2014 by NRW, repeated spraints were observed on a pile of old canvas. A camera trap was set for a period of 9 weeks from 25th July through to 2nd October 2014 to determine if there was still otter usage, but only cats were observed (53). It was considered that due to regular disturbance it is highly unlikely the shed supports breeding otter, but it is possible that the shed provides a resting place.

The 2025 Otter survey of the Scheme Area carried out an update of the 2014 inspection (30) Appendix 6.5 and found no new holts within the Scheme Area, but did identify one potential rest site approximately 140m east of the Scheme Area described as,

"*A large area of trees and scrub with a small stream outlet close to the bypass bridge.*

A well-used human path runs through the cover but there are also areas of dense cover created by a fallen tree with possible mammal paths leading into it from the water." (30).

The 2025 survey also found multiple field signs within the vegetation (spraints and pathways) within the Scheme Area suggesting that the location is in regular use by this species.

The running water and associated bank habitats within the Scheme and wider landscape were considered to provide suitable habitat for commuting, foraging and resting otter. No suitable holt sites were identified during the survey. The shed was inspected, and no otter field signs were noted. The intertidal mudflats and saltmarsh are prone to regular changes in water height and as such do not provide suitable holt locations. In addition, the housing properties set back from the existing flood wall are regularly disturbed with limited cover opportunities for the species. The Scheme Area and immediate surrounds is unlikely to support natal holts for otter due to it being on the main river.

In conclusion the Scheme Area provides suitable habitat for commuting, foraging and resting otter, but is unlikely to be used as a holt or resting site location. As a result of this this receptor is considered to be of low sensitivity.

West European hedgehog

Habitats present within the Scheme Area and immediate surrounds that could be utilised by hedgehog include the gardens of residential properties and grassland habitats. However, no continuous native dominated hedge lines or habitat lines were noted, which are preferred by hedgehog.

The Scheme Area would not support important breeding populations of hedgehog, instead it is more likely to be used as a foraging resource for individuals from local populations. As a result of this this receptor is considered to be of negligible sensitivity.

6.8.4 Future baseline

This section of effects considers the likely evolution of the baseline without the implementation of the Scheme.

Changes to the ecological baseline, in the absence of the Scheme, have been considered in terms of pressures and trends as well as anticipated plan-driven overall improvements in biodiversity led by legislation and policies. In terms of surrounding land uses it is considered that the urban conurbation will remain static, if not expand in the future, whilst beyond that the proportion of agricultural land use is likely to remain similar.

As stated within Chapter 1: Introduction, Cardigan has a history of flood events which have had social, economic and environmental impacts upon the town. Major flood events have occurred between 2000–2020. In 2007, flood depths exceeded 0.5m, and further tidal floods occurred in 2008, 2012, and twice in 2014. One 2014 event was caused by surface water during low tide, while the most severe tidal flood on 3 January 2014 inundated 29 properties on St Mary's Street. The lower quayside, including Strand and Cattle Market, also flooded in 2007.

Low-lying residential and commercial properties, particularly on Strand, are highly vulnerable, with thresholds below 3.1m Above Ordnance Datum (AOD) and exposure to annual tidal flooding. The projected 0.5% Annual Exceedance Probability (AEP) (1 in 200) tidal level, including 100 years of climate change, is 4.75m AOD, which is well above current ground levels and therefore poses a risk of significant flooding. This corresponding increase in flood risk and associated sea level raise will fundamentally change the composition of the estuarine habitats within the Scheme Area over time reducing the area and diversity of the marginal habitats as the level of inundation increases. Estimating the effects of sea level rise on tidal range and therefore intertidal habitat is impacted by more factors than sea level rise alone, however for the purposes of habitat extent and functionality, sea level rise is expected to reduce the range of intertidal volume of the estuary, experienced under both neap and spring tidal conditions (54) with corresponding effects on reduced intertidal habitat extents.

Within the Study Area, statutory designated sites are afforded protection provisioned through the framework of nature conservation legislation. Whilst this legal protection remains in place, the future baseline for these sites is likely to be safeguarded, additionally benefiting in future from landscape-scale policies and initiatives led by strategic planning processes. Non statutory designated sites, such as LWS, are afforded protection through local planning policies and are likely to also benefit from plan-led strategies for nature conservation introduced by the Environment Wales Act 2016 and likely to be continued by the forthcoming Environment

(Principles, Governance and Biodiversity Targets) Bill. As such, changes to the future baseline of these sites are likely to be positive.

A combination of legal protection, local planning policy and local catchment plans are likely to safeguard important habitats, with the important contribution made by the statutory requirement for BNG applicable to the future baseline in ensuring that habitats are not lost to development where planning permission is required and are prioritised for replacement at a Local Authority geographical scale wherever possible. Along with the potential for implementation of agri-environmental schemes, changes to the future baseline of habitats support a long-term trend towards a more mosaic-like, ecologically rich and visually diverse rural landscape. That said, urbanising influences from possible future housing development and highway improvements linked to national and local policy drivers, and attendant potential for negative effects, may act to counterbalance some of these habitat improvements.

Protected species are afforded varying levels of legal protection from killing, injury, loss of shelter and resting places, and disturbance. Species groups are variously safeguarded through the requirement for derogation licences, permits and consents for works which could affect the species or their habitat. In the absence of the Scheme, it is likely these species would continue to be present within suitable supporting habitats and would react to larger-scale population trends, potentially expanding their range and territories to maintain a favourable conservation status. However, this is not necessarily the case, the latest population data for Otter within Wales shows a decline in the species population for the first time since the 1970s for the period 2010 to 2015-2018 (55) with the reason for this decline unclear. Similarly, the population trends for bats within Wales as reported by the National Bat Monitoring (56) program suggests that why overall bat populations are considered stable, there is distinct variation in trends for individual species. Greater and lesser horseshoe populations have increased in Wales over the past five years whereas brown long eared populations are declining.

Rare and notable species risk being overlooked in terms of legal protection and consequently any loss of habitat, failure in the control of INNS leading to increased distribution or abundance and human disturbance and urbanisation have potential to negatively affect the success of these taxa in the future. As a result, in the absence of the Scheme, balanced against the potential supporting habitat benefits of Nature Recovery Action Plans and Net Benefit for Biodiversity and the implementation of the upcoming Environment (Principles, Governance and Biodiversity Targets) Bill, declines and localised loss of some other species is possible.

The other developments which will form part of the future baseline identified in Chapter 12: Cumulative Effects have been reviewed, and do not materially alter the future baseline assessed for this aspect.

6.8.5 Summary of sensitivity by receptor

Table 6-186 contains a summary of sensitivity for each Biodiversity and Nature receptor.

Table 6-186 Summary of Sensitivity by Receptor

Receptor name	Sensitivity of Receptor
Afon Teifi SSSI	High
Afon Teifi SAC	Very High

Receptor name	Sensitivity of Receptor
Cardigan Bay SAC and West Wales Marine SAC	Very High
Broadleaved Scattered Trees	Negligible
Running Water	N/A Assessed within Afon Teifi SSSI and SAC
Intertidal Mudflats and Associated Intertidal Biotopes	Moderate
Saltmarsh	Moderate
Amenity Grassland	Negligible
Poor Semi-Improved Neutral Grassland	Negligible
Amphibians and Reptiles	Negligible
Bats	Low
Birds – Breeding	Negligible
Birds - Wintering	Low
Fish – Diadromous Fish	High
Fish – Marine and Estuarine Fish	Low
Invertebrates	Low
Otter	Low
West European Hedgehog	Negligible

6.8 Assessment of effects

This section describes the outcomes of the assessment, identifying the Likely Significant Effects on Biodiversity and Nature Conservation. Where Likely Significant Effects are reported, additional mitigation is described in section 6.10 with the residual effects described in section 6.11. For further information on embedded mitigation see Chapter 2: Project Description and Chapter 10: Water Environment and Chapter 11: Land use and Soils.

6.9.1 Likely impacts and embedded mitigation

The following is a description of likely Biodiversity and Nature Conservation Impacts likely to occur as a result of the Scheme as it is described in Chapter 3: Project Description. This includes an assessment of Impact Magnitude by Receptor. Where an impact is considered to be not applicable it is included in the summary table only.

Habitat loss

Construction phase

The construction of the flood defence wall in Areas 1-3 will lead to the permanent loss of approximately 489m^2 of intertidal habitat. The construction of the flood defence and creation

of intertidal set back habitat in Area 4 will lead to the permanent loss of approximately 586m^2 of terrestrial habitat. The works sill also lead to the loss of three trees Tree's identified by the bat Ground Level Tree assessment. T4 (T4 Category C (38)) is identified as having PRF-I suitability and subsequent endoscopic inspections found no evidence of roosting activity. T1 and T2 (T1 Category B, and a tree too small for classification (38)) were both identified as having negligible suitability for bats.

Habitat loss in the construction phase considered to be a negative impact for a number of receptors.

- For poor semi-improved grassland there will be a permanent loss of 356m^2 habitat of negligible sensitivity to the new defence and new backwater where habitat creation is proposed in Area 4. In addition, to this there will be a temporary loss of 196m^2 poor semi improved- grassland of negligible sensitivity to construction within Area 4 for the duration of construction and reestablishment period (estimated 3 years). This temporary loss is offset by the reinstatement of grassland habitat through reseeding (See habitat creation below). This habitat in its current condition (moderate) is considered to be common at the district level and therefore this impact is of small negative magnitude.

- For amenity grassland there will be a permanent loss of 34.36m^2 habitat to the new defence and new backwater where habitat enhancement is proposed in Area 4 in the garden of Tiefi House. In addition, to this there will be a temporary loss of 113m^2 amenity grassland to construction within Foundry field for the duration of construction and reestablishment period (estimated 3 years). This temporary loss is offset by the reinstatement of grassland habitat through reseeding (See habitat creation below). This habitat in its current condition (poor) is considered to be common at the local level and therefore this impact is of negligible negative magnitude.

- For amphibians, reptiles and west European hedgehog the magnitude of impact is considered to be negligible negative as whilst the grassland habitat loss does remove suitable foraging habitat for these species the likely local populations are small and therefore this impact is unlikely to measurably affect the conservation status of the species at the district level.

The impact is considered to be neutral for the following receptors.

- For the Afon Teifi SSSI, Afon Teifi SAC and Cardigan Bay SAC and West Wales Marine SAC (and Running water habitat type), the habitats being lost are not notified/qualifying features. The small scale of these losses when compared to the size of the Teifi estuary mean that it is that they will not affect the overall favourable conservation status of those sites. As a result, the magnitude of the impact is considered to be neutral.

- For broadleaved scattered trees this habitat due to its limited species, age and structural diversity is considered to be of site value only and as a result when combined with the limited area of total loss the magnitude of impact is considered to be neutral.

- For saltmarsh there will be temporary loss (for duration of construction and until establishment of Area 4 estimated at 5 years) of 34m^2 semi-natural saltmarsh intertidal habitat within the Scheme Area to the footprint of the new flood wall. The establishment of new saltmarsh habitat within Area 4 will be left to the natural expansion of the existing retained semi-natural and natural saltmarsh habitat within the project area and immediate surrounds. The habitat within the project area in its current condition (moderate) is considered to be common within the Afon Teifi estuary and therefore this impact of this temporary loss is of neutral magnitude.

- For intertidal mudflats and associated intertidal biotopes the encroachment of the of the new wall defence into the estuary will result in the temporary (for duration of construction and until establishment of Area 4 estimated at 3 years) approximate loss of 489m^2 of intertidal muds. However, this impact is offset by the creation of the new backwater habitat in Area 4 (see Habitat Creation section below) and design approach with habitat niches targeted to replicate natural estuarine features. This will mean that the Scheme results in a no net loss of intertidal habitat overall. The exact composition of the intertidal habitat will be down to natural river processes after creation.

- For bats no roosts were identified as present within the features to be lost , the habitats affected are suboptimal foraging areas for the species present in the locality, and the majority of the replacement habitat (see Habitat Creation below) will be of a similar value for likely prey species. As a result the magnitude of impact is considered to be neutral.

- For birds (breeding and wintering), invertebrates and otter the magnitude of impact is considered to be neutral as whilst the intertidal habitat loss does remove suitable habitat for these species the likely local populations are small and therefore this impact is unlikely to measurably affect the conservation status of the species at the district level.

- The saltmarsh habitat is high in the tidal range and is therefore of limited value for fish (diadromous and marine and estuarine) species. As there is no net loss of intertidal habitat overall for the Scheme as a result the magnitude for all fish receptors of habitat loss is deemed neutral.

Operational phase

No impact is predicted as a result of the project via this impact pathway during the operational phase.

Habitat adaptation

Construction and operational phase

Habitat adaptation is an impact that spans both the construction and operational phase of development with no easy definition between the two and as a result they are discussed together in this section.

The installation of sheet piling and construction of the sea defence wall will result in the permanent adaptation of 1947m^2 of intertidal mud habitat through the creation of the engineered riverbank for the flood defence and to address the future baseline impacts of coastal squeeze. Due to the alteration in bank slope profile the total surface area of the intertidal habitat within the project area will increase marginally to 2147m^2.

The engineered riverbank (and need for the Scheme) has been developed around providing an adaptable pathway for habitats to avoid the impacts of coastal squeeze in this location. Current intertidal areas within the Scheme area (with the exception of slipways) are backed by vertical walls associated with existing structures; sea level rise with the Scheme will, in a future baseline scenario, see the total loss of intertidal habitats as there is no realistic expectation for the removal of present-day levels of coastal protection in Cardigan.

An embanked structure with designed opportunities for accretion of sediment and establishing of habitat niches within the constructed form, using materials that can support those objectives, provides an opportunity for habitats to adapt to rising tidal levels. The habitats that can then develop on the structure would provide a greater functionality (access by faunal species, variation in habitats, opportunities for fish, invertebrate and prey species) than would otherwise be maintained by existing wall structures.

The habitats present on the structure will represent the estuarine habitat context, with riparian and brackish-tolerant planting growing down from above mean high water springs to create a mixed habitat in this upper zone. This interface area is also considered suitable for saltmarsh species to take hold, as has occurred on gabion basket structures within the Study Area baseline, along with sheltered suitable areas within the wider Scheme design such as slipways and Area 4.

The top third 599m^2 of the engineered riverbank in Areas 1-4 will be seeded with a native coastal estuarine grassland mix (see Chapter 8: Landscape and Visual). Initially this area will be cut annually to prevent the establishment of woody vegetation however, over time with the increase of frequency of tidal inundation the natural salt levels should impede the growth of these species. This seeded area of the engineered riverbank area will change over time as tidal range increases as a result of climate change, with suitable conditions to likely result in the long term transition from salt tolerant grassland, to upper saltmarsh, to reedbed and finally to mud as the frequency of tidal inundation increases throughout the 100 year lifetime of the defence.

Below present-day MHWS on the engineered riverbank (and noting the lifespan of the Scheme and changes to tidal levels over time) habitat prediction can be understood based on those habitats recorded in similar setting adjacent to the Scheme. On the left bank, opposite Cambrian Quay at the downstream extent of the Scheme, habitats recorded based on sheltered bedrock and stable boulders in the eulittoral zone are subject to reduced salinity and characterised by the wrack *Fucus ceranoides*. In these habitats, green seaweeds *Ulva intestinalis* and *Ulva lactuca* may be present together with shore crab *Carcinus maenas* and the occasional barnacle *Austrominius modestus* and *Semibalanus balanoides*. Proposed engineered riverbank habitats within the same intertidal zone and on replica substrate surfaces would reasonably be predicted to develop similarly, with the additional benefit of the specific habitat design features integrated into the engineered riverbank surface.

Habitat adaptation is an impact of positive magnitude for the following receptors.

- For saltmarsh the creation of additional suitable areas within this habitats niche tidal range (28) should offer additional opportunity for natural movement up the tidal range in response to climate change. The existing locations this habitat is present on within the Scheme Area are distinct shelves (on top of the first layer of flood defence gabions or dumped ballast piles), with no obvious areas for expansion up the bank gradient in response to raised tidal levels. The existing height of this feature at approximately 1.9m AOD is below the average minimum saltmarsh limit present within the Teifi marshes nature reserve upstream (28). Modelling undertaken as part of the flood consequence assessment for the project predicts that MHWS will rise on average by 1cm per year for the 100-year lifespan of the defence (36). Estimating the effects of sea level rise on tidal range and therefore intertidal habitat is impacted by more factors than sea level rise alone. Understanding the resulting effects on intertidal habitats extent from these impacts is however more generally predictable and this is assumed reduced intertidal areas for the purposes of climate change impacts on estuaries. This is because sea level rise is expected to reduce the range of intertidal volume of the estuary, experienced under neap and spring tidal conditions (54). The proposed design for the engineered riverbank will ensure that the tidal range habitat niche for saltmarsh is retained longer into the future (although the current water level predictions do suggest that the new saltmarsh habitat on the upper reaches of the engineered riverbank will be largely lost due to coastal squeeze by the end of the 100 year design life of the defence). As a result of this the magnitude of impact is considered to be negligible positive.

Habitat adaptation is considered to be an impact of neutral magnitude for the following receptors

- For the Afon Teifi SSSI, Afon Teifi SAC and Cardigan Bay SAC and West Wales Marine SAC (and running water habitat type), the habitats being modified are not qualifying features or key habitats of species of the designations. The small scale of this modification when compared to the size of the Teifi estuary mean that it is that they will not affect the functioning or integrity of those sites. As a result, the magnitude of the impact is considered to be neutral, however benefits to mobile species like otter are expected to be realised over time as coastal squeeze in the future baseline scenario would have impaired opportunities for linear movement, concealment and foraging.

- For Intertidal Mudflats and Associated Intertidal Biotopes the engineered riverbank represents the necessary adaption to coastal squeeze and coastal protection which is the underlying strategic driver for the Scheme. The engineered riverbank seeks to minimise the short-term impact and maximise longer-term beneficial effects by adapting the soft sediment habitat type common within the estuary, for another (littoral rock-based) estuarine habitat; as a result and despite the prevention of total loss over time of intertidal mudflat habitat due to coastal squeeze, this is considered to be an impact of neutral magnitude.

- The salt tolerant grassland creation will overall have a neutral magnitude impact. The habitat on river side of the wall although likely to be of better quality due to the lack of public access, will over time become affected by the increased tidal range of the Teifi and therefore Naturally transition into estuarine habitat (likely Salt marsh, reed bed and mud). The creation on the shore side of the defence wall in Area 4 is permanent. This will be seeded with a more diverse mixture of species that present in the existing habitat

present within the Scheme Area. However, the smaller size and likely poorer habitat condition assessment (as a result of higher anthropogenic impact) will reduce its biodiversity value.

- For bats the magnitude of impact is neutral as the habitats affected are suboptimal foraging areas.

- For birds (breeding and wintering), and otter the magnitude of impact is considered to be neutral as whilst the intertidal habitat adaptation does affect theoretically suitable habitat for these species, the assessed value of the Scheme Area local populations is low and therefore this loss is unlikely to measurably affect the favourable conservation status of the species at the district level.

- For fish (diadromous and marine and estuarine) the choice to use rock rolls (engineered riverbank) and rip rap (Engineered riverbank toe) and a shallower gradient where possible should ensure that the engineered riverbank incorporates sheltered niches for fish and their prey species as well as areas of deeper sediments for invertebrates. The risk to fish species is minimised further by the fact all of the fish receptors identified are highly mobile and none of the receptors are constrained to specific habitat types or areas. They are therefore likely to be able to use other areas of available habitat, either further upstream or downstream, for foraging and spawning. As a result, the magnitude for all fish receptors of habitat adaptation is deemed neutral.

- For invertebrates the habitats proposed are typical for estuarine shore environments and will offer niches for both mud dwelling species such as flat worms and rock shore dwelling species such as crabs. As a result, the magnitude for all fish receptors of habitat adaptation is deemed neutral.

Habitat creation

Construction and operational phase

Habitat creation is an impact that spans both the construction and operational phase of development with no easy definition between the two and as a result they are discussed together in this section.

The Scheme includes 489m^2 of intertidal habitat creation in Area 4, between the retained saltmarsh on top of the existing rock gabions and new flood defence. This area will be landscaped to include a natural channel, pools and raised bank all within the expected natural tidal range in order to create semi natural niches for the establishment of intertidal habitats, similar to a natural backwater or cove. Once created the habitats will be left to naturally recolonise with plants and the river allowed to naturally dump and regrade the silt with tidal action. The design proposed will allow conditions for natural deposition of river silt immediately and it is likely that local native estuarine species and habitats will have colonised the area within five years. This area is connected to the natural saltmarsh habitats to the east of the site via the retained area of semi-natural saltmarsh on gabions and the Afon Teifi Saltmarsh – niche Assessment (28) Appendix 6.3 identified this area as suitable for saltmarsh expansion should suitable topography be provided as a result it is highly likely that these species will be among

the early colonisers of areas where the tidal inundation conditions are suitable. The habitats within area 4 when established will likely be a mixture of intertidal muds, saltmash and reedbed. The design will allow the habitats to change and adjust over time driven by the tidal processes of the River Teifi, with ratio of mud to vegetated habitats likely changing in response to larger flood events.

The poor semi-improved grassland within the construction area in the region of Gloster Row car park will be reseeded with a suitable biodiverse native grassland seed mix (see Chapter 8: Landscape and Visual). Whilst this area will not be subject to the same tidal influence, this area will likely be subject to increased, anthropogenic disturbance as a result of its location as a result it is assumed that the condition of this habitat when established will likely be poor.

The landscaping for Strand within Area 1 includes the provision of a new band of native tree screening as well as planted beds including species of wildlife value (see Chapter 8: Landscape and Visual).

Habitat creation is an impact of positive magnitude for the following receptors.

- For saltmarsh the creation of additional suitable areas within this habitats niche tidal range (28) should offer additional opportunity for natural movement up the tidal range in response to climate change. The existing locations this habitat is present on within the Scheme Area are distinct shelves (on top of the first layer of flood defence gabions or dumped ballast piles), with no obvious areas for expansion up the bank gradient in response to raised tidal levels. The existing height of this feature at approximately 1.9m AOD is below the average minimum saltmarsh limit present within the Teifi marshes nature reserve upstream (28). Modelling undertaken as part of the flood consequence assessment for the project predicts that MHWS will rise on average by 1cm per year for the 100-year lifespan of the defence (36). Estimating the effects of sea level rise on tidal range and therefore intertidal habitat is impacted by more factors than sea level rise alone. Understanding the resulting effects on intertidal habitats extent from these impacts is however more generally predictable and this is assumed reduced intertidal areas for the purposes of climate change impacts on estuaries. This is because sea level rise is expected to reduce the range of intertidal volume of the estuary, experienced under neap and spring tidal conditions (54). The proposed design for the Area 4 will ensure that the tidal range habitat niche for saltmarsh is retained much longer into the life span of the defence (although the current water level predictions do suggest that the habitat will still be lost from the Scheme Area by the end of the 100 year lifespan of the defence). However, suitable conditions for this habitat will be retained for longer on the engineered riverbank within Areas 1-3 as a result of it greater height at the base of the defensive wall. As a result of this the magnitude of impact is considered to be negligible positive.

The impact is considered to be neutral for the following receptors.

- For the Afon Teifi SSSI, Afon Teifi SAC and Cardigan Bay SAC and West Wales Marine SAC (and running water habitat type) the small scale of these created habitats when compared to the size of the Teifi estuary mean that it is that they will not affect the overall integrity or function of those sites. As a result, the magnitude of the impact is considered to be neutral.

- For broadleaved scattered trees the positive impact of the habitat creation is offset by the loss of habitat to the new defence structure footprint. This will mean that the Scheme results in a no net loss of habitat overall. As a result, the magnitude of the impact is neutral.

- For intertidal mudflats and associated intertidal biotopes the positive impact of the habitat creation is offsets the loss of habitat to the new defence structure footprint. This will mean that the Scheme results in a no net loss of intertidal habitat overall. As a result, the magnitude of the impact is neutral.

- For bats the magnitude of impact is considered to be neutral as although the habitats created are suitable their scale is insufficient to affect significantly core sustenance zones of local roost populations and therefore this creation is unlikely to measurably affect the favourable conservation status of the species at the district level.

- For birds (breeding and wintering), invertebrates and west European hedgehog the magnitude of impact is considered to be neutral. The habitat creation does create suitable habitat for these species, however the scale is of change is small and is within a very urban location, so this creation is unlikely to measurably affect the favourable conservation status of the species at the district level.

- For fish (diadromous and marine and estuarine) the creation of the new backwater habitat in Area 4 will result in a no net loss of intertidal habitat overall for the Scheme although the exact composition of the habitat will be down to natural river processes after creation. As a result, magnitude for all fish receptors of habitat creation is deemed neutral.

Terrestrial pollution and dust

Construction phase

There is potential that excavation and ground works may expose pollutants within the ground/soil, however, effects related to ground/soil borne pollution have been assessed in full within ES Chapter 11: Land and Soil.

Mitigation measures to be employed during the Scheme development are as follows:

- The use of silt curtains (correctly installed to manufacturer's recommendations) to minimise sediments entering Teifi Estuary (standard practice).

- If trenches are to be excavated in Made Ground to remove obstructions ahead of sheet piling they should be backfilled with suitable clean fill.

- Formal monitoring of Made Ground and natural soils, and groundwater for potential contamination. Monitoring should include the use of Rapid Screening Methods using field test kits or portable instruments (eg Photo-Ionisation Detector (PID) for volatile organic compounds and X-Ray Fluorescence (XRF) for heavy metals), and formal sampling of soils and groundwater for laboratory testing should indications of contamination be observed.

- Any visual or olfactory evidence of contamination encountered during construction works should be further investigated to determine spatial extents and concentrations (it is likely that works will need to be stopped during this investigation into unexpected contamination).

- Standard practices for protecting the water environment should be adhered to (e.g. bunded fuel storage, use of plant nappies, suitable spill kits with trained personnel, silt fencing) in accordance with current good practice guidance including NRW Guidance for Pollution Prevention 5: Works and maintenance in or near water (version 1.2 February 2018), and CIRIA C741: Environmental Good Practice on Site Guide (4th edition, 2015).

- Where desiccated soils are disturbed during construction such that dust could be created, then mitigation to control dust (e.g. damping down soils) should be in place.

- Appropriate management strategies should be in place to deal with potentially contaminated soils if they are encountered during construction. These should include measures to ensure the safety of construction workers, to prevent further contamination of the environment, and an appropriate storage, testing and disposal strategy if contaminated soils are to be removed from the Scheme Area.

- Should any of the above encounter significant contamination in soil or groundwater, a remediation strategy should be developed, agreed with Ceredigion Council and NRW, and implemented with a verification plan to confirm that remediation objectives have been achieved.

- The above should be included in the Pollution Prevention Plan for the construction phase of the Scheme.

The embedded mitigation measures are sufficient to manage any impact and therefore the magnitude of impact is considered neutral for all receptors likely to be affected.

Operational phase

No impact is predicted as a result of the project via this impact pathway during the operational phase.

Water flow (Tidal current) changes

Construction phase

The installation of the flood defence Scheme would reduce the cross-sectional area of the river in the Scheme Area. This has the potential to increase water velocities in the area of the Scheme. Hydraulic modelling of the Scheme has been undertaken to investigate the effect of the reduction in cross sectional area on water velocities (see Chapter 10: Water Environment). The modelling concluded that the Scheme would have negligible impact on local water velocities.

The embedded mitigation measures are sufficient to manage any impact and therefore the magnitude of impact is considered negligible negative for all receptors likely to be affected.

Operational phase

No impact is predicted as a result of the project via this impact pathway during the operational phase.

Aquatic pollution and accidental spills

Construction phase

The works will require an excavator/piling rig in the intertidal zone. To minimise the possibility of a pollution incident, best practice guidance will be implemented when working near water (GPP5: Works and maintenance in or near water) and a Pollution Prevention Plan will be required to be in place. Best practice measures will be in place to prevent accidental spills. Biodegradable hydraulic oil will be used when possible and no refuelling will be undertaken at the work site. Concrete pours pose a risk of water pollution through leaching of uncured material and accidental spillage. Concrete pours will be scheduled during low tide periods to minimise direct contact with water during curing. Marine grade concrete will be used to ensure quick curing, enhance durability and reduce the potential for washout and leaching.

With these best practice measures in place along with the implementation of a Pollution Prevention Plan, potential for effects from a pollution event is considered negligible and therefore the magnitude of impact is considered neutral for all receptors likely to be affected.

Operational phase

No impact is predicted as a result of the project via this impact pathway during the operational phase.

Terrestrial noise and vibration

Construction phase

Effects in relation to noise and vibration comprise the following:

- Disturbance that can lead to the abandonment of areas of shelter at times when the disturbed species would not usually be active, leading to increased stress and predation risk.
- High noise levels that can lead to the abandonment of core resting sites, commuting or foraging areas by mobile species.
- Disturbance of mobile species at sensitive periods of their yearly life cycle e.g. disturbance during breeding period, when raising young or hibernation.

Calculations for vibratory piling were carried out in accordance with BS 5228 Part 2 to predict PPV levels at various distances (37) Appendix 5.1. The sheet piling activity is expected to last for approximately nine weeks.

The predictions establish key screening distances for human perception:

- Receptors within 30m of piling may experience vibration levels above the 1.0 mm/s moderate impact threshold.
- Receptors within 5m of piling may experience levels above the 10 mm/s 'intolerable' threshold.

Throughout the construction programme, the primary strategy for managing noise and vibration will be the application of Best Practicable Means (BPM) as set out within Appendix 6.9. BPM involves minimising site noise levels at all times, whilst having due regard to the practicability and economic implications of any embedded mitigation measure.

As part of the works, a Construction Environmental Management Plan (CEMP) will be developed to ensure that environmental impacts are avoided and minimised during construction. BPM mitigation measures for noise and vibration will be included in the CEMP.

Where significant negative effects are still predicted after the application of standard BPM or at particularly sensitive receptors, measures will be adopted to reduce effects as far as practicable. Potential additional mitigation measures are outlined within section 9 of the Noise and Vibration Assessment (Appendix 5.1). The specific details of these measures will be finalised by the Principal Contractor and approved via the CEMP, or a specific Noise and Vibration Management Plan prior to works commencing.

Terrestrial noise and vibration within the construction phase is an impact of negative magnitude for the following receptors.

- For breeding birds in addition to the disturbance, the impact could result in bird species, abandoning habitual nesting sites within the Scheme Area for the season, with a corresponding impact on breeding success. However, as previously stated the species list of breeding birds found within and in close proximity to the Scheme Area is considered to be of site importance only and this effect will be temporary and will revert to normal as soon as the works are completed as a result the magnitude has been assessed as small negative.
- Any bats roosting within properties adjacent to the Scheme would be subject to additional noise and vibration disturbance. The baseline surveys found no evidence of roosts of high conservation status in these properties and as a result of this and the temporary nature of the works the impact magnitude is set at negligible negative.
- For amphibian and reptiles, wintering birds, otter, west European hedgehog, the primary effect will be disturbance resulting in likely avoidance of the area during the piling works. This effect will be temporary and will revert to normal as soon as the works are completed as a result the magnitude has been assessed as negligible negative.

Operational phase

No impact is predicted as a result of the project via this impact pathway during the operational phase.

Aquatic noise and vibration

Construction phase

Vibropiling,augering and other in channel works associated with the construction of the flood defence (including the construction of the piling platform have the potential to generate and propagate underwater noise (as sound pressure motion) and vibration (as particle motion). Underwater noise and vibration can cause several effects on aquatic species including:

- Behavioural effects (e.g. reduced detection of predators/prey, inhibited communication between conspecifics, alteration in swimming behaviour);
- Masking effects (i.e. the reduced detectability of a given sound owing to the simultaneous occurrence of another sound);
- Temporary Threshold Shift (TTS) in hearing (short or long-term changes in hearing sensitivity that may or may not reduce fitness);
- Recoverable tissue injury (not resulting in mortality e.g. minor internal or external hematoma); and
- Mortality or potential mortal injury (immediate or delayed death).

The following text is taken from the Cardigan Tidal Flood Risk Management Scheme – Fish Ecology Technical Note (20) Appendix 6.2 with minor revisions for clarity within this Environmental Statement.

The most recent and relevant guidelines for the purposes of the assessment of the impacts of underwater noise associated on fish are the Acoustical Society of America (ASA) Sound Exposure Guidelines for Fishes and Sea Turtles (57). These guidelines provide directions and recommendations for setting criteria (including injury and behavioural criteria) for fish.

The guidelines broadly group fish into the following categories based on their anatomy and the available information on hearing of other fish species with comparable anatomies:

- Group 1: Fish lacking swim bladders that are sensitive only to sound particle motion and show sensitivity to a narrow band of frequencies (e.g. lampreys, gobies);
- Group 2: Fish with a swim bladder where the organ does not appear to play a role in hearing. These fish are sensitive only to particle motion and show sensitivity to a narrow band of frequencies (e.g. Atlantic salmon); and
- Group 3: Fish that have special structures mechanically linking the swim bladder to the ear. These fishes are sensitive primarily to sound pressure, although they also detect

particle motion (e.g. European eel). These species have a wider frequency range, and generally show higher sensitivity to sound pressure than fishes in Groups 1 and 2.

Species scoped into this assessment are categorised into the following hearing groups outlined in Table 6-197.

Table 6-197: Hearing abilities of fish species scoped into this assessment.

Hearing group	Receptor / Species
Group 1 (no swim bladder)	River lamprey, sea lamprey, flounder, plaice, common goby, sand goby, lesser sand-eel, greater sand-eel
Group 2 (swim bladder is not involved with hearing)	Atlantic salmon, brown/sea trout, thick-lipped grey mullet, thin-lipped grey mullet, golden grey mullet
Group 3 (swim bladder involved with hearing)	European eel, Atlantic herring, European seabass, sprat

(57) sets out criteria for effects arising from different sources of noise. The criteria used within this assessment are associated with continuous noise (i.e. vibro-pilling and augering). Where insufficient data exists to determine a quantitative value, (57) categorised in relative terms as high, moderate or low risk at three distances from the source: near (i.e. in the tens of metres), intermediate (i.e. in the hundreds of metres) or far (i.e. in the thousands of metres) (Table 6-20).

Table 6-20: Risk of effects arising from noise exposure to categorised fish groups (57)

Hearing group	Mortality and potential mortal injury	Recoverable injury	TTS	Masking	Behavioural
Group 1	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) Moderate (I) Low (F) Low	(N) High (I) High (F) Moderate	(N) Moderate (I) Moderate (F) Low
Group 2	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) Moderate (I) Low (F) Low	(N) High (I) High (F) Moderate	(N) Moderate (I) Moderate (F) Low
Group 3	(N) Low (I) Low (F) Low	170 dBrms 1µPa for 48hrs	158 dBrms 1µPa for 12hrs	(N) High (I) High (F) High	(N) High (I) Moderate (F) Low
Peak and rms sound pressure levels dB re 1 µPa; SEL dB re 1 µPa2·s. All criteria are presented as sound pressure even for fish without swim bladders since no data for particle motion exist.					

Those fish with an absence of a swim bladder (Group 1) or that have a swim bladder which is not involved in hearing (Group 2), are understood to be insensitive to sound pressure and are most likely to detect particle motion. Group 3 fish (those fish with a swim bladder that is involved in hearing) are understood to be able to detect both particle motion and sound pressure, and are more sensitive to sound than Group 1 and 2 fish species.

Most Group 1, 2 and 3 fish species are expected to be able to avoid noise sources before mortality and potential mortal injuries could occur. However, there might be some temporary physiological effects and behavioural responses. In relation to underwater noise produced during vibro-piling and auguring, Popper et al. (2014) indicates that there is a low risk of mortality and potential mortal injuries and recoverable injuries within the near (tens of metres), intermediate (hundred of metres) and far (thousands of metres) fields for Groups 1, 2 and 3. For behavioural effects there is a moderate risk in the near and intermediate fields, and low risk in the far fields for Group 1 and 2, and a high risk in near fields, moderate risk in intermediate fields and low risk in the far fields for Group 3.

Aquatic noise and vibration within the construction phase is an impact of negative magnitude for the following receptors, in the absence of mitigation.

- The diadromous fish; Atlantic salmon, sea trout, European eels, river lampreys and sea lampreys, are likely to migrate passed the Scheme and therefore underwater noise may impede upon or delay their migration. The piling and augering works are scheduled to have a duration of approximately 2 months and there is potential for a temporal overlap with key migratory periods for these species, within the Afon Teifi. The magnitude has therefore been set as small negative.
- Afon Teifi SAC, Afon Teifi SAC and Cardigan Bay SAC and West Wales Marine SAC highlight diadromous fish species Atlantic salmon, river lamprey and sea lamprey as key features within their citations. As a result of this any significant impact on these species would result in a change to the favourable conservations status the designated sites. Therefore, the magnitude of impact has been set as small negative.
- All other marine and estuarine fish receptors are expected to be able to avoid the impact before potential mortal injuries could occur, occupy nearby suitable habitats of the estuary or adjacent coastal waters and return upon cessation of the activities. They have been deemed to be of low vulnerability (reasonable capacity to avoid), high recoverability (return upon cessation of activities). The magnitude has therefore been assessed as negligible negative.
- Birds (wintering and breeding), otter have potential to be directly disturbed by the impact of noise of and vibration but also by a wider reduction of prey availability as fish species avoid the area surrounding the Scheme Area during the pilling and augering works. The is effect will be temporary and will revert to normal as soon as the works are completed as a result the magnitude has been assessed as negligible negative.

Operational phase

No impact is predicted as a result of the project via this impact pathway during the operational phase.

Changes in suspended solids (water clarity)

Construction phase

When undertaken in water including the installation of the piling platform piling and augering activities and the placement of rip rap and rock rolls have the potential to cause sediment resuspension and increase suspended sediment concentrations causing a decrease in water clarity. With appropriate standard pollution prevention measure as described in Chapter 10: Water environment in place, this would be expected to be a very localised, short term and temporary increase in suspended sediment concentrations, and given the nature of the local environment, would be unlikely to be detectable above background levels and would quickly disperse with tidal movements.

With these best practice measures in place, potential for effects from a change in water clarity is considered negligible and therefore the magnitude of impact is considered neutral for all receptors likely to be affected.

Operational phase

No impact is predicted as a result of the project via this impact pathway during the operational phase.

Artificial lighting at night

Construction phase

Artificial lighting at night has been demonstrated to be a major constraint on nocturnal species such as bats, otter and birds. Impacts can vary by species but include:

- Increased predation risk;
- Disruption/barrier effect on foraging and commuting routes; and
- Disruption of usual activity schedule (daytime species becoming active at night when prey availability maybe lower so increasing stress).

The proposed construction working hours would be governed by Ceredigion County Council and are typically expected to be limited to daytime on weekdays between 0730 and 1800 during the summer and 0800 and 1630 during winter months due to decreased daylight hours. If weekend working is permitted, this would likely take place on Saturdays between 0730 and 1300. Activities within the site compounds (Northern and Southern Compound) may continue outside of the main construction activity hours. Out of hours works, if required, would be agreed in advance with the Local Authority Environmental Health Officer. Increased levels of artificial lighting at night. As a result, construction lighting is unlikely to be a significant issue.

In addition, to construction lighting the Scheme is likely to require additional security lighting for key equipment and or risk areas. This will be designed in a manner to minimise the impact

on nocturnal wildlife, through management of light spill onto the river corridor, timers and the use of motion activated lighting. As a result, security lighting is unlikely to be a significant issue.

As part of the works, a Construction Environmental Management Plan (CEMP) will be developed to ensure that environmental impacts are avoided and minimised during construction, through the implementation of BPM mitigation measures. The CEMP would detail mitigation measures specific to the construction phase and help to demonstrate the Scheme's commitment to environmental protection and sustainability.

With these best practice measures in place the potential for effects from additional artificial lighting during construction is considered negligible and therefore the magnitude of impact is considered neutral for all receptors likely to be affected.

Operational phase

The proposals for Area 1 include the moving of two existing streetlamps closer to the river as a result of the creation of the new pedestrian area behind the defence wall. This will potentially result in an increase in light spill onto the intertidal habitats and river in this location.

This impact will be reduced partially by the height of the new flood defence wall.

If designed appropriately through the use of light cowlings and light spectrum used the light spill could be reduced to below levels currently present within the Scheme Area. However this minimal level would need to respect the minimums required for public health and safety.

In addition to the above the tree planting including in the landscape proposal for Area 1 will provide additional screening of light from the street lighting on the opposite side of Strand from the defence.

These proposals have been designed with the concept of improving the connectivity between the river and Cardigan Castle driveway for the greater horseshoe roost present there. However, they will also provide a benefit for other bat species and nocturnal species such as otter using the river at this location.

The reduction in lighting impact in the operational phase is considered to be a positive effect for a number of receptors.

- For otter and bats this is considered to be a small positive impact due to the reduction in disturbance, improvement in habitat connectivity and reduction in predation risk.
- For wintering birds and breeding birds, this is considered to be a small positive due to the reduction in disturbance and reduced predation risk.
- For invertebrates this is considered to be a negligible positive to a reduction in the level of disruption of natural lifecycle of night emerging insects. However, the effect will be limited due to the already high levels of artificial lighting in this area.

- For diadromous fish and marine and estuarine fish receptors, this will affect the ambient light levels within the river but this is unlikely to result in a measurable difference in behaviour. As a result, the magnitude of impact is considered to be neutral.

- For west European hedgehog, amphibians and reptiles, whilst lighting presents an issue for this species the habitats in Area 1 are generally unsuitable for the species and therefore the magnitude of impact is considered to be neutral.

- For the statutory designated sites Afon Teifi SSSI, Afon Teifi SAC this is considered to be a neutral impact as these both include otter within their citation and the ability of this species through the Scheme Area would be enhanced by this change but this is unlikely to measurably affect the favourable conservation status of the species within areas of the designated sites.

For the remaining receptors the magnitude of impact is considered to be neutral as they are primarily terrestrial habitats and species and therefore would have limited exposure to a flood related pollution incident.

Anthropogenic disturbance

Construction Phase

The majority of the retained habitats of biodiversity value will be subject to disturbance during the construction period. Although all areas of the scheme are currently subject to anthropogenic disturbance to some degree currently, via the slipways or unofficial dog walking paths or fishing locations, the presence of the construction team will represent a significant increase in activity for the duration of the construction. This will increase the risk of:

- Behavioural disruption of mobile species;

- Disturbance of mobile species that can lead to the abandonment of areas of shelter at times when the disturbed species would not usually be active, leading to increased stress and predation risk; and

- Trampling / compaction damage to plant species and sensitive habitats.

Throughout the construction programme, the primary strategy for managing anthropogenic disturbance will be the application of Best Practicable Means (BPM). BPM involves minimising site disturbance levels at all times, whilst having due regard to the practicability and economic implications of any embedded mitigation measure. Embedded Measures will include:

- Toolbox talks for all contractors prior to entering the site to make them aware of ecologically sensitive areas of the site and of all stop procedures should certain sensitive species be found during the works;

- Ecological Clerk of Works (ECoW) supervision during works near to or within ecologically sensitive areas; and

- Restricting access to retained habitats via the use of signage and fencing and clearly demarked areas on drawings (e.g: root protection areas).

As part of the works, a Construction Environmental Management Plan (CEMP) will be developed to ensure that environmental impacts are avoided and minimised during construction, through the implementation of BPM mitigation measures. The CEMP would detail mitigation measures specific to the construction phase and help to demonstrate the Scheme's commitment to environmental protection and sustainability.

During the construction phase the amount of anthropogenic disturbance of the foreshore will be increased significantly above the usual levels expected of this area regardless of the embedded mitigation as a result this is considered to be negative effect of negligible magnitude for all receptors.

Operational phase

During the operational phase the impact of anthropogenic disturbance will be reduced when compared to the existing baseline this will be as a result of the following elements built into the Scheme design:

- The number of slipways reduced from two publicly accessible boat ramps to one controlled access foot ramp for canoes and kayaks from foundry field; and
- Access to habitats in front of the flood defence will be restricted to maintenance access only.

This restriction in access will block the existing access to the informal footpaths through the intertidal habitats reducing the disturbance impact from dog walkers and fisherman.

The reduction in lighting impact in the operational phase is considered to be a positive effect for a number of receptors.

- For otter, wintering birds and breeding birds this is considered to be a small positive impact due to the reduction in disturbance.
- For the saltmarsh and intertidal habitats this is considered to be a small positive due to the reduction in; associated trampling and damaging of vegetation, litter and nutrient enrichment (from dog urine and faeces).
- For amphibians and reptiles and west European hedgehog this is considered the magnitude of impact is considered to be neutral as the habitats affected are suboptimal for these species and the likely populations numbers are small.
- For the statutory designated sites Afon Teifi SSSI, Afon Teifi SAC this is considered to be a neutral impact as these both include otter within their citation and the ability of this species to move through the Scheme Area would be enhanced by this change but this is unlikely to measurably affect the favourable conservation status of the species within areas of the designated sites.

Invasive Non-Native Species

Invasive Non-Native Species (INNS) have been recorded within the Scheme Area during the surveys undertaken to support this Environmental Statement. A stand of Japanese Knotweed has been identified adjacent to the entrance of a proposed work compound SN 18235 46093 (not located within the construction zone).

All activities will follow best practice guidance for the prevention of spread of Invasive Non-Native Species including:

- Responsible sourcing of soils and plants used for landscaping; and
- Cleaning and maintenance of equipment and introduced of construction material (e.g. rip rap) (e.g. Check, Clean, Dry Protocol) to reduce the risk of spread or introduction of INNS.

As part of the works, a Construction Environmental Management Plan (CEMP) will be developed to ensure that environmental impacts are avoided and minimised during construction, through the implementation of BPM mitigation measures. The CEMP would detail mitigation measures specific to the construction phase and help to demonstrate the Scheme's commitment to environmental protection and sustainability.

With these best practice measures in place the risk of spread of Invasive Non-Native Species construction is considered negligible and therefore the magnitude of impact is considered neutral for all receptors likely to be affected.

Operational phase

No impact is predicted as a result of the project via this impact pathway during the operational phase.

Reduced flood risk could result in reduced potential for environmental pollution during and following a flood event

Construction phase

No impact is predicted as a result of the project via this impact pathway during the construction phase.

Operational phase

As stated within Chapter 1: Introduction Cardigan has a history of flood events which have had social, economic and environmental impacts upon the town. Major flood events have occurred between 2000–2020. In 2007, flood depths exceeded 0.5m, and further tidal floods occurred in 2008, 2012, and twice in 2014. One 2014 event was caused by surface water during low tide, while the most severe tidal flood on 3 January 2014 inundated 29 properties on St Mary's Street. The lower quayside, including Strand and Cattle Market, also flooded in 2007. Within the time frame of the scheme (100 years) without further intervention the frequency and severity of these

flood events will increase. Each flood event will result in an uncontrolled pollution event as materials from the urban terrestrial environment are drawn back into the river including road dust (including car exhaust brake and tyre wear waste) and litter.

The flood defences have been designed to 4.95m AOD to meet the 1 in 200 design standard with climate change and allow for 0.2m of freeboard to account for uncertainty in long range forecasting of the effects of climate change. This will result in a reduction in frequency of flood pollution events improving water quality of the Afon Teifi in the long term.

The improvement in water quality in the operational phase is considered to be a positive effect for a number of receptors.

- For the statutory designated sites Afon Teifi SSSI, Afon Teifi SAC and Cardigan Bay SAC and West Wales Marine SAC this is considered to be a negligible positive impact as these are all directly hydrologically connected to the Scheme Area and therefore, would be exposed to any pollution incident. However, due to the scale of these sites their conservation status is unlikely to be affected by any changes in the Scheme Area.

- For intertidal habitats and saltmarsh this is considered a small positive impact as these marginal habitats would be most likely to be affected immediately by any flood deposited litter and other detritus.

- For diadromous fish and wintering birds this effect will be limited to their migration periods through the Scheme Area and so the magnitude is considered to be negligible positive.

- For breeding birds and otter this is considered to be a negligible positive impact due to the small population likely to be present within the Scheme Area at any one time.

- For marine and estuarine fish receptors and invertebrates this will affect all resident species and therefore the magnitude is considered to be small positive.

For the remaining receptors the magnitude of impact is considered to be neutral as they are primarily terrestrial habitats and species and therefore would have limited exposure to a flood related pollution incident.

6.9.2 Summary of impact Magnitude by Receptor

Table 6-219 contains a summary of impact magnitude for each Biodiversity and Nature receptor during the construction phase.

Table 6-219 Summary of Magnitude by Receptor during the Construction Phase

Receptor	Impact and Magnitude											
	Habitat Loss	Habitat Adaptation	Habitat Creation	Terrestrial Pollution and Dust	Water flow (tidal current) changes	Aquatic Pollution and accidental spills	Terrestrial Noise and Vibration	Aquatic Noise and Vibration	Changes in suspended solids (water clarity)	Artificial Lighting at Night	Anthropogenic disturbance	Invasive Non-Native Species
Afon Teifi SSSI	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	N/A	Small -	Neutral	Neutral	Negligible -	Neutral
Afon Teifi SAC	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	N/A	Small -	Neutral	Neutral	Negligible -	Neutral
Cardigan Bay SAC and West Wales Marine SAC	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	N/A	Small -	Neutral	N/A	Negligible -	Neutral
Broadleaved Scattered Trees	Neutral	N/A	Neutral	Neutral	N/A	N/A	N/A	N/A	N/A	N/A	Negligible -	Neutral
Intertidal Mudflats and Associated Intertidal Biotopes	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	N/A	N/A	Neutral	N/A	Negligible -	Neutral
Saltmarsh	Neutral	Negligible +	Negligible +	Neutral	Neutral	Neutral	N/A	N/A	Neutral	N/A	Negligible -	Neutral
Amenity Grassland	Negligible -	N/A	N/A	Neutral	N/A	N/A	N/A	N/A	N/A	N/A	Negligible -	Neutral
Poor Semi-Improved Neutral Grassland	Small -	N/A	Neutral	Neutral	N/A	N/A	N/A	N/A	N/A	N/A	Negligible -	Neutral
Amphibians and Reptiles	Negligible -	N/A	Neutral	Neutral	N/A	Neutral	Negligible -	N/A	Neutral	Neutral	Negligible -	Neutral
Bats	Neutral	Neutral	Neutral	Neutral	N/A	Neutral	Negligible -	N/A	Neutral	Neutral	Negligible -	N/A
Birds – Breeding	Neutral	Neutral	Neutral	Neutral	N/A	Neutral	Small -	Negligible -	Neutral	Neutral	Negligible -	N/A
Birds - Wintering	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Negligible -	Negligible -	Neutral	Neutral	Negligible -	N/A
Fish – Diadromous Fish	Neutral	Neutral	Neutral	N/A	Negligible -	Neutral	N/A	Small -	Neutral	Neutral	Negligible -	Neutral
Fish – Marine and Estuarine Fish	Neutral	Neutral	Neutral	N/A	Negligible -	Neutral	N/A	Negligible -	Neutral	Neutral	Negligible -	Neutral
Invertebrates	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	N/A	N/A	Neutral	Neutral	Negligible -	Neutral
Otter	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Negligible -	Negligible -	Neutral	Neutral	Negligible -	N/A
West European Hedgehog	Negligible -	N/A	Neutral	Neutral	N/A	N/A	Negligible -	N/A	N/A	Neutral	Negligible -	N/A

Table 6-220 contains a summary of impact magnitude for each Biodiversity and Nature receptor during the operational phase.

Table 6-220 Summary of Magnitude by Receptor during the Operational Phase

Receptor	Magnitude of Impact				
	Habitat Adaptation	**Habitat Creation**	**Artificial Lighting at Night**	**Anthropogenic disturbance**	**Reduced flood risk could result in reduced potential for environmental pollution during and following a flood event.**
Afon Teifi SSSI	Neutral	Neutral	Neutral	Neutral	Negligible +
Afon Teifi SAC	Neutral	Neutral	Neutral	Neutral	Negligible +
Cardigan Bay SAC and West Wales Marine SAC	Neutral	Neutral	N/A	N/A	Negligible +
Broadleaved Scattered Trees	N/A	Neutral	N/A	N/A	Neutral
Intertidal Mudflats and Associated Intertidal Biotopes	Neutral	Neutral	N/A	Small +	Small +
Saltmarsh	Negligible +	Negligible +	N/A	Small +	Small +
Amenity Grassland	N/A	N/A	N/A	N/A	Neutral
Poor Semi-Improved Neutral Grassland	N/A	Neutral	N/A	N/A	Neutral
Amphibians and Reptiles	N/A	Neutral	Neutral	Neutral	Neutral
Bats	Neutral	Neutral	Small +	N/A	Neutral
Birds – Breeding	Neutral	Neutral	Small +	Small +	Negligible +
Birds - Wintering	Neutral	Neutral	Small +	Small +	Negligible +
Fish – Diadromous Fish	Neutral	Neutral	Neutral	N/A	Negligible +
Fish – Marine and Estuarine Fish	Neutral	Neutral	Neutral	N/A	Small +
Invertebrates	Neutral	Neutral	Negligible +	N/A	Small +
Otter	Neutral	Neutral	Small +	Small +	Negligible +
West European Hedgehog	N/A	Neutral	Neutral	Neutral	Neutral

6.9.3 Significance of effect

Table 6-231 contains the significance of effect for each Biodiversity and Nature receptor during the construction phase after assessment against the significance matrix included within Table 6-5.

Table 6-231 Significance of effect by Receptor during the Construction Phase

Receptor	Sensitivity	Impact and Magnitude											
		Habitat Loss	Habitat Adaptation	Habitat Creation	Terrestrial Pollution and Dust	Water flow (tidal current) changes	Aquatic Pollution and accidental spills	Terrestrial Noise and Vibration	Aquatic Noise and Vibration	Changes in suspended solids (water clarity)	Artificial Lighting at Night	Anthropogenic disturbance	Invasive Non-Native Species
Afon Teifi SSSI	**High**	None	None	None	None	None	None	None	Moderate Significant -	None	None	Minor -	None
Afon Teifi SAC	**Very High**	None	None	None	None	None	None	None	Moderate Significant -	None	None	Minor -	None
Cardigan Bay SAC and West Wales Marine SAC	**Very High**	None	None	None	None	None	None	None	Moderate Significant -	None	None	Minor -	None
Broadleaved Scattered Trees	**Negligible**	None	None	None	None	None	None	None	None	None	None	Neutral	None
Intertidal Mudflats and Associated Intertidal Biotopes	**Moderate**	None	None	None	None	None	None	None	None	None	None	Neutral	None
Saltmarsh	**Moderate**	Neutral	Neutral	Neutral	None	None	None	None	None	None	None	Neutral	None
Amenity Grassland	**Negligible**	Neutral	None	None	None	None	None	None	None	None	None	Neutral	None
Poor Semi-Improved Neutral Grassland	**Negligible**	Neutral	None	None	None	None	None	None	None	None	None	Neutral	None
Amphibians and Reptiles	**Negligible**	Neutral	None	None	None	None	None	Neutral	None	None	None	Neutral	None
Bats	**Low**	None	None	None	None	None	None	Neutral	None	None	None	Neutral	None
Birds – Breeding	**Negligible**	None	None	None	None	None	None	Neutral	Neutral	None	None	Neutral	None
Birds - Wintering	**Low**	None	None	None	None	None	None	Neutral	Neutral	None	None	Neutral	None
Fish – Diadromous Fish	**High**	None	None	None	None	Neutral	None	None	Moderate Significant -	None	None	Minor -	None
Fish – Marine and Estuarine Fish	**Low**	None	None	None	None	Neutral	None	None	Neutral	None	None	Neutral	None
Invertebrates	**Low**	None	None	None	None	None	None	None	None	None	None	Neutral	None
Otter	**Low**	None	None	None	None	None	None	Neutral	Neutral	None	None	Neutral	None
West European Hedgehog	**Negligible**	Neutral	None	None	None	None	None	Neutral	None	None	None	Neutral	None

Table 6-24 contains the significance of effect for each Biodiversity and Nature receptor during the construction phase after assessment against the significance matrix included within Table 6-5.

Table 6-24 Significance of effect by Receptor during the Operational Phase

Receptor	Sensitivity	Magnitude of Impact				
		Habitat Adaptation	**Habitat Creation**	**Artificial Lighting at Night**	**Anthropogenic disturbance**	**Reduced flood risk could result in reduced potential for environmental pollution during and following a flood event.**
Afon Teifi SSSI	**High**	None	None	None	None	Minor +
Afon Teifi SAC	**Very High**	None	None	None	None	Minor +
Cardigan Bay SAC and West Wales Marine SAC	**Very High**	None	None	None	None	Minor +
Broadleaved Scattered Trees	**Negligible**	None	None	None	None	None
Intertidal Biotopes	**Moderate**	None	None	None	Minor +	Minor +
Saltmarsh	**Moderate**	Neutral	Neutral	None	Minor +	Minor +
Amenity Grassland	**Negligible**	None	None	None	None	None
Poor Semi-Improved Neutral Grassland	**Negligible**	None	None	None	None	None
Amphibians and Reptiles	**Negligible**	None	None	None	None	None
Bats	**Low**	None	None	Neutral	None	None
Birds – Breeding	**Negligible**	None	None	Neutral	Neutral	Neutral
Birds - Wintering	**Low**	None	None	Neutral	Neutral	Neutral
Fish – Diadromous Fish	**High**	None	None	None	None	Minor +
Fish – Marine and Estuarine Fish	**Low**	None	None	Neutral	None	Neutral
Invertebrates	**Low**	None	None	Neutral	None	Neutral
Otter	**Low**	None	None	Neutral	Neutral	Neutral
West European Hedgehog	**Negligible**	None	None	None	None	None

6.10 Mitigation measures

Aquatic noise and vibration

In water, auguring and piling should not be undertaken between March and November inclusive. Auguring and piling are permitted between March and November only during periods when the tidal level is below the level of the piling works area. Between December and February, when these seasonal restrictions would not apply, in water activities can be undertaken during the daytime only.

In addition to the seasonal in water restrictions above, it is recommended that soft starts are used for piling activities. This involves the gradual and incremental increase in piling power until full operational power is reached and provides fish the opportunity to move away from the noise source before the onset of full power.

6.11 Significance and duration of residual effects

If the Mitigation measures as listed within section 6.10 are applied the Magnitude of Impact on Diadromous Fish and by proxy Afon Teifi SSSI, Afon Teifi SAC, Cardigan Bay SAC and West Wales Marine SAC is reduced to Negligible negative. This impact is restricted to the duration of the pilling works only. As a result of this change to the Impact Magnitude the effect is reduced to a non-significant minor negative.

No significant residual effects are predicted for Biodiversity and Nature conservation.

6.12 Monitoring

As stated within the Chapter 2: Project Description, post operational monitoring will be undertaken in the form of an annual inspection of the flood defence wall and lower toe berm (engineered riverbank) from the wet side of the defences. In addition, vegetation strimming will take place on the lower toe berm (engineered riverbank) 2-3 times a year.

6.13 Difficulties and uncertainties

Difficulties and uncertainties on the individual baseline assessments and sensitivity assessment are included within section 6.8. There are no identified difficulties or uncertainties on the Assessment of Effects or Assessment of Significance.

6.14 Summary of assessment

Only one significant impact was identified during the assessment, in the absence of targeted mitigation. The impact of aquatic noise and vibration on Afon Teifi SSSI, Afon Teifi SAC and Cardigan Bay SAC and West Wales Marine SAC and diadromous fish was found to be a small negative impact on receptors of High and Very High sensitivity. Additional mitigation measures in the form of timing and working methodologies will mitigate this risk and result in no negative significant residual effect.

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7 Historic Environment

7.1 Introduction

This chapter assesses the likely significant effects from construction and operation of the Scheme, with respect to the Historic Environment. This chapter details the baseline environment, assessment of likely significant effects, and where necessary, mitigation measures to avoid, reduce or minimise significant effects are proposed.

This chapter is not intended to be read as a standalone assessment, and references should be made to Chapters 1-4. This chapter should be read in conjunction with the following topic chapters due to potential interactions between topics:

- Chapter 5: Population and Human Health
- Chapter 8: Landscape and Visual Amenity

7.2 Competent expert evidence

This Historic Environment chapter has been undertaken by Philip Poucher, who has 25 years experience in the archaeology and heritage sector, living and working primarily in Wales for the past 20 years.

Philip has undertaken many historic environment impact assessments, examining the relationship between the historic environment and the potential impact from a variety of developments. He has a proven track record in analysing what is of significance for heritage assets, and what within their settings would contribute to understanding and appreciation of that significance. These are the criteria against which the magnitude of change and potential impacts are weighed as part of a methodical approach to EIA. He has written the historic environment chapters of several EIAs and is well-versed in the history and archaeology of Cardigan, having updated the previous desk-based assessment (Poucher, 2021 (see Appendix 7.1)), carried out work on the urban characterisation of Cardigan in 2007 (Cook and Poucher, 2007) and contributed to a short book on the history of Cardigan.

Qualifications include:

BA (Hons) Archaeology

MCIfA Member of the Chartered Institute of Archaeologists

7.3 Planning policy and legislative context

This section describes the relevant legislation, policy and guidance that has been considered in developing the Scheme design, and in the assessment of effects with respect to the Historic Environment. This legislation, policy and guidance has been reviewed and where applicable has informed the assessment through the identification and categorisation of sensitive receptors, requirements for mitigation, and the scope and/or method of assessment.

7.3.1 International and National Policy

- Future Wales: The National Plan 2040 (Welsh Government, 2021), including Policy 8: Flooding, Policy 25: Regional Growth Areas – Mid Wales and Policy 26: Growing the Mid Wales Economy.
- The Historic Environment (Wales) Act 2023 (Welsh Government, 2024a), including Part 2 scheduled monuments, Part 3 listed buildings, Part 4 conservation areas, Part 6 registered parks and gardens, historic place names and historic environment records.
- Planning Policy Wales Edition 12 (Welsh Government, 2024b), including relevant supplementary Technical Advice Notes (TANs), Circulars and Policy Clarification Letters (PCLs).

Table 7-1 - Summary of relevant national planning policies

Policy	Summary	Relevance
Future Wales: The National Plan 2040 (Welsh Government, 2021)		
Policy 8 – Flooding	Flood risk management that enables and supports sustainable strategic growth and regeneration in National and Regional Growth Areas will be supported. The Welsh Government will work with Flood Risk Management Authorities and developers to plan and invest in new and improved infrastructure, promoting nature-based solutions as a priority. Opportunities for multiple social, economic and environmental benefits must be maximised when investing in flood risk management infrastructure. It must be ensured that projects do not have negative impacts on international and national statutory designated sites for nature conservation and the features for which they have been designated.	The policy addresses general flood risk management, but no specific reference to the historic environment is included within this policy.
Policy 25: Regional Growth Areas – Mid Wales	The Welsh Government supports sustainable growth and development in a series of inter-connected towns across the region. Development in these Regional Growth Areas should meet the regional housing, employment and social needs of Mid Wales. The Regional Growth Areas include Cardigan and the Teifi Valley. The Welsh Government supports development in all parts of the region in meeting local needs. Strategic and Local Development Plans will determine the most appropriate locations for growth in Mid Wales and should demonstrate how a regional approach has informed decisions on future growth.	The policy supports growth within Cardigan, referencing other policies within the Plan. It highlights the strong cultural heritage of the area but does not reference the historic environment specifically.

Policy	Summary	Relevance
Policy 26: Growing the Mid Wales Economy	The Welsh Government supports the growth and development of existing and new economic opportunities across Mid Wales. The Welsh Government will work with local authorities, communities, stakeholders and businesses to ensure that its investments and policies support a strong regional economy. Strategic and Local Development Plans must develop policies that support agricultural and land based traditional rural enterprises; and provide a flexible framework to support the development of new, innovative and emerging technologies and sectors.	As above
The Historic Environment (Wales) Act 2023 (Welsh Government, 2024a)		
	Specific legislation consolidating existing primary and secondary legislation related to the historic environment in Wales, providing a legal framework for the management and protection of the historic environment in Wales.	This chapter considers the impact upon scheduled monuments, listed buildings, conservation areas, historic parks and gardens and assets listed on the Historic Environment Record.
Planning Policy Wales Edition 12 (Welsh Government, 2024b)		
Chapter 6, 'Distinctive and Natural Places'	Explains how planning systems must take into account the Welsh Government's objectives to protect, conserve, promote and enhance the historic environment as a resource for the general well-being of present and future generations. It also sets out the planning policies for the sustainable management of specific categories of historic environment assets.	This chapter is informed by a desk-based assessment which identifies the known and potential elements of the historic environment, taking into the account the sources of information and guidance outlined within Chapter 6 of PPW (Ed.12). The Historic Environment chapter of the ES assesses the likely significance of the effect of the Scheme upon these identified receptors.

Policy	Summary	Relevance
TAN [24] The Historic Environment (Welsh Government, 2017a)	This technical advice note provides guidance on how the planning system considers the historic environment during development, plan, preparation and decision making on planning and Listed Building Consent applications. It addressed conservation principles, heritage impact assessments, and the protection of archaeological remains and listed buildings.	Initial consultation has been undertaken with Cadw, who provide advice and decisions on applications affecting nationally significant historic environment features, and the development management section of Heneb – Dyfed Region, who provide advice and decisions on applications affecting the historic environment of the regional area. Agreed methodologies have been established and used in assessments.

7.3.2 Local Policy

The Historic Environment is subject to the relevant policies and procedures as laid out in the Ceredigion Local Development Plan (LDP) (end date 2022, adopted 2013) (Ceredigion County Council, 2013). The current plan is due for replacement but a replacement plan is currently paused whilst further work is being carried out in association with phosphate levels in the River Teifi (Afon Teifi) catchment area, therefore the plan adopted in 2013 is still applicable. Relevant policies in the existing LDP are set out in Table 7-2.

Table 7-2 - Summary of relevant local planning policies

Policy	Summary	Relevance
Policy DM07: Conservation Areas	Development within Conservation Areas, as designated on the Proposal Map, and any future designated Conservation Areas must demonstrate that regard has been had to Conservation Area Appraisals, where available, and national guidance. National policies are regarded as sufficient to guide development in Conservation Areas, but Conservation Area Appraisal Reports should be taken into account in determining planning applications in these areas.	A Conservation Area Appraisal was produced in 2024, (Griffiths, 2024) this has been utilised within the assessment of the likely significance of the effect of the Scheme.

Policy	Summary	Relevance
Policy DM19: Historic and Cultural Landscape	Development affecting landscapes or buildings which are of historical or cultural importance and make an important contribution to the character and interest of the local area, will be permitted where the distinctive appearance, architectural integrity or their settings will not be significantly negatively affected. Where possible development should enhance these qualities and special character. This policy makes specific mention of preserving scheduled monuments, registered historic landscapes and gardens, and utilising information held on the Historic Environment Record, National Monuments Record and Landmap.	The Historic Environment chapter assesses the likely significance of the effect of the Scheme upon all heritage assets listed within DM19 within the Site and surrounding area. Where likely significant negative effects are identified, mitigation measures to prevent, reduce, or offset them are proposed.

7.4 Assessment guidance

The following guidance documents were used in this assessment, as described in the Methodology (Section 7.7):

- Design Manual for Roads and Bridges (DMRB) Volume 11, LA106: Cultural Heritage Assessment (Highways England, 2020)
- Standard and guidance for historic environment desk-based assessment (CIfA, 2014, rev.2020)
- Heritage Impact Assessment in Wales (Welsh Government/Cadw, 2017b)
- Setting of Historic Assets in Wales (Welsh Government/Cadw, 2017c)
- Conservation Principles for the Sustainable Management of the Historic Environment in Wales (Welsh Government/Cadw, 2011)
- Guide to Good Practice on Using The Register Of Landscapes Of Historic Interest In Wales In The Planning And Development Process (Revised 2nd Edition) (Welsh Governmoent/Cadw & CCW, 2007)

7.5 Consultation

An EIA Scoping Opinion was provided by Ceredigion County Council and NRW Marine Licencing Team in December 2023. An update to the Scoping Opinion from Ceredigion County Council was provided on the 16th October 2025. It was agreed that the Historic Environment was to be scoped in and the methodologies provided, and used within this chapter, were appropriate. It was stated that the Environmental Statement should include:

- Assessment of direct and indirect impacts on designated assets
- Justification for significance and magnitude of change
- Consideration of cumulative effects

- Details of mitigation measures and how they will be delivered

These impacts and effects should be assessed for both the construction and operational phases of the Scheme.

Consultations with the Development Management section of Heneb – Dyfed Region, in their role as archaeological advisors to the Local Planning Authority has been undertaken and will likely be ongoing. Previous desk-based assessments have been produced (Meek 2015, Poucher, 2021 (see Appendix 7.1)) detailing the potential impacts of the Scheme on the historic environment, and a draft Project Design has been produced and circulated, which details proposed mitigation related to the historic environment for the Scheme.

Consultation has also been undertaken with Cadw regarding the potential impacts of the Scheme on designated heritage assets within the study area. As stated above, previous desk-based assessments and a draft Project Design have been produced and circulated. An Assessment of the Significance of the Impact of Development On the Historic Landscape (ASIDOHL) has also been produced as part of the current assessment, assessing the impacts upon the historic landscape (Poucher, 2025). This is included in Appendix 7.2.

7.6 Scoped in receptors and potential effects

Impacts and effects have been assessed for both the construction and operational phases of the Scheme. The receptors have been scoped in at the initial assessment phase, detailed in the desk-based assessment (Appendix 7.1) and summarised in Table 7 Receptors within the study area. The impacts have been assessed against maximum design parameters for the Scheme, as illustrated in Table 8 Design parameters.

7.7 Methodology

The purpose of this section is to describe how likely significant effects relating to the Historic Environment have been assessed. A more general explanation of assessment methodology used throughout the EIA is provided in Chapter 4: EIA Methodology.

7.7.1 Definition of the study area

The Scheme lies along the north bank of the Afon Teifi through Cardigan, Ceredigion, running from the Castle Street/Cardigan Bridge area along Strand to the Gloster Row car park.

This area comprises a built waterfront along the south side of Strand. At the western end lies a roadside area in front of the castle and modern commercial and residential units of a bathroom showroom and garage. Midway along lies a boathouse and hut and area of open ground used by the Scouts, with residential property and gardens to the east. The eastern end of the area comprises the Gloster Row car park and adjacent open ground. These properties are fronted by mixed vertical stone walling and embankments, with two slipways, one central adjacent to the Scout Boathouse, and one to the east adjacent to Gloster Row car park. A former slipway at the west end is now occupied by a DCWW discharge chamber. At high tide the river flows against the vertical stone walling and embankments, at low tide an area of estuarine mudflats fronts the area. Strand is a narrow street that runs parallel to the river, with a mix of commercial, residential and storage properties along the north side. The commercial centre of Cardigan lies

to the northwest, beyond the site of Cardigan Castle. Residential and other properties lie to the north and northeast of the site, and along the southern banks of the river. Cardigan Bridge lies within 20m downstream, with the modern Priory Bridge 140m upstream.

This chapter makes extensive use of a detailed historic environment desk-based assessment produced in 2015 (Meek, 2015) and subsequently updated (Poucher, 2021 (see Appendix 7.1)), supplemented with current (October 2025) data. The desk-based assessment established a 100m zone around the Scheme to gather known information on the historic environment, which is considered appropriate for the scale of the Scheme and its potential impacts. A wider area has been included to examine the potential impact on the setting of high status receptors in the surrounding landscape, the extent of which is determined by a Zone of Theoretical Visibility of the Scheme and potential impacts along the estuarine area.

7.7.2 Baseline information

A comprehensive desk-based review was undertaken to inform the baseline assessment for the Historic Environment. This review was initially undertaken in 2015 (Meek, 2015), updated in 2021 (Poucher, 2021 (see Appendix 7.1)) and reviewed during the creation of this ES chapter. In addition, an ASIDOHL has been undertaken to assess the impacts upon the historic landscape (Poucher, 2025 (see Appendix 7.2)). The existing studies and datasets referred to as part of the desk-based review for the Historic Environment are summarised in Table 7-3.

Table 7-3 - Summary of desk-based review sources

Title	Source	Year published	Author
Historic Environment Record	Heneb – The Trust for Welsh Archaeology	2025	Heneb
National Monument Record	Royal Commission on the Ancient and Historic Monuments of Wales (RCAHMW)	2025	RCAHMW
Scheduled monument, listed building, registered parks and gardens, conservation areas, registered historic landscape descriptions	Cof Cymru online database. DataMap Wales digital information	2025	Welsh Government / Cadw
Historic mapping	Various	Various	Speed, J, Wood, J, Ordnance Survey
Aerial Photography	Various		Royal Air Force, Ordnance Survey, RCAHMW, Google

Title	Source	Year published	Author
LiDAR data	DataMap Wales digital information	2025	Welsh Government
Proposed Tidal Flood Alleviation Scheme, Cardigan, Ceredigion: Archaeological Desk-Based Assessment Update 2021 (Report No.2021/77)	Dyfed Archaeological Trust (now Heneb)	2021	Poucher, P
Proposed Tidal Flood Alleviation Scheme, Cardigan, Ceredigion: Archaeological Desk-Based Assessment. (Report No.2015/08)	Dyfed Archaeological Trust (now Heneb)	2015	Meek, J.,
Proposed Flood Alleviation Scheme At Cardigan, A Desk-Based Assessment, (Report No. 2006/12)	Cambria Archaeology (now Heneb)	2006	Murphy, K
Historic Town Surveys of Cardigan and Tregaron: Part 3: Cardigan Town, (Report No. 2007/21)	Cambria Archaeology (now Heneb)	2007	Cook, N & Poucher, P
Register of Landscapes of Outstanding Historic Interest in Wales. Cardiff: Cadw	Cadw	1998	Cadw
Strand and Carriers Lane. Cardigan, Wales: Archaeological Watching Brief	Headland Archaeology	2022	James, L
Aberteifi / Cardigan Conservation Area Appraisal	The Griffiths Heritage Consultancy Ltd	2024	The Griffiths Heritage Consultancy Ltd

7.7.3 Sensitivity

The first step in environmental assessment is understanding the value or sensitivity of environmental receptors.

The terms used to define sensitivity are based on and have been adapted from those used in the Design Manual for Roads and Bridges (DMRB) methodology (Highways England, 2020). In all cases, the evaluation of receptor sensitivity, impact magnitude and significance of effect has been informed by professional judgement and is underpinned by narrative to explain the conclusions reached.

The criteria for defining sensitivity (sometimes described as heritage value) in this chapter of the ES are outlined in Table 7-4.

Table 7-4 - Sensitivity criteria

Sensitivity/Value	Definition
Very High	Very high importance and rarity, international scale, very limited potential for substitution. This includes World Heritage Sites (including nominated sites), assets of acknowledged international importance and assets that can contribute significantly to acknowledged international research objectives
High	High importance and rarity, national scale and limited potential for substitution. This includes designated assets (scheduled monuments, listed buildings, registered parks and gardens, conservation areas, registered historic landscapes) including proposed sites, non-designated assets of schedulable or listing quality and importance, assets that can contribute significantly to acknowledged national research objectives
Medium	High or medium importance and rarity, regional scale, limited potential for substitution. Designated or non-designated assets that contribute to regional research objectives.
Low	Low or medium importance and rarity, local scale. Non-designated assets of local importance, assets compromised by poor preservation and/or poor survival of contextual associations, assets of limited value, but with potential to contribute to local research objectives
Negligible	Very low importance and rarity, local scale. Assets with very little or no surviving archaeological interest.

7.7.4 Magnitude of change

The significance of an effect is determined based on the sensitivity of a receptor and the magnitude of change. The criteria for defining magnitude in this chapter of the ES are outlined in Table 7-5.

Table 7-5 - Magnitude of change criteria

Magnitude of change		Definition
High	Negative	Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements. Change to most or all key archaeological materials, such that the resource is totally altered. Comprehensive changes to setting.
	Positive	Large scale or major improvement or resource quality; extensive restoration or enhancement; major improvement of attribute quality.

Magnitude of change		Definition
Medium	Negative	Loss of resource but not negatively affecting the integrity; partial loss of/damage to key characteristics, features or elements. Changes to many key archaeological materials, such that the resource is clearly modified. Considerable changes to setting that affect the character of the asset.
	Positive	Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality.
Low	Negative	Some measurable change in attributes, quality or vulnerability, minor loss of, or alteration to, one (maybe more) key characteristics, features or elements. Changes to key archaeological materials, such that the asset is slightly altered. Slight changes to setting.
	Positive	Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some positive impact on attribute or a reduced risk of negative impact occurring.
Negligible	Negative	Very minor loss or detrimental alteration to one or more characteristics, features or elements. Very minor changes to archaeological materials, or setting.
	Positive	Very minor benefit to, or positive addition of one or more characteristics, features or elements.
No change		No loss or alteration of characteristics, features or elements; no observable impact in either direction.

7.7.5 Significance of effect

As stated, the significance of an effect is determined based on the sensitivity of a receptor and the magnitude of change. The method employed for this assessment is presented in Table 7-6. Where a range of significance levels is presented, the final assessment for each effect is based upon professional judgement. In all cases, the evaluation of receptor sensitivity, impact magnitude and significance of effect has been informed by professional judgement and is underpinned by narrative to explain the conclusions reached.

For the purpose of this assessment, any effects with a significance level of minor or less are not considered to be significant in terms of the EIA Regulations, whilst those that are scored as moderate might be significant, subject to professional judgement. A score that is not significant does not negate the requirement for further mitigation.

Table 7-6 - Assessment matrix for significance of effect

Sensitivity of Receptor	Magnitude of Change				
	No Change	**Negligible**	**Low**	**Medium**	**High**
Negligible	Negligible	Negligible	Negligible or Minor	Negligible or Minor	Minor

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

Where the magnitude of change is 'no change', no effect would arise. The definitions for significance of effect levels are described as follows:

- Major: These positive or negative effects are considered to be very important considerations and are likely to be material 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.

- Moderate: These positive or negative effects have the potential to be important and may influence the key decision-making process. The cumulative effects of such factors may influence decision-making if they lead to an increase in the overall positive or negative l effect on a particular resource or receptor.

- Minor: These positive or negative effects are generally, but not exclusively, raised as local factors. They are unlikely to be critical in the decision-making process but are important in the iterative design process of the Scheme, and in determining a mitigation strategy.

- Negligible: No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

- No change: No loss or alteration of characteristics, features or elements; no observable impact in either direction.

7.8 Baseline environment and likely future evolution

The section below describes the baseline environment and its likely future evolution. The current baseline environment scenario refers to the current state of environmental characteristics within the Scheme Area.

7.8.1 Types of receptors

This chapter considers the significance of effect on designated receptors, non-designated receptors, and historic landscapes. Designated receptors include scheduled monuments, listed buildings, historic parks and gardens and conservation areas. Non-designated receptors include

sites recorded on the regional Historic Environment Record and the National Monuments Record, and any other additional sites and areas of potential identified during the initial assessment stages. Historic landscapes include those listed on the Register of Landscapes of Historic Interest in Wales (Cadw, 1998).

Scheduled Monuments are historic and archaeological sites considered to be of national importance. These sites are given legal protection, and consideration of the impact of development upon these sites and their settings are considerations of the planning process.

Listed Buildings are buildings and structures of national importance given legal protection by being placed on a 'List' of Buildings of Special Architectural or Historic Interest. Buildings on the List are given one of three grades which denote their level of importance (Grade I, II* & II), Grade I being the highest. A listed building may not be demolished, extended, or altered without special permission from the local planning authority.

Parks and gardens of special historic interest in Wales are included on a Register of Historic Parks and Gardens, designed to provide comprehensive information to assist decision makers to help protect and preserve essential features of these parks and gardens, and enable their significance and character to be protected through the planning system. The Register is now statutory but does not impose new legal restrictions or change the consent regime.

Conservation Areas are designated to preserve and enhance the special character of areas of architectural or historic interest. The purpose of designating a Conservation Area is to provide the Planning Authority with an additional measure of control over an area that they consider to be of special historic of architectural value.

The regional Historic Environment Record is held and maintained by Heneb – The Trust for Welsh Archaeology and contains details of all historic and archaeological sites (both designated and non-designated) within the region. The National Monuments Record is held and maintained by the Royal Commission on the Ancient and Historical Monuments of Wales, and contains similar data.

Registered Historic Landscapes are landscapes of historic interest included on the Register of Landscapes of Historic Interest in Wales (Cadw, 1998). These landscapes are a non-statutory designation but considered of national importance. The landscape boundaries and associated details have been created to assist decision makers and landscape managers to help ensure that the historic character of the landscape is sustained, and that where change is contemplated, it is well-informed. The registered landscapes have been further sub-divided into individual Historic Landscape Character Areas, further details of which are included in the associated ASIDOHL (see Appendix 7.2).

7.8.2 Receptors within the study area

The study area is outlined in Section 7.7. This included the immediate footprint of the Scheme development, along with a study area of 100m in all directions, used to gather information on the heritage resource and establish potential impacts. This study area was established at the initial desk-based assessment stage. As the Scheme has developed, two potential site compound areas have also been established which partly lie outside this study area, therefore these compound locations have been included in addition to the 100m study area. A wider

study area was used to examine the potential impact upon high-status designated receptors, based on professional judgement. In the event however, most high-status designated receptors also lay within the 100m study area, with only historic landscape components lying beyond that area.

No scheduled monument lies within the Scheme footprint. There are three scheduled monuments within the 100m study area surrounding the Scheme.

No listed buildings lie within the Scheme footprint. There are 36 listed building within the 100m study area surrounding the Scheme.

There is one registered historic park and garden within the 100m study area. The grade II listed Cardigan Castle (PGW (Dy) 72(CER) is an 18th to 19th century pleasure garden set within the grounds of Cardigan Castle, set to provide a romantic setting to Castle Green House. The area is also a scheduled monument and shares a group value with Castle Green House (Listed building ref. 10459), Cardigan Castle (Listed building ref. 10458; scheduled monument CD123) and the outbuildings at the rear entrance drive to Castle Green House (Listed building ref. 10461). The gardens include significant viewpoints, described in the Cadw Register description as 'Fine panoramic views from the front of the house and gardens across the Afon Teifi and beyond' (Cadw, 2007).

With the exception of the Gloster Row car park the Scheme lies within the Cardigan Conservation Area, the boundary of which runs along the mean high water mark on the Teifi (including Cardigan Bridge). Details of the Cardigan Conservation Area, designated in 1989, are contained within the Cardigan Conservation Area Appraisal (2024). The Conservation Area is described as high value in each aspect (Evidential, Historical, Aesthetic and Communal). It is described thus:

— Evidential;

  There are still upstanding remnants of major Medieval buildings within Cardigan and much of the layout of the centre of the town still reveals a great deal about its Medieval origins. The town also still has a good survival of significant later Post Medieval buildings, evidenced in the number of sites that have been protected as listed buildings and Scheduled Ancient Monuments.

  Many of the buildings within the town centre retain their Georgian structure and architectural features. These are important for understanding Georgian society and its impact on West Wales, building techniques and styles, and for the development of the town in this period.

  The Victorian adaptation and construction with in the town tells the story of the various social and economic forces at work during this period and the development and impact of new forms of transport and local businesses such as the brick works and the influence of fashion, places and people from further away than was previously possible.

  The archival holdings and historical research which has been carried out for Cardigan are a prolific and valuable resource.

Cardigan has extensive archaeological potential.

— Historical;

Cardigan Castle is believed to be the first stone castle ever built by a Welshman. To celebrate its completion in 1176, Lord Rhys ap Gruffydd hosted a gathering of bards, musicians, and performers: the first Eisteddfod, and the start of the Welsh tradition of cultural festivals that continues today.

The town soon grew in the shadow of the castle, becoming both the centre of native Welsh and Royal control throughout its turbulent Medieval history. Its position as the county town and its maritime links meant Cardigan retained its importance in West Wales throughout much of the subsequent Post Medieval period.

By the beginning of the 13th century the settlement at Cardigan was regarded a "privileged, fortified island of commercial activity, broad horizons, administrative autonomy and strategic importance" (Griffiths, R.A. 1990. 'The Making of medieval Cardigan in Ceredigion vol xi no 2, p97-133).

Cardigan exemplifies key historical events, characters and national and regional trends such as: the violent and disruptive Medieval conflicts in Wales between the Normans and the native Welsh; the growth and decline of the maritime industry in West Wales and nationally; the impact of the growth in popularity and prosperity of West Wales in the Georgian period; the growth of tourism; and the impact of the railways, amongst others.

— Aesthetic;

Cardigan is an attractive town, which has been made more so by continuous and extensive investment in its historic infrastructure. It is popular with tourists and locals alike.

The historic buildings, the river setting and its gently curving streets and small alleys, greatly contribute to the aesthetic value of the town and create a sense of discovery and engagement. High quality modern design, for example at the Castle, has contributed to its significance.

There are a few, mostly modern industrial or commercial, areas which detract from its aesthetic value. These are generally outside of the town centre. The few empty historic buildings within the main shopping area also detract from its visual appeal.

— Communal;

The conservation area contains a number of public buildings and community resources such as the Guildhall, Shire Hall, Castle, churches, pubs, chapels, shops, restaurants, hotels, and others.

The main commercial and economic activity happens within the boundary of the conservation area meaning that the area has a high community value for income and employment.

During the process of producing this appraisal, an initial survey was sent to stakeholders asking them to identify what they thought was important about the conservation area and if there were any issues. Unfortunately, no responses were received to this survey.

In order to gather public comments about the first draft of the appraisal and management plan, a public consultation drop in event was held at Cardigan during September 2023. The draft appraisal and management plan were also available to download via a web link. Three people attended the session and a good number of comments were received which have been used to revise the appraisal.

This rate of engagement is, from experience, considered to be rather on the low side for a town such as Cardigan. However, it is clear from the written and verbal responses that the local community has pride in the town, its architecture and history and would like it to be preserved and enhanced.

The Scheme lies within the Lower Teifi Valley Landscape of Special Historic Interest (HLW(D)14). This area encompasses the lower Teifi valley from the estuary to the confluence with the Afon Cych and area around Cenarth 16.5km upriver.

The Historic Environment Record (HER) records 54 receptors within the study area. The National Monuments Record (NMR) records 36 sites within the study area, largely also recorded as either listed buildings and/or on the HER, but includes five additional sites.

The archaeological and historical background to the area is outlined in the accompanying desk-based assessment. In brief, although many archaeological sites are recorded in the wider Teifi catchment area, the archaeological potential for the study area was considered to be low for the prehistoric, Roman and early medieval periods. Cardigan was definitively established as a castle and settlement during the medieval period, and therefore there is considered to be heightened potential for medieval and post-medieval archaeological sites.

Within the Scheme area there is an increased potential for medieval activity around the northern bridgehead, below the castle walls, although no specific features are recorded in this area. 18th century images show the tide reaching the base of the castle walls with no development in this area. A possible medieval bridge site is also suggested in the Gloster Row area, although there is little direct evidence for this. Other general medieval riverside activity is possible throughout the Scheme area, but no major medieval development has been evidenced. During the early 19th century Castle Terrace developed at the foot of the castle and western end of the Scheme area with a range of shops and workshops recorded. By the mid 19th century some sea defences and land reclamation may have begun along Strand and with the Scheme area. By the late 19th century Strand itself had developed as a street, with some development along the riverfront and trade directories listing workshops, maritime and industrial units. The extant riverside walling has clearly been rebuilt, repaired, extended, and adapted throughout its use. Test pit excavations show that in areas of modern redevelopment, from Cardigan Bridge to the J&M

Garage, large scale clearance has taken place and concrete foundations added, as a result below-ground remains may be heavily disturbed in these areas. Recent archaeological monitoring of a rising main along Carrier's Lane and Strand and a discharge chamber on the riverfront adjacent to the Bathroom Centre recorded little of archaeological interest (James, 2022). Two wall fragments were recorded, which appeared to relate to the 19th century buildings of Castle Terrace, with riverine deposits below.

The locations of the various receptors within the study area are shown in Plate 7-, Plate 7-2 and Plate 7-3, divided for clarity between their value/sensitivity. These receptors are also outlined in Table 7-7, along with their value/sensitivity and a brief description. There are numerous instances of overlaps where the same receptor is recorded from different sources, for example Cardigan Castle, recorded as scheduled monument (CD123), grade I listed building (LB ref.10458), within the HER (PRN 1082) and NMR (NPRN 92314). These receptors as listed as a single site in Table 7-7, with all references given. Henceforth only the top reference number (in bold) will be used as an identifier in this chapter.

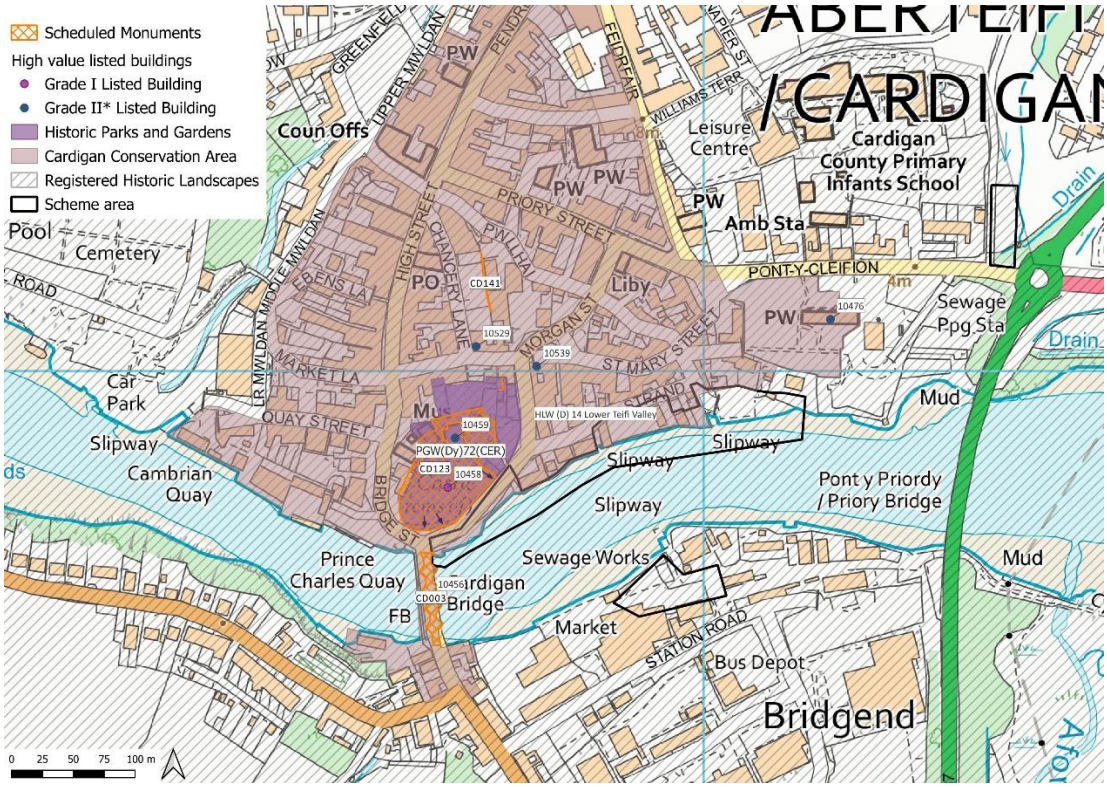

Plate 7-1 – High value assets within the study area. (OS) Licence Number 100019311.

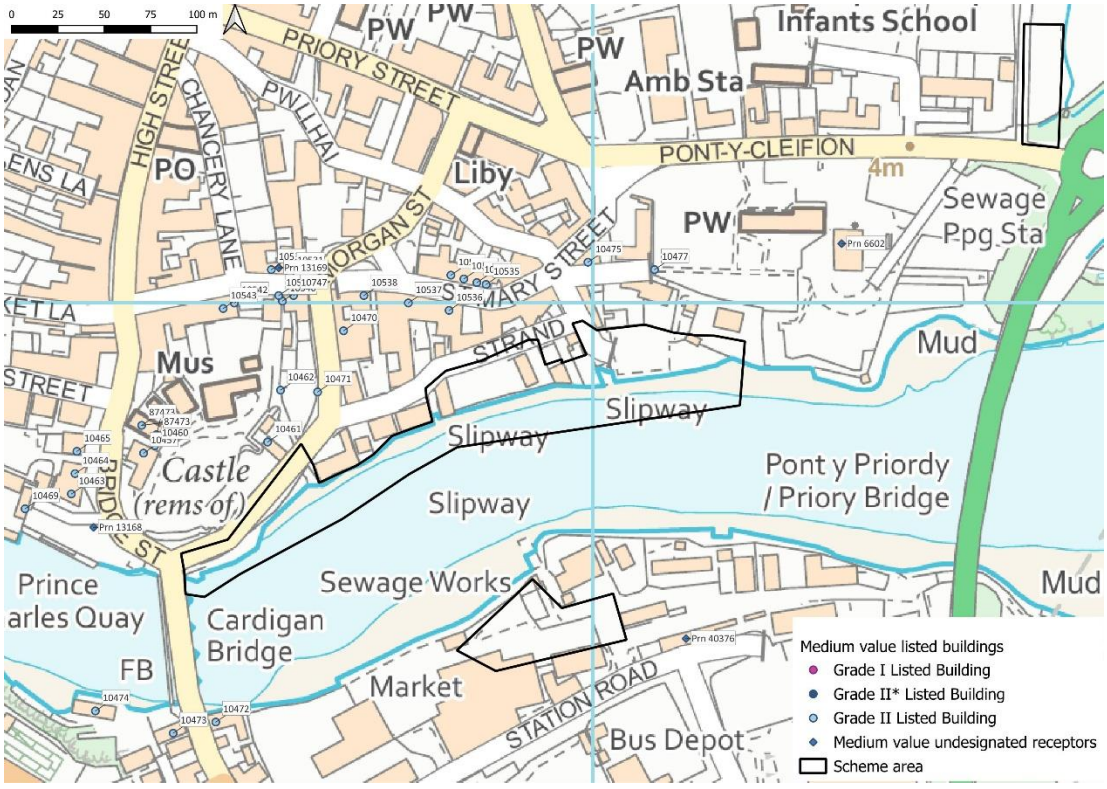

Plate 7-2 – Medium value assets within the study area. (OS) Licence Number 100019311.

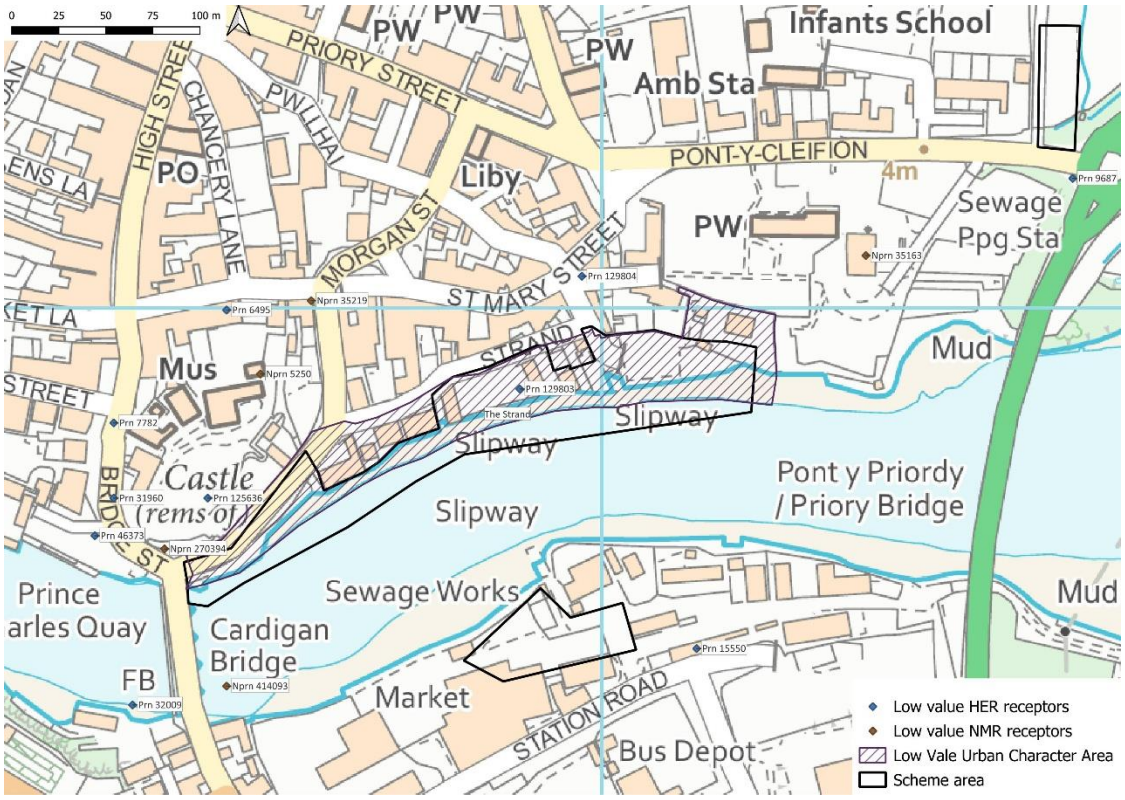

Plate 7-3 – Low value assets within the study area. (OS) Licence Number 100019311.

Table 7-7 - Receptors within the study area

Name and Reference No.	Sensitivity / Value	Description
Cardigan Bridge **CD003** LB 10456 PRN 5303, 8506, 32015. NPRN 23850	High value Scheduled monument Grade II* listed building	Traditional road bridge across the Teifi, potentially constructed in the 13th century, widened in the 18th and 19th centuries. Scheduled for its potential to contain significant archaeological information concerning chronology and building techniques.
Cardigan Castle **CD123** LB ref.10458 PRN 1082 NPRN 92314	High value Scheduled monument Grade I listed building	Site of a medieval castle, built early 12th century, rebuilt in stone in around 1171 by Lord Rhys and the site of the first eisteddfod in 1176. Visible masonry is mid-13th century and later, and later incorporated into the house and grounds of Castle Green House. An archaeologically, historically and culturally significant site.
Cardigan Town Walls **CD141** PRN 8371	High value Scheduled monument	Two surviving stretches of the medieval town wall of Cardigan, possibly 13th century or later. Scheduled for its importance within the wider medieval context and its potential to contain information regarding chronology, building techniques and functional detail.

Name and Reference No.	Sensitivity / Value	Description
Castle Green House **LB Ref.10459** PRN 20917 NPRN 5249	High value Grade II* listed building	Early to mid-19th century house incorporating a castle tower, which lies within the castle grounds. Recently restored and opened as a museum.
The Parish Church of St Mary **LB.Ref.10476** PRN 5302 NPRN 120061, 306605	High value Grade II* listed building	Parish church, former priory church with 12th century origins.
No.7 St Mary's Street **LB Ref. 10529** PRN 6607	High value Grade II* listed building	Late 18th or early 19th century gentry house
Avondale **LB Ref. 10539** PRN 6487 NPRN 5082	High value Grade II* listed building	Early 18th century house, which fronts St Mary's Street
Ty Castell **LB Ref 10457** PRN 57346	Medium value Grade II listed building	Early to mid-19th century house
Gatepiers & Gates to Castle Green House **LB ref 10460** PRN 56500	Medium value Grade II listed building	Formal entrance gates of c.1828.
Outbuildings at Castle Green House Stable Yard **LB ref.10461** PRN 57347 NPRN 31483	Medium value Grade II listed building	Outbuildings of c.1828, including stables and possible coach house.
Retaining Wall in Castle Green Grounds to E of House **LB ref 10462** PRN 57348	Medium value Grade II listed building	19th century retaining wall.
The Grosvenor Hotel **LB ref 10463** PRN 6493 NPRN 5549	Medium value Grade II listed building	Later 18th century house, now an Inn. Refurbished early 2000s.
Castle Chambers **LB ref 10464** PRN 57349 NPRN 408688	Medium value Grade II listed building	Later 18th century house.

Name and Reference No.	Sensitivity / Value	Description
Glenroy House **LB ref 10465** PRN 6494 NPRN 5475	Medium value Grade II listed building	Early 19th century house.
Pantywylan **LB ref. 10469** PRN 57353	Medium value Grade II listed building	Early 19th century warehouse.
Former Hope Chapel **LB Ref 10470** PRN 57354	Medium value Grade II listed building	Former English Congregational Chapel of 1837, used as a printing house for much of the 20th century.
Boundary Wall to Castle Green House **LB ref 10471** PRN 56524	Medium value Grade II listed building	Early 20th century boundary wall.
The Castle Inn **LB ref 10472** PRN 6600, 32011 NPRN 5268	Medium value Grade II listed building	Early 19th century Inn.
Bridge Warehouse **LB ref 10473** PRN 5301, 57355 NPRN 34179	Medium value Grade II listed building	Early to mid 19th century warehouse. Also known as Edwards Warehouse
Bridgend Warehouse **LB ref 10474** PRN 5300 NPRN 34177	Medium value Grade II listed building	Mid 18th century warehouse, remodelled in the mid 19th century, now flats.
Imperial House **LB ref 10475** PRN 57356	Medium value Grade II listed building	Early 19th century villa, becoming Conservative Club building in the early 20th century.
Gates & Gatepiers to Churchyard of Church of St Mary **LB ref 10477** PRN 57357	Medium value Grade II listed building	Early 19th century gates and piers.
No.8 St. Mary's Street **LB ref 10530** PRN 57398	Medium value Grade II listed building	19th century house.
No.9 St. Mary's Street **LB ref 10531** PRN 97399 NPRN 35217	Medium value Grade II listed building	Early 19th century house.

Name and Reference No.	Sensitivity / Value	Description
No.19 St. Mary's Street **LB ref 10532** PRN 57400	Medium value Grade II listed building	Early to mid 19th century house.
Cemaes; No.20 St Mary's St **LB ref 10533** PRN 57401	Medium value Grade II listed building	Early to mid 19th century house.
No.21 St. Mary's Street **LB ref 10534** PRN 57402	Medium value Grade II listed building	Early to mid 19th century pair of houses.
No.22 St. Mary's Street **LB ref 10535** PRN 57403	Medium value Grade II listed building	Early to mid 19th century pair of houses.
No.32 St.Mary's Street **LB ref 10536** PRN 57404	Medium value Grade II listed building	Early 19th century house.
The Angel Hotel **LB ref 10537** PRN 6486 NPRN 5074	Medium value Grade II listed building	Early 19th century hotel
Cardigan & Tivyside Advertiser; No.39 St.Mary's St **LB ref 10538** PRN 57405 NPRN 35218	Medium value Grade II listed building	Early 19th century house, now a newspaper office.
Pedestrian Gate between no 43 & The Old Stables **LB ref 10540** PRN 57406	Medium value Grade II listed building	Early 19th century gate.
The Old Stables **LB ref 10541** PRN 56494 NPRN 407372	Medium value Grade II listed building	Early 19th century stable block, now offices. Associated with Castle Green House.
The Old Custom House (part) **LB ref 10542** PRN 57407 NPRN 35211	Medium value Grade II listed building	Early 19th century former custom house, now shops.

Name and Reference No.	Sensitivity / Value	Description
The Old Custom House **LB ref. 10543** PRN 57408 NPRN 35211	Medium value Grade II listed building	Early 19th century former custom house, now shops.
No.43 St. Mary's Street **LB ref. 10747** PRN 25745 NPRN 35220	Medium value Grade II listed building	Early 19th century house.
1&2 Green Street, including attached stable and boundary wall **LB ref 87473** PRN 127945 NPRN 305482	Medium value Grade II listed building	Early 18th century pair of cottages. Now part of the entrance to Cardigan Castle.
Cardigan Castle **PGW (Dy) 72(CER)** NPRN 409005	High value Grade II listed park and garden	18th to 19th century pleasure garden set within the grounds of Cardigan Castle, set to provide a romantic setting to Castle Green House. Includes significant views across the Afon Teifi and beyond.
Cardigan Conservation Area	High value Conservation area	Conservation area drawn around the historic core of Cardigan.
Lower Teifi Valley Landscape of Special Historic Interest **HLW(D)14**	High value Historic Landscape	Historic landscape covering the lower Teifi valley, including Cardigan. Sub-divided into character areas, the Scheme lying with HLCA 410 Cardigan.
Territorial Hall **PRN 6495** NPRN 35298	Low value Unlisted historic building	18th Century building
Teifi House **PRN 6496,** 129805 NPRN 35284	Low value Unlisted historic building	18th century stone-built, 2-storey house
Cardigan Benedictine Priory **PRN 6602**	Medium value Undesignated archaeological site	Site of medieval Benedictine priory. The site is now occupied by Cardigan and District Memorial hospital
Volk's Bakery **PRN 7782**	Low value Undesignated archaeological site	Medieval artefacts recovered during a salvage excavation in the 1970s
Priory **PRN 9687**	Low value Undesignated archaeological site	Gilt-brass figure of St. John - part of altar cross found at this location

Name and Reference No.	Sensitivity / Value	Description
Bridge Street Gate **PRN 13168**	Medium value Undesignated archaeological site	Gateway through the medieval town walls
Wolf Gate **PRN 13169**	Medium value Undesignated archaeological site	Gateway through the medieval town walls
Cardigan Station **PRN 15550**	Low value Undesignated archaeological site	Site of Cardigan Railway station, which was closed during the 1960's. Few traces of the station now survive and the area is now an industrial estate and farmers mart.
Teifi Quay; Prince Charles Quay **PRN 31960**	Low value Undesignated archaeological site	Wharf
Mercantile Wharf **PRN 32009**	Low value Undesignated archaeological site	Post-medieval wharf on the south side of the river, below the bridge.
Capel Sidan; St Julian's Chapel **PRN 40376**	Medium value Undesignated archaeological site	Site of medieval chapel, supposedly built late 12th century. Gone by 1800, may now lie beneath the former Cardigan railway station site.
Bridge Street Cottages **PRN 46373**	Low value Undesignated archaeological site	Row of 19th century cottages, now demolished
Cardigan Castle kiln **PRN 125636**	Low value Undesignated archaeological site	Medieval corn drying-kiln mentioned in records relating to Cardigan Castle in 1300.
St Mary's Foundry **PRN 129803** NPRN 40392	Low value Undesignated historic building	Site of a Smithy marked on 1st and 2nd edition OS map.
Red Lion Inn **PRN 129804**	Low value Undesignated historic building	18th Century Public House
Cardigan Castle Green House Gardeners Cottage **NPRN 5250**	Low value Undesignated historic building	Gardeners' cottage built as part of Castle Green House
Cardigan Castle Pillbox **NPRN 270394**	Low value Undesignated historic building	Second world war, Type 24 'bullet proof' pillbox covering Cardigan Bridge.
The Priory **NPRN 35163**	Low value Undesignated historic building	Site of 17th century house, rebuilt to designs by John Nash early 19th century. Used as a hospital in the 20th century
No.42 St. Mary's St **NPRN 35219**	Low value Undesignated historic building	Early 19th century house with a shop front.

Name and Reference No.	Sensitivity / Value	Description
Cardigan Harbour **NPRN 414093**	Low value Undesignated archaeological site	Cardigan harbour, includes wharfs and warehouses on the west side of the bridge.
Strand - Urban character area 8 **Archaeological potential**	Low value Undesignated archaeological site	High potential for late 18th and 19th century archaeological remains related to the reclamation and development of Castle Terrace and Strand.
Strand - Urban character area 8 **Archaeological potential**	Low value Undesignated archaeological site	Given the history of Cardigan there is considered to be a low to medium potential for medieval archaeological remains throughout the area, relating to a potential for activity around Cardigan Bridge, a river crossing around the Gloster Row slipway and other riverside activity, such as quaysides, landing stages, fish traps, weirs, small fishing vessels and evidence of conflict.

7.9 Assessment of effects

This section describes the outcomes of the assessment, identifying the likely significant effects on the Historic Environment. Where likely significant effects are reported, additional mitigation is described in Section 7.10 with the residual effects described in Section 7.11.

7.9.1 Design parameters

The impacts of the construction and the operational phases of the Scheme have been assessed. The potential impacts arising from the construction phase and the operational phase of the Scheme are listed in Table 7-8, along with the maximum design parameters against which each impact has been assessed. A description of the potential effect on receptors caused by each identified impact is given below.

Table 7-8 - Design parameters

Potential Impacts	Maximum Design Parameters	Justification
Ground breaking activities associated with construction	**Construction phase** Damage to or destruction of identified and potential receptors through ground-breaking activity due to: • Excavations and clearance for temporary haul roads, temporary piling platforms, working compounds and any other required hard standings and foundations • Removal of existing riverside walling in Areas 1 and 2. • Removal of stone gabions in Area 4 • Landscaping works and re-profiling to enable access • Proof digging and auguring prior to the Installation of sheet piling • Installation of sheet piling • Excavations for pile wall toe • Riverbank landscaping and regrading for set back area (Area 4) • Landscaping and excavations during reinstatement works and creation of public space	The damage or destruction of receptors through ground-breaking activity would be considered a permanent impact
Other construction activities causing ground disturbance and impacts	**Construction phase** Damage to identified and potential receptors through unintentional ground-breaking activity due to: • Vehicle movement across soft ground • Storage of overburden • Unplanned clearance and landscaping works	The damage or destruction of receptors through unintentional ground-breaking activity would be considered a permanent impact
Construction-related activities causing impacts	**Construction phase** Damage to identified and potential receptors through activities related to the construction activity due to: • Vibration from piling rigs • Vibration from general ground-breaking construction • Damage caused by the passage of construction vehicles along haul routes	The damage or destruction of receptors through vibration or movement of construction vehicles would be considered a permanent impact

Potential Impacts	Maximum Design Parameters	Justification
Alterations to the setting of designated receptors	**Construction phase** Construction activity has the potential to impact upon the setting of designated receptors, through • Removing or affecting the condition of elements that contribute to the setting of these receptors, • Affecting access to and from these receptors • Affecting visibility to and from these receptors • Detrimental noise effects during construction activities **Operational phase** The operational life of the Scheme has the potential to alter the setting of designated receptors, by • Affecting important views to and from the receptors, • Altering the understanding of the receptors, • Impacting the tranquillity of the receptors • Altering the traditional layout and use of the landscape associated with the receptors	Impacts to setting during the construction phase would be considered permanent in relation to the removal or damage to aspects of the setting, and temporary (short-term) impact in changes to access, visibility and noise. Impacts to setting during the operational phase would be considered a permanent impact as the operational life is assumed to extend a generation or more.
Positive impacts to receptors	**Operational phase** The operational life of the Scheme has the potential to bring positive changes to all receptors, by • Reducing the risk of future flooding events and the resultant damage to the receptors • Improving access to and stability of the built receptors	Impacts during the operational phase would be considered a permanent impact as the operational life is assumed to extend a generation or more

7.9.2 Construction phase

Table 7-7 has listed all potential receptors that could be affected by the impacts outlined above. The associated desk-based assessment (Poucher, 2021 (see Appendix 7.1)) describes all receptors in detail, including those where no impact could be identified.

Of those potential receptors no change during the construction phase could be identified on the following:

- **CD141** Cardigan Town Walls
- **LB Ref. 10529** No.7 St.Mary's Street
- **LB ref 10460** Gatepiers & Gates to Castle Green House
- **LB ref. 10469** Pantywylan
- **LB Ref 10470** Former Hope Chapel

- **LB ref 10477** Gates & Gatepiers to Churchyard of Church of St Mary
- **LB ref 10540** Pedestrian Gate between no 43 & The Old Stables
- **LB ref 10542** The Old Custom House (part)
- **LB ref. 10543** The Old Custom House
- **PRN 6495** Territorial Hall
- **PRN 6602** Cardigan Benedictine Priory
- **PRN 7782** Volk's Bakery
- **PRN 13168** Bridge Street Gate
- **PRN 13169** Wolf Gate
- **PRN 31960** Teifi Quay; Prince Charles Quay
- **PRN 32009** Mercantile Wharf
- **PRN 46373** Bridge Street Cottages
- **PRN 125636** Cardigan Castle kiln
- **NPRN 270394** Cardigan Castle Pillbox
- **NPRN 35163** The Priory
- **NPRN 35219** No.42 St.Mary's St
- **NPRN 414093** Cardigan Harbour

A Noise and Vibration Assessment (Appendix 5.1 of Chapter 5: Population and Human Health) has identified potential impacts from noise and vibration during construction works on properties along Bridge Street, High Street and Quay Street including several listed buildings that have not been included within the assessment of likely significant effects on the historic environment. The impacts of noise and vibration on these additional receptors however are considered to be negligible and therefore they have not been added to the assessment of the historic environment.

The impacted receptors are presented in Table 7-9 with a brief discussion of the impact.

The magnitude of change is dependent on the extent to which construction activities would impact upon the receptors and the condition and extent of those receptors, as far as can be currently understood.

The impacts from construction activities would be direct, negative, permanent impacts upon the identified receptors through the loss of elements of these receptors that cannot be replaced.

The impacts to setting would be negative, temporary (short-term) impacts to identified receptors during the construction phase.

Table 7-9 - Magnitude of change during construction phase

Name and Reference No.	Sensitivity / Value	Magnitude of change	Justification
Cardigan Bridge **CD003**	High value	Low negative	Temporary impact on setting in changes and restrictions to important views to and from the bridge along the riverside to the east, restricted access to the bridge from Strand and increased noise levels during construction works and use of haul roads. Structure not identified as being at risk from vibration works associated with construction, and mitigation measures would be in place to prevent accidental damage during adjacent construction works.
Cardigan Castle **CD123**	High value	Negligible / Low negative	Temporary impact on visual setting in changes to views from important viewpoints looking along the river from within the castle grounds. Temporary negligible impact on setting due to noise levels during constructions works affecting tranquillity and enjoyment of castle by temporary visitors.
Castle Green House **LB Ref.10459**	High value	No change / Negligible negative	Temporary negligible impact on setting due to noise levels during constructions works affecting tranquillity and enjoyment of the building by temporary visitors.
The Parish Church of St Mary **LB.Ref.10476**	High value	Negligible negative	Temporary impact on visual setting in changes to and restrictions to limited views to and from the church tower. Some slight restrictions on access from the riverside possible. Temporary negligible impact on setting due to noise levels during constructions works.
Avondale **LB Ref. 10539**	High value	No change / Negligible negative	Temporary negligible impact on setting due to noise levels during constructions works and use of haul roads.
Ty Castell **Lb Ref 10457**	Medium value	No change / Negligible negative	Temporary negligible impact on setting due to noise levels during constructions works.

Name and Reference No.	Sensitivity / Value	Magnitude of change	Justification
Outbuildings at Castle Green House Stable Yard **LB ref.10461**	Medium value	Low negative	Temporary impact on visual setting in limited views to and from the buildings. Potential temporary impacts to access. Temporary minor impact on setting due to noise levels and vibration during constructions works. No structural damage is anticipated, impact affecting residents only and the building is not permanently occupied.
Retaining Wall in Castle Green Grounds to E of House **LB ref 10462**	Medium value Grade II listed building	Negligible negative	Temporary impact on visual setting in limited views to and from the structure.
The Grosvenor Hotel **LB ref 10463**	Medium value	No change / Negligible negative	Temporary negligible impact on setting due to noise levels during constructions works and use of haul roads
Castle Chambers **LB ref 10464**	Medium value	No change / Negligible negative	Temporary negligible impact on setting due to noise levels during constructions works and use of haul roads
Glenroy House **LB ref 10465**	Medium value	No change / Negligible negative	Temporary negligible impact on setting due to noise levels during constructions works and use of haul roads
Boundary Wall to Castle Green House **LB ref 10471**	Medium value	Negligible negative	Temporary impact on visual setting in limited views to and from the structure. Potential temporary impacts to access.
The Castle Inn **LB ref 10472**	Medium value	Low negative	Temporary impact on visual setting in limited but important views to and from the building. Temporary minor impact on setting due to noise levels during constructions works.
Bridge Warehouse **LB ref 10473**	Medium value	Negligible negative	Temporary impact on visual setting in limited views from the building. Temporary minor impact on setting due to noise levels during constructions works.

Name and Reference No.	Sensitivity / Value	Magnitude of change	Justification
Bridgend Warehouse **LB ref 10474**	Medium value Grade II listed building	Negligible negative	Temporary impact on visual setting in limited views from the building. Temporary minor impact on setting due to noise levels during constructions works.
Imperial House **LB ref 10475**	Medium value	No change / Negligible negative	Temporary negligible impact on setting due to noise levels during constructions works.
No.8 St. Mary's Street **LB ref 10530**	Medium value	No change / Negligible negative	Temporary negligible impact on setting due to noise levels during constructions works.
No.9 St. Mary's Street **LB ref 10531**	Medium value	No change / Negligible negative	Temporary negligible impact on setting due to noise levels during constructions works.
No.19 St. Mary's Street **LB ref 10532**	Medium value	No change / Negligible negative	Temporary negligible impact on setting due to noise levels during constructions works.
Cemaes; No.20 St Mary's St **LB ref 10533**	Medium value	No change / Negligible negative	Temporary negligible impact on setting due to noise levels during constructions works.
No.21 St. Mary's Street **LB ref 10534**	Medium value	No change / Negligible negative	Temporary negligible impact on setting due to noise levels during constructions works.
No.22 St. Mary's Street **LB ref 10535**	Medium value	No change / Negligible negative	Temporary negligible impact on setting due to noise levels during constructions works.
No.32 St. Mary's Street **LB ref 10536**	Medium value	Negligible negative	Temporary minor impact on setting due to noise levels during constructions works.
The Angel Hotel **LB ref 10537**	Medium value	No change / Negligible negative	Temporary negligible impact on setting due to noise levels during constructions works and use of haul roads.
Cardigan & Tivyside Advertiser; No.39 St. Mary's St **LB ref 10538**	Medium value	No change / Negligible negative	Temporary negligible impact on setting due to noise levels during constructions works.
The Old Stables **LB ref 10541**	Medium value	Negligible negative	Temporary minor impact on setting due to noise levels during constructions works and use of haul roads.
No.43 St. Mary's Street **LB ref. 10747**	Medium value	No change / Negligible negative	Temporary negligible impact on setting due to noise levels during constructions works.

Name and Reference No.	Sensitivity / Value	Magnitude of change	Justification
1&2 Green Street, including attached stable and boundary wall **LB ref 87473**	Medium value	No change / Negligible negative	Temporary negligible impact on setting due to noise levels during constructions works.
Cardigan Castle **PGW (Dy) 72(CER)**	High value	Low negative	Temporary impact on visual setting in limited but significant views to and from the castle grounds. Significant views have been identified in the Cadw Register (Cadw, 2007) from the front of the house and gardens across the Afon Teifi and beyond. These views incorporate part of the development area, largely the west and east ends with the central area largely hidden by buildings. The development area also only forms part of the more extensive views that incorporate wider stretches of the river and traditional and modern development to the south of the river. The castle walls (and restrictions on access to them by visitors to the castle) and mature tree growth within and along the edge of the gardens have reduced the visibility of the development area from these viewpoints.
Cardigan Conservation Area	High value	Low negative	Direct impacts on current elements of the designated Conservation Area, but these are not anticipated to alter the values of the Conservation Area. Temporary visual and access impacts.
Lower Teifi Valley Landscape of Special Historic Interest **HLW(D)14**	High value	Negligible / Low negative	Direct impacts on physical elements of the historic landscape character area, such as slight change in alignment and change in appearance of riverside walling, removal of slipway access, reduction of Gloster Row car park and redesign of riverside area in front of the castle. These are not significant characteristics of the Historic Landscape area however. Impacts are assessed in the ASIDOHL (Appendix 7.2). Assessed as a negligible to low direct impact in absolute terms, negligible visual impact on the landscape as a whole.

Name and Reference No.	Sensitivity / Value	Magnitude of change	Justification
Teifi House **PRN 6496**	Low value	Negligible / Low negative	Potential direct impact from construction traffic and activity around narrow access to Gloster Row adjacent to this property.
Priory **PRN 9687**	Low value	Low negative	Potential groundworks associated with northern compound could directly impact associated archaeological remains.
Cardigan Station **PRN 15550**	Low value	Negligible / Low negative	Potential groundworks associated with southern compound could directly impact associated archaeological remains.
Capel Sidan; St Julian's Chapel **PRN 40376**	Medium value	Negligible / Low negative	Potential groundworks associated with southern compound could directly impact associated archaeological remains.
St Mary's Foundry **PRN 129803**	Low value	Low negative	Proximity to groundworks suggests potential direct impact through construction activities, including excavations, vibrations and movement of machinery. Noise and vibration assessment indicates this building may experience PPV levels exceeding guideline values for cosmetic damage. Temporary restrictions to access and noise levels during construction works negatively affecting setting.
Red Lion Inn **PRN 129804**	Low value	No change / Negligible negative	Temporary negligible impact on setting due to noise levels during constructions works.
Cardigan Castle Green House Gardeners Cottage **NPRN 5250**	Low value	No change / Negligible negative	Temporary negligible impact on setting due to noise levels during constructions works.
Strand - Urban character area 8 **Archaeological potential (post-medieval)**	Low value	Low / Medium negative	Direct impact on potential archaeological remains through ground-breaking activities.
Strand - Urban character area 8 **Archaeological potential (medieval)**	Low value	Low / Medium negative	Direct impact on potential archaeological remains through ground-breaking activities.

The methodology for establishing the significance of effect is outlined in Table 7-6. These results are laid out in Table 7-10. Negligible to minor effects are not considered significant. Moderate to major effects are considered significant.

Where no change during construction phase has been determined, as outlined in the list of 22 receptors, the significance of effect would be negligible and these results have been omitted from Table 7-10.

Table 7-10 - Significance of effect during construction phase

Name and Reference No.	Sensitivity / Value	Magnitude of change	Significance of effect
Cardigan Bridge **CD003**	High value	Low negative	Minor / Moderate
Cardigan Castle **CD123**	High value	Negligible / Low negative	Minor
Castle Green House **LB Ref.10459**	High value	No change / Negligible negative	Negligible
The Parish Church of St Mary **LB.Ref.10476**	High value	Negligible negative	Minor
Avondale **LB Ref. 10539**	High value	No change / Negligible negative	Negligible
Ty Castell **Lb Ref 10457**	Medium value	No change / Negligible negative	Negligible
Outbuildings at Castle Green House Stable Yard **LB ref.10461**	Medium value	Low negative	Minor
Retaining Wall in Castle Green Grounds to E of House **LB ref 10462**	Medium value	Negligible negative	Negligible
The Grosvenor Hotel **LB ref 10463**	Medium value	No change / Negligible negative	Negligible
Castle Chambers **LB ref 10464**	Medium value	No change / Negligible negative	Negligible
Glenroy House **LB ref 10465**	Medium value	No change / Negligible negative	Negligible
Boundary Wall to Castle Green House **LB ref 10471**	Medium value	Negligible negative	Negligible
The Castle Inn **LB ref 10472**	Medium value	Low negative	Minor
Bridge Warehouse **LB ref 10473**	Medium value	Negligible negative	Negligible
Bridgend Warehouse **LB ref 10474**	Medium value	Negligible negative	Negligible
Imperial House **LB ref 10475**	Medium value	No change / Negligible negative	Negligible

Name and Reference No.	Sensitivity / Value	Magnitude of change	Significance of effect
No.8 St. Mary's Street **LB ref 10530**	Medium value	No change / Negligible negative	Negligible
No.9 St. Mary's Street **LB ref 10531**	Medium value	No change / Negligible negative	Negligible
No.19 St. Mary's Street **LB ref 10532**	Medium value	No change / Negligible negative	Negligible
Cemaes; No.20 St Mary's St **LB ref 10533**	Medium value	No change / Negligible negative	Negligible
No.21 St. Mary's Street **LB ref 10534**	Medium value	No change / Negligible negative	Negligible
No.22 St. Mary's Street **LB ref 10535**	Medium value	No change / Negligible negative	Negligible
No.32 St. Mary's Street **LB ref 10536**	Medium value	Negligible negative	Negligible
The Angel Hotel **LB ref 10537**	Medium value	No change / Negligible negative	Negligible
Cardigan & Tivyside Advertiser; No.39 St. Mary's St **LB ref 10538**	Medium value	No change / Negligible negative	Negligible
The Old Stables **LB ref 10541**	Medium value	Negligible negative	Negligible
No.43 St. Mary's Street **LB ref. 10747**	Medium value	No change / Negligible negative	Negligible
1&2 Green Street, including attached stable and boundary wall **LB ref 87473**	Medium value	No change / Negligible negative	Negligible
Cardigan Castle **PGW (Dy) 72(CER)**	High value	Low negative	Minor
Cardigan Conservation Area	High value	Low negative	Minor / Moderate
Lower Teifi Valley Landscape of Special Historic Interest **HLW(D)14**	High value	Negligible / Low negative	Minor
Teifi House **PRN 6496**	Low value	Negligible / Low negative	Negligible
Priory **PRN 9687**	Low value	Low negative	Negligible / Minor
Cardigan Station **PRN 15550**	Low value	Negligible / Low negative	Negligible / Minor

Name and Reference No.	Sensitivity / Value	Magnitude of change	Significance of effect
Capel Sidan; St Julian's Chapel **PRN 40376**	Medium value	Negligible / Low negative	Negligible / Minor
St Mary's Foundry **PRN 129803**	Low value	Low negative	Negligible / Minor
Red Lion Inn **PRN 129804**	Low value	No change / Negligible negative	Negligible
Cardigan Castle Green House Gardeners Cottage **NPRN 5250**	Low value	No change / Negligible negative	Negligible
Strand - Urban character area 8 **Archaeological potential (post-medieval)**	Low value	Low / Medium negative	Minor
Strand - Urban character area 8 **Archaeological potential (medieval)**	Low value	Low / Medium negative	Minor

During the construction phase a negligible, or negligible to minor significance of effect is determined for 52 individual receptors. A minor significance of effect is determined for a further 8 individual receptors. This effect is not considered significant in terms of the EIA Regulations.

Two receptors, namely Cardigan Bridge CD003 and Cardigan Conservation Area have a significance of effect of minor to moderate. A moderate effect is considered possibly significant in terms of the EIA Regulations.

7.9.3 Operational phase

The operational phase of the development has the potential to impact upon the setting of a limited number of receptors. These impacts would be direct and indirect, both negative and positive, permanent factors as the operational life of the development is anticipated to last beyond a generation.

Of those potential receptors no change could be identified during the operational phase on the following:

- **LB Ref.10459** Castle Green House
- **LB Ref. 10529** No.7 St.Mary's Street
- **Lb Ref 10457** Ty Castell
- **LB ref 10460** Gatepiers & Gates to Castle Green House
- **LB ref 10462** Retaining Wall in Castle Green Grounds to E of House

- **LB ref 10463** The Grosvenor Hotel
- **LB ref 10464** Castle Chambers
- **LB ref 10465** Glenroy House
- **LB ref 10471** Boundary Wall to Castle Green House
- **LB ref 10477** Gates & Gatepiers to Churchyard of Church of St Mary
- **LB ref 10540** Pedestrian Gate between no 43 & The Old Stables
- **LB ref 10541** The Old Stables
- **LB ref 10542** The Old Custom House (part)
- **LB ref. 10543** The Old Custom House
- **LB ref 87473** 1&2 Green Street, including attached stable and boundary wall
- **PRN 6602** Cardigan Benedictine Priory
- **PRN 7782** Volk's Bakery
- **PRN 9687** Priory
- **PRN 13168** Bridge Street Gate
- **PRN 13169** Wolf Gate
- **PRN 15550** Cardigan Station
- **PRN 31960** Teifi Quay; Prince Charles Quay
- **PRN 32009** Mercantile Wharf
- **PRN 40376** Capel Sidan; St Julian's Chapel
- **PRN 46373** Bridge Street Cottages
- **PRN 125636** Cardigan Castle kiln
- **NPRN 5250** Cardigan Castle Green House Gardeners Cottage
- **NPRN 270394** Cardigan Castle Pillbox
- **NPRN 35163** The Priory
- **NPRN 414093** Cardigan Harbour
- **Archaeological potential (post-medieval)** Strand - Urban character area 8

- **Archaeological potential (medieval)** Strand - Urban character area 8

The impacted receptors are presented in Table 7-11 with a brief discussion of the impact.

Table 7-11 - Magnitude of change during operational phase

Name and Reference No.	Sensitivity / Value	Magnitude of change	Justification
Cardigan Bridge **CD003**	High value	Low negative	Change in the visual setting with views from (including important viewpoints) the bridge upriver impacted through a change in appearance and height of the riverside wall. The wall would be a new and prominent feature in these views, changing the current appearance of piecemeal development. Some views to the bridge impacted with the new riverside wall becoming a more prominent element when viewing the bridge from the east, potentially reducing the prominence of the bridge in these views. Improved amenity value of the area in front of the castle and immediately adjacent to the bridge, with improvements to its current appearance and public access would be a positive impact helping to offset visual changes, although negative impacts remain.
Cardigan Castle **CD123**	High value	Low negative	Change in the visual setting with views from (including important viewpoints) the castle walls and castle grounds over and along the Teifi altered with a more prominent riverside wall structure. Some views to the castle impacted with a heightened riverside wall being both more prominent in important views of the castle from the south and partially obscuring the base of the castle wall along Strand. Some negligible positive impacts through reducing the negative visual impacts in view from the south of modern Welsh Water station on riverside and improving the appearance of the area at the base of the castle walls..

Name and Reference No.	Sensitivity / Value	Magnitude of change	Justification
Cardigan Town Walls **CD141**	High value	Negligible positive	Reduced risk of flooding and associated damage
The Parish Church of St Mary **LB.Ref.10476**	High value	Negligible negative	Change in the visual setting with limited views from the church tower across the river impacted by alterations to the line of the riverside wall at the east end and overall increase in the height of the wall. Such views are however likely to be rarely accessed.
Avondale **LB Ref. 10539**	High value	Negligible positive	Reduced risk of flooding and associated damage to the building and its contents.
Outbuildings at Castle Green House Stable Yard **LB ref.10461**	Medium value	Negligible negative / Negligible positive	Slight change to visual setting in views to and from the buildings with a heightened and therefore more prominent riverside wall, potentially restricting some views of the river. Positive impacts of reduced flood risk and associated damage along with improved amenity value through improvements to the riverside area immediately to the south and masking of the new Welsh Water station.
Pantywylan **LB ref. 10469**	Medium value	Negligible negative	Minor change to visual setting in views from building with increased height and prominence of riverside wall beyond the bridge affecting views of the river.
Former Hope Chapel **LB Ref 10470**	Medium value	Negligible positive	Reduced risk of flooding and associated damage.
The Castle Inn **LB ref 10472**	Medium value	Negligible negative	Change to visual setting in important views from the building across the river. The new riverside wall would be a more prominent feature and obscure current visible structures. This would be slightly offset however to improvements to the current appearance of the area immediately opposite the building and obscuring modern riverside Welsh Water structures.

Name and Reference No.	Sensitivity / Value	Magnitude of change	Justification
Bridge Warehouse **LB ref 10473**	Medium value	Negligible negative	Change to visual setting with a more prominent riverside wall impacting views upriver from the building. These views are somewhat limited by the presence of Cardigan Bridge, reducing the impact.
Bridgend Warehouse **LB ref 10474**	Medium value	Negligible negative	Change to visual setting with a more prominent riverside wall impacting views upriver from the building. These views are somewhat limited by the presence of Cardigan Bridge, reducing the impact.
Imperial House **LB ref 10475**	Medium value	Negligible positive	Reduced risk of flooding and associated damage.
No.8 St. Mary's Street **LB ref 10530**	Medium value	Negligible positive	Reduced risk of flooding and associated damage.
No.9 St. Mary's Street **LB ref 10531**	Medium value	Negligible positive	Reduced risk of flooding and associated damage.
No.19 St. Mary's Street **LB ref 10532**	Medium value	Low positive	Reduced risk (in a higher risk area) of flooding and associated damage.
Cemaes; No.20 St Mary's St **LB ref 10533**	Medium value	Low positive	Reduced risk (in a higher risk area) of flooding and associated damage.
No.21 St. Mary's Street **LB ref 10534**	Medium value	Low positive	Reduced risk (in a higher risk area) of flooding and associated damage.
No.22 St. Mary's Street **LB ref 10535**	Medium value	Low positive	Reduced risk (in a higher risk area) of flooding and associated damage.
No.32 St. Mary's Street **LB ref 10536**	Medium value	Low positive	Reduced risk (in a higher risk area) of flooding and associated damage.
The Angel Hotel **LB ref 10537**	Medium value	Low positive	Reduced risk (in a higher risk area) of flooding and associated damage.
Cardigan & Tivyside Advertiser; No.39 St.Mary's St **LB ref 10538**	Medium value	Low positive	Reduced risk (in a higher risk area) of flooding and associated damage.
No.43 St. Mary's Street **LB ref. 10747**	Medium value	Negligible positive	Reduced risk of flooding and associated damage.

Name and Reference No.	Sensitivity / Value	Magnitude of change	Justification
Cardigan Castle **PGW (Dy) 72(CER)**	High value	Low negative	Change to visual setting in significant viewpoints views to and from gardens. Significant views have been identified in the Cadw Register (Cadw, 2007) from the front of the house and gardens across the Afon Teifi and beyond. The more prominent riverside wall would be visible at the west and east ends from these viewpoints. The central area would be hidden by existing buildings however and the development area also only forms part of the more extensive views that incorporate wider stretches of the river and traditional and modern development to the south of the river. The castle walls (and restrictions on access to them by visitors to the castle) and mature tree growth within and along the edge of the gardens have reduced the visibility of the development area from these viewpoints.
Cardigan Conservation Area	High value	Negligible negative / Low positive	Alteration of current elements along river front, altering the appearance and prominence of the riverside wall, visibility of riverside structures and partial restrictions of access to the river through the removal of a slipway, along with alterations in views to and from individual historic buildings noted above (negative). Protection of more notable elements of character area from flood risks and associated damage, improvements to the area in front of the castle and a reduction in the prominence of some modern riverside structures by partially obscuring them with the new wall (positive).
Lower Teifi Valley Landscape of Special Historic Interest **HLW(D)14**	High value	Negligible negative	Impacts are assessed in the ASIDOHL (Appendix 7.2). Assessed as a negligible to low direct impact in absolute terms, negligible visual impact on the landscape as a whole.
Territorial Hall **PRN 6495**	Low value	Negligible positive	Reduced risk of flooding and associated damage.

Name and Reference No.	Sensitivity / Value	Magnitude of change	Justification
Teifi House **PRN 6496**	Low value	Negligible positive	Reduced risk of flooding and associated damage.
St Mary's Foundry **PRN 129803**	Low value	Negligible negative / Low positive	Slight change to setting, but reduced risk (in a higher risk area) of flooding and associated damage.
Red Lion Inn **PRN 129804**	Low value	Negligible positive	Reduced risk of flooding and associated damage.
No.42 St. Mary's St **NPRN 35219**	Low value	Negligible positive	Reduced risk of flooding and associated damage.

The methodology for establishing the significance of effect is outlined in Table 7-6. These results are laid out in Table 7-12. Negligible to minor effects are not considered significant. Moderate to major effects are considered significant.

Where no change during operational phase has been determined, as outlined in the list of 32 receptors, the significance of effect would be negligible, and these results have been omitted from Table 7-12.

Table 7-12 - Significance of effect during operational phase

Name and Reference No.	Sensitivity / Value	Magnitude of change	Significance of effect
Cardigan Bridge **CD003**	High value	Low negative	Minor / Moderate
Cardigan Castle **CD123**	High value	Low negative	Minor / Moderate
Cardigan Town Walls **CD141**	High value	Negligible positive	Minor
The Parish Church of St Mary **LB.Ref.10476**	High value	Negligible negative	Minor
Avondale **LB Ref. 10539**	High value	Negligible positive	Minor
Outbuildings at Castle Green House Stable Yard **LB ref.10461**	Medium value	Negligible negative / Negligible positive	Negligible / Minor
Pantywylan **LB ref. 10469**	Medium value	Negligible negative	Negligible / Minor
Former Hope Chapel **LB Ref 10470**	Medium value	Negligible positive	Negligible / Minor
The Castle Inn **LB ref 10472**	Medium value	Negligible negative	Negligible / Minor
Bridge Warehouse **LB ref 10473**	Medium value	Negligible negative	Negligible

Name and Reference No.	Sensitivity / Value	Magnitude of change	Significance of effect
Bridgend Warehouse **LB ref 10474**	Medium value	Negligible negative	Negligible
Imperial House **LB ref 10475**	Medium value	Negligible positive	Negligible / Minor
No.8 St. Mary's Street **LB ref 10530**	Medium value	Negligible positive	Negligible / Minor
No.9 St. Mary's Street **LB ref 10531**	Medium value	Negligible positive	Negligible / Minor
No.19 St. Mary's Street **LB ref 10532**	Medium value	Low positive	Minor
Cemaes; No.20 St Mary's St **LB ref 10533**	Medium value	Low positive	Minor
No.21 St. Mary's Street **LB ref 10534**	Medium value	Low positive	Minor
No.22 St. Mary's Street **LB ref 10535**	Medium value	Low positive	Minor
No.32 St. Mary's Street **LB ref 10536**	Medium value	Low positive	Minor
The Angel Hotel **LB ref 10537**	Medium value	Low positive	Minor
Cardigan & Tivyside Advertiser; No.39 St. Mary's St **LB ref 10538**	Medium value	Low positive	Minor
No.43 St. Mary's Street **LB ref. 10747**	Medium value	Negligible positive	Negligible / Minor
Cardigan Castle **PGW (Dy) 72(CER)**	High value	Low negative	Minor / Moderate
Cardigan Conservation Area	High value	Negligible negative / Low positive	Minor
Lower Teifi Valley Landscape of Special Historic Interest **HLW(D)14**	High value	Negligible negative	Minor
Territorial Hall **PRN 6495**	Low value	Negligible positive	Negligible / Minor
Teifi House **PRN 6496**	Low value	Negligible positive	Negligible / Minor
St Mary's Foundry **PRN 129803**	Low value	Negligible negative / Low positive	Negligible / Minor
Red Lion Inn **PRN 129804**	Low value	Negligible positive	Negligible / Minor
No.42 St.Mary's St **NPRN 35219**	Low value	Negligible positive	Negligible / Minor

During the operational phase a negligible, or negligible to minor significance of effect is determined for 47 individual receptors. A minor significance of effect is determined for a further 12 individual receptors, of which only 2 receptors are considered to have a negative impact. This effect is not considered significant in terms of the EIA Regulations.

Three receptors, namely Cardigan Bridge CD003, Cardigan Castle CD123 and Cardigan Castle PGW (Dy) 72 (CER) have a significance of effect of minor to moderate. A moderate effect is considered possibly significant in terms of the EIA Regulations.

7.10 Mitigation measures

As outlined in Chapter 2: Project Development, the Scheme has undergone several design changes as it has been developed, with the current proposals incorporating mitigation measures to avoid and reduce impacts upon known elements of the historic environment during the construction phase. A detailed design is illustrated on the Environmental Masterplan.

These design changes include the placement of the proposed flood defence wall largely in front of the existing wall to avoid the need to remove buildings of potential historic interest and impact on the potential buried archaeological resource in this area, thereby reducing its impact on the Cardigan Conservation Area and the Lower Teifi Valley Landscape of Special Historic Interest (HLW(D)14). The point at which the new flood defence wall ties into existing structures at the west end has also been addressed to avoid direct impacts upon Cardigan Bridge (CD003). The design of the new flood defence wall incorporates slate cladding to integrate the structure into the traditional building material used in Cardigan and reduce the visual impact on receptors such as Cardigan Castle (CM003), Cardigan Conservation Area and the Lower Teifi Valley Landscape of Special Historic Interest (HLW(D)14). Improvements have also been introduced to the public realm area along Strand, in front of the castle to improve the appearance of the area, and public access. Street tree planting has been introduced but placed with consideration given to significant and important viewpoints from Cardigan Castle (CD003) and the associated registered Parks and Garden (PGW (Dy) 72(CER)).

As part of this process a draft Project Design (Poucher, 2024) for archaeological works has been created in order to mitigate some of the potential direct impacts upon the historic environment during the construction phase. This Project Design was developed alongside a slightly different alignment of the Scheme footprint which included the demolition of structures of historic interest along Strand. The current Scheme no longer requires such demolition, consequently mitigation measures associated with that, namely historic building recording, are no longer considered appropriate mitigation. The Project Design does however detail the archaeological monitoring and recording of any ground disturbing works that may reveal archaeological deposits. Such ground disturbing work is detailed in Table 7-8, although the insertion of sheet piling is unlikely to afford the opportunity to monitor below-ground deposits. This Project Design has been circulated amongst appropriate bodies, namely NRW, Cadw and Heneb-Development Management, for information and comment. An updated and approved Project Design for archaeological mitigation would be required at Construction Phase therefore this is not included as an Appendix at this stage, but the principles for the archaeological monitoring and recording of groundworks has been established.

7.11 Significance and duration of residual effects

During the construction phase a minor to moderate significance of effect was identified on Cardigan Bridge CD003 and Cardigan Conservation Area. Mitigation measures designed into the Scheme to control construction activities would help alleviate potential damage to CD003. Impacts to the setting of both CD003 and Cardigan Conservation Area would be temporary (short-term) in nature during the construction phase, and direct impacts upon Cardigan Conservation Area are not considered to cause a distinct alteration to the various values of the Conservation Area. It is therefore considered that the significance of effect upon both receptors during the construction phase would be a minor negative residual effect, which is not significant.

During the operational phase a minor to moderate significance of effect was identified on Cardigan Bridge CD003, Cardigan Castle CD123 and Cardigan Castle PGW (Dy) 72 (CER). It is anticipated that significant views from Cardigan Castle CD123 and Cardigan Castle PGW (Dy) 72 (CER) would be limited to the west end of the Scheme with views further upriver obscured by riverside buildings and visual restrictions within the castle grounds. Design proposals for Area 1 (the former Castle Terrace area) improve the visual appearance of the area, improve public access through the area, take the significant viewpoints into account in the placement of trees and mask the modern Welsh Water works, all of which are considered to be a positive improvement on current views, and are therefore considered unlikely to detrimentally alter significant elements of the setting of these two receptors.

Cardigan Bridge CD003 includes important views that encompass a greater area of the Scheme, with much of the new flood defence wall visible as a new and prominent feature, changing the current appearance of the north side of the river from these viewpoints. The alignment of the Scheme to maintain a line close to the previous, visual design finishes such as the slate cladding of the wall, and in particular the treatment of the adjacent public space within Area 1 is considered to limit the detrimental impact upon the setting of this asset.

It is therefore considered that the significance of effect upon Cardigan Bridge CD003, Cardigan Castle CD123 and Cardigan Castle PGW (Dy) 72 (CER) during the operational phase would be a minor negative residual effect, which is not significant.

7.12 Monitoring

No future monitoring is required as a consequence of the assessment of historic environment, except where mitigation is required as determined by the planning authority or other appropriate determining body.

7.13 Difficulties and uncertainties

It is assumed that the information held within the consulted datasets is sufficiently accurate for the purpose of assessing impacts on the historic environment resource. The Historic Environment Record and National Monuments Record Wales (the primary datasets used in the assessment) are records of known archaeological and historical assets. They are not exhaustive and do not preclude the existence of further assets which are unknown at present.

Areas of archaeological potential can be identified, but the precise nature of this resource is not fully understood at this stage.

7.14 Summary of assessment

This chapter has assessed the baseline evidence for historic environment to provide an understanding of its significance and the likely impacts and environmental effects that would result from the Scheme.

A large number of individual receptors have been identified that could potentially be affected by the Scheme. With mitigation measures taken into account the residual significance of effect upon these receptors range from negligible to minor, which is not considered significant in terms of the EIA Regulations.

A summary of the results of the assessment is presented in Table 7-13.

Table 7-13 - Summary of potential effects on the historic environment

Receptor Name and Reference No.	Sensitivity / Value	Magnitude of change during construction phase	Magnitude of change operational phase	Significance of effect during construction phase	Significance of effect during operational phase	Residual significance of effect after mitigation
Cardigan Bridge **CD003**	High value	Low negative	Low negative	Minor / Moderate	Minor / Moderate	Minor
Cardigan Castle **CD123**	High value	Negligible / Low negative	Low negative	Minor	Minor / Moderate	Minor
Cardigan Town Walls **CD141**	High value	No change	Negligible positive	Negligible	Minor	Minor
Castle Green House **LB Ref.10459**	High value	No change / Negligible negative	No change	Negligible	Negligible	Negligible
The Parish Church of St Mary **LB.Ref.10476**	High value	Negligible negative	Negligible negative	Minor	Minor	Minor
No.7 St Mary's Street **LB Ref. 10529**	High value	No change	No change	Negligible	Negligible	Negligible
Avondale **LB Ref. 10539**	High value	No change / Negligible negative	Negligible positive	Negligible	Minor	Minor
Ty Castell **Lb Ref 10457**	Medium value	No change / Negligible negative	No change	Negligible	Negligible	Negligible
Gatepiers & Gates to Castle Green House **LB ref 10460**	Medium value	No change	No change	Negligible	Negligible	Negligible
Outbuildings at Castle Green House Stable Yard **LB ref.10461**	Medium value	Low negative	Negligible negative / Negligible positive	Minor	Negligible / Minor	Negligible / Minor

Receptor Name and Reference No.	Sensitivity / Value	Magnitude of change during construction phase	Magnitude of change operational phase	Significance of effect during construction phase	Significance of effect during operational phase	Residual significance of effect after mitigation
Retaining Wall in Castle Green Grounds to E of House **LB ref 10462**	Medium value	Negligible negative	No change	Negligible	Negligible	Negligible
The Grosvenor Hotel **LB ref 10463**	Medium value	No change / Negligible negative	No change	Negligible	Negligible	Negligible
Castle Chambers **LB ref 10464**	Medium value	No change / Negligible negative	No change	Negligible	Negligible	Negligible
Glenroy House **LB ref 10465**	Medium value	No change / Negligible negative ge	No change	Negligible	Negligible	Negligible
Pantywylan **LB ref. 10469**	Medium value	No change	Negligible negative	Negligible	Negligible / Minor	Negligible / Minor
Former Hope Chapel **LB Ref 10470**	Medium value	No change	Negligible positive	Negligible	Negligible / Minor	Negligible / Minor
Boundary Wall to Castle Green House **LB ref 10471**	Medium value	Negligible negative	No change	Negligible	Negligible	Negligible
The Castle Inn **LB ref 10472**	Medium value	Low negative	Negligible negative	Negligible	Minor	Negligible / Minor
Bridge Warehouse **LB ref 10473**	Medium value	Negligible negative	Negligible negative	Negligible	Negligible	Negligible
Bridgend Warehouse **LB ref 10474**	Medium value	Negligible negative	Negligible negative	Negligible	Negligible	Negligible
Imperial House **LB ref 10475**	Medium value	No change / Negligible negative	Negligible positive	Negligible	Negligible / Minor	Negligible / Minor

Receptor Name and Reference No.	Sensitivity / Value	Magnitude of change during construction phase	Magnitude of change operational phase	Significance of effect during construction phase	Significance of effect during operational phase	Residual significance of effect after mitigation
Gates & Gatepiers to Churchyard of Church of St Mary **LB ref 10477**	Medium value	No change	No change	Negligible	Negligible	Negligible
No.8 St. Mary's Street **LB ref 10530**	Medium value	No change / Negligible negative	Negligible positive	Negligible	Negligible / Minor	Negligible / Minor
No.9 St. Mary's Street **LB ref 10531**	Medium value	No change / Negligible negative	Negligible positive	Negligible	Negligible / Minor	Negligible / Minor
No.19 St. Mary's Street **LB ref 10532**	Medium value	No change / Negligible negative	Low positive	Negligible	Minor	Minor
Cemaes; No.20 St Mary's St **LB ref 10533**	Medium value	No change / Negligible negative	Low positive	Negligible	Minor	Minor
No.21 St. Mary's Street **LB ref 10534**	Medium value	No change / Negligible negative	Low positive	Negligible	Minor	Minor
No.22 St. Mary's Street **LB ref 10535**	Medium value	No change / Negligible negative	Low positive	Negligible	Minor	Minor
No.32 St. Mary's Street **LB ref 10536**	Medium value	Negligible negative	Low positive	Negligible	Minor	Minor
The Angel Hotel **LB ref 10537**	Medium value	No change / Negligible negative	Low positive	Negligible	Minor	Minor
Cardigan & Tivyside Advertiser; No.39 St. Mary's St **LB ref 10538**	Medium value	No change / Negligible negative	Low positive	Negligible	Minor	Minor

Receptor Name and Reference No.	Sensitivity / Value	Magnitude of change during construction phase	Magnitude of change operational phase	Significance of effect during construction phase	Significance of effect during operational phase	Residual significance of effect after mitigation
Pedestrian Gate between no 43 & The Old Stables **LB ref 10540**	Medium value	No change	No change	Negligible	Negligible	Negligible
The Old Stables **LB ref 10541**	Medium value	Negligible negative	No change	Negligible	Negligible	Negligible
The Old Custom House (part) **LB ref 10542**	Medium value	No change	No change	Negligible	Negligible	Negligible
The Old Custom House **LB ref. 10543**	Medium value	No change	No change	Negligible	Negligible	Negligible
No.43 St. Mary's Street **LB ref. 10747**	Medium value	No change / Negligible negative	Negligible positive	Negligible	Negligible / Minor	Negligible / Minor
1&2 Green Street, including attached stable and boundary wall **LB ref 87473**	Medium value	No change / Negligible negative	No change	Negligible	Negligible	Negligible
Cardigan Castle **PGW (Dy) 72(CER)**	High value	Low negative	Low negative	Minor	Minor / Moderate	Minor
Cardigan Conservation Area	High value	Low negative	Negligible negative / Low positive	Minor / Moderate	Minor	Minor
Lower Teifi Valley Landscape of Special Historic Interest **HLW(D)14**	High value	Negligible / Low negative	Negligible negative	Minor	Minor	Minor
Territorial Hall **PRN 6495**	Low value	No change	Negligible positive	Negligible	Negligible / Minor	Negligible / Minor

Receptor Name and Reference No.	Sensitivity / Value	Magnitude of change during construction phase	Magnitude of change operational phase	Significance of effect during construction phase	Significance of effect during operational phase	Residual significance of effect after mitigation
Teifi House **PRN 6496**	Low value	Negligible / Low negative	Negligible positive	Negligible	Negligible / Minor	Negligible / Minor
Cardigan Benedictine Priory **PRN 6602**	Medium value	No change	No change	Negligible	Negligible	Negligible
Volk's Bakery **PRN 7782**	Low value	No change	No change	Negligible	Negligible	Negligible
Priory **PRN 9687**	Low value	Low negative	No change	Negligible / Minor	Negligible	Negligible / Minor
Bridge Street Gate **PRN 13168**	Medium value	No change	No change	Negligible	Negligible	Negligible
Wolf Gate **PRN 13169**	Medium value	No change	No change	Negligible	Negligible	Negligible
Cardigan Station **PRN 15550**	Low value	Negligible / Low negative	No change	Negligible / Minor	Negligible	Negligible / Minor
Teifi Quay; Prince Charles Quay **PRN 31960**	Low value	No change	No change	Negligible	Negligible	Negligible
Mercantile Wharf **PRN 32009**	Low value	No change	No change	Negligible	Negligible	Negligible
Capel Sidan; St Julian's Chapel **PRN 40376**	Medium value	Negligible / Low negative	No change	Negligible / Minor	Negligible	Negligible / Minor
Bridge Street Cottages **PRN 46373**	Low value	No change	No change	Negligible	Negligible	Negligible
Cardigan Castle kiln **PRN 125636**	Low value	No change	No change	Negligible	Negligible	Negligible

Receptor Name and Reference No.	Sensitivity / Value	Magnitude of change during construction phase	Magnitude of change operational phase	Significance of effect during construction phase	Significance of effect during operational phase	Residual significance of effect after mitigation
St Mary's Foundry **PRN 129803**	Low value	Low negative	Negligible negative / Low positive	Negligible / Minor	Negligible / Minor	Negligible / Minor
Red Lion Inn **PRN 129804**	Low value	No change / Negligible negative	Negligible positive	Negligible	Negligible / Minor	Negligible / Minor
Cardigan Castle Green House Gardeners Cottage **NPRN 5250**	Low value	No change / Negligible negative	No change	Negligible	Negligible	Negligible
Cardigan Castle Pillbox **NPRN 270394**	Low value	No change	No change	Negligible	Negligible	Negligible
The Priory **NPRN 35163**	Low value	No change	No change	Negligible	Negligible	Negligible
No.42 St. Mary's St **NPRN 35219**	Low value	No change	Negligible positive	Negligible	Negligible / Minor	Negligible / Minor
Cardigan Harbour **NPRN 414093**	Low value	No change	No change	Negligible	Negligible	Negligible
Strand - Urban character area 8 **Archaeological potential (post-medieval)**	Low value	Low / Medium negative	No change	Minor	Negligible	Negligible / Minor
Strand - Urban character area 8 **Archaeological potential (medieval)**	Low value	Low / Medium negative	No change	Minor	Negligible	Negligible / Minor

7.15 References

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8 Landscape Character and Visual Amenity

8.1 Introduction

This chapter assesses the likely significant effects arising from the construction and operation of the Scheme on landscape character and visual amenity. This chapter details the baseline environment, assessment of likely significant effects, and where necessary, mitigation measures to avoid, reduce or minimise significant effects are proposed.

This chapter should be read alongside Chapters 1-4 (Introduction, Project Development, project description, and EIA Methodology). In addition, this chapter should also be read in the context of the following topic chapters due to potential interactions between topics:

- Chapter 5: Population and Human Health
- Chapter 7: Historic Environment
- Chapter 12: Cumulative Assessment.

This chapter should be read in conjunction with the following appendices:

- Appendix 8.1: LVIA Methodology
- Appendix 8.2: Landscape and Visual Assessment Tables
- Appendix 8.3: Photographic Record.

8.2 Competent expert evidence

This chapter has been prepared by Chartered Landscape Architects at Binnies:

- Senior Landscape Architect Heather Goodrick CMLI with over 12 years' experience including multiple LVIAs focussing on flood defence projects.
- Senior Landscape Architect Theresa Dendy CMLI.

Refer to the full Statement of Competency for further details.

8.3 Planning policy and legislative context

This section describes the relevant legislation, policy and guidance that has been considered in developing the Scheme design, and in the assessment of effects with respect to landscape character and visual amenity. This legislation, policy and guidance have been reviewed and where applicable has informed the assessment through the identification and categorisation of sensitive receptors, requirements for mitigation, and the scope and/or method of assessment.

8.3.1 International and National Policy

Planning Policy Wales

Planning Policy Wales (Edition 12, 2024) (PPW12) is published by the Welsh Government to promote the delivery of sustainable development and the well-being of Wales in line with legislation such as the Planning (Wales) Act 2015 and the Well-being of Future Generations (Wales) Act 2015.

Placemaking is an important part of PPW12. Aspects of placemaking most relevant to landscape character and visual amenity as assessed in this chapter are the integration of public realm designs into the landscape, and maintaining the identity, cultural associations and distinctive qualities of a place including the natural and built environment. The layout, form, scale and visual appearance of developments should be integral to development design, as should a development's relationship to its surrounding landscape. A development should respond to its surroundings in terms of its site layout and fabric, movement, built form, materials use, biodiversity and soundscape.

8.3.2 Local Policy

Ceredigion County Council Local Development Plan 2007-2022

The Ceredigion County Council Local Development Plan 2007-2022 (LDP) contains strategies and policies that are highly relevant to landscape and visual amenity which are summarised below:

- Policy DM17: General Landscape requires that development does not have a significant negative effect on the qualities and special character of the visual, historic, geological, ecological or cultural landscapes and seascapes of Ceredigion by causing significant visual intrusion, being insensitively sited, introducing incompatible features or not being harmonious with the landscape, or by loss of traditional or important features. Where possible, development should enhance the qualities and special character of the landscape.

- Policy DM18: Special Landscape Areas (SLAs) requires that proposals for development within SLAs are assessed in relation to scale and nature of development and their ability to be accommodated without significant damage to, and where possible the enhancement of, the valued visual, historic, geological, ecological and cultural characteristics of the SLA.

- Policy DM19: Historic and Cultural Landscape requires that development does not significantly negatively affect the distinctive appearance, architectural integrity or setting of landscapes or buildings which are of historical or cultural importance.

Supplementary Planning Guidance documents ABERTEIFI/CARDIGAN Conservation Area Appraisal, and Special Landscape Areas, are also relevant and describe the special characteristics and features of Conservation Areas and SLAs respectively.

8.4 Assessment guidance

The following guidance documents were used in this assessment, as described in the Methodology (Appendix 8.1):

- Guidelines for Landscape and Visual Assessment (Third Edition) (GLVIA3)
- Landscape Institute Technical Guidance Note (TGN) 06/19: Visual Representation of Development Proposals, Landscape Institute, September 2019 (under review from January 2024).
- NRW guidance note 46 (GN46): Using LANDMAP in Landscape and Visual Impact Assessments (NRW, updated March 2023)
- An Approach to Landscape Character Assessment, Natural England, 2014
- LITGN-2024-01 (Landscape Institute, August 2024): Notes and Clarifications on aspects of the 3rd Edition of Guidelines on Landscape and Visual Impact Assessment.

8.5 Consultation

In relation to landscape character and visual amenity, Ceredigion County Council (CCC) were consulted in January 2025 in relation to the scope of the assessment, the selection of viewpoints, the methodology, and the extent of the LVIA study area. CCC responded requesting an additional viewpoint to those originally suggested, from the south bank of the River Teifi (Afon Teifi) near Cardigan Bridge. This viewpoint was added (viewpoint 10). Apart from this additional viewpoint, CCC commented '*We are satisfied with the radius of the viewpoints and consider that the works are unlikely to impact upon any viewpoint at a greater distance than No.13.*' No comments were received on the scope of the assessment, methodology, or extent of the LVIA study area.

A detailed list of all consultation undertaken in relation to this ES can be found in Chapter 4 EIA Methodology.

8.6 Scoped in receptors and potential effects

An EIA Scoping Opinion was provided by the Local Planning Authority in December 2023. An update to that Scoping Opinion was provided on the 16th October 2025. It was agreed that landscape character and visual amenity be scoped in, and that the methodologies provided, and used within this chapter, were appropriate.

The landscape character and visual amenity topic was scoped into the EIA due to the potential for likely significant effects during the construction and operational phases of the Scheme. The key landscape and visual changes associated with the Scheme include the construction of a flood defence wall and rock roll riverbank along the north bank of the Afon Teifi, changes to the riverbank footprint and mudflat extent, alterations to the existing plateau area beneath Cardigan Castle, and public realm improvements along Strand including paving, planting and street trees. During construction temporary impacts would arise from construction plant, site compounds, haul routes and temporary sheet pile structures.

Tables 8-1 and 8-2 outline the likely significant effects which are to be assessed within this chapter, as described in the EIA Scoping Opinion.

Table 8-1 Scoped in Likely Significant Effects (construction)

Environmental Effect	Receptor
Change to landscape character during construction from the introduction of new elements such as site compounds and access routes, welfare facilities, hoarding, construction plant, material storage or stockpiling, or from removal of buildings, trees or vegetation to construct the Scheme.	LCA1 Cardigan urban area (host character area) LCA2 River and intertidal habitat (host character area) LCA4 Southern enclosed slopes (intervisible with the Scheme at a distance of 180m).
Change to visual amenity during construction from the addition of site compounds and access routes, welfare, hoarding, construction plant, material storage or stockpiling; or from the appearance of the flood defence wall before final finishes are applied. Where buildings, trees or vegetation are removed to enable construction, currently hidden views could be opened up, or hoarding or other construction activities could block views.	Local residents Occupiers of buildings used for employment Pedestrians, cyclists and road users Visitors to attractions, such as the Cardigan Castle and Gardens Members of the public enjoying hospitality and public amenity locations Individuals and groups using the river Individuals and groups participating in outdoor leisure activities, such as walking and running, especially those using Public Rights of Way (PRoW) or the Wales Coast Path.

Table 8-2 Scoped in Likely Significant Effects (operation)

Environmental Effect	Receptor
Change to landscape character during operation from the introduction of new elements and materials to build the flood defence Scheme or associated public realm enhancements, or from the removal or degradation of an element or feature which formed a key part of the character of the area. There could be a change in appearance of the river corridor resulting from hydrological change as a result of the Scheme.	As construction receptors

Environmental Effect	Receptor
Change to visual amenity during operation from the introduction of new elements and materials to build the Scheme or associated public realm enhancements, or from blocking or limiting of existing views. There could be a change in appearance of the river corridor resulting from hydrological change as a result of the Scheme.	As construction receptors

8.6.1 Landscape Character

As described in the methodology (see Section 8.7 and Appendix 8.1), the study area has been divided into appropriately-scaled Landscape Character Areas (LCAs) by the Landscape Architect and these are shown on Figure 8.1 Landscape Character. Areas which may experience likely significant effects to their landscape character as a result of the Scheme are scoped into the assessment and are noted below:

- LCA1 - Cardigan urban area (host character area)
- LCA2 - River and intertidal habitat (host character area)
- LCA4 - Southern enclosed slopes (intervisible with the Scheme at a distance of 180m).

LCA3 and LCA5 have been scoped out of the assessment due to distance from the Scheme, very limited intervisibility with the Scheme, and views of Cardigan not being a key feature of their character.

Impacts on the Pembrokeshire Coast National Park have been scoped out of this assessment; at a distance of 2.9km the National Park is not likely to experience significant impacts as part of the Scheme. In their 2025 Scoping Opinion Addendum, NRW Development planning Advisor commented: '*The National Park boundary lies approximately 3km away to the west and north-west at its closest points. We do not consider there is likely to be an impact on the National Park at this distance*.'

8.6.2 Visual Amenity

Given the Scheme's location in the centre of Cardigan town, within an estuary and surrounded by elevated countryside, the range of receptors that could potentially experience visual effects from the Scheme is broad and includes the following:

- Local residents
- Occupiers of buildings used for employment
- Pedestrians
- Road users

- Visitors to attractions, such as the Cardigan Castle and Gardens
- Members of the public enjoying hospitality and public amenity locations
- Individuals and groups using the river
- Cyclists on National Cycle Network Routes
- Individuals and groups participating in outdoor leisure activities, such as walking and running, especially those using PRoW or the Wales Coast Path.

All of the above were identified as potentially experiencing a significant change in their views depending on their location and proximity to the Scheme.

8.7 Methodology

A summary of the methodology is provided in this chapter with full detail in Appendix 8.1.

The purpose of this section is to describe how likely significant effects relating to landscape character and visual amenity have been assessed. Further detail on this methodology can be found in Appendix 8.1, which differs from that used for other EIA topics. In line with GLVIA3, a key part of the assessment of effects on landscape character and visual amenity is the application of professional judgement, applying a qualitative judgement rather than measurable parameters which apply to other EIA topics. In line with GLVIA3, judgements regarding magnitude are derived from several factors, and not only from the extent of a receptor affected, thereby differing from the methodology for other ES topics (which is described in Chapter 4: EIA Methodology). Similarly, judgements regarding receptor sensitivity in LVIA are made using combined judgements of susceptibility and value, which differs from other ES topics. Chapter 4: EIA Methodology explains that ES topic chapters may use slightly different judgement criteria or terminology depending on the industry best practice guidance utilised, and that where criteria and terminology do vary, this is outlined within the topic chapter. Definitions of duration of effects are the same as for other ES topics.

8.7.1 Definition of study area

As explained in Chapter 4: EIA Methodology, the study area is specific to topic chapters. The study area for LVIA was established using guidance in GLVIA3 and GN46 (NRW, updated March 2023). An initial search area was first set at 3km, as although the Scheme is of low vertical elevation, there is surrounding high ground from which the Scheme could be visible. A Zone of Theoretical Visibility (ZTV) was undertaken for this 3km search area, which shows where the Scheme would theoretically be visible from. The study area was then derived from the landscape character areas falling within (or partly within) the 3km search area, and which have intervisibility with the Scheme as shown on the ZTV (see Figure 8.2).

The resultant study area is shown on Figure 8.1 Landscape Character. This process results in a study area which is a combination of the wider landscape around the Scheme which may be influenced in a significant manner and extent of the area from which the Scheme is potentially visible.

8.7.2 Baseline information

The baseline for consideration of landscape and visual effects was gathered through desk study (including LANDMAP analysis, national landscape character and marine character assessments and ZTV analysis) and a site visit by the Landscape Architects. The site visit was undertaken on 11th and 12th February 2025 by Heather Goodrick CMLI and Theresa Dendy CMLI.

The first stage of understanding the visual amenity baseline was the establishment of the ZTV (Figure 8.2), which shows the areas from which the development is theoretically visible. Analysis of the ZTV informed identification of the 'visual receptors', as well as aiding viewpoint selection and indicating the development's potential influence on the wider landscape.

Photographs showing views from a number of representative viewpoints were taken to record the visual baseline, and all photographic viewpoints are located within areas shown to have visibility in the ZTV. Viewpoints frequented by members of the public, such as from PRoW or settlements, as well as viewpoints from which the proposed development is likely to be prominent, are favoured as they are likely to represent a greater concentration of potentially affected users. Baseline photographs and Type 1 visualisations (annotated viewpoint photographs) are used to inform the appraisal process.

For landscape character, in the absence of a published landscape character assessment at a local level, the study area has been divided into appropriately-scaled Landscape Character Areas (LCAs) by the Landscape Architect.

8.7.3 Significance

The significance of landscape or visual effects has been determined by a consideration of the sensitivity of the receptor and the magnitude of change and is assessed as major, major-moderate, moderate, moderate-minor, minor, minor-negligible or negligible, as described in Appendix 8.1.

Landscape and visual effects can be positive or negative and, in some instances, may be considered neutral. Neutral effects are those which overall are neither negative nor positive but may incorporate a combination of both.

Sensitivity

For assessing landscape effects sensitivity is a combination of the landscape receptor's susceptibility to the type and nature of change and the value attached to the landscape receptor. For visual effects sensitivity is a combination of the susceptibility of the visual receptor and the value attached to particular views.

Magnitude of Change

The magnitude of landscape or visual change arising from the proposed development at any particular location has been assessed in terms of its size or scale, geographic extent of the area or receptor that is influenced and its duration and reversibility.

Significance

Where the effect has been classified as Major or Major/Moderate this is considered to be equivalent to likely significant effects referred to in the EIA Regulations. Where Moderate effects are predicted, professional judgement has been applied case-by-case to determine whether they constitute likely significant effects in the context of the EIA Regulations.

8.8 Baseline environment and likely future evolution

The section below describes the baseline environment and its likely future evolution. The current baseline environment scenario refers to the current state of environmental characteristics within the Scheme Area. The description of the likely future evolution of the baseline addresses how current conditions are expected to change without the Scheme, including consented developments that are not yet present in the landscape but are expected to be constructed.

8.8.1 Landscape designations and value

Set out below are the landscape designations relevant to the Scheme. Heritage designations that are most relevant to the landscape and visual assessment are noted as they can affect the sensitivity of a receptor or the value attached to a receptor, or affect the character of an area, and therefore affect this assessment. For an assessment of impacts on heritage designations in their own right, refer to the Chapter 7: Historic Environment.

Landscape designations

Cardigan is located approximately 2.9km east of Pembrokeshire Coast National Park. National Parks are a landscape designation at a national level, aimed at protecting the highest quality landscapes in the country. However, at a distance of 2.9km, it is not considered likely that Pembrokeshire Coast National Park would be impacted by the Scheme, and it is therefore not discussed further.

The Scheme is located on the periphery of Special Landscape Area (SLA) 7: Teifi Valley as defined by Ceredigion County Council, which is a non-statutory landscape designation. SLAs are protected through local planning policy, the key policy of relevance being DM18: Special Landscape Areas (Ceredigion County Council, 2024), as described in Section 8.3. SLA7 is shown on Figure 8.1 Landscape Character and is defined for its distinctive and coherent sinuous river valley and wooded tributaries, with the Cors Caron raised mire at its head and a number of international and national nature conservation designations along its length. The SLA description does account for the character of the river valley changing as it passes through Cardigan where it is constricted by the urban surroundings, and also for being open with mudflats downstream of Cardigan. Incised valley sides to tributaries dominated by woodland, some small settlements and farms, and a sense of enclosure, are described as being characteristic upstream of Cardigan. SLA7 is assessed in this chapter as a receptor.

A small number of trees have been identified within the Scheme Area, the majority of the area is designated as a conservation area therefore trees are protected. There are no Tree Preservation Orders within the Scheme Area.

Heritage designations

The likely significant effects upon heritage designations as receptors are assessed in Chapter 7: Historic Environment and are not described in this chapter. However, heritage designations can influence the landscape character baseline and/or the value attached to landscape character or people's views, and are described for this reason in this chapter.

Except for the Gloster Row Car Park, the Scheme lies on the periphery of Cardigan Conservation Area, the boundary of which runs along the mean high water mark on the Afon Teifi. Key features of the Conservation Area are described as the prevalence of historic buildings, the medieval street layout, the prominent Cardigan Castle and historic importance of the Afon Teifi. There is a further Conservation Area within the study area, at St Dogmaels, 1.2km west of the Scheme Area.

There are three Scheduled Monuments within the immediate vicinity of the Scheme. Cardigan Bridge is located on the western edge of the Scheme Area and is both a Scheduled Monument and a Grade II* Listed Building (LB Ref. 10456). Cardigan Castle, adjacent to the Scheme Area in the north-west, is a Scheduled Monument, Grade I Listed Building (LB ref.10458), and Grade II Registered Historic Park and Garden (Parks and Gardens Register Number: PGW (Dy) 72(CER)). Cardigan Town Walls Scheduled Monument (the remains of two stretches of defensive town wall) is located 100m east of the Scheme Area.

There are a further 31 listed buildings within 100m of the Scheme Area. Four of these are Grade II* listed. These include Castle Green House (LB Ref.10459) approximately 80m north of the Scheme Area, The Parish Church of St Mary (LB Ref.10476), a church with 12th century origins lying 70m to the northeast of the Scheme Area, No.7 St Mary's Street (LB Ref. 10529), a late 18th or early 19th century gentry house, which lies 90m to the northwest of the Scheme Area, and Avondale (LB Ref. 10539) which fronts St Mary's Street 60m to the north of the Scheme Area.

The remainder of the listed buildings are Grade II listed, the majority being post-medieval structures along Bridge Street, St Mary's Street and Church Street associated with the expansion in the town during the 18th and 19th centuries.

The Scheme Area, and much of the historic core of Cardigan lies within the Lower Teifi Valley Landscape of Special Historic Interest (HLW(D)14). This area encompasses the lower Teifi valley from the estuary to the confluence with the Afon Cych and the area around Cenarth 16.5km upriver. Within this the Scheme Area lies within Historic Landscape Character Area (HLCA) 410 Cardigan, a character area drawn around the urban extent of Cardigan.

8.8.2 Landscape Character Baseline

Landscape character assessments exist at various scales. At a national level, Cardigan is situated in National Landscape Character Area (NLCA) 40: Dyffryn Teifi /Teifi Valley, and the Afon (River) Teifi is in National Marine Character Area (NMCA) 16: Bae Ceredigion (de)/Cardigan Bay (South). The Scheme sits on the border of these two character areas.

National Landscape Character Area (NLCA) 40: Dyffryn Teifi /Teifi Valley: The NLCA explains how the estuary in which the town is located was formed and the town's historical character and

development. The historic settlement pattern still exists in the town, represented by the old stone bridge across the Afon Teifi (Cardigan Bridge) and main roads following the bottom of the valley sides.

National Marine Character Area (NMCA) 16: Bae Ceredigion (de)/Cardigan Bay (South): The NMCA focuses on coastal waters. It describes how Cardigan is the meeting point for the Afon Teifi and the sea and how this is part of a wider SSSI and SAC designated river system. It also describes the maritime cultural and social influences on the landscape.

Teifi Estuary Seascape Character Area (Pembrokeshire Coast National Park SCA1) includes the tidal estuary from Cardigan Bridge and west through the valley to the open water of Cardigan Bay. As a smaller character area than NLCAs and NMCAs, it provides a more focussed description of the estuary on its approach to Cardigan. It describes the estuary as having natural scenic beauty modified by historic coastal settlement. Relevant characteristics of the area include the mature deciduous trees lining the estuary west of Cardigan around St Dogmaels, contained views in the estuary, many moorings and slipways and activity on the water and the built waterfront at Cardigan.

As described in the Methodology, these character areas are considered too large-scale to form receptors in their own right, and, in the absence of a published landscape character assessment at a local level, the landscape architect has defined Landscape Character Areas (LCAs) on which to assess the impacts of the Scheme. The LCAs identified within the study area are shown on Figure 8.1 Landscape Character, and the baseline character of the three LCAs scoped into the assessment are described in Table 8-3.

Two of the character areas, LCA1 Cardigan urban area and LCA2 River and intertidal habitat, lie partially within the Scheme Area and are both identified as host character areas. LCA1 Cardigan urban area extends to the north and south of the Scheme, whilst LCA2 River and intertidal habitat extends along the Afon Teifi to the east as far as Teifi Marshes, and to the west as far as the Ceredigion coastline. Teifi Marshes lies at the end of the tidal reach of the Afon Teifi. LCA4 Southern enclosed slopes lies 180m south west of the Scheme, and has intervisibility with the Scheme as shown by the ZTV.

It is likely that in future the river level within the Teifi would rise due to climate change, changing the character of the river at low tide as it passes through Cardigan. Currently at low tide mudflats are exposed which are characteristic of the tidal range of the Afon Teifi, although these are inundated at high tide. In the future, exposure of these mudflats would become less frequent.

There are no consented developments considered likely to change the future character of the area. There is one major development consented within proximity of the Scheme, a proposal for the construction of a mixed-use development which includes office workspace, café, residential development, storage building and associated works, located at the former Cardigan and District Hospital Pont-y-cleifion to the east of the Scheme, on the eastern edge of Cardigan town (Application number: A240176). This development was not screened in to require EIA. The buildings proposed as part of this application are set back from the river, with the riverside area comprising soft landscaping. Apart from the historic core represented by Cardigan Conservation Area, riverside buildings through Cardigan as well as urban fringe developments are largely modern and constructed of a variety of building styles and materials; construction of consented development A240176 would not alter this baseline.

Table 8-3 Landscape Character Areas description

Landscape Character Area	Description	Distance from development
LCA1 - Cardigan urban area	Urban settlement comprising intact historic core with traditional building materials of slate and painted render. There is a strong medieval street pattern, based around Cardigan Castle on a promontory overlooking the river. The historic settlement is designated as Cardigan Conservation Area and there are other historic landmarks such as Cardigan Bridge, which is a Scheduled Monument along with the castle. Cardigan Castle is a key feature within the area, initially built with local stone and restored with Cilgerran slate and has strong cultural associations as the site of the first Eisteddfod. Buildings are close-knit, often facing straight onto the highway without front gardens. Modern commercial buildings on the settlement edge are not in keeping with the traditional historic core and detract from the integrity of the landscape; south of the river lies a commercial/industrial area, which does not have a cohesive built form but comprises a variety of construction materials including modern buildings and warehouses, which is mirrored in some warehouse style buildings north of the river, either side of the historic core. Housing developments are found to the north, and across the river to the south. The settlement is on gently sloping land in a valley bottom along the Afon Teifi, with which the town has a strong association, and there are some attractive views along the riverside, though marred by the industrial riverside development. The character is small-scale and enclosed due to built form, and views are generally short-range. The interface with the river is important, but the river is only visible from the immediate surrounding area; from elsewhere within the Cardigan urban area the interrelationship with the river is not apparent. The A487 forms a boundary between the urban area of Cardigan and the adjacent farmland to the east. The settlement continues on the south bank of the river, before the southern boundary of the LCA marked by steep pastoral slopes. This LCA is bisected by the river and intertidal habitat, which forms its own character area.	0m
LCA2 - River and intertidal habitat	Riverine environment comprising intertidal mudflats and coastal saltmarsh, and including the intertidal area within Teifi Marshes Nature Reserve. A low lying area, open with no settlements, though stone is used as an occasional	0m

Landscape Character Area	Description	Distance from development
	building material and varied floodwall construction detracts from the unity of the area. There are extensive, sweeping mudflats through which sinuous channels form in changing patterns, with mudflats inundated at high tide. There is a sense of tranquillity, remoteness and wildness, and a strong, distinctive character. There are attractive views out to the surrounding hills which form a backdrop to the area, but detractive views of corrugated metal warehouses and industrial style buildings at Cardigan and a caravan park north of the river. The character area supports several protected species and habitats but recreational pressure, coastal defences and climate change are potential threats to the habitats within the area. Upstream of Cardigan masses of reeds line the channel edges and cover the nature reserve. Through and downstream of Cardigan the reeds dissipate. Although at high tide the channel is constrained by walls on both sides as it passes through Cardigan, the intertidal character of the exposed mudflats is still present at low tide. Due to curves in the river alignment, not a high proportion of the river can be seen at any one time, until it widens out at the river mouth; until then views are mid-range.	
LCA4 - Southern enclosed slopes	A rural environment characterised by steep sided hills with incised valleys, small scale regular field pattern and the settlement of St Dogmaels, which has steep, narrow, winding roads with houses clustered closely together, and the motte (Old Castle Mound Scheduled Monument) visible amongst dwellings. A large part of St Dogmaels is designated as St Dogmaels Conservation Area, centred around the motte and including ribbon development along roads. Pembrokeshire County Council have not yet published a Conservation Area Appraisal for St Dogmaels Conservation Area to describe its special character and distinctiveness. Aside from St Dogmaels, settlement largely consists of farmsteads of varying scale and including some Listed Buildings. Fields are bounded by hedgebanks, intact hedgerows with trees and woodland is present in valley bottoms. The changing landform and in places dense woodland cover provides a sense of closeness and restricts views. There is little intervisibility with adjacent character areas, though there are occasional views out over the Teifi valley and estuary.	180m

Landscape Character Area	Description	Distance from development
	The southern boundary of this character area is marked by the change in topography, field pattern, vegetation typology and perceptual qualities of the plateau above the slopes. The urban settlement of Cardigan and the Afon Teifi form boundaries to the north.	

The sensitivity of each of these three LCAs as receptors is set out in Tables 8-4 to 8-6. As described in the Methodology, sensitivity of a receptor is derived from its susceptibility to change, and its value.

Table 8-4 Cardigan urban area sensitivity

Landscape receptor		
LCA1 - Cardigan urban area		
Susceptibility of receptor	**Value attached to the landscape**	**Sensitivity of the receptor**
Low	National	Medium
Rationale		
Cardigan urban area is judged to have a low susceptibility to change, as it is judged to be able to accommodate the type and nature of the Scheme. This is an urban landscape, with existing built form, including linear features, and a variety of construction materials, where views are generally short range, and the character is enclosed and contained. The value attached to this landscape is judged to be national, due to cultural associations, designated assets and intactness. The historic core of this area is defined as a Conservation Area, and contains the Scheduled Monuments of Cardigan Castle and Cardigan Town Walls. Cardigan Castle is also a Registered Park and Garden and Listed Building, and there are several other Listed Buildings within the area. There are cultural associations with the arts, with Cardigan the first host of the national Eisteddfod festival. The character of the historic core is fairly intact and distinctive, though incongruous elements increase away from the historic centre, and towards the edges of the character area. The combination of low susceptibility and national value means that this receptor has medium sensitivity.		

Table 8-5 River and intertidal habitat sensitivity

Landscape receptor		
LCA2 - River and intertidal habitat		
Susceptibility of receptor	**Value attached to the landscape**	**Sensitivity of the receptor**
High	National	High

Landscape receptor
Rationale
The river and intertidal habitat is a large scale, flat and open landscape with mid-range views and a sinuous form, in which a linear built structure may be highly visible and appear out of place. There is little existing built form in the area. The landscape is judged to be highly susceptible to change from the type and nature of the proposed development. The landscape is locally designated for the value and importance of its landscape through Special Landscape Area (SLA) 7 and also boasts several natural heritage designations for ecological and geomorphological interest. Supplementary Planning Guidance: Special Landscape Areas (Ceredigion County Council, adopted 2014) identifies that impacts upon estuarine habitats and landscape is a key issue that could affect this SLA. The river has a strong cultural influence on the surrounding land that it borders, including the settlement of Cardigan. The landscape is largely intact, in good condition with few incongruous elements. It is a distinctive feature within views which are an important part of the experience of recreation and amenity, including from the Wales Coast Path. The landscape is tranquil and contains limited evidence of human intervention, and forms an important blue infrastructure function. The value of this landscape is therefore judged to be national. The combination of high susceptibility and national value means this receptor has high sensitivity.

Table 8-6 Southern enclosed slopes sensitivity

Landscape receptor		
LCA4 - Southern enclosed slopes		
Susceptibility of receptor	**Value attached to the landscape**	**Sensitivity of the receptor**
Medium	Regional	Medium
Rationale		

Landscape receptor
The Southern enclosed slopes are considered to have a medium susceptibility to change from the type and nature of the proposed development. This is a small scale landscape with an intimate character, containing a mix of some built form and rural landscape. Whilst built structures are present, they are not large scale and a long, linear feature may therefore appear out of place. Furthermore, built features are traditional in form and the area does not contain a wide variety of built vernacular. Part of the area is defined as St Dogmaels Conservation Area. Views however are short range due to the contained nature of the landscape. The value attached to this landscape is judged to be regional. The landscape includes the Old Castle Mound at St Dogmaels and some Listed Buildings contribute to the cultural heritage value. The landscape is intact and coherent, though is not notably rare. Experience of the landscape is important for recreation and amenity, and the landscape is peaceful with some areas of remoteness away from settlement. The combination of medium susceptibility and regional value means that this receptor has medium sensitivity.

SLA7 is also assessed in this chapter as a receptor. The sensitivity of SLA7 is set out in table 8-7.

Table 8-7 SLA7: Teifi Valley sensitivity

Landscape receptor		
SLA 7: Teifi Valley		
Susceptibility of receptor	**Value attached to the landscape**	**Sensitivity of the receptor**
High	Regional	High-Medium
Rationale		
As a landscape formed by natural processes, SLA7 is considered highly susceptible to change from the introduction of built form. Key characteristics of the SLA are the sinuous river valley with open mudflats downstream of Cardigan, incised valley sides to tributaries with wooded slopes, and lack of built form though there are some small settlements and farms. In this context, linear built form would be out of place and it is not considered that the landscape could absorb it without undue impacts. As a non-statutory designation, SLA7 is considered to be of Regional value. The combination of high susceptibility and regional value means this receptor has high-medium sensitivity.		

8.8.3 ZTV and the Visual Envelope

The Zone of Theoretical Visibility (ZTV) is shown on Figure 8.2 and has been used to aid the identification of those receptors that are likely to be most affected by the Scheme. An explanation of how the ZTV was derived is provided in the Methodology (Appendix 8.1).

The ZTV model shows that the main area of visibility is contained within the river corridor due to the Scheme's location in a built up urban area, where built form provides screening. This includes visibility from bridges crossing the river, and from the river banks.

The ZTV model is unable to show visibility through the underneath of bridges as the bridges are interpreted as solid shapes. Site verification confirmed that there are clear views from the east of Priory Bridge at the east end of the Scheme, but the structure of Cardigan Bridge to the west of the Scheme restricts views under it.

The model indicates partial views from fields to the southwest of Cardigan due to elevation, in areas where there is an absence of vegetation and buildings to impede views.

To the east of Cardigan as far as 3km away in limited locations the model indicates limited areas in fields where the Scheme would be visible, but from such a distance, given the height of the Scheme, it is unlikely that it would be easily discernible.

The ZTV shows small dots of visibility along field boundaries and within the town. These dots mark the location of trees. Due to their height the model identifies these locations as areas of visibility but have been discounted in our analysis.

8.8.4 Visual Receptors

Visual receptors are "*the different groups of people who may experience views of the development*" (GLVIA, 3rd edition, para 6.3). In order to identify those groups who may be significantly affected the ZTV study, baseline desk study and site visits have been used.

As described in the Methodology (Appendix 8.1), receptors have been grouped to aid the assessment. The receptor groups in Table 8-8 are located within the study area and are likely to have visibility of the Scheme, as shown on the ZTV (Figure 8.2).

Table 8-8 Visual receptor groups

Receptor group	Description of view(s)	Approximate distance from Scheme
Residents of homes on Church Street and Strand on the north bank of the Afon Teifi	Properties are set back from the river, with gardens and (in the case of Church Street residents) Gloster Row car park between properties and the river. Vegetation and garden boundaries partially obscure views across the river. A limited number of residents have clear views to the river from gardens, with Pentood industrial estate visible on the opposite bank.	0-50m

Receptor group	Description of view(s)	Approximate distance from Scheme
Indoor users of buildings on the north bank of the Afon Teifi	The bathroom centre (including its offices) and the boat house have views looking directly on the river. The scout hut has oblique views onto the river. There are two industrial sheds adjacent to the river with no windows.	<5m
Users of recreational open spaces on the north bank of the Afon Teifi	The open spaces along the north bank (field of scout hut and boathouse; and Gloster Row car park) have uninterrupted views of the river in close proximity, with Pentood industrial estate visible on the opposite bank. From Gloster Row car park, there are long-range views east along the river corridor toward Teifi Marshes.	0-20m
Pedestrians on Strand, Cardigan footbridge, Bridge Street and Prince Charles Quay	From Cardigan footbridge there are long-range views east along the river corridor toward Teifi Marshes. From Strand and Bridge Street pedestrians have views of the river over the existing low slate wall that follows the pavement on Strand and along the north bank towards Gloster Row car park. From Prince Charles Quay and the Grosvenor pub views are limited to the stretch between Cardigan Bridge and the bus stop on Strand. In all cases the river is seen with the backdrop of Pentood Industrial Estate and rising hills on the opposite bank; and in context of other built form on the north bank including Cardigan Castle and Bridge.	0-30m
Visitors to Cardigan Castle and Gardens	Visitors have glimpsed views towards Priory Bridge in the distance, Gloster Row car park and the north riverbank adjacent to the car park; and Strand between the Bathroom Centre and Cardigan Bridge. The rest of the north bank is obscured by vegetation and buildings.	30m
Residents of homes on Station Road on the south bank of the Afon Teifi	Properties are set back from the river, with localised views of the river visible between intervening industrial buildings and vegetation. Cardigan Castle is visible in the background.	>100m
Workers in industrial units on the south bank of the Afon Teifi	Occupiers of units have direct uninterrupted views across the river to the north bank (dependent on working in a building with windows or working outside). The urban area of Cardigan is visible on the north bank.	>80m

Receptor group	Description of view(s)	Approximate distance from Scheme
Pedestrians and cyclists on riverside routes	Users of NCN along the south bank have direct views across to the north bank of the Afon Teifi between Cardigan Bridge and Priory Bridge, and long range views along the river corridor. Views become more oblique moving west from Priory Bridge. Priory Bridge is a raised vantage point affording a clear view of the entire length of the Scheme from Gloster Row car park to Cardigan Bridge.	>75m
Road users	From Cardigan Bridge and Priory Bridge there are uninterrupted views of the north bank of the river, including existing slate walls. From Strand and Bridge Street, road users have views over the existing slate wall of the river (albeit broken by a metal railing fence and along the north bank towards Gloster Row car park.	2m-170m
Individuals and groups using the river	Users of the river have mid range views east and west along the river corridor as far as bends in the river in either direction. Users of the river are at a lower elevation than other receptors, with existing river walls visible on both banks as users pass by Cardigan urban area (relative height depending on the tide), with the built form of Cardigan visible above eye level.	0-80m
Users of the Wales Coast Path	Views range from immediately adjacent the Scheme Area as the Coastal Path passes over Cardigan Bridge footbridge and along Bridge Street, to distant views from high ground to the west.	2m-400m
Users of Ceredigion Coast Path and other PRoW in the wider area	There are distant and glimpsed views of the Scheme Area from PRoW east and south of Cardigan. PRoW along with other recreational routes are shown on Figure 5.2 and described in Chapter 5 Population and Human Health.	400m-2.5km
Residents of properties on Pont-y-Clefion (receptor for construction effects only)	Residents of properties on Pont-y-Clefion do not have intervisibility with the operational Scheme as shown by the ZTV, however they are close to or overlooking the northern compound which is accessed off Pont-y-Clefion. Direct views from these properties would be of Pont-y-Clefion and traffic along this road, with the former Cardigan and District Hospital Pont-y-Cleifion development opposite; the properties do not directly face the compound location. The property closest to the compound location does however have side windows which would overlook the compound.	0-150m

The sensitivity of each of these receptors is set out in Table 8-9. As described in the Methodology, sensitivity of a receptor is derived from its susceptibility to change, and its value.

Susceptibility of visual amenity receptors is as defined in the Methodology:

- Local residents; users of footpaths; and people visiting Cardigan Castle and Gardens are defined as having high susceptibility.
- Local road users; and people engaged in outdoor recreation (other than pedestrians) are defined as having medium susceptibility.
- Users of indoor buildings are defined as having low susceptibility.

Table 8-9 Sensitivity of visual receptor groups

Receptor	Susceptibility	Value	Sensitivity
Residents of homes on the north bank of the Afon Teifi (Church Street and Strand)	High	Community	High-Medium
Indoor users of buildings on the north bank of the Afon Teifi	Low	Community	Low
Users of recreational open spaces on the north bank of the Afon Teifi	Medium	Community	Medium
Pedestrians on Strand, Cardigan footbridge, Bridge Street and Prince Charles Quay	High	National	High
Visitors to Cardigan Castle and Gardens	High	National	High
Residents of homes on the south bank of the Afon Teifi (Station Road)	High	Community	High-Medium
Workers in industrial units on the south bank of the Afon Teifi	Low	Community	Low
Pedestrians and cyclists on riverside routes	High	Regional	High-Medium
Road users	Medium	National	High-Medium
Individuals and groups using the river	Medium	Regional	High-Medium
Users of the Wales Coast Path	High	National	High
Users of Ceredigion Coast Path and other PRoW	High	Regional	High-Medium
Residents in properties close to or overlooking the northern compound	High	Community	High-Medium

8.8.5 Site Fabric baseline

Strand (Plate 8-1) is a busy one-way road located in the west of the Scheme Area, in the setting of Cardigan Castle. There is a bus stop at the eastern end near a bathroom centre, though no seating or shelter are provided. The tarmac footway along the left carriageway of Strand is constrained by an existing low slate wall, and at the western end the topography is steep.

Between the Afon Teifi and the Strand footway is a lower plateau, where public access is restricted by the low wall. The plateau surface is paved, with metal railings along the riverside edge, and has become overgrown. Adjacent the bathroom centre is a DCWW outfall asset. The inspection chamber associated with the outfall asset has been clad sensitively, similar to Cardigan Castle walls, however it is surrounded by utilitarian metal railings which are incongruous.

Buildings are present along the north bank in a varied range of construction materials (Plate 8-2), including the bathroom centre showroom which is clad in timber, white painted bathroom centre offices, two corrugated metal warehouses, a boat house painted in a prominent bright blue colour, a pebble-dashed scout hut and residential properties. Properties are built close together and have a maximum height of two storeys. There is a shared grassed field between the boat house and scout hut.

At the eastern end of the Scheme Area, Gloster Row car park is a small, tarmac car park providing parking for 23 cars. A small grassed area is present adjacent to the car park and is publicly accessible.

The river is at a lower level than the surrounding land, and is constrained by river walls as it passes the Scheme area. The river walls on the north bank appear to be built of dark grey slate, but are disjointed and varied in height, with gaps comprising bare ground or short grass. The river bed has extensive mudflats (Plate 8-1), inundated at high tide.

Plate 8-1: view of Cardigan Castle and Bridge from the south bank, with Strand visible in front of the castle. Mudflats are exposed at low tide.

Plate 8-2: view of the north bank from Priory bridge, showing the mix of built form. Cardigan Castle and Bridge are visible downstream.

8.9 Assessment of effects

This section describes the outcomes of the assessment, identifying the likely significant effects on landscape character and visual amenity. Where the effect has been classified as Major or Major/Moderate this is considered to be equivalent to likely significant effects referred to in the EIA Regulations. Where likely significant effects are reported, additional mitigation and residual effects are discussed in Sections 8.10 and 8.11. Cumulative impacts are addressed in Chapter 12: Cumulative Effects.

The Scheme design includes embedded landscape and visual mitigation measures and the assessment presented in this chapter reflects the Scheme design with embedded mitigation incorporated. Section 8.10 identifies any additional mitigation that could further reduce effects but which is not currently embedded in the Scheme design. Landscape and visual mitigation embedded in the Scheme design is:

- Slate cladding to the flood defence wall in a material and bond pattern to match Cardigan Castle, providing a coherent cladding pattern whilst being in keeping with local character and context.
- Use of engineered concrete coping to reduce the flood defence wall height compared to use of natural stone coping. Natural stone coping would have needed to be laid above flood defence level; whereas the engineered coping can form part of the flood defence.
- Seeding of the upper riverbank slope and crest with a locally characteristic estuarine seed mix to reduce the visual impact of the flood defence when viewed from the riverward side, by breaking up the vertical mass of the defence and providing a softening effect.
- Public realm enhancements along Strand incorporating slate paving to tie in with paving used at adjacent Prince Charles Quay and Cardigan Castle entrance; street trees; and planting beds. These measures would be positive changes providing compensation, and the taller planting would break up the mass of the flood defence wall as viewed from Strand, reducing its visual impact.
- Setting the flood defence wall back from the road at Strand to reduce the loss of wide views.
- Removal of incongruous utilitarian railings around an existing riverside plateau would be a positive change, providing compensation.

8.9.1 Effects on Site Fabric

During operation, the northern riverbank would be formed of the flood defence, consisting of an approximately 3m high engineered riverbank to which rock rolls are attached to the lower 2.4m, with a vegetated upper 0.6m. The upper vegetated slope would be seeded with an estuarine and salt tolerant seed mix. The lower 2.4m would not be vegetated as part of the Scheme, although sediment from the river is expected to be washed into the rock crevices over time, and is expected to form a habitat of seaweeds and lichen on littoral mud, similar to that

found on both banks downstream of Cardigan Bridge. A flood defence wall would be visible on top of the engineered riverbank, and would be clad in slate similar to Cardigan Castle. This differs from the existing riverbank, with its incoherent mix of various height walls, mud and shingle, grass banks and ledges, boat access ramps and vegetation from adjacent gardens.

Along Strand between Cardigan Bridge and the bathroom centre, public realm enhancements would provide a positive change to a currently unmaintained lower plateau area consisting of paving and self-set buddleia enclosed on the southern side by municipal railings. The highway pavement alongside this is black tarmac. As part of the Scheme the pavement would be widened, and the resulting area paved in slate for consistency with surrounding material use at Prince Charles Quay and Cardigan Castle. Street trees would be planted along the roadside and planted beds would separate pedestrians from the busy road. The estuarine and salt tolerant seed mix used on the upper riverbank slope would also be used on the remaining section of plateau on the riverward side of the defence, for consistency.

At Gloster Row car park there would be a loss of car park space as the flood defence wall is realigned away from the river, allowing more space for estuarine habitats on the riverward side. There would be a loss of a small area of green space to the east of the current car park; this along with separation from the river would give a more urbanised feel to the car park.

8.9.2 Effects on Landscape Character

The detailed assessment of effects for each landscape character area is set out in Appendix 8.2. The summary of sensitivity, magnitude and significance presented in Tables 8-10 and 8-11 are derived from those detailed judgements.

Table 8-10 Construction effects on Landscape Character Areas

Receptor	Sensitivity	Magnitude	Significance	Positive/negative
LCA1 Cardigan urban area	Medium	Slight	Moderate-Minor (not significant)	Negative
LCA2 River and intertidal habitat	High	Moderate	**Major-Moderate (significant)**	Negative
LCA4 Southern enclosed slopes	Medium	Negligible	Minor-Negligible (not significant)	Negative

Table 8-11 Operational effects on Landscape Character Areas

Receptor	Sensitivity	Magnitude	Significance	Positive/negative
LCA1 Cardigan urban area	Medium	Slight	Moderate-Minor (not significant)	Negative
LCA2 River and intertidal habitat	High	Moderate	**Major-Moderate (significant)**	Negative
LCA4 Southern enclosed slopes	Medium	Negligible	Minor-Negligible (not significant)	Negative

For two of the three assessed character areas, LCA1 Cardigan urban area and LCA4 Southern enclosed slopes, both the construction and operational effects are judged to be not significant.

For LCA1 Cardigan urban area, this is largely due to the surrounding context of built form, the contained nature of the area, and, during operation, the use of a cladding appropriate to the local environment. For LCA4 Southern enclosed slopes, the distance from the Scheme means that effects are indirect only. As the likely effect on these two character areas is judged to be not significant, they are not discussed further within this chapter. The impact on receptors which are expected to experience likely significant effects are further described below.

Effects on the character of SLA7: Teifi Valley have also been assessed. During construction, SLA7 would experience disturbance to tranquillity and peacefulness from construction machinery, and large scale plant breaking up the open nature of the river around the location of the Scheme. The key characteristics relating to incised wooded tributaries, or settlement pattern would not be altered. The scale of change is considered to be small as there would be little change to features or characteristics forming the purpose of the designation. Cors Caron raised mire at the SLA's east end is far removed from the Scheme, and impacts would be limited in extent. Combined with a short term duration of these construction effects, the resultant magnitude of effect during construction would be Negligible, and the resultant significance Minor, i.e. not significant.

During operation, SLA7 would experience change to its northern boundary as it passes through Cardigan, due to the introduction of the flood defence. This would form a higher boundary than at present, and the defence footprint would encroach into the river compared to the present situation. However, the SLA description acknowledges that the settlement of Cardigan already applies squeeze upon the river, and consequently the character of the river corridor through Cardigan already departs from the character of the river corridor elsewhere in the SLA. Cardigan is viewed as a 'change point' within the SLA description, with the character of the SLA varying considerably upstream compared to downstream of Cardigan. It is therefore considered that during operation the Scheme would have a Negligible scale of effect on SLA7. As with construction effects, this would be experienced over only a limited extent of the SLA, resulting in a Negligible magnitude of effect. The resultant significance Minor, i.e. not significant.

Likely significant effects during construction

One character area, LCA2 River and intertidal habitat, has been identified as having a likely significant effect during both construction and operation. During construction, a large scale of change is expected from disturbance to tranquillity from construction plant, disruption to the flat, open nature of the river through construction activities, and from incongruous construction materials until the final finishes to structures are installed. The temporary haul road would extend into the river, limiting the presence of the intertidal mudflats which are a key feature of the area. These changes would affect an intermediate extent of the character area.

The duration of effect would be short term, and the resulting magnitude moderate. As described in the Baseline section 8.8, the sensitivity of this receptor is judged to be high, which when combined with a moderate magnitude of change results in a significance of major-moderate during construction, i.e. a significant effect. The effect would be negative.

Likely significant effects during operation

During operation, LCA2 would experience a medium scale of change from the widened flood defence footprint and associated loss of mudflats which are a key characteristic of this character area and from the new feature of the rock rolls, particularly of the mesh enclosing the installed rock rolls which would appear out of place. It is noted however that the change to a consistent defence design as part of the Scheme would provide a positive change when compared to the existing incoherent mix of defence styles and materials; as would limiting intervisibility with existing modern inconsistent built form on the north bank of the river, particularly corrugated metal warehouse-style buildings, through screening provided by the flood defence. In contrast to the construction period, these changes during operation would only affect a localised extent of the character area, as the footprint of the permanent works is smaller than that of the construction working area, and the Scheme during operation would be passive and not affect tranquillity of the wider character area. The effect would however be permanent; although the appearance of the rock rolls would soften over time it is not considered that this would reduce the magnitude of the change.

As a result there would be a medium scale of change over a localised extent of LCA2. The duration of effect would be permanent, and the resulting magnitude moderate. The high sensitivity of the receptor, combined with the moderate magnitude of change, results in a significance of major-moderate during operation, i.e. a significant effect. The effect is overall judged to be negative, despite the Scheme resulting in some positive and some negative impacts on this character area during operation.

8.9.3 Effects on Visual Amenity

The detailed assessment of effects for each visual receptor group is set out in Appendix 8.2. The summary of sensitivity, magnitude and significance presented in Tables 8-12 and 8-13 are derived from those detailed judgements.

Table 8-12 Construction effects on visual amenity receptors

Receptor	Sensitivity	Magnitude	Significance	Positive/ negative
Residents of homes on the north bank of the Afon Teifi	High-Medium	Moderate	**Major-Moderate (significant)**	Negative
Indoor users of buildings on the north bank of the Afon Teifi	Low	Moderate	Moderate-Minor (not significant)	Negative
Users of recreational open spaces on the north bank of the Afon Teifi	Medium	Slight	Moderate-Minor (not significant)	Negative
Pedestrians on Strand, Cardigan footbridge, Bridge Street and Prince Charles Quay	High	Moderate	**Major-Moderate (significant)**	Negative

Receptor	Sensitivity	Magnitude	Significance	Positive/ negative
Visitors to Cardigan Castle and Gardens	High	Negligible	Minor (not significant)	Negative
Residents of homes on the south bank of the Afon Teifi	High-Medium	Slight	Moderate-Minor (not significant)	Negative
Workers in industrial units on the south bank of the Afon Teifi	Low	Moderate	Moderate-Minor (not significant)	Negative
Pedestrians and cyclists on riverside routes	High-Medium	Moderate	Moderate (not significant)	Negative
Road users	High-Medium	Moderate	Moderate (not significant)	Negative
Individuals and groups using the river	High-Medium	Moderate	**Major-Moderate (significant)**	Negative
Users of the Wales Coast Path	High	Slight	Moderate (not significant)	Negative
Users of Ceredigion Coast Path and other PRoW	High-Medium	Negligible	Minor-Negligible (not significant)	Negative
Residents in properties close to or overlooking the northern compound (receptor for construction effects only)	High-Medium	Slight	Moderate-Minor (not significant)	Negative

Table 8-13 Operational effects on visual amenity receptors

Receptor	Sensitivity	Magnitude	Significance	Positive/ negative
Residents of homes on the north bank of the Afon Teifi	High-Medium	Slight	Moderate (not significant)	Negative
Indoor users of buildings on the north bank of the Afon Teifi	Low	Moderate	Moderate-Minor (not significant)	Negative
Users of recreational open spaces on the north bank of the Afon Teifi	Medium	Substantial	**Major-Moderate (significant)**	Negative
Pedestrians on Strand, Cardigan footbridge, Bridge Street and Prince Charles Quay	High	Moderate	**Major-Moderate (significant)**	Neutral

Receptor	Sensitivity	Magnitude	Significance	Positive/ negative
Visitors to Cardigan Castle and Gardens	High	Negligible	Minor (not significant)	Positive
Residents of homes on the south bank of the Afon Teifi	High-Medium	Slight	Moderate-Minor (not significant)	Neutral
Workers in industrial units on the south bank of the Afon Teifi	Low	Moderate	Moderate-Minor (not significant)	Neutral
Pedestrians and cyclists on riverside routes	High-Medium	Moderate	Moderate (not significant)	Neutral
Road users	High-Medium	Moderate	Moderate (not significant)	Negative
Individuals and groups using the river	High-Medium	Moderate	Moderate (not significant)	Negative
Users of the Wales Coast Path	High	Slight	Moderate (not significant)	Neutral
Users of Ceredigion Coast Path and other PRoW	High-Medium	Negligible	Minor-Negligible (not significant)	Negative

For eight of the assessed visual amenity receptors, both the construction and operational effects are judged to be not significant. This is largely due to the urban context within which the Scheme is located, existing built form screening views and reducing the extent of receptors affected, the distance of some receptors from the Scheme, and the positive influence of the embedded mitigation. These receptors are not discussed further in this chapter; further detail can be found in Appendix 8.2. The impact on receptors which are expected to experience likely significant effects are further described below.

Pedestrians on Strand, Cardigan footbridge, Bridge Street and Prince Charles Quay are likely to experience significant effects during both the construction and the operation of the Scheme. Residents of homes on Church Street and Strand on the north bank of the Afon Teifi and individuals and groups using the river are expected to experience significant effects during construction, and users of recreational open spaces (old foundry site and open space at Gloster Row car park) on the north bank of the Afon Teifi are likely to experience significant effects during operation.

Likely significant effects during construction

During construction, residents of homes on the north bank of the Afon Teifi would experience close views of construction machinery, haul road, unclad sheet pile flood defence before the final finish is applied, and oblique views of the southern compound across the river. The scale of change would be medium, and the extent localised to properties at the east end of the Scheme close to Gloster Row car park. Combined with the short-term nature of the change this results in a moderate magnitude of change. When this is combined with the high-medium

sensitivity of the receptor the result is a major-moderate significance of effect during construction, i.e. a significant effect. The effect would be negative.

During construction, pedestrians on Strand, Cardigan footbridge, Bridge Street and Prince Charles Quay would experience immediate views of construction machinery, site fencing and partial views of the temporary haul road, but the field of view occupied by construction works would be limited. There would also be views of the unclad sheet pile flood defence before the final finish is applied. The pedestrian footway along the south side of Strand would be temporarily closed to the public for the duration of the works, however the footway along the northern side would remain open; receptors on Strand would therefore remain present during the construction period. The scale of change would be medium and the extent intermediate. Combined with the short-term duration, there would be a moderate magnitude of change. The sensitivity of the receptor is high, resulting in a significance of major-moderate, i.e. significant. The effect would be negative.

For individuals and groups using the river, during construction the scale of change would be large due to their very close proximity to the works. Access along the river would continue during construction; exclusion zones would be established to ensure the safety of users, but the river would remain navigable. The flood defence would be constructed from the riverward side, on a temporary haul road, in the immediate vicinity of river users. They would have views of the unclad sheet pile flood defence before the final finish is applied. The change would be experienced over an intermediate extent, and be short-term in duration, resulting in a moderate magnitude of change. Combining this with the high-medium sensitivity of the receptor results in a major-moderate, i.e. significant effect. The effect would be negative.

Likely significant effects during operation

The changes experienced by the same pedestrians on Strand, Cardigan footbridge, Bridge Street and Prince Charles Quay during operation would vary along their route. From Cardigan footbridge pedestrians would see the new flood defence wall atop the constructed riverbank along the north bank of the Afon Teifi, partially blocking views of the lower parts of buildings and traffic on the north bank. The artificial appearance of the rock rolls is likely to appear out of place, although the varied form of the defence would break up what would otherwise be an imposing wall, and the vegetated upper slope will provide a softening effect. The change would be more apparent at low tide, when the rock roll surfaced riverbank will be most visible. At high tide the change experienced would be of the vegetated upper slope and flood wall, but the rock rolls would not be visible. The impact of the flood defence wall is reduced through slate and bond pattern to match Cardigan Castle, providing a coherent cladding pattern whilst being in keeping with local character and context. Pedestrians on Strand between the bathroom centre and Cardigan Bridge would have their views of the river limited by the flood defence wall, which would vary between 2m to 1.1m high above pavement level. However, views along Strand would be improved through public realm enhancements which would introduce new slate surfacing, planting, trees and seating. Pedestrians using this route would therefore experience changes to their views which are positive (public realm enhancements) and negative (limited views of the river). From Prince Charles Quay there would be limited change to views as only the westernmost part of the flood defence wall would be visible, occupying a very small part of the view. The scale of change for this receptor group would be medium, but the change would be more noticeable on Strand close to the Bathroom Centre and bus stop, and only slight

at Prince Charles Quay. The moderate scale of change would be experienced over a localised extent. Combined with the permanent duration of the change this would result in a moderate magnitude of change. As sensitivity of the receptor is high, this results in a major-moderate, i.e. significant effect. The effect from the loss of the river views would be negative, while the effect from the public realm enhancements and material selection which ties the Scheme together in a coherent way would be positive. The overall effect is judged to be neutral (a combination of both negative and positive effects in equal measure). The change is significant due to the scale and permanence of alteration to the view, but the overall effect is judged neutral because beneficial and adverse components of the change are balanced.

Users of the recreational open spaces on the north bank of the Afon Teifi comprise individuals and groups using the old foundry site by the boat house and scout hut, Gloster Row car park and its adjacent grassed open space. During operation these receptors would experience a large scale change to their views from the introduction of the flood defence wall and slight changes to surrounding open space. The defence would stand approximately 2m high relative to the ground level at the old foundry site, completely blocking views of the river. Changes to views at Gloster Row car park would consist of the new flood defence wall between 1.0-1.6m high restricting views of the river, and partial loss of the grassed open space and car park. Long range views along the river corridor from Gloster Row car park would be disrupted by the height of the flood defence wall. Although the impact of the flood defence wall would be reduced through sensitive cladding, these users will still experience a large scale change to their views due to the height of the flood defence and the proximity of the receptor to the Scheme, but the extent would be localised. Due to the permanent duration of the change the magnitude of change would be substantial. Combining this with the medium sensitivity of the receptor results in a major-moderate, i.e. significant effect. The effect would be negative.

8.10 Mitigation measures

Embedded mitigation as listed in section 8.9 has reduced the impacts of the Scheme on landscape and visual amenity receptors, notably the cladding of the flood defence wall in a material and pattern similar to that of Cardigan Castle, use of an engineered concrete wall coping to reduce the wall height compared to use of natural stone coping, seeding of the upper riverbank and the public realm enhancements along Strand. However, significant effects during construction and operation are still expected to arise from the following:

- The presence of moving machinery, unclad sheet pile flood defence before final finishes are applied, noise and reduction in tranquillity during construction.
- The incursion of the engineered riverbank into the river and loss of characteristic mudflats during operation.
- The proposed flood defence wall blocking views of the river from the north bank during operation.
- The imposing height of the proposed flood defence for users of the river during operation.

The above effects cannot be prevented, as construction of the flood defence is a matter of public safety. The engineered riverbank is required to structurally stabilise the flood defence

wall, and the flood defence must be built to a height sufficient to reduce flood risk. Construction impacts cannot be prevented, though would only be short term.

No substantive additional mitigation measures have been identified, although the planning approvals process should ensure that the cladding material and pattern of the flood defence wall remains similar in appearance to Cardigan Castle. It is recommended that wall cladding samples using the specific quarried material will be required to be made available on site for inspection once a contractor for the construction of the Scheme is appointed.

8.11 Significance and duration of residual effects

Since no substantive additional mitigation is proposed the effects as described above do not change.

8.12 Difficulties and uncertainties

The following difficulties and uncertainties have been identified in relation to the assessment of landscape and visual amenity effects:

- The assessment of likely significant effects within this chapter relies upon the use of professional judgement. Within EIA, the use of professional judgement is always required. However, this is substantiated wherever possible with evidence which informs the opinion of the competent expert.
- The landscape architects visited publicly accessible locations only during the site visit, therefore photographic records are taken from publicly accessible locations only. Professional judgement has been applied to assess receptors located on private land.
- At the time of the site visit, locations of compounds and haul roads were not known. For the visual amenity receptor group: Residents in properties close to or overlooking the northern compound (a receptor for construction effects only), there is therefore no viewpoint photograph taken to illustrate their view.

8.13 Summary of assessment

Significant effects are considered likely for a limited number of landscape and visual amenity receptors during both the construction and operation phases of the Scheme. Significant effects are considered likely to one landscape character area receptor, LCA2 River and intertidal habitat, during construction and operation. Significant effects are considered likely to three visual amenity receptor groups during construction, and two during operation. Those visual amenity receptor groups likely to experience significant effects are residents of homes on the north bank of the Afon Teifi, users of recreational open spaces on the north bank of the Afon Teifi, pedestrians on Strand, Cardigan footbridge, Bridge Street and Prince Charles Quay, and individuals and groups using the river. All these receptor groups are in immediate or close proximity to the Scheme.

All except one significant effect are considered to be negative. The exception is the effect on visual amenity of pedestrians along Strand during operation of the Scheme, who would experience both the positive impact of the public realm enhancements along Strand and the

coherent material use of the flood defence wall cladding tying it into its setting, and the negative impact of the loss of river views. The overall effect on this receptor is considered to be neutral, i.e. a combination of both positive and negative impacts in equal measure.

Significant residual effects would remain due to the height of the flood defence wall, footprint of the constructed riverbank and, during construction, views of machinery and plant. It is not considered that there is any further mitigation that could be incorporated into the Scheme design to reduce the effect on any of the above receptors to not significant.

8.14 References

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9 Traffic and Transport

9.1 Introduction

This chapter assesses the likely significant effects from the construction of the Scheme, with respect to Traffic and Transport. This chapter details the baseline environment, assessment of likely significant effects, and where necessary, mitigation measures to avoid, reduce or minimise significant effects are proposed.

This chapter should be read in conjunction with the topic chapters outlined below due to potential interactions between topics. It should also be read along with the outline Construction Traffic Management Plan (oCTMP):

- Chapter 5: Population and Human Health

9.2 Competent expert evidence

This chapter has been completed by SCP Transport Planning (part of the RSK Group) a well-respected transport planning and infrastructure design team that have substantial experience in developing environmental statements in relation to traffic and transport.

Summaries of the qualifications and experience of the chapter authors are set out in Table 9-1.

Table 9-1 - Competent experts

Author/checker/reviewer	Qualification/professional membership	Years of experience
Jacob Clegg	GradCIHT	2 years
Ciaran Conlon	MCIHT	3 years
William Tong	MCIHT	7 years
Ian Wickett	FCIHT	20 years

9.3 Planning policy and legislative context

This section describes the relevant legislation, policy and guidance that has been considered in developing the Scheme design, and in the assessment of effects with respect to this chapter. This legislation, policy and guidance have been reviewed and where applicable has informed the assessment through the identification and categorisation of sensitive receptors, requirements for mitigation, and the scope and/or method of assessment.

9.3.1 International and National Policy

Planning Policy Wales (PPW) (Welsh Government, 2020)

The Planning Policy Wales (PPW), together with supplementary Technical Advice Notes (TANs), sets out the national planning policy framework for Wales, with the primary objective of ensuring that the planning system contributes towards the delivery of sustainable development and improves the social, economic, environmental, and cultural well-being of Wales.

This ES has been prepared in accordance with polices outlined in the above, with additional documentation such as the oCTMP outlining measures taken to minimise the environmental impact of the Scheme.

Technical Advice Note 18: Transport (Welsh Government, 2007)

TAN 18 is a supplementary document to the PPW and presents advice on land use integration, development location, parking, design, sustainable travel, and impact assessment.

This ES has been prepared in accordance with Section 9 of the document, 'Assessing Impacts and Managing Implementation'.

Welsh Transport Appraisal Guidance (Welsh Government, 2024)

The Welsh Transport Appraisal Guidance (WeITAG) sets out guidance on planning and appraisal for transport. It outlines that infrastructure projects should align with sustainability, well-being, and climate objectives, and the role of impact assessments in determining this.

This ES has been prepared in accordance with WeITAG guidance, with likely significant effects on the environment assessed in Section 9.9.

9.3.2 Local Policy

Ceredigion Local Development Plan

The Ceredigion Local Development Plan (LDP1) was adopted by Ceredigion County Council in 2013, and outlines policies supporting Ceredigion County Council's ambitions to promote sustainable development in Ceredigion.

This ES has been prepared in accordance with the vision and objectives outlined in the document.

Cardigan Place Plan

The Cardigan Place Plan was adopted by Ceredigion County Council in 2024, and outlines the vision and strategy for continued development in Cardigan. Key themes outlined in the document include well-being of residents and the local environment.

This ES takes the above into account and contains assessment on likely significant effects on the environment in Section 9.9. Accompanying documents, such as the oCTMP, introduce measures to minimise any potential impacts.

Active Travel (Wales) Act 2013

The Active Travel Act 2013 for Wales required Ceredigion County Council to produce an Integrated Network Map setting out a 15-year programme of improvements to active travel routes.

Improvements to cycling and walking routes were subject to public consultation in the active travel designated localities of Aberystwyth, Cardigan and Lampeter. The Integrated Network Maps were submitted to the Welsh Government in November 2017 and approved in February 2018.

The ES takes the above improvements into account through accompanying documents such as the oCTMP which seeks to minimise impacts to local communities and other road users. It is noted however that the routes are only aspirational at this stage.

9.4 Assessment guidance

The following guidance documents were used in this assessment, as described in the Methodology (Section 9.7):

- Environmental Assessment of Traffic and Movement (IEMA, 2023)

9.5 Consultation

An EIA Scoping Opinion was provided by the Local Planning Authority in December 2023. An update to that Scoping Opinion was provided on the 16th October 2025. This outlined that the proposed methodology was appropriate and that the ES should include:

(i) A Transport Assessment covering the County Road network and A487.

(ii) A Construction Site and Traffic Management Plan.

(iii) Details of on-site parking and materials compound.

(iv) A pre-condition survey of minor County Roads to be used to access the riverside site, with any damage to be repaired at the developer's expense.

No further specific consultation has taken place with respect to Traffic and Transport.

9.6 Scoping Assessment

The scope of this assessment has been established throughout the EIA process and design of the Scheme.

This section provides an evidence base for scoping matters in or out following further iterative assessment. Table 9-2 outlines the receptors/matters that have been scoped in or out of the assessment.

The Scoping Opinion provided by the Local Planning Authority in December 2023 and October 2025 has scoped out the need for an assessment of the operational phase of the Scheme.

Table 9-2 - Receptors Scoped in or out of Further Assessment

Receptor/Matter	Phase	Scoped in or out	Justification
A487	Construction	Scoped in	During the construction phase, traffic would be generated by a range of activities including: - Construction staff arriving and leaving the compounds - Supply of construction materials and plant associated with the establishment of the compounds and the main construction works Construction traffic has the potential to affect severance, driver delay, pedestrian delay, non-motorised user amenity, fear and intimidation and road user safety along the links/receptors outlined.
Pont-Y-Cleifion	Construction	Scoped in	
Morgan Street	Construction	Scoped in	
Carrier's Lane	Construction	Scoped in	
Strand	Construction	Scoped in	
Station Road	Construction	Scoped in	
B4546	Construction	Scoped in	
All road users	Operation	Scoped out	Once the Scheme is operational, the effect on the local road system is expected to be minimal for maintenance purposes. Access to the Scheme would utilise the same access junctions used for the construction phase.

9.7 Methodology

9.7.1 Assessment methodology and criteria

The relevant elements for the ES in terms of assessment transport and traffic impact are the magnitude and significance of consequences on the assessed links within the study area as a result of the additional trips during the construction phase of the Scheme.

The significance of an effect is determined based on the magnitude of change and the deemed sensitivity of the affected receptor. This section describes the criteria applied in this chapter to sensitivity of receptors and magnitude of potential impacts of Scheme traffic.

The Institute of Environmental Management and Assessment (IEMA) provides the traffic and transport assessor with the necessary framework for assessment (58). The Environmental

Assessment of Traffic and Movement (58) guidance (hereafter referred to as the 'IEMA Guidance') has been used in this assessment. Note, while IEMA is now known as the Institute of Sustainability and Environment Professionals (ISEP), since the IEMA Guidance was published under the IEMA name, it will continue to be referred to as such.

The impacts assessed as part of the traffic and transport assessment are as follows:

Severance of communities: Severance is the perceived division that can occur within a residential area if it becomes separated by a major traffic artery and is used to describe the factors that separate people from other people and places. For example, severance may be affected as a result of an increase in traffic that could affect the difficulty of crossing a road. The effects of severance can be applied to motorists, pedestrians or residents.

(v) **Road vehicle driver and passenger delay:** Delays to existing traffic have the potential to occur at several locations within the local highway network as a result of the additional traffic that would be generated by the development. The IEMA Guidance states that delays are only likely to be significant when the traffic on the network surrounding the development is already at, or close to, the capacity of the system.

(vi) **Non-motorised user delay:** Changes in the volume, composition or speed of traffic may affect the ability of people to cross roads and therefore increases in traffic levels are likely to lead to greater increases in delay. Delays are dependent upon the general level of pedestrian activity and general physical conditions of the crossing location. Given the range of local factors and conditions which can influence pedestrian delay, the IEMA Guidance does not recommend that thresholds be used as a means to establish the significance of pedestrian delay but recommends that reasoned judgements be made instead. However, the IEMA Guidance does note that, when existing traffic flows are low, increases in traffic of around 30% can double the delay experienced by pedestrians attempting to cross a road.

(vii) **Non-motorised user amenity:** This is broadly defined as the relative pleasantness of a journey, and is affected by traffic flow, traffic composition and pavement width/separation from traffic. The IEMA Guidance notes that changes in pedestrian amenity may be considered significant where the traffic flow is halved or doubled, with the former leading to a positive effect and the latter to a negative effect.

(viii) **Fear and intimidation on and by road users:** The scale of fear and intimidation experienced by pedestrians is dependent on the volume of traffic, its Heavy Goods Vehicle (HGV) composition, its proximity to people or the lack of protection caused by such factors as narrow pavement widths, as well as factors such as the speed and size of vehicles. There are no commonly agreed thresholds by which to determine the significance of this effect. However, the IEMA Guidance notes previous work that has been undertaken which puts forward thresholds that define the degree of hazard to pedestrians by average traffic flow, 18 hour/day heavy vehicle flow and average speed over an 18-hour day in miles per hour. The IEMA Guidance also notes that special consideration should be given to areas such as high-speed sections of road, locations of turning points and accesses. Consideration should also be given to areas frequented by school children, the elderly and other vulnerable groups.

(ix) **Road user and pedestrian safety:** Likely effects have the potential to arise where a proposed development is expected to produce a change in the character of the

traffic on the local road network, for example as a result of increased HGV movements. The IEMA Guidance states that the implications of local circumstances or factors which may elevate or lessen risks of accidents, such as junction conflicts, would require assessment in order to determine the potential significance of accident risk.

(x) **Hazardous/large loads:** Some developments may involve the transportation of dangerous or hazardous loads by road. Such movements may involve specialist loads that might be involved in the construction phase of the Scheme.

The IEMA Guidance provides the assessor with two rules to be considered as screening thresholds when assessing the impact of development traffic on a highway link (58), as follows:

(a) **Rule 1**: Include highway links where traffic flows will increase by more than 30% (or the number of HGVs will increase by more than 30%)

(b) **Rule 2**: Include highway links of high sensitivity where traffic flows have increased by 10% or more

Rule 1 and 2 have been used to determine the spatial scope of the traffic and transport assessment based on the geographical extent of the study area. It is considered that any increase in total traffic of less than 30% is imperceptible. Furthermore, forecast increases in total traffic of less than 10% result in no discernible environmental effect, hence the sensitivity threshold set in Rule 2.

On links where the forecast change in total traffic exceeds that which is outlined in Rule 1 or Rule 2 of the IEMA Guidance, a detailed assessment has been carried out based on the assessment criteria.

The levels of sensitivity for the assessment of receptors related to traffic and transport impacts have been outlined below and are based upon reasonable application of professional judgement and experience in line with the IEMA Guidance (58). The study area has been assessed to establish the sensitivity of the highway links that would be used by traffic accessing and egressing the Scheme. The links are classified as having 'negligible', 'low', 'medium' or 'high' sensitivity depending on the nature of the roads and receptors present on these links. These thresholds are based on professional judgement and defined based on IEMA Guidance and are summarised below:

High – Receptors of high sensitivity to change in traffic flows; schools, colleges, playgrounds, collision clusters, retirement homes, and urban/residential, homes without footways that are used by pedestrians and cyclists.

(xi) **Medium** - Receptors of medium sensitivity to change in traffic flows: congested junctions, doctor's surgeries, hospitals, shopping areas with roadside frontage, roads with narrow footways, unsegregated cycle ways, community centres, parks and recreation facilities.

(xii) **Low** - Receptors with low sensitivity to change in traffic flows: places of worship, public open space, nature conservation areas, listed buildings, tourist/visitor attractions and residential areas with adequate footway provision.

(xiii) **Negligible** - Receptors with negligible sensitivity to change in traffic flows including motorways and dual carriageway and/or land uses sufficiently distant from affected routes and junctions.

Table 9-25 sets out the significance matrix used to determine significant effects. The shaded boxes indicate those significance ratings which are deemed to be 'significant' effects ('major' or 'moderate'). For this assessment, any effects with a significance level of 'minor' or less are considered to be not significant. It should also be noted that any impacts may be temporary (such as construction traffic) or permanent and effects may be positive or negative.

Table 9-25 - Significance of Effect Matrix

Sensitivity of Receptor	Magnitude of change			
	High	**Medium**	**Low**	**Negligible**
High	Major - Significant	Major - Significant	Moderate - Significant	Minor – Not Significant
Medium	Major - Significant	Moderate - Significant	Minor – Not Significant	Negligible – Not Significant
Low	Moderate - Significant	Minor – Not Significant	Negligible – Not Significant	Negligible – Not Significant
Negligible	Minor – Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant

It is necessary to identify user groups ('receptors') and associated locations ('links'), which may be sensitive to changes in the transport and access network conditions. A sensitive area may be where pedestrian activity is high such as a school or town centre.

The IEMA Guidance sets out that particular user groups that may be sensitive to changes in traffic conditions should be identified as a starting point for the assessment of receptor sensitivity, these groups are:

(a) Non-motorised users
(b) Public Right of Way (PRoW) users
(c) Motorists and freight vehicles
(d) Public transport
(e) Emergency services

The IEMA Guidance also set out a list of potentially sensitive receptor geographic locations. These sensitive locations and receptors within these locations have been considered and have informed the assessment of significance when traffic associated with the Scheme is assigned to the road network:

(i) People at home
(ii) People at work
(iii) Sensitive and/or vulnerable groups (including young age, older age, income, health status, social disadvantage and access and geographic factors
(iv) Retail areas
(v) Recreational areas
(vi) Tourist attractions
(vii) Collision clusters and routes with road safety concerns
(viii) Junctions and highway links at (or over) capacity

For traffic and transport, the receptors are the users of the road, PRoW and communities through which construction traffic may travel.

The sensitivity of receptors has been identified for each link and has been completed through a desk-based review. In the absence of numerical thresholds and guidance to determine the sensitivity level of a receptor, the sensitivity of receptors has been identified using the assessor's professional judgement based on a range of factors including but not limited to density of properties along link, length of link and footpath provision.

Table 9-4 provides a more detailed criteria for the assessment of receptor sensitivity and sets out the different types of sensitive receptors relevant to traffic and transport.

Table 9-4 - Receptor sensitivity

Sensitive receptor	Built environment indicator	Receptor sensitivity
People at home	Residential properties	Negligible – No properties with direct frontage Low – Few properties (e.g. one side of the link) with direct highway frontage on construction traffic routes Medium – A number of properties with direct highway frontage (e.g. two sides of the link – low density) on construction traffic routes High – A large number of properties with direct frontage (e.g. two sides of the link – higher density)
People at work	Employment uses (Offices, industrial units etc)	Negligible/low – People are not negatively impacted when at work Medium – A number of people are negatively impacted when at work. High – A large number of people are negatively impacted when at work.
Sensitive and/or vulnerable groups	Disabled parking bays Retirement/care centres Playgrounds/Centres Schools	Negligible – No indication of sensitive groups present Low – At least one indicator of sensitive groups present, with direct highway frontage

Sensitive receptor	Built environment indicator	Receptor sensitivity
		Medium – Low number of sensitive groups present, with direct highway frontage High – Multiple indicators of sensitive groups present, with direct highway frontage
Sensitive locations	Hospitals Schools Historic buildings Places of worship	Negligible – No indication of sensitive groups present Low – At least one indicator of sensitive groups present, with direct highway frontage Medium – Low number of sensitive groups present, with direct highway frontage High – Multiple indicators of sensitive groups present, with direct highway frontage
Users walking	Crossing points PRoW Footways	Negligible – No indication of sensitive groups present Low – At least one indicator of sensitive groups present, with direct highway frontage Medium – Medium use by receptor group – footways present High – High receptor use with no footways
Users cycling/scooting	On/off road routes Designated routes or infrastructure	Negligible – No indication of sensitive groups present Low – At least one indicator of sensitive groups present e.g. off road cycle route Medium – On-road cycle route present with segregation High – On-road cycle route present with no segregation
Recreational areas	Parks Playground/areas Shopping and community centres	Negligible – No indication of sensitive groups present (unlikely usage) Low – At least one indicator of sensitive groups present Medium – Low number of sensitive groups present

Sensitive receptor	Built environment indicator	Receptor sensitivity
		High – Multiple indicators of sensitive groups present e.g. children present
Road users	Road links/junctions Baseline traffic volume Existing signage/infrastructure	Presence of affected parties outlined in this table determine the sensitivity For driver delay assessment (motorists at junctions): Negligible: No indication of delay present (unlikely usage) Low: Less than 0.3 ratio of flow to capacity Medium: 0.3 to 0.5 ratio of flow to capacity High: 0.5 to 0.85 ration of flow to capacity

The sensitivity of receptors within the study area varies depending on where the study area road links travel through. Receptor sensitivity within residential areas where there are numerous direct frontage accesses to the road, for example, is generally considered to be medium or high, as the receptors may be less able to accommodate change.

9.7.2 Magnitude of change

Table 9-5 provides a summary of the magnitude thresholds adopted from the IEMA Guidance. The thresholds are only a starting point for the assessment and in the assessment of specific effects, are accompanied by a desktop review and professional judgement.

Table 9-5 - Magnitude of change

Impact	Magnitude of change			
	Negligible	Low	Medium	High
Severance	Changes in total traffic flow of less than 30%	Changes in total traffic flow of 30%-60%	Changes in total traffic flow of 60%-90%	Change in total traffic flow over 90%
Driver Delay	Vehicle delay changes are less than 30 seconds as a result of the Scheme	Vehicle delay changes are between 31 and 40 seconds as a result of the Scheme	Vehicle delay changes are between 41 and 60 seconds as a result of the Scheme	Vehicle delay changes are between 61 and 90 seconds as a result of the Scheme

Impact	Magnitude of change			
	Negligible	**Low**	**Medium**	**High**
Non-motorised user delay	Assessment of this effect is based on a desktop review of non-motorised user facilities on links and on the change in total traffic in construction			
Non-motorised user amenity	Assessment of this link is based on a desktop review of non-motorised user facilities on links used by construction traffic			
Fear and intimidation	No change in step changes	One step change in level with, with: <400 vehicle increase in average 18 hour all vehicle two-way flow and/or <500 heavy vehicle increase in total 18 hour heavy vehicle flow	One step change in level with, with: >400 vehicle increase in average 18 hour all vehicle two-way flow and/or >500 heavy vehicle increase in total 18 hour heavy vehicle flow	Two step changes in level
Hazardous/Large loads	<30% increase in traffic	Quantitative assessment of road capacity based on existing traffic flows and predicted future levels		

9.7.3 Definition of study area

The site is central to the town of Cardigan along the River Teifi (Afon Teifi) within the Ceredigion region of Wales. The Scheme would be constructed along the northern bank of the river, extending from Cardigan Bridge, continuing along Strand, and reaching Gloster Row car park.

The local highway network is characterised by a network of small local roads within the town, connecting onto the A487, the largest road within the local area. This is illustrated in Plate 9-1.

Table 9-6 provides high-level descriptions of the roads contained within the study area.

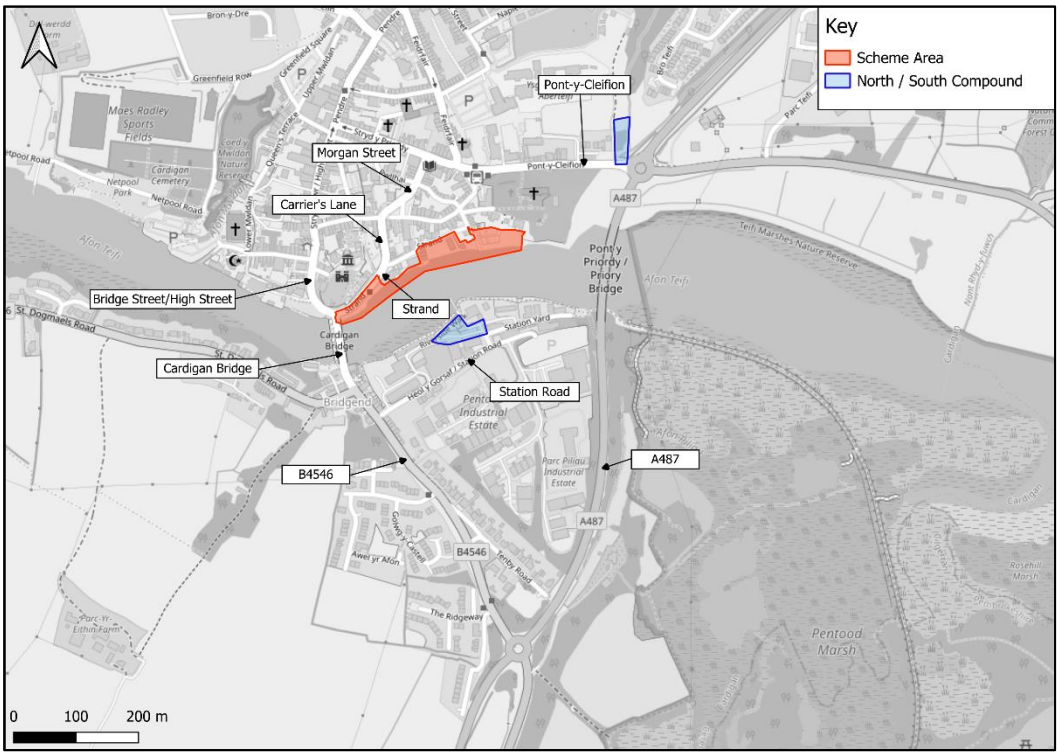

Plate 9-1 - Local road network

Table 9-6 - Study area road network

Road Name	Description
Strand	Strand is the main road within the site and is adjacent to the new flood defences. It is the primary access road to the site and where most construction work would take place. Strand is a one-way two-lane road that connects Carrier's Lane to Bridge Street/High Street and Cardigan Bridge (Castle Street) to reach the A487.
Carrier's Lane	Carrier's lane is a main access road to the site, and is a one-way single-lane road connecting southwards from Morgan Street onto Strand. To the northern extent of Carrier's Lane is the Carrier's Lane / Morgan Street / St Mary Street junction, facilitating vehicular access from the north-east of the town (via Morgan St) and from the High Street (via St Mary St). This road is also within the flood risk zone. There is on-street parking on the offside of the road.

Road Name	Description
Morgan Street	Morgan Street is a main access road to the site and is a one-way one-lane road connecting southwards from Priory Street/Pont-Y-Cleifion to Carrier's Lane.
Bridge Street/High Street	Bridge Street/High Street is a one-way single-lane road connecting northwards from Strand to the High Street/Priory Street junction.
Pont-Y-Cleifion	Pont-Y-Cleifion is a main access road to the site and is a two-way two-lane road connecting the A487 to Priory Street, St Mary Street, and Feidrfair.
A487	The A487 is the main road connecting the site and Cardigan to the surrounding area and regional road network and is a two-way two-lane road. To the north, it connects to regional destinations such as Aberystwyth. To the south it connects to destinations such as Fishguard. It is assumed that all HGV movements would use this road as it provides access to the site, and associated compounds, from the north and south.
B4546	The B4546 is a main egress road from the site, and is a two-way two-lane road connecting Strand/Cardigan Bridge (Castle Street) to the A487. It is anticipated that this road would be used by all vehicles egressing the site.

9.7.4 Traffic data

Existing traffic conditions

Annual traffic statistics on routes along the construction route have been extracted from the Department for Transport (DfT) traffic count point database (59) which provides an Annual Average Daily Traffic (AADT) value, based upon either manual counts, estimations using the previous year's manual count, or permanent Automatic Traffic Counters (ATCs). These are maintained by the local and Trunk Road authorities. The most recent traffic counts are from 2025.

For this study, traffic data was collected through 2 different sources:

- Department for Transport Traffic Counts

- Traffic Surveys (ATCs)

The purpose of this data is to ascertain baseline traffic levels on roads in the study area, in order to support the screening exercise undertaken in Section 1.8(a). The data sources are summarised in Table 9-7.

Table 9-7 - Traffic Surveys

Survey Type	Location	Date
Automatic Traffic Count – Traffic Sense	B4546	06/05/2025-12/05/25
	Carrier's Lane	06/05/2025-12/05/25
	Pont-Y-Cleifion	06/05/2025-12/05/25
	Station Road	06/05/2025-12/05/25
Automatic Traffic Count – Department for Transport	A487 (ID: 80260, south of A487/B4546 roundabout)	2024
	A487 (ID: 99777, between A487/Pont-Y-Cleifion roundabout and A487/B4546 roundabout)	2024
	A487 (ID: 99776, north of A487/Pont-Y-Cleifion roundabout)	2024

Road user safety

To ensure there are no underlying highway safety issues across the study area, personal injury collision (PIC) data has been analysed. The time period for the road traffic collision analysis includes the five-year period between 2019 and 2024 and is applicable to the current publicly available data from the DfT collision statistics website (60). ESRI ArcGIS software has been used to interrogate and map the collision locations and severity.

The extent of the study area is comprised of the Scheme Area and the surrounding road network likely to be used by construction traffic. This is illustrated in Plate 9-2.

Injuries are classified under the following categories:

- 'Slight' injury – e.g. slight shock with occurrences of sprains or bruises.
- 'Serious' injury – e.g. breakages, lacerations, concussion, or hospital admittance.
- 'Fatal' – e.g. resulted in mortality/death within 30 days after the incident.

Within the study area, there were a total of 7 collisions that occurred. Of these collisions, 6 were recorded as 'slight', and one as 'serious'. These results can be seen in Plate 9-2 and Table 9-.

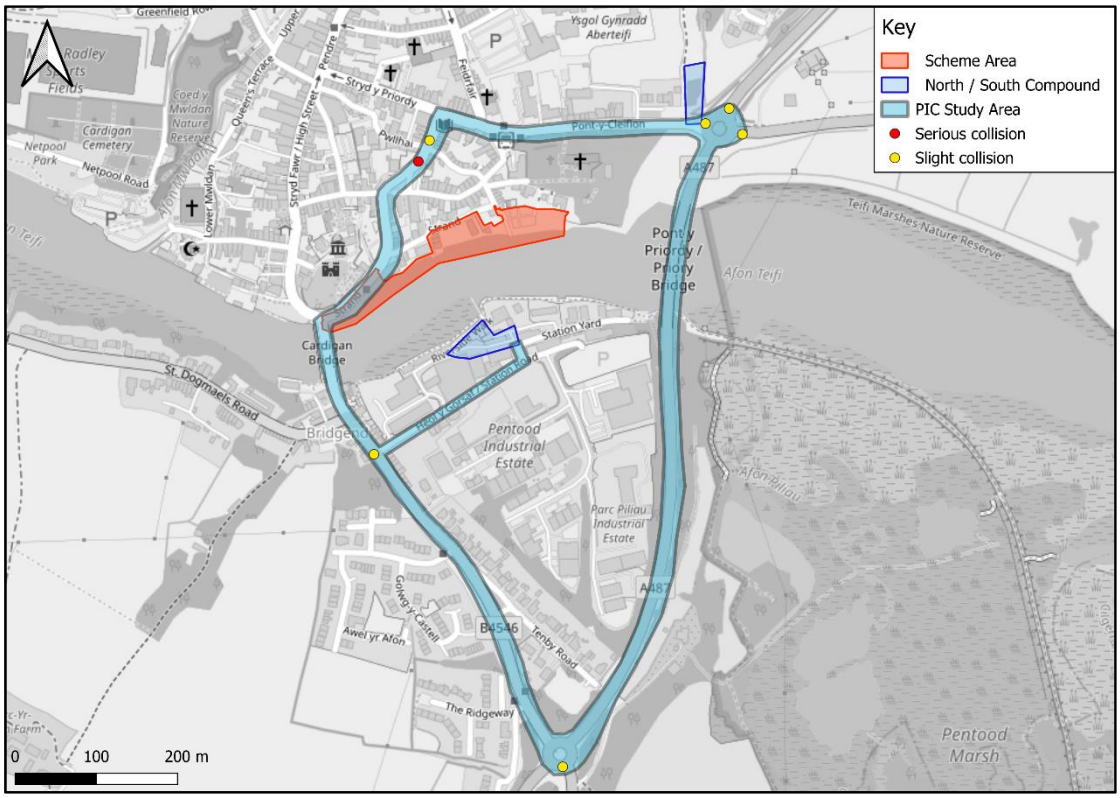

Plate 9-2 - PIC Study Area

Notably, no collisions have been identified within the immediate vicinity of the Scheme Area.

Three collisions categorised as 'slight' in severity are present at the Pont-Y-Cleifion Roundabout, which in total involved five cars and resulted in five casualties. There is no indication of common contributory factors.

While one 'serious' collision occurred within the study area, the lack of other collisions with similar nature or contributory factors suggests that no specific road design flaws are present that could be worsened by the Scheme construction. Notably, the 'serious' collision involved a singular car and did not involve any other vehicle. Given the small number of collisions over the past five years, relative to the volume of vehicle movements within the study area, and the lack of any collision clusters, no particular road safety concerns have been identified.

A summary of the recorded collisions for the five-year period is provided in Table 9-9. Detail on all incidents can be seen in the PIC report in Appendix 9.1.

Table 9-9 - Severity of PIC per year (2019-2024)

	Year of Incident						
PIC Severity	2019	2020	2021	2022	2023	2024	Total
Slight	2	1	1	0	2	0	6
Serious	0	0	0	0	1	0	1

	Year of Incident						
Fatal	0	0	0	0	0	0	0
Total	2	1	1	0	3	0	7

9.8 Baseline environment and likely future evolution

This section describes the baseline environment and its likely future evolution. The current baseline environment scenario refers to the current state of environmental characteristics within the Scheme.

9.8.1 Context

Location

The site is situated in Cardigan, a small rural town near the south-west coast of Wales, situated on the border of Ceredigion and Pembrokeshire on the tidal reach of the Afon Teifi. Due to its estuarian setting, several parts of the town are at risk of coastal and river flooding, hence the need for new flood risk defences.

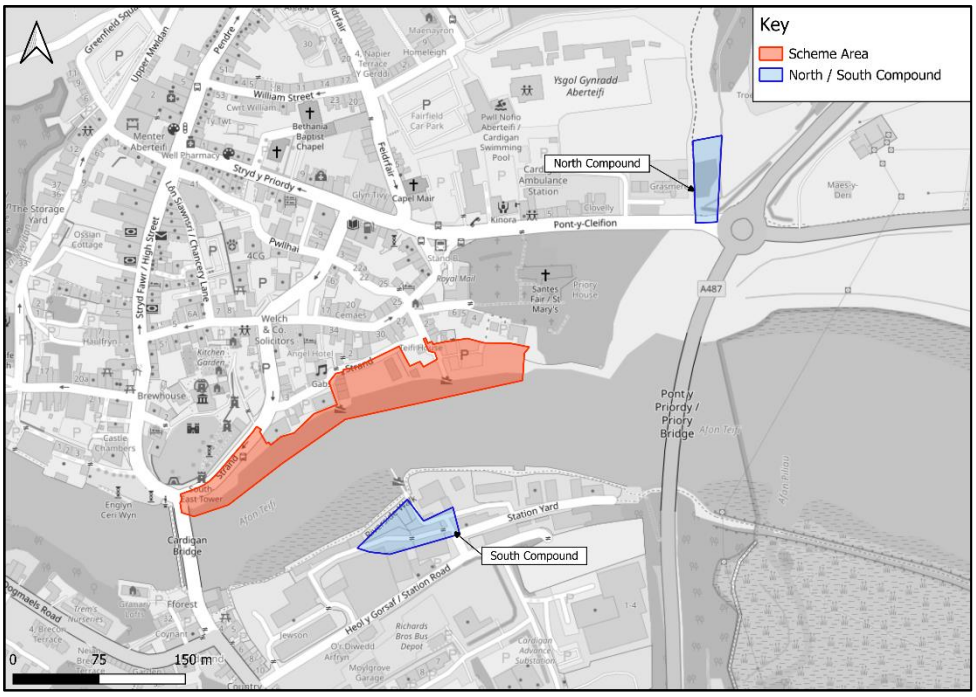

Plate 9-3 - Extent of Scheme Area and compounds

Pedestrian network

The area surrounding the site comprises mainly of residential/town centre roads with low speed limits. The surrounding highway network benefits from the provision of pedestrian footpaths and streetlighting. From the A487, the route to the Northern Compound also benefits from the provision of both single and double yellow line parking restrictions to prevent vehicles from

parking on the footpaths. Additionally, there is a pedestrian crossing point provided on Pont-Y-Cleifion.

Additionally, a number of the links within the study area are designated as active travel routes as part of the Cardigan Existing Route Map. These include:

- Morgan Street (CCC-CAR10-FW): comprised of footways on both sides of the carriageway and uncontrolled pedestrian crossings with tactile paving;
- Carrier's Lane (CCC-CAR10-FW): comprised of footways on both sides of the carriageway and uncontrolled pedestrian crossings with tactile paving. The western footway is separated from passing traffic by parking bays;
- Strand (CCC-CAR10-FW): comprised of footways on both sides of the carriageway and uncontrolled pedestrian crossings with tactile paving. A majority of the northern footway is separated from passing traffic by parking bays. The southern footway provides access to a bus stop;
- The B4546 (CCC-CAR11-FW): comprised of footways on one or both sides of the carriageway and uncontrolled pedestrian crossings with tactile paving. Several bus stops are accessible from both sides of the carriageway;
- The western extent of Pont-Y-Cleifion (CCC-CAR04-FW): comprised of footways on both sides of the carriageway and uncontrolled pedestrian crossings with tactile paving. Bus stops are accessible from both sides of the carriageway.

Public transport network

The closest bus stop to the Scheme Area is located on Strand, within the Scheme Area (Stop ID: cejamag), which is proposed to be temporarily closed during the construction period. This bus stop provides access to the 408 (Cardigan to Poppet Sands) service. In addition, there is a bus stop located on Bridge Street (Stop ID: cejajtm), approximately 140m from the Scheme Area. This bus stop provides access to the 408 and 430 (Cardigan and Narberth) services.

The closest bus stop to the Northern Compound is on Priory Street outside of the Cardigan Council offices (Stop ID: cejajpm), approximately 270m from the Northern Compound. The closest bus stop to the Southern Compound is the Golwg-y-castell stop (Stop ID: cejagwp) located approximately 550m from the Southern Compound.

The Priory Street stop provides access to the 408 and T5 (Haverfordwest to Aberystwyth) services. The Golwg-y-castell stop provides access to the 430 service.

Parking provision

At present, off-street parking provision is provided at Gloster Row car park, which is located within the Scheme Area and comprised of 23 car parking spaces, including one disabled parking space.

In addition, on-street parking in the form of bays is provided along Morgan Street, Carrier's Lane, and Strand. These bays are designated as short-stay parking, with a maximum stay of one

hour from Monday – Saturday, 08:00 – 18:00. With the exception of the parking bays, on-street parking is restricted by single-yellow lines along Morgan Street and Carrier's Lane, and by double-yellow lines along Strand.

9.8.2 Future baseline in the absence of the Scheme

In the absence of the Scheme, the future baseline of the study area would be influenced by planned changes in land use across a wide area and any road infrastructure schemes that are already under construction or are brought forward in the future. In such a scenario, due to the nature of the land use at the location of the Scheme, the Site itself is expected to remain unchanged and therefore not change its traffic generating potential.

Land use changes would be taken into account in the future baseline by applying traffic growth, allowed for in this assessment using traffic growth factors derived from the national Trip End Model Presentation Programme (TEMPro) database, maintained by the DfT. Separate traffic growth factors have been derived for minor roads and A roads, reflecting the impact of baseline traffic growth on differing parts of the road network. The traffic growth factors that have been applied to the baseline traffic flows shown in Table 9-10.

This enables the consideration of traffic growth to future years Table 9-11 and therefore the assessment of traffic impacts associated with the Scheme can be undertaken for the anticipated construction years.

Table 9-10 - Trip End Model Presentation Programme (TEMPro) traffic growth factors

Years Factored	Road Type	Growth Factor
2024 – 2027	Minor road	1.0176
2024 - 2027	A road	1.0164
2025 - 2027	Minor road	1.0147
2025 - 2027	A road	1.0138

Table 9-11 - Baseline and Future Traffic Count

Year	Location	Baseline Data			2027 Future Year		
		HGV	All Vehs	HGV%	HGV	All Vehs	HGV%
2025	B4546	134	5491	2.4%	136	5572	2.4%
2025	Carrier's Lane / Morgan Street / Strand	24	4436	0.5%	25	4501	0.5%
2025	Pont-Y-Cleifion	122	6617	1.8%	124	6714	1.8%
2025	Station Road	102	2846	3.6%	103	2888	3.6%

Year	Location	Baseline Data			2027 Future Year		
		HGV	All Vehs	HGV%	HGV	All Vehs	HGV%
2024	A487 (99777)	424	7140	5.9%	431	7257	5.9%
2024	A487 (99776)	260	8162	3.2%	264	8296	3.2%
2024	A484 (20589)	134	4211	3.2%	136	4280	3.2%

As indicated in Table 9-11, baseline HGV traffic equates to a maximum of approximately 5.9% of all traffic along the A487.

For non-motorised users, material alterations to the pedestrian, cycle, and PRoW networks within the timeframe of construction of the Scheme are not anticipated.

9.8.3 Construction phase trip generation

During the construction phase of the Scheme, transport impacts may arise from an increase in traffic resulting from deliveries of construction materials and movement of construction staff. Although there is intention to consolidate deliveries where possible and maximise the use of sustainable modes for workers and encourage car sharing, there would inevitably be road-based movements. Such movements may impact the local highway network and its users. Table 9-12 outlines the anticipated trip generation for the duration of the construction programme.

Table 9-12 - Daily trip generation throughout construction programme

Vehicle	Month of Construction																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Daily HGVs	7	11	11	11	11	11	6	1	7	8	2	2	3	10	19	19	16	8
Daily Staff Vehicles	9	9	9	12	12	12	12	12	36	36	36	36	36	36	36	36	24	11
Daily All Vehicles	16	20	20	23	23	23	18	13	43	44	38	38	39	46	55	55	40	19

9.8.4 Anticipated traffic routes

The proposed access route to the northern side of the Afon Teifi would follow the A487 onto Pont-Y-Cleifion via the roundabout, and down Morgan Street and Carrier's Lane to reach Strand. This route has been selected as it passes the Northern Compound area and allows for transit towards the Scheme Area. The proposed access route to the southern side of the Afon Teifi (i.e. Southern Compound area) would follow the A487 onto the B4546 via the roundabout, and down onto Station Road. This is illustrated in Plate 9-4.

The proposed egress route from the Scheme Area would follow Strand onto the B4546 via Cardigan Bridge (Castle Street), then onto the A487. The proposed egress route from the Northern Compound would begin at the A487/Pont-Y-Cleifion roundabout and follow the A487. The proposed egress route from the Southern Compound would follow Station Road onto the B4546 to the A487/B4546 roundabout. This is illustrated in Plate 9-5.

The proposed access route from the Northern Compound to the Scheme Area would be via Pont-Y-Cleifion, Morgan Street, and Carrier's Lane to reach Strand. The proposed access route from the Scheme Area to the Northern Compound would be via Strand, the B4546, the A487, and then exit at the A487/Pont-Y-Cleifion roundabout. This is illustrated in Plate 9-6.

The proposed access route from the Southern Compound to the Scheme Area would be via Station Road, the B4546, the A487, then onto Pont-Y-Cleifion via the roundabout, and down Morgan Street and Carrier's Lane to reach Strand. The proposed access route from the Scheme Area to the Southern Compound would be via the B4546 and Station Road. This is illustrated in Plate 9-.

There may also be an element of inter-compound trips between the Northern and Southern Compounds. It is anticipated that vehicles making these trips would use the A487, B4546, and Station Road.

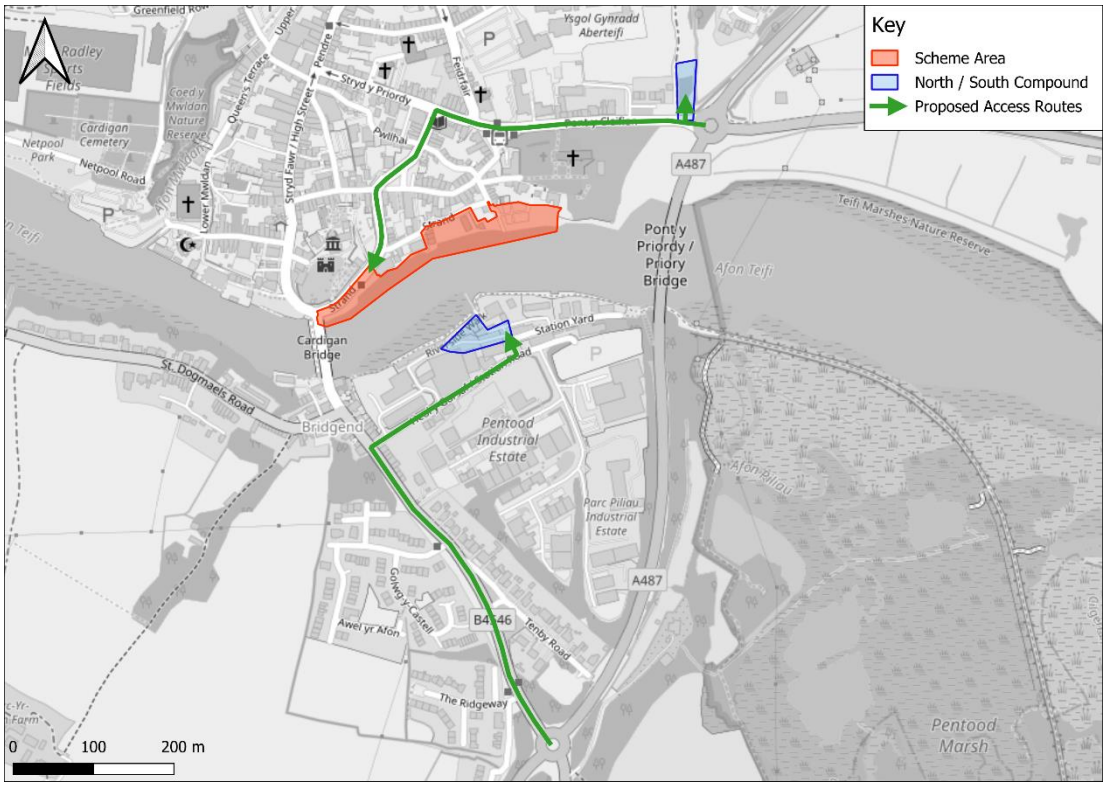

Plate 9-4 - Proposed traffic routes (access)

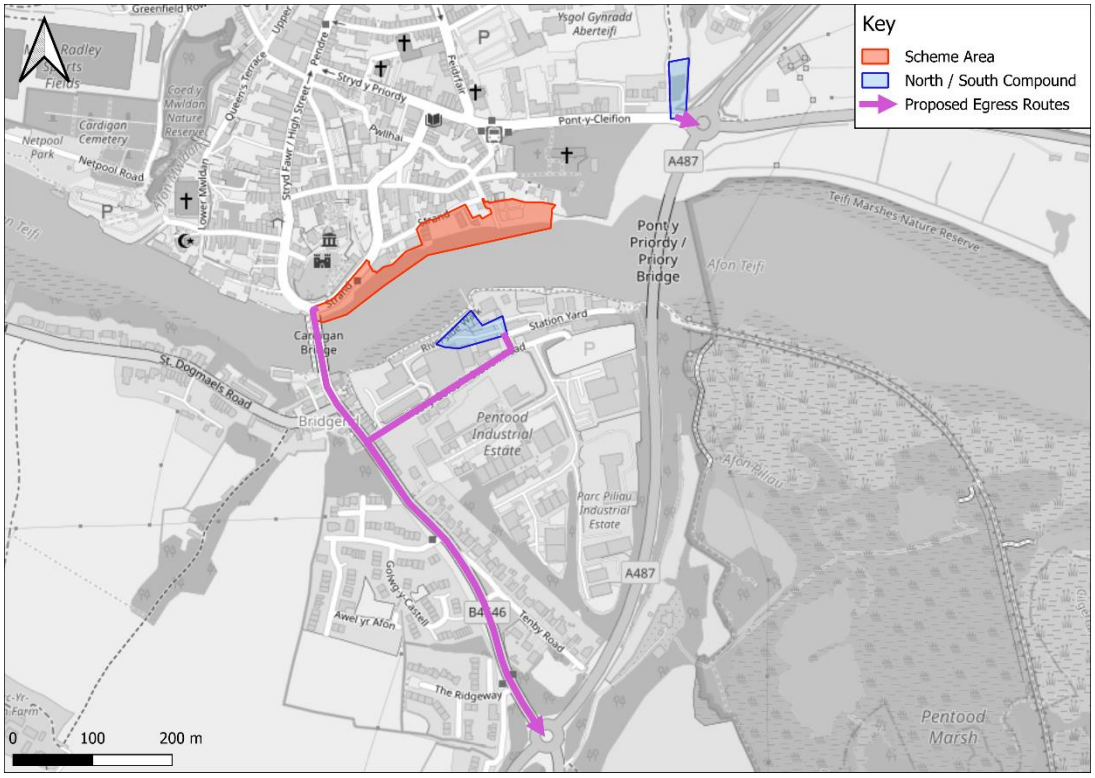

Plate 9-5 - Proposed traffic routes (egress)

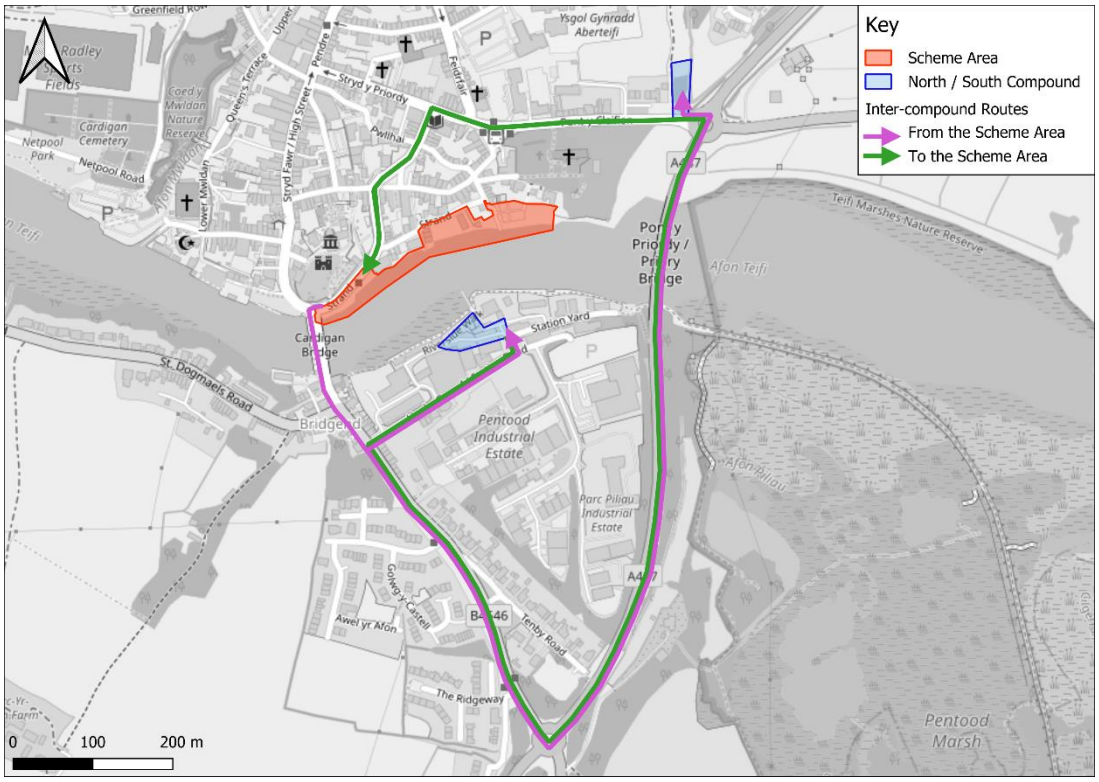

Plate 9-6 - Proposed traffic routes (between Scheme Area and compounds)

9.8.5 Character

The environment under consideration is defined by its central town location, coastal vulnerability, and multi-functional land use, all of which contribute to its distinctive character and influence the traffic and transport dynamics of the area.

The site is characterised by a one-way system that connects the north-eastern entry points of the site with the central river front, High Street, and the south of the town. The network supports a mixture of vehicular, pedestrian, and public transport movements, with the 408-bus route serving the town through the affected area. The surrounding mixed-use creates an active and sensitive environment, where traffic flow, access, and parking, can have wide-reaching impacts on daily life, business operations, and public services. The estuarian position is a defining characteristic of Cardigan and is the reasoning for the new development of flood defences with raising concerns about the flood risk to this region. This environmental pressure underscores the strategic importance of the Scheme.

The site acts as a transport and community focal point, linking key parts of the town and supporting a range of activities. Its centrality and connectivity mean that any disruption – such as road closures or parking restrictions – would have a ripple effect across the town's transport system and community functions.

9.8.6 Significance

Due consideration to the transport environment within the study area is given, owing to its strategic location, functional role, and the presence of sensitive receptors. The assessment of significance considers the quality, value, and designation of the existing infrastructure and its contribution to the wider community and regional connectivity.

The site is centrally located within the town of Cardigan, a key settlement in the Ceredigion region. The local highway network, including Strand, Carrier's Lane, Morgan Street, and the A487 trunk road, forms a critical part of the town's transport infrastructure. These roads facilitate movement within the town centre and provide regional connectivity to Aberystwyth, Fishguard, and Carmarthen. The A487 is a designated strategic route and serves as the primary corridor for freight, public transport, and general traffic. Its role in supporting economic activity and access to services elevates its significance within the transport network.

The transport environment supports a diverse mix of land uses, including residential, commercial, tourism, and public services. Commercial units such as Cardigan Bathroom Centre and Cardigan Bay Active rely on accessible road links and parking provision to maintain footfall and operational viability. Residential areas and community facilities, including schools and healthcare services, depend on safe and reliable transport routes for daily activity and emergency access. The presence of the 408-bus route and associated stops further enhances the significance of the area, providing essential public transport services to residents and visitors. Temporary disruption to these services during construction may disproportionately affect vulnerable groups, including the elderly and those without access to private vehicles.

The combination of strategic connectivity, community reliance, and environmental vulnerability underscores the high significance of the transport environment within the study area. This significance informs the assessment of potential impacts and the prioritisation of mitigation measures.

9.8.7 Sensitivity

The sensitivity of the transport environment has been assessed in accordance with professional judgement and guidance from IEMA (IEMA, 2023). Sensitivity is defined as the degree to which a receptor is likely to be affected by changes in traffic flows, accessibility, or transport infrastructure.

The receptors outlined in Table 9-4 have been classified as having negligible, low, medium or high sensitivity based on their characteristics, vulnerability and functional importance. The classification considers factors such as pedestrian activity, proximity to construction works, reliance on public transport and the presence of vulnerable users. Where vulnerable users are present, the impact on sensitivity is determined by factors such as concentration (locations such as care homes or schools would have a higher concentration), proximity to the highway frontage of the link, and quality of the pedestrian infrastructure along the link (higher quality infrastructure may mean that vulnerable users are less sensitive). The receptor classification can be seen in Table 9-12 which sets out the links within the study area and which receptor types are apparent along them.

Table 9-12 - Link Sensitivity within the Study Area

Link	Receptor(s) present	Justification	Sensitivity
Strand	Non-motorised users Road Users Sensitive and/or Vulnerable users	Strand has a limited number of non-residential properties fronting the carriageway, as well as pedestrian footways present on both sides of the road. Strand is a designated active travel route.	Medium
Carrier's Lane	People at home Non-motorised users Road users Sensitive and/or Vulnerable users	Carrier's Lane has a number of residential properties fronting the carriageway, as well as pedestrian footways present on both sides of the road. Carrier's Lane is a designated active travel route.	Medium
Morgan Street	People at home Non-motorised users Road users Sensitive and/or Vulnerable users	Morgan Street has a number of residential properties fronting the carriageway, as well as pedestrian footways present and car parking areas on both sides of the road. Morgan Street is a designated active travel route.	Medium
Pont-Y-Cleifion	People at home Sensitive locations Non-motorised users Recreational areas Road users Sensitive and/or Vulnerable users	Pont-Y-Cleifion has a number of residential properties fronting the carriageway along with Saint Mary's Church, pedestrian footways and crossing points and bus stops on both sides of the road	Medium

Link	Receptor(s) present	Justification	Sensitivity
B4546	People at home Non-motorised users Road users Sensitive and/or Vulnerable users	The B4546 has several residential properties fronting the carriageway, as well as pedestrian footways along both sides of the road. The B4546 is a designated active travel route.	Medium
Station Road	People at home People at work Non-motorised users Road users	Station Road has a number of residential and industrial properties fronting the carriageway. No pedestrian footways present.	Medium
A487	Road users	High-capacity road with limited direct impact. No sensitive receptors present	Negligible

9.9 Assessment of effects

The construction phase is set to be temporary across an 18-month period. However, construction traffic associated with the Scheme could have an effect on the following matters:

- Severance
- Driver delay
- Pedestrian delay
- Non-motorised user amenity
- Road safety
- Hazardous/Large loads

Construction activities that may result in impacts to the study area are listed below:

- Construction works within the highway
- Movement of the construction workforce to and from the site
- Movement of materials and construction equipment to and from the site

9.9.1 Screening

Table 9-13 sets out the peak construction daily two-way (or one-way for one-way links) trips by link section, as outlined previously in this chapter, as well as the net and percentage change from the addition of construction flows. Based on this change, the table refers to whether the link is included or excluded from further assessment for environmental effects. It should be noted that 'All Vehicles' in this table equates to cars, light good vehicles (LGVs), and heavy goods vehicles (HGVs).

Table 9-13 - Construction scenario daily two-way trips (or one-way trips for one-way links) (absolute and percentage change)

Link no.	Link Name	2027 Future Baseline		Construction traffic		% change with addition of construction traffic		Included or excluded from the assessment based on IEMA Guidance Rule 1 and 2
		All Vehicles	HGV	All Vehicles	HGV	All Vehicles	HGV	
1	A487, south of A487/B4546 roundabout	3836	263	36	19	1.43%	7.22%	Excluded
2	A487, between A487/Pont-Y-Cleifion roundabout and A487/B4546 roundabout)	7257	431	36	19	0.76%	4.41%	Excluded
3	A487, north of A487/Pont-Y-Cleifion roundabout	8296	264	36	19	0.66%	7.19%	Excluded
4	Pont-Y-Cleifion	6714	124	29	15	0.66%	12.24%	Excluded
5	Morgan Street / Carrier's Lane / Strand	4501	25	29	15	0.98%	61.90%	Included
6	B4546	5572	136	36	19	0.99%	13.99%	Excluded
7	Station Road	2888	103	7	4	0.38%	3.69%	Excluded

The results in Table 9-13 demonstrate that during the construction of the Scheme, the 'All Vehicle' or 'HGV' daily two-way trips are not predicted to increase by more than 30% across all but one link. The receptor sensitivity on these links varies as a result of residential properties/other sensitive receptors, however, owing to the small increase in daily two-way trips on these links, it is predicted that potential significant effects would not arise during construction.

For these links, as per IEMA Rule 1 and 2, it is considered that any increase in total traffic of less than 30% is imperceptible. Furthermore, forecast increases in total traffic of less than 10% result in no discernible environmental effect. As such, a detailed environmental assessment of traffic and transport is not required as all potential resultant effects associated with construction traffic would be considered negligible and not significant.

Notably, Morgan Street / Carrier's Lane / Strand is the exception to this. Whilst the 'All vehicle' movements on this link are only anticipated to increase by 0.98%, an increase of 62% of HGV movements is predicted. Consequently, as per IEMA rule 1, this link should be included for detailed environmental assessment.

However, it should be noted that this percentage increase is a result of very low recorded baseline HGV movements along this link, 25 per day. In the context of low baseline HGV movements, proportional (%) impacts can be overstated and so the absolute impact should instead be used as a reference for magnitude of change.

In the case of Morgan Street / Carrier's Lane / Strand, an additional 15 HGVs movements per day are anticipated. Assuming a fixed rate of HGV movements, during the winter months (the average winter working hours are more compressed than summer therefore a higher number of HGVs per hour), the daily working hours would be 08:00-16:30, which is equivalent to ~2 trips per hour, or one HGV trip every 34 minutes. This is considered to be imperceptible and would not result in any likely significant effects upon the baseline environment. As a result, no detailed environmental assessment of Morgan Street / Carrier's Lane / Strand is proposed.

Furthermore, it should be considered that Table 9-13 highlights the peak impact of the construction programme; impact would be considerably lower across much of the 18-month programme.

9.9.2 Construction

As part of the construction of the Scheme, the partial road closure of Strand would be implemented. The approximate area of this partial road closure is displayed in Plate 9-6.

Plate 9-6 - Extent of road closure, parking restriction, and bus stop closure

Plate 9-6 shows the area of Strand that would be impacted by closures. The nearside lane would be closed for the duration of construction which would result in the bus stop (Stop ID: cejamag) on this road being closed during the construction phase. Additionally, the on-street parking in the offside lane of Strand would be closed during the construction phase; this would allow cars to continue to be able to travel along Strand connecting to Bridge Street and Cardigan Bridge (Castle Street), rather than prohibiting traffic flow entirely.

In addition to the impacts at Strand, the Gloster Row car park located to the east would also be closed during the construction phase, but access to properties would be maintained.

An outline Construction Traffic Management Plan (oCTMP) is submitted in support of the planning application (see Appendix 9.2). The oCTMP provides a framework of the construction traffic routing, site access, delivery of materials, construction working hours and management and monitoring measures.

The oCTMP would be implemented, developed into a final CTMP, and managed by the Principal Contractor undertaking the construction works and sets out measures to avoid, minimise or mitigate the environmental effects of traffic during construction and would limit the impact on existing users of the public highway network or those located close to it.

The aim of the final CTMP is to outline the specific transport impacts arising from the construction works and to provide a framework for addressing these impacts. The CTMP only considers the construction phase of the Scheme and has been prepared to ensure that the construction process and management and mitigation measures, including temporary

diversions and construction vehicle management, minimise the impact on the existing users of the public highway network.

The CTMP includes procedures to mitigate against traffic and transport related impacts and includes procedures to manage movement of workers and HGVs, ensuring continued monitoring, review and improvement of the CTMP and associated mitigation measures put in place. It also outlines the routing strategy for the Scheme construction traffic, conditions survey requirements and onsite construction activities (wheel washing etc).

9.9.3 Operational trips (scoped out)

Given the nature of the Scheme, operational trips are expected to be negligible. An estimate of the operational flows and consideration to thresholds within the IEMA guidance is noted below.

As well as routine maintenance there may also be a requirement to repair and replace components on site as part of maintaining the Scheme during the operational phase. This could require the use of HGVs. Certainty of the number of HGVs required for these works is not known at this stage, given the extent of any repair and replacement works is unknown. However, as traffic flows are not expected to exceed the IEMA guidance Rule 1 criteria, "*Include highway links where traffic flows will increase by more than 30% (or the number of heavy goods vehicles will increase by more than 30%)*", an operational traffic assessment is not required in accordance with the Scoping Opinion. In addition, such works would not be undertaken frequently.

9.9.4 Opportunities for enhancement

The following opportunities for environmental enhancement in relation to traffic and transport have been identified:

- The public realm improvements and widening of the pavement at Area 1 would improve access and safety for pedestrians and users of the bus stop.
- A review of road signage at the junction of Strand, Castle Street and Bridge Street may lead to improved visibility on the junction.
- A review of street lighting on Strand in Area 1 could lead to an improvement in visibility for both pedestrians and motorists.

9.10 Mitigation measures

As detailed in Section 9.9.2, an oCTMP has been produced (see Appendix 9.2), which would be developed into a final CTMP by the Principal Contractor prior to commencement of construction.

9.11 Significance and duration of residual effects

No significant effects have been identified therefore an assessment of residual effects has not been undertaken.

9.12 Monitoring

To ensure that the impact of traffic and transport is controlled, the construction phase shall be audited against the requirements of the oCTMP by the Principal Contractor to ensure adherence.

9.13 Difficulties and uncertainties

Traffic surveys record daily or weekly flows, rather than constant recording. Therefore, data are considered a snapshot of road network behaviour inclusive of flows, turning movements and speed. However, it is not considered that this impacted the Applicant's ability to undertake the assessment presented in this chapter, nor has it affected the conclusions of the assessment, as this has been addressed by ensuring any analysis is conducted as a robust assessment scenario.

9.14 Summary of assessment

A summary of this assessment is presented in Table 9-126. the sensitivity of each receptor is identified alongside and the potential effects that could arise on those receptors. Any proposed additional mitigation measures are stated and the magnitude of change and residual effects then assessed. Finally, any monitoring requirements are stated where applicable.

Table 9-126 - Summary of likely traffic and transport effects

Receptor/Matter	Phase	Sensitivity	Potential effects	Magnitude of change	Monitoring requirement
A487	Construction	Negligible	All effects are considered to be negligible and not significant: Severance Driver delay Non-motorised user delay Non-motorised user amenity Fear & Intimidation Road safety Hazardous/large loads	Screened out/Negligible	Ongoing monitoring of construction traffic and staff travel matters would be undertaken in accordance with the Construction Traffic Management Plan
Pont-Y-Cleifion	Construction	Medium			
Morgan Street	Construction	Medium			
Carrier's Lane	Construction	Medium			
Strand	Construction	Low			
B4546	Construction	Medium			
Station Road	Construction	Medium			

Receptor/Matter	Phase	Sensitivity	Potential effects	Magnitude of change	Monitoring requirement
All road users	Operation	Negligible	-	-	-

9.15 References

Ceredigion County Council. (2013). *Ceredigion Local Development Plan (LDP1)*.

Ceredigion County Council. (2024). *Cardigan Place Plan.*

DfT. (2025). *Road safety statistics*. Retrieved from https://www.gov.uk/government/collections/road-accidents-and-safety-statistics

DfT. (2025). *Road traffic statistics map: count points*. Retrieved from https://roadtraffic.dft.gov.uk/count-points

IEMA. (2023). *Environmental Assessment of Traffic and Movement.*

10 Water Environment

10.1 Introduction

This chapter assesses the likely significant effects from construction and operation of the Scheme, with respect to Water Environment. This chapter details the baseline environment, assessment of likely significant effects, and where necessary, mitigation measures to avoid, reduce or minimise significant effects are proposed.

This chapter is not intended to be read as a standalone assessment, and references should be made to Chapters 1-4. This chapter should be read in conjunction with the following topic chapters due to potential interactions between topics:

- Chapter 6: Biodiversity and Nature Conservation
- Chapter 11: Land Use and Soils

10.2 Competent expert evidence

Technical Lead Jenny Marshall-Evans is an Associate Director with 15 years' experience working in the environment sector, specialising in the water environment. She is a Chartered Environmentalist and a Chartered member of the Chartered Institute of Water and Environmental Management. Jenny is an expert in water quality, water resource management, Water Framework Directive (WFD) and EIA, having worked on large infrastructure projects, flood alleviation schemes and water utilities projects, including authoring and leading the Water EIA chapter for multiple developments.

Technical Author Nick Hill is a Water Environmental Scientist with 8 years' experience within the water environment sector. Nick has previous EIA experience on several DCO projects in the flood risk and renewable energy sector. This includes authoring the Water EIA chapter and two appendices (WFD Compliance Assessment and Geomorphology Baseline Assessment) for a DCO flood alleviation scheme.

10.3 Planning policy and legislative context

This section describes the relevant legislation, policy and guidance that has been considered in developing the Scheme design, and in the assessment of effects with respect to Water Environment. This legislation, policy and guidance has been reviewed and where applicable has informed the assessment through the identification and categorisation of sensitive receptors, requirements for mitigation, and the scope and/or method of assessment.

10.3.1 International and national policy

The Environment Act 1995

The Act made provision for the establishment of the Environment Agency (in England and Wales[5]), which is an important consultee for water environment elements of the Scheme. It also sets out the statutory duties of the Environment (in England and Wales) towards the water environment and conservation. In Wales, many of the Environment Agency's former Welsh functions were transferred to the Natural Resources Body for Wales (known as Natural Resources Wales).

The Environment Act 2021

The Act is a new standalone primary legislation implementing new frameworks and filling post-Brexit gaps to increase and enforce adoption of environmental provisions. Of most relevance is Part 5, which sets out relevant legislation post Brexit for water, including the use of The Water Environment (Water Framework Directive (WFD) (England and Wales)) Regulations 2017 and changes to the priority substances listed. The Act aims to improve water quality and habitats. Scheme construction and operation elements would affect the water environment.

The Water Environment (Water Framework Directive (WFD) (England and Wales)) Regulations 2017

The Regulations require a process to manage, protect and improve the water environment and implements River Basin Management Plans (RBMPs). The Scheme affects WFD surface water and groundwater bodies which are within the Scheme Area. Consequently, a WFD assessment has been undertaken to comply with these regulations and as a requirement of the EIA.

The Water Resources Act 1991, as amended by the Water Act 2003 and the Water Resources (Abstraction and Impounding) Regulations 2006

The Act sets out provisions for the control of pollution of water, abstraction, working in or near watercourses and consent for the erection of temporary and permanent obstructions of watercourses. The Scheme would require all the above.

The Environmental Permitting (England and Wales) Regulations 2016 (as amended)

The Act sets out Regulations for abstraction and impounding licensing and flood risk activity permitting. The Scheme requires planning permission and a marine licence. It is expected that the marine licence would satisfy the needs of flood risk activity permit requirements.

Environmental Targets (Water) (England) Regulations 2022

The Regulations extend to both England and Wales, and impose new legally binding targets on the Secretary of State in relation to water to reduce sediment pollution. The Scheme would affect water quality in construction relevant to those targets.

The Groundwater Regulations 1998

[5] Since 2013 the Environment Agency Wales changed to Natural Resources Wales.

The Regulations focus on the protection of groundwater for domestic or agricultural use. The Scheme has the potential to introduce changes to groundwater quality and quantity, but it has been assessed to ensure compliance with the regulations.

Welsh National Marine Plan (WNMP) (2019)

The WNMP sets out policies for the next 20 years for the sustainable use of Wales' seas. Policies under the plan should be considered in relation to the Water Environment include:

(c) SOC_03 Marine Pollution Incidents - Proposals should demonstrate how they minimise their risk of causing or contributing to marine pollution incidents.

(d) ENV_06: Air and water quality - Proposals should demonstrate that they have considered their potential air and water quality impacts and should, in order of preference:

(ix) avoid adverse impacts; and/or

(x) minimise adverse impacts where they cannot be avoided; and/or

(xi) mitigate adverse impacts where they cannot be minimised.

If significant adverse impacts cannot be avoided, minimised or mitigated, proposals must present a clear and convincing case for proceeding.

10.3.2 Local policy

Ceredigion County Council Local Development Plan 2007-2022

The Key Issues and Policies relating to this chapter are:

- Key Issue 6: Environment and Climate Change
- KI6.4. The need to ensure the protection and enhancement of ecosystem services as well as air, soil and water quality generally; protection against noise and light pollution and land instability; and to reduce demand for water and protect local geodiversity.
- Policy DM22: General Environmental Protection and Enhancement
- Policy DM23: Coastal Management

The assessment has considered these key issues and policies by addressing the impacts of climate change such as flood risk, whilst using the Scheme as an opportunity to enhance quality and diversity of the existing environment.

Shoreline Management Plan (SMP)

SMP Policy Unit 21 5.14 - St Ann's Head to Great Ormes Head

The SMP sets a long-term strategic approach for managing coastal and estuarine environments. Cardigan is situated within Unit 5.14; the policy is 'Managed Realignment' through set-back defences in the short (2025), medium (2055), and long term (2105), subject to nature conservation interests.

The National Strategy for Flood and Coastal Erosion Risk Management in Wales (FCERM) October 2020 (61)

This publication addresses the increasing risk of flood and coastal erosion due to climate change by establishing long-term policies and actions to reduce the risk to homes, businesses, and the environment in the subsequent decade. The key objectives of this are:

- Risk Management: the strategy promotes a collaborative approach between local authorities and community groups, including to clarify roles and responsibilities to enhance public understanding of flood risks and resilience.
- Climate Adaptation: the strategy stresses the need readjust to address the impacts of climate change, such as sustainable drainage systems and revised planning policies to prevent future developments from increasing flood risks.
- Community Engagement: the strategy encourages public involvement in discussions about flood risk management to ensure that communities are informed and can participate in decision-making processes.
- Integration with Planning: the strategy aligns with new planning guidance and the Wales Flood Risk Assessment Map to inform development and planning decisions.

Natural Resources Wales Flood Risk Management Plan: Mid Wales Place (62)

This plan identifies Cardigan as being at risk for flooding from rivers and the sea, using the example of the January 2014 event where 30 properties were flooded. Cardigan is noted as one of the five communities in this region which are expected to undergo the greatest change in danger from the risk of flooding from the sea. The flood defence works at Cardigan are cited as one of the key delivery highlights for flood risk management activity. Of the 14 priorities listed, the following apply to the Scheme:

- Priority 1: Respond to the climate and nature emergencies by seeking innovative practices, promoting adaptation and preparing for future change.
- Priority 2: Develop and deliver catchment approaches to reduce flooding and contribute to ecosystem resilience, working with partners and stakeholders where possible and appropriate.
- Priority 3: Improve community resilience to current and future flood risk. Work with partners to support communities to become more aware and take action to mitigate their own flood risk.
- Priority 4: Seek and take opportunities for enhancement to the health and wellbeing of communities, biodiversity and the environment, and the wider benefits they provide, to support NRW's response to the Nature Emergency.
- Priority 11: Prioritise our work on a risk basis in alignment with Welsh Government's National FCERM Strategy and develop our evidence base to secure future investment in flood risk management.

10.4 Assessment guidance

The general guidance used in this assessment is described within Chapter 4: EIA Methodology.

Guidance utilised which is specific to the assessment of Water Environment is listed below:

- GN14 Marine Physical Processes Guidance to inform Environmental Impact Assessment (63)

10.5 Consultation

Chapter 2: Project Development contains consultations in more detail, and the broader engagement with stakeholders. Section 2.3.2 summarises the outcomes of a workshop held with geomorphological specialists from Ceredigion County Council (CCC) and NRW, during which aspects related to this chapter were discussed.

10.6 Scoped in receptors and potential effects

The Scoping Opinion received from Ceredigion County Council on 16th October 2025 (following advice from NRW) advised that hydromorphology, physical processes and WFD compliance should all be scoped into this assessment.

The following effects to the Teifi transitional WFD water body were therefore scoped into this chapter:

- Construction - Impacts on hydromorphology, physical process and WFD compliance.
- Operation – Impacts on hydromorphology from permanent channel narrowing and hydrodynamic changes.

The scoping opinion also advised that this chapter should include 'a robust, evidence-based WFD Compliance Assessment supported by a Baseline Geomorphology Technical Note and updated hydraulic modelling.' Both assessments are included within the appendices of this chapter. The scoping opinion also advised that a Flood Consequence Assessment (FCA) is required and findings are to be included within this chapter.

Potential impacts to water quality have been scoped out from detailed assessment in the ES with provision of a Construction Environmental Management Plan (CEMP) as embedded mitigation. This would ensure that any contaminants from soils or construction materials are prevented from entering the water body and potentially deteriorating water quality.

The following receptors have been scoped out of this ES for the water environment, as no impact pathways have been identified to require detailed assessment:

- Piliau - headwaters to confluence with Teifi
- Mwldan river waterbody
- Teifi – Afon Ceri to estuary river waterbody

- Teifi river waterbody
- Teifi and Coastal Ceredigion groundwater body

10.7 Methodology

The purpose of this section is to describe how likely significant effects relating to Water Environment have been assessed. A more general explanation of assessment methodology used throughout the EIA is provided in Chapter 4: EIA Methodology. The individual assessment methodologies are set out within the respective appendices:

- Detailed Water Framework Directive (WFD) Compliance Assessment (Appendix 10.1)
- Baseline Geomorphology Technical Note (Appendix 10.2)
- Flood Consequence Assessment (64)
- Cardigan Tidal Flood Risk Management Scheme Hydraulic Modelling Report (Appendix 10.3)

10.7.1 Desk based assessment

The assessment of the Scheme impacts upon the water environment requires an understanding of the baseline condition of the surface water, groundwater and WFD receptor waterbodies within the study area. Data sources that have been used comprise of:

- Baseline Geomorphology Technical Note (Appendix 10.2)
- Natural Resources Wales (NRW) Water Watch Wales interactive mapping (65)
- DataMapWales (66)
- British Geological Society (BGS) Geology Viewer (67)

10.7.2 Definition of study area

The study area for this assessment has been determined by:

- The immediate footprint of the Scheme
- The WFD water bodies (surface and groundwater) and any other surface water features within and in proximity to the Scheme
- Identification of hydrological connections that could create a pathway for impacts or effects on any of the surface or groundwater features

Due to the location of the Scheme within a WFD transitional water body on a tidally influenced section of the River Teifi (Afon Teifi), a broad spatial study area has been selected. This encompasses the tidal section of the Afon Teifi within and adjacent to the Scheme, extending out to the upstream and downstream boundaries of the Teifi Estuary WFD Transitional water

body. Although the water body limits extend well beyond the immediate project works area, a precautionary approach has been taken to ensure all potential construction and operation impacts upstream and downstream of the works in Cardigan are identified. This study area is shown in Appendix C of Appendix 10.1.

The Zone of Influence (ZOI) for hydromorphological impacts has been defined in the Geomorphology Technical Note (Appendix 10.2) as local to the Scheme footprint and adjacent channel, extending approximately 500m upstream and downstream, with limited potential for wider estuarine hydrodynamic effects.

Adjacent WFD waterbodies (Piliau, Mwldan, and upstream Teifi river water bodies) were considered during scoping but have been excluded from detailed assessment in this chapter due to the absence of plausible pathways for significant impacts on the water environment beyond the defined study area. These waterbodies are, however, referenced in the appended Detailed WFD Compliance Assessment in Appendix 10.1. Potential impacts on fish within these waterbodies are addressed in Chapter 6: Biodiversity and Nature Conservation and not within the scope of this chapter.

10.7.3 Significance

Significance is determined using a combination of sensitivity of the receptor, magnitude of the change and duration of effect. This is outlined within Chapter 4: EIA Methodology. The guidance used to define the criteria of sensitivity and magnitude is defined in section 10.4.

Sensitivity

The criteria used to assess receptor sensitivity is set out in Table 10-1, this includes examples of the types of features used to determine sensitivity.

Table 10-1 Receptor sensitivity criteria

Sensitivity	Criteria
High	Main river or WFD water body with limited modifications or pressures, varied morphological features and largely natural processes ('High' or 'Good' ecological status). For Heavily Modified Water Bodies (HMWB), all identified mitigation measures are 'In Place' ('Good' Ecological Potential). Designated Shellfish or High Status Bathing Waters. Water body (surface or ground) providing drinking water to a large population.

Sensitivity	Criteria
Medium	Main river or WFD water body with some identified modifications or pressures that influence the variety of morphological features present and processes operating ('Moderate' ecological status). For Heavily Modified Water Bodies (HMWB), not all identified mitigation measures are 'In Place' ('Moderate' ecological potential). Good Status Bathing Waters. Water body (surface or ground) providing drinking water to a small population.
Low	WFD water body with 'Poor' or 'Bad' ecological status/potential. Ordinary Watercourse or other non-WFD water body, typically with extensive modifications and limited natural processes
Negligible	Artificial ditches

Magnitude of Change

To determine the magnitude of change, the nature of the change (positive or negative) and characteristics (i.e. whether direct or indirect, secondary, cumulative, short or long-term, permanent or temporary, reversible or irreversible) were assessed and classified as high, moderate, low, very low, or negligible. The magnitude of a change on a receptor reflects consideration of information and analysis relating to the spatial extent (localised/isolated versus widespread with potential secondary effects); the extent (type and quantity of receptor affected); and the duration (short, medium or long-term). Table 10-2 defines these criteria with relation to potential for impact upon the water environment.

Table 10-2 Criteria for the magnitude of change

Magnitude	Criteria
High	Substantial change in hydromorphological, biological or physico-chemical elements at the water body scale, such that a change in WFD classification is possible, or objectives would not be met in the future.

Magnitude	Criteria
	For HMWB, the impact would prevent WFD mitigation objectives from being implemented in the future. Positive impacts would substantially contribute to the implementation of HMWB mitigation measures. Substantial change in quality of a Protected Area, resulting in a reduction in classification status. Complete loss of a drinking water, industrial or agricultural water resource.
Medium	Measurable change in hydromorphological, biological or physico-chemical elements at less than the whole water body scale. A change in WFD classification is unlikely but may still need some mitigation or controls for the impacts. Objectives could still be met in the future. For HMWB, positive impacts would contribute to a limited number of HMWB mitigation measures. Measurable change in quality of a Protected Area, but unlikely to result in a change of classification status. Some reduction in quality or availability of a drinking water, industrial or agricultural water resource.
Low	Measurable but localised or slight change in hydromorphological, biological or physico-chemical elements of a water body. No risk of change in WFD classification but may still need

Magnitude	Criteria
	some mitigation or controls for the impacts. Objectives could still be met in the future. Neutral effects on HMWB mitigation measures – no conflicts, but no positive contribution either. Measurable but localised or slight change in in quality of a Protected Area, but unlikely to result in a change of classification status. Measurable but localised or slight changes in the availability of a drinking water, industrial or agricultural abstraction.
Negligible	No discernible change to a water body or water resource but no measurable loss in quality or availability.
No Change	No measurable change from the current baseline condition would occur.

The assessment of environmental effects has used the criteria as shown in the matrix in Table 10-3. After establishing the sensitivity of the receptor using criteria within Table 10-1 and assessing the magnitude of change using the criteria within Table 10-2, the effect to the receptor has been determined as either significant (major or moderate effects) or not significant (minor or negligible effects).

Table 10-3 Significance of effect matrix

	High Sensitivity	Medium Sensitivity	Low Sensitivity	Negligible
High magnitude	Major (significant)	Major (significant)	Moderate (significant)	Minor
Medium magnitude	Major (significant)	Moderate (significant)	Minor	Minor
Low magnitude	Moderate (significant)	Minor	Negligible	Negligible
Negligible magnitude	Minor	Negligible	Negligible	Negligible
No change	None	None	None	None

10.8 Baseline environment and likely future evolution

The section below describes the baseline environment and its likely future evolution. The current baseline environment scenario refers to the current state of environmental characteristics within the Scheme Area. A desk-based study was undertaken to develop an understanding of the baseline condition of the surface and groundwater resources.

Further detail on the spatial distribution of the bedrock and superficial geology is set out within Chapter 11: Land Use and Soils.

Surface Water

The Afon Teifi is the dominant surface water feature within the defined study area and is the primary driver for the Scheme. Originating from Llyn Teifi in the Cambrian Mountains, the river flows southwest through predominantly rural uplands before passing through Cardigan and discharging into Cardigan Bay. The catchment is largely rural, with land use comprising agriculture, forestry, and upland moorland.

Within Cardigan itself, the Afon Teifi is transitional, both tidally and fluvially influenced, connecting both the marine and freshwater systems. The tidal limit of the river is located at Llechryd approximately 6.75 km upstream of the Scheme Area in Cardigan.

The following watercourse within the study area is scoped into this assessment and is designated as a WFD water body:

- Teifi Estuary transitional waterbody (GB511006206900)

The transitional waterbody, is currently achieving "Moderate" overall status in Cycle 3. It is not designated as a heavily modified waterbody (HMWB) and its morphology status is "High". Due to this, the sensitivity of the Teifi Estuary transitional waterbody receptor is deemed to be High.

Two key tributaries enter the Teifi within the study area but are not defined as receptors for this assessment:

- Afon Piliau, entering the Teifi approximately 180 m upstream on the left bank just upstream of Pont Y Priordy
- Afon Mwldan, entering approximately 290 m downstream on the right bank downstream of Cardigan bridge

Several minor drains and small watercourses also discharge into the Teifi within Cardigan, both upstream and downstream of the Scheme footprint.

Hydromorphology

Please refer to the Baseline Geomorphology Technical Note (Appendix 10.2) for a comprehensive baseline of the Afon Teifi morphology, informed by a site walkover.

Under the WFD, the Teifi Estuary transitional waterbody, is currently at 'High' status for morphology status and is not designated as a HMWB. The hydrological regime has not been assessed.

The Teifi is macrotidal and has a significant fluvial input. Tides are asymmetric and flood dominant, although it is noted that this can change during instances of increased fluvial discharge. Upstream of Cardigan Bridge, tidal influence remains, however fluvial processes are dominant (68).

The Scheme area already has significant bank protection which spans nearly the full length of each side of the river and is comprised of a mix of stone walls and gabions. This restricts natural processes, reducing the ability of the channel to migrate and limits morphological diversity of the intertidal zone.

The site walkover has reported that the substrate consists primarily of fine sediments forming mudflats, with some areas of dense and continuous saltmarsh along the right bank through Cardigan.

Based on the High morphology status WFD classification, and the presence of estuarine habitats such as mudflats and saltmarsh, hydromorphology sensitivity for this assessment is considered High.

Hydrogeology

The bedrock geology of the study area is dominated by sedimentary mudstones, which are generally characterised by low permeability and limit groundwater movement (67). Beneath the Scheme footprint lies the Nantmel Mudstones Formation, while to the west, the geology transitions into several other formations, including the Dinas Island Sandstone and Mudstone Formation, the Cwm Degwel Mudstone Member, and the Net Pool Mudstone Formation. These lithologies are classified as Secondary A aquifers which support only minor groundwater resources. The groundwater-surface water connection is therefore expected to be low with flows restricted primarily to fractures and thin sandstone layers

Above the bedrock, the superficial geology comprises of alluvial and tidal deposits of clay, silt and sand and gravels (67). These deposits are more permeable and have potential to hold shallow groundwater in proximity to the Afon Teifi. Outside of the Scheme footprint and further away from the river, other superficial deposits comprise of alluvium, glacial till and head deposits which are likely to influence shallow groundwater dynamics.

Flood risk

Several significant flood events have occurred in Cardigan between 2000 and 2020. The lowest lying residential and commercial properties in Strand area have a threshold level below 3.1m AOD and potentially impacted most years. The 0.5% Annual Exceedance Probability still water tidal level for the town, including 100 years of climate change, is estimated at 4.75m AOD, which is well above the existing ground levels at several locations, and the lowest properties are vulnerable to significant depths of flooding.

Tidal flooding represents one of the most significant sources of flood risk in Cardigan. The online NRW long term flood risk flood map includes flood extents for tidal flood risk. The lower quayside is an area of 'high' risk, which has a 3.3% AEP or greater risk of flooding. This area is inundated by the tide, which affects the lower Strand and the Cattle Market areas. Low-lying residential and commercial properties are affected by a tidal event that can be expected to occur every year.

There is a 'high' risk of fluvial flooding on the north bank of the Afon Teifi at Strand, which has a 3.3% AEP flood or greater risk of flooding. There is also 'high' risk of flooding upstream of Priory bridge, to the south of the A484. For surface water, most of the town is at 'very low' risk, which has less than 0.1% AEP risk of flooding.

The entire study area (behind the proposed flood defence wall) is currently classified as Flood Zone 3 for rivers and the sea. Further information is available in the Flood Consequence Assessment (64)

10.9 Assessment of effects

This section describes the outcomes of the assessment, identifying the likely significant effects on Water Environment for the scoped in receptors. Where likely significant effects are reported, additional mitigation is described in Section 10.10 with the residual effects described in Section 10.11.

Construction

During construction, impacts on hydromorphology, physical process and WFD compliance could occur from:

Impacts to structure and substrate of the river bed from direct adaptation to habitat.

The Baseline Geomorphology Technical Note (Appendix 10.2) details that the existing substrate of the Teifi Estuary at the Scheme location is dominated by fine sediments with locations of rubble, possibly historic barge ballast, along the margins. During construction, there would be temporary impacts to both the structure and substrate of the bed due to the direct adaptation of the habitat; direct impacts and changes would occur as the haul road is constructed and used along the foreshore. The haul road would later be modified to form the engineered riverbank and as such the adaptation of existing habitats remains through operation as the design of the engineered riverbank would be formed of rock rolls, allowing intertidal habitat to develop and support biodiversity. The impacts are localised and minor in scale when compared to the size of the Teifi Estuary water body.

Prior to construction, a CEMP would be developed to ensure that environmental impacts are avoided and minimised during construction. The CEMP would detail mitigation measures specific to the construction phase and help to demonstrate the Scheme's commitment to environmental protection and sustainability. Standard good practice for working in or near water would be applied and would likely include measures to avoid sediments entering the water and measures to minimise the area of bed impacted by the works.

In relation to the impacts to structure and substrate of the river bed from direct adaptation of the habitat, impact would result in a slight, but measurable change to the hydromorphology in the local area. The magnitude of change is therefore considered as low, resulting in a moderate (significant) effect, that is negative, temporary, and direct.

Impacts to the intertidal zone from direct adaptation to habitat.

As mentioned previously, existing structure of the intertidal zone of the Teifi Estuary at the Scheme location is dominated by fine sediments with locations of rubble, possibly historic barge ballast along the margins, hard engineered banks and small sections of intertidal vegetation. During construction, there would be temporary impacts to the structure of the intertidal zone due to the direct adaptation of the habitat. Direct impacts and changes to the habitat would occur during the construction phase as the haul road is constructed and used along the foreshore, along with construction of the new flood defence wall.

Prior to construction, a CEMP would be developed to ensure that environmental impacts are avoided and minimised during construction. The CEMP would detail mitigation measures specific to the construction phase and help to demonstrate the Scheme's commitment to environmental protection and sustainability. Standard good practice for working in or near water as set out in the Guidance for Pollution Prevention 5: Works and maintenance near water (69) would be applied and would likely include measures to avoid sediments entering the water and measures to minimise the area of bed impacted by the works.

In relation to the impacts to the intertidal zone from direct adaptation to habitat, the impact would result in a slight, but measurable change to the hydromorphology in the local area. The magnitude of change is therefore low, resulting in a moderate (significant) effect, that is negative, temporary, and direct.

WFD Classification (surface and Groundwater bodies)

The Detailed WFD Compliance Assessment (Appendix 10.1) has considered the construction impacts of the Scheme against the Teifi Estuary transitional waterbody and has found that the Scheme would not result in deterioration of any water quality elements for this waterbody. The magnitude of change is therefore considered as negligible, resulting in a negligible (not significant) effect, that is negative, permanent and direct.

Operation

During operation, impacts on hydromorphology, physical process and WFD compliance could occur from:

Impacts to hydrodynamics from direct, permanent changes to river cross-sectional geometry and reduction in tidal prism.

Changes to the cross-sectional geometry have the potential to affect hydrodynamics. One-dimensional hydraulic modelling was undertaken; Table 10-27 details the modelled velocities at Node TE01_0755. This node is located at an existing narrow point in the channel, and where the engineered riverbank is proposed, and as such is expected to show the most significant changes in velocities. All velocities for Q50 and Q1 inflows have a minor increase in velocities due to the

Scheme. The results indicate that at Q50 to Q1 flows, the Scheme would not result in a change to the structure and substrate of the Estuary as the Hjulston-Sundborg diagram (70) details no change to erosion, transportation or deposition of fine sediment. During the QMED simulations, there is a modelled increase of 0.327 m/s in velocities during a High Astronomical Tide (HAT). Hjulston-Sundborg diagram (70) indicates that this increase in velocities would result in the erosion of coarse granules to fine pebbles as defined by the Wentworth classes. It would also result in the transportation of coarse pebbles and fine cobbles. As the sediments locally are dominated by fines, and there are no predicted changes to fine sediment dynamics, the modelling indicates a low risk of changes to the quality, structure and substrate due to hydrodynamic changes based on alterations of the cross-sectional geometry.

Table 10-27 - Baseline Velocities adjacent to Scheme at Node TE01_0755

Fluvial Inflow	Tide	Baseline Velocity (m/s)	Scheme Velocity (m/s)	Difference (m/s)
Q50	High Astronomical Tide (HAT)	0.0774	0.0792	0.0018
	Mean High Water Spring (MHWS)	0.093	0.0956	0.0026
	Mean Low Water Spring (MLWS)	0.532	0.552	0.02
Q1	High Astronomical Tide (HAT)	0.663	0.678	0.015
	Mean High Water Spring (MHWS)	0.783	0.804	0.021
	Mean Low Water Spring (MLWS)	1.414	1.462	0.048
QMED	High Astronomical Tide (HAT)	0.636	0.963	0.327
	Mean High Water Spring (MHWS)	1.096	1.125	0.029
	Mean Low Water Spring (MLWS)	1.584	1.638	0.054

The Scheme is located in the upper estuary, where the tidal prism is relatively small. A minor reduction in tidal prism can be expected due to the Scheme from the new flood defence wall alignment, increased wall height and engineered riverbank at the toe of the flood defence wall. Additionally, the creation of new intertidal habitat in Area 4 would result in a minor increase in tidal prism. Minor changes are expected to the tidal prism due to the relatively small volume lost by the engineered riverbank and flood defence wall alignment. Changes in flood defence wall height are above the modelled water levels under the QMED and HAT scenarios, and as such, only impact the tidal prism during significant flood events. Also, the area of adapted intertidal habitat would mitigate the loss of tidal prism by the engineered riverbank and new flood defence wall alignment. Based on this, there are no anticipated impacts to the tidal regime associated with the Scheme in both construction and operation.

As there is no discernible change to the hydrodynamics of the waterbody due to the Scheme, the magnitude of change to hydrodynamics is therefore negligible, resulting in a minor (not significant) effect, that is negative, permanent, and direct.

Permanent loss of existing habitat and geomorphological features from flood wall.

Direct impacts and changes would occur during the construction phase as the haul road is constructed and used along the foreshore, along with construction of the new flood defence wall resulting in impacts on geomorphological features including salt marsh and the intertidal zones, as discussed above. However, this will be temporary in nature, because once operational the haul road would be modified to form the engineered riverbank, which will be constructed with rock rolls. This will allow intertidal habitat to develop which will enhance geomorphological diversity, in addition to supporting biodiversity. Due to the sloped nature of the engineered riverbank, the resulting area available for intertidal habitat to develop will also be marginally larger. Furthermore, the slope enables the habitat to migrate upwards in accordance with rising sea levels, meaning it is more resilient to climate change than the current habitats, which are backed with restrictive vertical walls.

Additionally, Area 4 (see Chapter 3: Project Description) would set back flood defences, allowing a new area of intertidal habitat to develop. The design approach incorporates habitat niches targeted to replicate natural estuarine features. This will mitigate for the loss of intertidal habitat from the footprint of the flood defence wall and the space between the existing wall and the new flood defence wall. It is anticipated that the area of the new habitat would be of the same size as the area lost, with improved quality. The exact composition of the intertidal habitat will be down to natural river processes after creation.

Therefore, the overall operational magnitude of change from permanent loss of existing habitat from the flood wall is negligible, resulting in a minor (not significant) effect, that is positive, permanent, and direct.

WFD Classification (surface and groundwater bodies)

The Detailed WFD Compliance Assessment (Appendix 10.1) has considered the operational impacts of the Scheme against the Teifi Estuary transitional waterbody and has found that the Scheme would not result in deterioration of any water quality elements for this waterbody. The magnitude of change is therefore considered as negligible, resulting in a negligible (not significant) effect, that is negative, permanent and direct.

Flood Risk

The Flood Consequence Assessment (64) summarises that the Scheme will reduce both tidal and fluvial flood risk, without causing detrimental flood risk elsewhere. Modelling results have advised that the Scheme will provide protection up to the 0.5% AEP tidal event, accounting for climate change, which will not negatively impact peak flood levels, extents, or velocities outside of the Scheme's footprint. Where increases in water levels or velocities have been observed, these are shown to be minor and highly localised, and still satisfy the requirements of TAN15. There is one exception, for the 0.1% AEP fluvial flood with climate change – however, the results for this are uncertain, and overall do not detract from achieving the requirements for TAN15. As

such, the magnitude of change is major, resulting in a major (significant) effect, that is positive, permanent, and direct.

10.10 Mitigation measures

The following embedded mitigation measures have been adapted into the Scheme to reduce negative impacts:

- The legally binding avoidance measures shown in Table 5 of the Detailed WFD Compliance Assessment (Appendix 10.1) are included within the proposal. These include a Construction Environmental Management Plan (CEMP) and the use of silt curtains under a Pollution Prevention Plan.

- The design of the engineered riverbank, formed by rock rolls, provides the opportunity for intertidal habitat to establish and improve. Additionally, Area 4 would set back flood defences, allowing a new area of intertidal habitat to develop, mitigating the habitat lost during construction. This will have long term benefits by directly improving habitat quality in addition to enhancing climate change resilience such as to sea level rise due to the sloped riverbank profile which will allow habitat migration.

- The design has been shown to mitigate flood risk in Cardigan, including having accounted for the impacts of climate change and rising tidal levels, which has been built into the design.

10.11 Significance and duration of residual effects

Table 10-5 summarises the significance and duration of residual effects for each scoped in effect.

Table 10-5 - Summary of significance and duration of residual effects.

Scoped in Effect	Significance	Duration
Impacts to structure and substrate of the river bed from direct adaptation to habitat.	**Construction** The magnitude of change is considered as low, resulting in a moderate (significant) effect, that is negative, temporary, and direct. As this is unavoidable, the magnitude of change therefore remains low, resulting in a moderate (significant) effect, that is negative, temporary, and direct.	Short-term (construction phase)
Impacts to the intertidal zone from direct adaptation to habitat.	**Construction** The magnitude of change is low, resulting in a moderate (significant)	Short-term (construction phase)

Scoped in Effect	Significance	Duration
	effect, that is negative, temporary, and direct. As this is unavoidable, the magnitude of change therefore remains low, resulting in a moderate (significant) effect, that is negative, temporary, and direct.	
Impacts to hydrodynamics from direct, permanent changes to river cross-sectional geometry and reduction in tidal prism.	**Operation** The magnitude of impacts is negligible, resulting in a minor (not significant) effect, that is negative, permanent, and direct.	Permanent (operation phase)
Permanent loss of existing habitat from flood wall.	**Operation** The magnitude of change from permanent loss of existing habitat from the flood wall is therefore negligible, resulting in a minor (not significant) effect, that is positive, permanent, and direct.	Permanent (operation phase)
WFD Classification (surface and Groundwater bodies)	**Construction and operation** The magnitude of change is considered as negligible, resulting in a negligible (not significant) effect, that is negative, permanent and direct.	N/A

10.12 Monitoring

The Detailed WFD Compliance Assessment (Appendix 10.1) has identified that monitoring surface water quality should be undertaken during construction as a standard good practise measure. This is likely to include the use of automated river water quality instruments (measuring several parameters at short intervals such as turbidity, dissolved oxygen, and temperature) both upstream and downstream of the works area with trigger limit alerts to determine whether construction activities are negatively impacting the Afon Teifi estuary. If limits are exceeded, then works in the river should be suspended until conditions recover.

10.13 Difficulties and uncertainties

The baseline developed for the assessment has been supported by and informed by specific studies and surveys to provide a better understanding of the relevant conditions in the Scheme area. It is assumed that the information held within the consulted datasets is sufficiently accurate for the purpose of assessing impacts on the water environment.

To date, the WFD Compliance Assessment has been based on 1D hydraulic modelling only, not 2D modelling. This is less detailed and does not fully represent factors such as full flow paths. However, the level of detail provided by the 1D modelling has been determined to be sufficient for the Scheme's requirements at this stage.

10.14 Summary of assessment

This assessment has drawn on the findings of the Detailed WFD Compliance Assessment (Appendix 10.1), the Baseline Geomorphology Note (Appendix 10.2), the Flood Consequence Assessment (64), and the Hydraulic Modelling Report (Appendix 10.3) to identify the significance of the impacts of the Scheme on intertidal habitats and channel structure. It has found that the impacts to the structure and substrate of the river bed and to the intertidal zone due to direct adaptation to habitat during construction are low, resulting in a moderate (significant) effect, that is negative, temporary, and direct. Impacts to hydrodynamics during operation are negligible, resulting in a minor (not significant) effect, that is negative, permanent, and direct. The permanent loss of existing habitat from the flood wall during operation is negligible, resulting in a minor (not significant) effect, that is positive, permanent, and direct. Impacts to the overall classifications of WFD waterbodies is considered negligible (not significant), negative, permanent and direct.

10.15 References

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11. Land Use and Soil

11.1 Introduction

This chapter assesses the likely significant effects from construction and operation of the Scheme, with respect to Land Use and Soil. This chapter details the baseline environment, assessment of likely significant effects and, where necessary, mitigation measures to avoid, reduce or minimise significant effects are proposed.

This chapter should be read in conjunction with the following topic chapters due to potential interactions between topics:

- Chapter 5: Population and Human Health
- Chapter 6: Biodiversity and Nature Conservation
- Chapter 7: Historic Environment
- Chapter 10: Water Environment
- Chapter 12: Cumulative Effects

11.2 Competent expert evidence

Technical Lead Benjamine Tucker is a Principal Geotechnical and Geo-environmental Engineer with over 19 years' experience across the full range of geotechnical and full range of geoenvironmental deliverables, including authoring EIA sections for Soils and Controlled Waters on several projects. Ben has experience as author and technical lead for Soils and Land as well as Materials and Waste topics on large scale Nationally Significant Infrastructure Projects (NSIPs) requiring a Development Consent Order (DCO).

Technical Author Stephanie Rebours-Smith is a Senior Geotechnical Engineer with over 11 years' experience in the full range of geoenvironmental deliverables, including authoring EIA sections for Soils and Land, and Groundwater Resources on small scale and large scale NSIPs.

11.3 Planning policy and legislative context

This section describes the relevant legislation, policy and guidance that has been considered in developing the Scheme design, and in the assessment of effects with respect to Land Use and Soil. This legislation, policy and guidance has been reviewed and where applicable has informed the assessment through the identification and categorisation of sensitive receptors, requirements for mitigation, and the scope and/or method of assessment.

11.3.1 International and National Policy

- The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (SI 2017/572) (EIA Regulations, HM Government, 2017a). The EIA Regulations provide a

framework for assessing the impact of a development on the environment in which it will exist.

- The Marine Works (Environmental Impact Assessment) (Amended) Regulations 2017 (HM Government, 2017b). Addresses the steps required when a proposed activity such as the Scheme has the potential to impact the marine environment.

- Control of Asbestos Regulations (CAR) (HM Government, 2012). Legislation regarding the control of asbestos is relevant due to the presence of asbestos containing material in the foreshore. The reuse or disposal options for asbestos containing soil and silt would be controlled through the CAR.

- The Environmental Protection Act (EPA) 1990 Part 2A, supplemented by the Contaminated Land (England) (Amendment) Regulations 2006 (HM Government, 2012). Part 2A of the EPA provides the framework for approaching land affected by contamination. This legislation sets out the source-pathway-receptor (SPR) model under which is used for all assessment of land for contamination. We have developed our methodology for this ES to be compliant with this legislation, for example by considering the pollutant linkages between sources, pathways, and existing receptors. In developing our methodology for this ES, we have applied the risk-based source-pathway-receptor model to ensure compliance, evaluating contaminant linkages between potential sources, transport pathways, and existing receptors. Mitigation measures are then developed to prevent spread of contamination during construction and operation activities in order to protect receptors from harm.

- Welsh Government Contaminated Land Statutory Guidance 2012 (Welsh Government, April 2012). Describes how the Welsh Government requires local authorities to approach land potentially affected by contamination and implement Part 2A of the EPA 1990.

- Welsh National Marine Plan (Welsh Government, 2019) Addresses the marine environment in Wales, including provision to minimise pollution to air or water. Relevant here to demonstrate the need to control pollution from entering surface waters.

- HM Government. The Water Resources Act 1991, as amended by the Water Act 2003 and the Water Resources (Abstraction and Impounding) Regulations 2006. This describes methods to be undertaken to protect water, including groundwater.

- Water Framework Directive (WFD) 2000 (European Parliament, 2000). This describes methods to be undertaken to protect water, including groundwater. It has been maintained following the UK departure from the European Union in England and Wales as the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017.

11.3.2 Local Policy

Ceredigion Local Development Plan (LDP1), 2007 – 2022 (Adopted 2013) (Ceredigion County Council, 2021). This plan was due to be updated; however, COVID and additional information

regarding phosphate in rivers (NRW 2021) means that it remains current and the update to LDP2 has been paused. This plan sets forth the approach to growth in the Ceredigion council area.

Development of Land Affected by Contamination: A Guide for Developers (Welsh Local Government Association & Environment Agency Wales, 2012). Sets out expectations of developers with regard to Preliminary Risk Assessment (Desk Study) and Intrusive Site Investigations prior and during the planning process.

11.4 Assessment guidance

The following guidance documents were used in this assessment, as described in the Methodology.

- IEMA (2022) A New Perspective on Land and Soil in Environmental Impact Assessment. Industry guidance on assessing effects on soils and land in EIA. The Soils and Land methodology and assessment complies with the principles set out within this document in order to follow good practice.
- The Land Contamination Risk Management (LCRM) guidance (The Environment Agency, 2023). This guidance delineates the preferred approach towards investigating for potential contamination linkages as established in Part 2A and Welsh Government, April 2012.
- Eurocode 7. Engineering guidance for geotechnical works and site investigation, This provides best practice in ground investigation.
- BS 1377-2:2022 (British Standards Institution, BSI, 2022). Methods of test for soils for civil engineering purposes. Classification tests and determination of geotechnical properties. Used to inform soil testing methods that provide relevant characteristics for permeability and groundwater flow estimates at the site.
- BSI (2020) BS EN ISO 21365:2020 Conceptual site models for potentially contaminated sites. British standard for conceptual site models. Provides additional guidance on different methods to create a CSM.
- BS 8500:2023 Concrete – Complimentary British Standard to BS EN 206 (BSI, 2023). Includes a methodology for assessing how to specify concrete for different exposure classes, strength classes, and durability requirements in chemically aggressive environments.
- BS 5930:2015+A1:2020 Code of Practice for ground investigations. Informed the ground investigations undertaken for the Scheme.
- BS 10175:2011+A2:2017(BSI, 2017) Investigation of potentially contaminated sites: Code of Practice. Informed the ground investigations undertaken for the Scheme.
- Contaminated Land: Applications in Real Environments (CL:AIRE, 2016) - Control of Asbestos Regulations 2012: Interpretation for Managing and Working with Asbestos in Soil and Construction & Demolition materials: Industry Guidance. Control of Asbestos

Regulations 2012: Interpretation for Managing and Working with Asbestos in Soil and Construction & Demolition materials: Industry Guidance (shortened name CAR-SOIL™). Guidance note addressing how to approach the risk of asbestos in soil at brownfield sites such as the Scheme.

- CL:AIRE (2011) The Definition of Waste: Development Industry Code of Practice (DoWCoP) (CL:AIRE, 2011). The approach adopted in the UK to reuse surplus soil in an environmentally safe manner.

- CL:AIRE (2025). Piling and Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention. Guidance on piling through contaminated land. Includes approaches to assessing the risk and describes methods to prevent creating additional pathways during ground improvement works, such as the sheet piled walls proposed as part of the Scheme.

- Construction Industry Research and Information Association(CIRIA) C552 (2001) Contaminated Land Risk Assessment – A Guide to Good Practice. Risk assessment with respect to potential contamination is based heavily on Ciria C552.

- CIRIA C741 (2015) Environmental Good Practice on Site Guide (4th edition). Guidance that informed mitigation.

- Defra (2011) Code of practice for the sustainable use of soils on construction sites

- (Defra, 2018). Guidance on preventing degradation of soils during construction.

- EA (2009). Updated technical background to the CLEA model. Technical guidance on the theory behind the Contaminated Land Exposure Assessment (CLEA) model, which is the UK standard method for determining what exposure limits to set for various chemicals depending on receptor. This guidance document provides a framework for developing generic assessment criteria, which was then used to develop a baseline understanding of contamination in the Scheme Area.

- NRW (February 2018) Guidance for Pollution Prevention 5: Works and maintenance in or near water (version 1.2) Guidance that informed mitigation.

- Water Framework Directive – United Kingdom Advisory Group (WFD-UKTAG) (July 2014). UKTAG River & Lake Assessment Method Specific Pollutants (Metals) Metal Bioavailability Assessment Tool (M-BAT). Guidance on understanding fate and bioavailability of certain metals in the environment.

11.5 Consultation

Chapter 2: Project Development contains consultations in more detail, and the broader engagement with stakeholders.

Specific to the land use and soils topic, Ceredigion Council (Pollution Protection team and Petroleum Officer/Trading Standards) have been approached for historical information regarding ground investigation and risk assessment, landfill records, mining activities, pollution incidents or consent exceedances, and tanks within or near the Scheme Area.

Responses have not yet been received to the date of issue of this document.

11.6 Scoped in receptors and potential effects

The only affected receptor explicitly scoped in for assessment is the Teifi Estuary.

It is implied in the Scoping Opinion that the standard identification of receptors as outlined in LCRM (EA, 2023) should be undertaken; therefore, additional receptors have also been considered.

The full list of receptors considered in this assessment are as follows:

- Human health;
- Controlled surface water (Teifi Estuary);
- Controlled groundwater (Secondary undifferentiated bedrock and superficial aquifers); and
- Onsite buildings and structures, and construction materials.

The potential effect identified at scoping is mobilisation of contaminants from sediments into the Teifi Estuary.

The Scoping Opinion implied that other effects should be considered; the full list of effects considered in this assessment are the viable pollution linkages identified in the conceptual site model. These are:

- Migration of contamination to on-site receptors from off-site sources.
- Creation of new pathways between on-site sources (including but not limited to river sediments disturbed by the piling works) and on and off-site receptors (including but not limited to the Teifi Estuary).

Scoped out are all effects related to the operational phase of the project.

The assessment of impacts on other soil functions have also been scoped out; meaning that, unless they could be harmed by contamination, we are not considering effects related to:

- agricultural impacts,
- mineral resource impacts,
- contribution to archaeological preservation, and
- biological soil functions (such as supporting the carbon and nitrogen cycles, as a component of the hydrological cycle, and supporting ecological habitats).

11.7 Methodology

The purpose of this section is to describe how likely significant effects relating to Land Use and Soil have been assessed. A more general explanation of assessment methodology used throughout the EIA is provided in Chapter 4: EIA Methodology.

The overall approach has been to gather baseline information about the Scheme Area and its surroundings, then assess that with respect to the potential for significant possibility of significant harm using the standard approach outlined in LCRM.

In the UK a risk-based approach is taken to assess the significance of contamination present within a study area. In a regulatory sense, for land to be deemed as contaminated land under Part 2A of the Environmental Protection Act 1990, or for there to be a significant 'risk' of contamination, there must be clearly identifiable pollutant linkages. Land contamination and risk management guidance documentation (e.g. Statutory Guidance to Contaminated Land (Defra, 2012) and Land Contamination Risk Management (LCRM), EA 2023) sets out the process for risk assessment as previously noted. The following contaminant linkage definitions apply for assessments:

- Contaminant source: contamination that has the potential to cause unacceptable negative effects to a receptor. It may comprise chemical, biological, or physical agents.
- Pathway: a route whereby a contaminant may come into contact with the receptor. Examples include human ingestion of contaminated soil and leaching of contaminants from soil and migrating into water resources.
- Receptor: a target that may be affected by contamination. Examples include human occupants or users of the Scheme, surface or groundwater bodies, or structures.

These definitions informed a Conceptual Site Model (CSM) which assesses the likelihood of pre-existing contamination being encountered during the construction phase such that it could cause significant negative effects on identified receptors.

We have assessed the effects that could arise due to the disturbance of land affected by pre-existing contamination. We have also evaluated the potential for contamination to infiltrate into groundwater should a pathway already exist or if there is a possibility of one or more new pathways being created (e.g. through excavation or pre-augering and piling through Made Ground or riverbed sediments).

Based on this assessment, we have established the likelihood of any significant effects from contamination upon identified receptors in the future and identified the necessary control measures.

11.7.1 Definition of Study Area

The Study Area for Chapter 11: Land Use and Soils, is the Scheme Area plus a 500m radius buffer, as indicated on Figures 11.1 and 11.2.

11.7.2 Baseline information

Baseline information regarding contamination was gathered following the methodology set out in LCRM Stage 1 Tier 1 (Contamination Preliminary Risk Assessment) and Tier 2 (Generic Quantitative Risk Assessment (GQRA) following intrusive site investigations). This includes the following:

- Groundsure Enviro+Geo Insight report (reference GS-SQR-C8M-SGX-TC2, Groundsure, 2024);
- Topographical Maps (Ordnance Survey, obtained via Groundsure, 2024);
- BGS GeoIndex (BGS, 2025);
- England and Wales Geological Map 1:50,000 scale Sheet 193 Cardigan and Dinas Island Solid and Drift Geology (BGS, 2003) (BGS, 2024);
- DataMap Wales (2025);
- Aerial and Street View Photography (Google Earth, 2024; Google, 2024);
- Unexploded Ordnance (UXO) (Zetica, 2024); and
- Flood Records (NRW, 2024).

Existing information has also been collated from reports produced by Binnies and others; the contents of which are assumed to be an accurate representation of the prevailing conditions at the Scheme. The following reports have been provided and reviewed to inform this ES:

- Ground Investigation Report by WYG Environment Planning Transport Ltd for Natural Resources Wales (WYG, 2015).
- Ground Investigation Report by CJ Associates on behalf of Binnies UK Ltd for Natural Resources Wales (CJ Associates, 2022).
- NRW NGF Cardigan Tidal Flood Risk Management Scheme (FRMS) Ground Investigation Report and Seepage Assessment by Binnies UK Ltd for Natural Resources Wales (Binnies, 2022).
- Cardigan Contamination Preliminary Risk Assessment by Binnies UK Ltd for Natural Resources Wales (Binnies, 2026).
- Cardigan Land Contamination Risk Assessment Report by Binnies UK Ltd for Natural Resources Wales (Binnies, 2026).
- Cardigan TFRMS Sediment Survey - Technical Note (Binnies, 2026).
- Cardigan TFRMS Water Framework Directive Assessment by Binnies UK Ltd for Natural Resources Wales (Binnies, 2025).

11.7.3 Significance

Our evaluation of significance and analysis of consequences is based on established EIA assessment approaches and expert professional judgement. We have relied on industry approved standards, guidelines, and current legislation to support the assessment. The potential exists for a variety of likely significant effects on soil and land to arise from the construction of the Scheme. We have assessed these effects according to relevant guidance as discussed in section 11.3.

11.7.4 Sensitivity

The criteria used to assess receptor sensitivity is provided in Table 11-.

Table 11-1 Receptor sensitivity criteria

Sensitivity	Criteria
Very High	All direct exposure pathways on human health receptors. Land supporting internationally designated ecological site, e.g. Ramsar, Special Area of Conservation (SAC). Inner groundwater source protection zones (SPZ1), public reservoir, or potable water supply for public consumption and the geology supporting these.
High	Indirect exposure pathways in residential areas, schools, recreational areas, allotments. Nationally designated ecological sites e.g. Sites of Special Scientific Interest (SSSI) and the land supporting these. Principal aquifer, surface waters of high quality (using Water Framework Directive definition) and the geological units supporting these. Areas with geodiversity designation, e.g. Regionally Important Geological and Geomorphological Sites (RIGS).
Moderate	Indirect exposure pathways to places of work and public open space e.g. retail/shopping parks. Locally designated ecological sites e.g. Local Nature Reserve and the land that supports these. Outer and total catchment groundwater source protection zones (SPZ2 and SPZ3), or Secondary aquifer and the geological units that support these.
Low	Indirect exposure pathways to commercial/industrial developments. Areas mainly covered by hard surfacing. Building fabric. No sites of significant ecological value. Unproductive aquifer.

Sensitivity	Criteria
Negligible	As for low sensitivity, but with no clear connection between sources of impact and soil function. Broken SPR linkage.

11.7.5 Magnitude of change

To determine the magnitude of change, the nature of the change (positive or negative) and characteristics (i.e. whether direct or indirect, secondary, cumulative, short or long-term, permanent or temporary, reversible or irreversible) were assessed and classified as high, moderate, low, very low, or negligible. The magnitude of change is its severity or scale. The magnitude of a change on a receptor reflects consideration of information and analysis relating to the spatial extent (localised/isolated versus widespread with potential secondary effects); the extent (type and quantity of receptor affected); and the duration (short, medium or long-term). Short term duration is considered during the construction and maintenance period up to nominally two years, medium term is considered less than ten years, and long-term or permanent changes are considered for any change lasting ten years or more.

Table 11-2 defines these criteria with relation to potential for land contamination.

Table 11-2 Criteria for the magnitude of change

Magnitude	Criteria
High	Exceedance of statutory guidance or legislation. A high probability of creating a source-pathway-receptor (SPR) linkage such that the most sensitive receptors within the Scheme would encounter contamination at concentrations capable of causing harm to living organisms, disrupting ecological functions, or negatively affecting property.
Moderate	A moderate probability of creating an SPR linkage such that the most sensitive receptors within the Scheme would encounter contamination at concentrations capable of causing harm to living organisms, disrupting ecological functions, or negatively affecting property.
Low	A low probability of creating an SPR linkage such that the most sensitive receptors within the Scheme would encounter contamination at concentrations capable of causing harm to living organisms, disrupting ecological functions, or negatively affecting property.

Magnitude	Criteria
Very Low	A very low probability of creating an SPR linkage such that the most sensitive receptors within the Scheme would encounter contamination at concentrations capable of causing harm to living organisms, disrupting ecological functions, or negatively affecting property.
No Change	No SPR linkage identified. Negligible likelihood of creating SPR linkage such that the most sensitive receptors within the Scheme would encounter contamination at concentrations capable of causing harm to living organisms, disrupting ecological functions, or negatively affecting property.

The assessment of environmental effects has used the criteria as shown in the matrix in Table 11-3. After establishing the sensitivity of the receptor using criteria within Table 11- and assessing the magnitude of change using the criteria within Table 11-2, the effect to the receptor has been determined as either significant (major or moderate effects) or not significant (minor or negligible effects).

Table 11-3 Significance of effect matrix

	Very high sensitivity	High sensitivity	Moderate sensitivity	Low sensitivity	Negligible sensitivity
High magnitude	Major (significant)	Major (significant)	Major (significant)	Moderate (significant)	Minor
Moderate magnitude	Major (significant)	Major (significant)	Moderate (significant)	Minor	Negligible
Low magnitude	Moderate (significant)	Moderate (significant)	Minor	Negligible	Negligible
Very low magnitude	Minor	Minor	Negligible	Negligible	Negligible
No change	None	None	None	None	None

11.8 Baseline environment and likely future evolution

The section below describes the baseline environment and its likely future evolution. The current baseline environment scenario refers to the current state of environmental characteristics within the Scheme Area. This section is a summary of the LCRM Stage 1 Tier 1 (Contamination Preliminary Risk Assessment) and Tier 2 Contamination Risk Assessment, which are included as Appendix 11.1 and 11.2, respectively. This also includes information from the Technical Note on contamination in the sediments (Appendix 11.3).

11.8.1 Description of existing baseline environment

Geology

Made Ground is mapped throughout the Scheme and extends along the riverbank to the west and east of the site, as well as further north into Cardigan Town. Given the distribution of Made Ground along the banks of the River Teifi (Afon Teifi) it is anticipated that the site is situated on reclaimed land.

Superficial deposits (Figure 11.1) underlying the Made Ground comprise Tidal River or Creek Deposits with Till at depth. The northern half of the Northern Compound is indicated to be entirely underlain by Till.

Bedrock (Figure 11.2) is comprised of Mudstone belonging to the Nantmel Mudstone Formation.

Recent intrusive ground investigations confirmed ground conditions expected from publicly available records (BGS mapping and borehole records).

No geologically designated area is located within 1km of the Study Area.

Risks associated with ground stability are classified as negligible to low. Two landslips (defined as mass movement deposits, primarily superficial deposits that have moved down slope under gravity) are recorded within the Study Area. The first was located approximately 130m to the southwest of the Scheme and the second approximately 260m to the northeast of the Scheme; however, the topography is such that unstable ground at the Scheme is not considered likely.

Faults are noted in the vicinity of the Scheme (the Ogof Cadno fault approximately 250m to the north of Northern Compound and the Newport Sands fault approximately 200m to the south of the Southern Compound). As these are at a distance from the Scheme they are not likely to pose a risk and there have not been considered further.

Hydrology and hydrogeology

The nearest surface water body is the Teifi Estuary, located within the Scheme near the southern border. This has a WFD rating of Moderate overall and is classed as a SAC and SSSI.

The superficial aquifer at the Scheme is classified as Secondary Undifferentiated. Two 'Secondary A' superficial aquifers are located within 200m of the Scheme Area, to the northwest and southeast. The bedrock aquifer beneath the Scheme Area is classified as Secondary B. Groundwater quality is rated as 'Poor' overall by the WFD.

Groundwater vulnerability is mapped in the Groundsure report as one kilometre grid squares. The Study Area is located near the intersection of four of these kilometre-squares and as such, it is shown to range from low to high, with high vulnerability in both bedrock and superficial aquifers in the southeast and low vulnerability in the superficial aquifer in the north. Given the site setting and history of land use, it is considered likely that groundwater at the Scheme is of high vulnerability in superficial aquifers and medium vulnerability in bedrock aquifers.

No surface or groundwater abstractions are recorded within 2km of the Scheme and the Scheme is not located within a source protection zone (SPZ).

Depth to groundwater has been recorded as varying from 0.6mOD (low tide) to +2.5mOD (high tide), with the water table encountered in the Made Ground deposits at high tide and the cohesive Alluvium. No clear aquiclude exists in the Alluvial layers.

11.8.2 Historical development

The main Scheme Area was developed by the earliest map editions, primarily into residential use. On-site former industrial land uses include a smithy, known as "The Old Foundry".

The Southern Compound was formerly part of the railway terminus, then redeveloped to be open land associated with an off-site pumping station in the 1960s. There is no evidence of previous development at the Northern Compound location.

Mapping showing the historical land uses at the Scheme is provided in Appendix 11.1.

11.8.3 Other environmental issues

Made Ground

Made Ground is mapped throughout the Scheme Area and it is understood that the Scheme is situated on reclaimed land. The Southern Compound is indicated to be on landscaped ground, presumably associated with the redevelopment of the former railway station. This is confirmed by the ground investigations, which found up to 5.3m thickness of Made Ground comprising a highly variable mix of gravel sized fragments of concrete and brick, and clay with gravel of mudstone and anthropogenic origins (e.g. slate, brick, and/or ceramic fragments).

Landfilling

One historical landfill was recorded within the Study Area, located 475m to the north of the Scheme Area. This was first recorded in 1910 with no record of closure, and accepted inert, industrial, commercial, and household waste. This was observed on the historical maps from 1889 to 1953 (when it was indicated to be embankments).

Potential contaminative land uses

Current industrial activities within the Scheme Area are related to mooring and unloading facilities (slipway) in Area 4 and licenced discharges associated with a pumping station at the eastern end of Area 1.

11.8.4 Environmental setting

Teifi Estuary is classified as a Site of Special Scientific Interest (SSSI). The designation covers the Teifi from headwaters to coast including four Teifi Estuary Woodland and Marshes areas within 2km upstream of the Scheme Area. The Scheme is located within the Afon Teifi / River Teifi SAC defined as areas best representing the range and variety within the European Union of habitats

and (non-bird) species. Relevant features of interest leading to this designation include rivers with floating vegetation, brook lamprey, river lamprey, Atlantic salmon, bullhead and otter.

11.8.5 Baseline summary

This information was used to inform a Contamination Preliminary Risk Assessment and form the Conceptual Site Model for the Scheme (included in the Contamination Risk Assessment report in Appendix 11.2).

Sources identified are as follows:

- Extensive Made Ground on-site following land reclamation, assumed to be in hydraulic continuity with the surrounding area.
- Industrial units (bathroom supply shop & old forge crafts, a former smithy) in Area 3.
- Industrial land use in Cardigan Town (including petrol filling stations 90-120m north of the site, hospital and ambulance station with associated tanks 5-160m east of the site, and a landfill 475m north of the site).
- River sediments understood to have been affected historically in the area by industrial land uses alongside and upstream of the Afon Teifi, including a foundry, sawmill, and timber yard on the southern side (left bank) of the river.

Contamination receptor groups are summarised in Table 11-.

Table 11-4 Summary of receptors at different phases of the Scheme

Receptor	Sensitivity	Baseline	Construction	Post development
Human health (construction workers and future site users)	High to very high	Potentially present	Potentially present	Potentially present
Teifi Estuary (SSSI and SAC)	High	Potentially present	Potentially present	Potentially present
Bedrock aquifers	Moderate	Potentially present	Potentially present	Potentially present
Superficial aquifers	Moderate	Potentially present	Potentially present	Potentially present

Identified pathways and the construction phase in which they apply are summarised in Table 11-5.

Table 11-5 Pathways and at which phases of the Scheme they are present

Pathway	Baseline	Construction	Post development
Direct contact with construction workers and/or site users, and incidental ingestion and	Potentially present	Potentially present	Potentially present

Pathway	Baseline	Construction	Post development
inhalation of particles. Direct contact between aggressive ground and infrastructure.			
Migration of contaminants in the soil leachate.	Potentially present	Potentially present	Potentially present
Vertical and lateral migration of contaminated groundwater.	Potentially present	Potentially present	Potentially present
Disturbing and mobilising river sediments during construction.	n/a	Potentially present	n/a
Exposed river sediments (potentially containing contaminants) becoming inundated by rising tide waters during an emergency event (e.g. when works have suspended due to unforeseen circumstances such as machine breakdown, safety incident, or encountering unexpected archaeological material or UXO).	n/a	Potentially present	n/a

11.8.6 Future baseline evolution

The baseline is not expected to change significantly from the current baseline. New potential sources of contamination are considered unlikely to occur which would be the primary mechanism for the baseline to change in the future.

New receptors may be introduced through developments in the vicinity of the Scheme; these are discussed in detail in Chapter 12: Cumulative Effects. Although several new residential developments are proposed, they are up hydraulic gradient from the Scheme and in keeping with other off-site human health receptors. Therefore, the future baseline would be materially the same as the current baseline.

11.9 Assessment of effects

This section describes the outcomes of the assessment, identifying the likely significant effects on Land Use and Soil. Where likely significant effects are reported, additional mitigation is described in section 11.10 with the residual effects described in section 11.11. These likely significant effects (prior to mitigation) are included in Table 11-66.

Minor and negligible effects (which are found to be those related to Made Ground in contact with the superficial aquifer) have not been considered further in this assessment.

Table 11-6 Likely significant effects without implementation of mitigation

Effect No.	Description of effect	Receptor and sensitivity	Magnitude and reasoning	Significance without mitigation
11-01	The proposed works within the intertidal zone (construction platform and probing or pre-excavation for buried obstructions ahead of sheet piling) would disturb riverbed sediments. This leads to the potential for metals or hydrocarbons (encountered in very low concentrations in river sediments) to mobilise and enter the Teifi Estuary.	Teifi Estuary. Very high Sensitivity.	Low. A low proportion of on-site soil samples (a total of three out of the 30 samples tested from recent and historical ground investigations) exceeded conservative published Generic Assessment Criteria focused on human health (that for Public Open Space park land). Recent foreshore sediment leachate testing analysis (see Cardigan TFRMS Sediment Sampling Technical Note, Binnies, 2026) indicated only slight exceedances of conservative published transitional (estuaries) and coastal waters Environmental Quality Standards (EQS) for two heavy metals at localised areas within the Scheme Area. However, a site-specific assessment using bio-accessibility assessment tools produced by WFD-UKTAG indicates that the two metal concentrations measured are unlikely to have any negative effects on the Teifi Estuary. To gain an indicative understanding of risk to the marine environment, the analytical results were also compared against results against Water Framework Directive (WFD) standards and Centre for Environment, Fisheries and Aquaculture Science (CEFAS) Action Levels. Whilst there were some exceedances of heavy metals and PAH's above the most stringent CEFAS Action Level 1 (meaning the sediment would not be suitable for disposal to a marine environment), there were no significant water quality risks identified with respect to WFD standards, and so the overall risk that an SPR linkage would be realised from contaminated sediments in the Scheme Area is likely to be low.	Moderate Negative
11-02	Made Ground is in hydraulic connectivity with the river, and the potential exists for it or industrial activity onsite to have leached contamination into shallow groundwaters. The design of the Scheme would reduce groundwater and leachate flows to Teifi Estuary but the pollution linkage would not necessarily be broken by the Scheme. During construction, there is the potential for Made Ground to have an increased contact with the river in Area 4 (Gloster Row car park) only	Teifi Estuary. Very high Sensitivity.		Moderate Negative

Effect No.	Description of effect	Receptor and sensitivity	Magnitude and reasoning	Significance without mitigation
	(where the flood defence would be set back to allow for the establishment of estuarine / riverine habitats). Contact with groundwater remains unchanged.		Furthermore, site specific derived assessment criteria from a Detailed Quantitative Risk Assessment (to determine a more representative analysis of leaching potential of soils at the Scheme) is anticipated to demonstrate further that concentrations present are relatively low risk to controlled waters.	
11-03	Should excavations be left open in the intertidal zone (e.g. if works have suspended due to unforeseen circumstances such as machine breakdown, safety incident, or encountering unexpected archaeological material or UXO) the loosened sediments could potentially be inundated at high tide, entering the water with any sorbed contaminants.	Teifi Estuary. Very high sensitivity.	Low As per effect 11-01. Additionally, emergency / unforeseen events are unlikely and very infrequent on a well managed construction site with contingency plans in place, so the likelihood of occurrence is, at most, low.	Moderate Negative
11-04	During construction, site operatives may be in direct contact with Made Ground or with localised contamination associated with industrial activity on site (both current and historical), or with contamination that has migrated on-site from off-site sources. This may then mobilise to human health receptors via inhalation and	Human Health, Very high sensitivity	Low. A low proportion of on-site soil samples (a total of three out of the 30 samples tested from recent and historical ground investigations) exceeded conservative published Generic Assessment Criteria focused on human health (that for Public Open Space park land). Only 1 soil sample out of a total of 7 analysed (2015 ground investigation) confirmed the presence of Asbestos Containing Materials (ACMs) in the foreshore. Further ACMs may be encountered during excavations in the Scheme Area but based on historical investigations are likely to be cement	Moderate Negative

Effect No.	Description of effect	Receptor and sensitivity	Magnitude and reasoning	Significance without mitigation
	ingestion of soil/dust, or through direct contact.		bound and within partially saturated soils, minimising the risk of free fibres becoming airborne.	

All other pollutant linkages are considered to have an effect in the operational phase of the Scheme only, which has been scoped out.

11.10 Mitigation measures

Mitigation measures to be employed during the Scheme development are as follows:

- The use of an intervention method such as bubble or silt curtains (correctly installed to manufacturer's recommendations) to minimise sediments entering Teifi Estuary (standard practice).

- If trenches are to be excavated in Made Ground to remove obstructions ahead of sheet piling, they should be backfilled with suitable clean fill (i.e. inert material of an appropriate grain size to allow sheet piling to progress unhindered, free from anthropogenic content or chemical constituents in excess of generic screening values) and excavated material removed and recycled/disposed of appropriately off-site.

- Formal monitoring of Made Ground and natural soils, and groundwater for potential contamination. Monitoring should include the use of Rapid Screening Methods using field test kits or portable instruments (e.g. Photo-Ionisation Detector (PID) for volatile organic compounds and X-Ray Fluorescence (XRF) for heavy metals), and formal sampling of soils and groundwater for laboratory testing should indications of contamination be observed or detected.

- Establish baseline groundwater and surface water quality on and around the Scheme Area, and upstream and downstream of the Scheme in the Afon Teifi by controlled water sampling and laboratory testing. This should be conducted several months before construction commences to have a baseline data set to compare to post construction.

- During construction, monitoring surface water quality could include the use of automated river water quality instruments (measuring several parameters at short intervals such as turbidity, dissolved oxygen, and temperature) both upstream and downstream of the works area with trigger limit alerts to determine whether construction activities are negatively impacting the Afon Teifi estuary. If limits are exceeded then works in the river should be suspended until conditions recover. It is anticipated that acceptable limits would be provided in the Flood Risk Activity Permit (FRAP) from the local NRW Fisheries team to understand trigger action limits.

- Any visual or olfactory evidence of contamination encountered during construction works should be further investigated to determine spatial extents and concentrations (it is likely that works would need to be stopped during this investigation into unexpected contamination).

- Standard practices for protecting the water environment should be adhered to (e.g. bunded fuel storage, use of plant nappies, suitable spill kits with trained personnel, silt fencing) in accordance with current good practice guidance including NRW Guidance for Pollution Prevention 5: Works and maintenance in or near water (version 1.2

February 2018), and CIRIA C741: Environmental Good Practice on Site Guide (4th edition, 2015).

- Standard practice to protect existing soil and land quality at the Northern and Southern Compounds (e.g. stripping and stockpiling topsoil for future reinstatement, protecting against spills), should also be undertaken.

- Contingency plan for excavations in the intertidal zone to be covered/protected if they cannot be backfilled within a single low tide event (before the next high tide inundation).

- Risks posed to workers from contamination in the partially saturated soil and water can be mitigated by appropriate PPE (to be used at all times) and good personal hygiene using well maintained site welfare facilities. Where desiccated soils are disturbed during construction such that dust could be created, then mitigation to control dust (e.g. damping down soils) should be in place.

- Given the presence of asbestos, an asbestos in soils construction risk assessment should be undertaken in accordance with relevant guidance (including the Control of Asbestos Regulations 2012) to ensure risks from asbestos exposure are adequately assessed and controlled measures are implemented as necessary during the works, including removal of surface ACM fragments identified along the foreshore prior to construction.

- Appropriate management strategies should be in place to deal with potentially contaminated soils (including asbestos) if they are encountered during construction. These should include measures to ensure the safety of construction workers, to prevent further contamination of the environment, and an appropriate storage, testing and disposal strategy if contaminated soils are to be removed from the Scheme Area.

- A remediation options appraisal and remediation strategy is required for the landscaped areas of the Scheme where site end-users may come into contact with contaminated Made Ground soils. Successful remediation (followed by verification) would eliminate the source-pathway-receptor linkage, thereby reducing the risk to an acceptable level.

- The mattress of rock rolls covered by imported / reused clean soil proposed for bank stability in Area 4 would likely also break any potential contamination pathway between the Made Ground and future site users and maintenance workers.

- The suitability for reuse of site won topsoil would be assessed as part of the remediation strategy once design has finalised. This has the potential to reduce the volume of clean soil imported.

The above should be included in the Pollution Prevention Plan for the construction phase of the Scheme.

11.11 Significance and duration of residual effects

Residual effects are any effects remaining after all proposed mitigation measures have been implemented. In essence, they are effects which cannot be avoided. The effects detailed in section 11.9, Table 11-65, have been reevaluated following the application of the above mitigation measures as presented in Table 11-7. The residual effects are, at most, minor negative effects (i.e. no longer significant). These would have a temporary duration.

Table 11-7 Residual effects with mitigation implemented

Effect No.	Description of effect	Receptor and sensitivity	Residual effect with mitigation implemented and reasoning	Duration of residual effect
11-01	The proposed works within the intertidal zone (construction platform and probing or pre-excavation for buried obstructions ahead of sheet piling) would disturb riverbed sediments. This leads to the potential for metals or hydrocarbons (present in very low concentrations in river sediments) to mobilise and enter the Teifi Estuary.	Teifi Estuary. Very high sensitivity.	**Minor neutral.** The use of silt or bubble curtains (standard practice to minimise movement of sediments into controlled waters) would also minimise movement of any contaminants contained within the sediments.	Temporary short term-construction period only
11-02	Made Ground is in hydraulic connectivity with the river, and the potential exists for it or industrial activity onsite to have leached contamination into shallow groundwaters. The design of the Scheme would reduce groundwater and leachate flows to Teifi Estuary but the pollution linkage would not necessarily be broken by the Scheme. During construction, there is the potential for Made Ground to have an increased contact with the river in Area 4 (Gloster Row car park) only (where the flood defence would be set back to allow for the establishment of estuarine / riverine habitats). Contact with groundwater remains unchanged.	Teifi Estuary. Very high sensitivity.	**None.** Very low levels of metals and hydrocarbons have been found in soil samples to date which only slightly exceed EQS GAC. Leachate test results also show no exceedances of published and site-specific EQS with bioavailability assessment, indicating no significant risk to controlled waters. Testing groundwater and surface water samples collected prior to construction would confirm whether the potential sources have been realised. Whilst unlikely, if significant concentrations of contamination are present in the groundwater, the pollution linkage would need to be broken through undertaking an options appraisal and developing and implementing a suitable remediation strategy followed by verification. If negligible concentrations of contaminants are present within the groundwater / surface water, then it would be confirmed that there is no pollution linkage and no further action is required.	Not applicable
11-03	Should excavations be left open in the intertidal zone (e.g. if works have suspended due to unforeseen circumstances such as machine breakdown, safety	Teifi Estuary.	**Minor negative.** Emergency / unforeseen events are unlikely and very infrequent on a well managed construction site. Mitigation in	Temporary short term-

Effect No.	Description of effect	Receptor and sensitivity	Residual effect with mitigation implemented and reasoning	Duration of residual effect
	incident, or encountering unexpected archaeological material or UXO) the loosened sediments could potentially be inundated at high tide, entering the water with any sorbed contaminants.	Very high Sensitivity	the form of good practice and having contingency plans for emergencies would reduce magnitude to very low.	construction period only
11-04	During construction, site operatives may be in direct contact with Made Ground or with localised contamination associated with industrial activity on site (both current and historical), or with contamination that has migrated onsite from offsite sources. This may then mobilise to human health receptors via inhalation and ingestion of soil/dust, or through direct contact.	Human Health, Very high sensitivity	**Minor negative.** Standard PPE, good personal hygiene and welfare facilities, procedures in place to manage dust and localised contamination (e.g. hydrocarbons, asbestos) would reduce exposure to a minimum, mitigating against the risk to construction workers.	Temporary short term-construction period only

11.12 Monitoring

Data gaps in some areas of the Scheme mean that additional soil sampling would be required if the soil is being removed from the Scheme Area. In keeping with standard practice, hazardous waste classification and Waste Acceptance Criteria (WAC) sampling and testing of excavated soil from Area 4 would occur near the start of the works.

A watching brief comprising monitoring of Made Ground, natural soils and groundwater for signs of potential contamination shall be maintained as part of the Pollution Prevention Plan. Monitoring should include the use of appropriate Rapid Screening Methods as well as visual and olfactory observation. Should indications of contamination be observed, formal sampling and chemical analysis of soils and groundwater should be conducted.

Groundwater and surface water quality monitoring would be undertaken to demonstrate that the water environment is not negatively impacted by the Scheme. This would be at appropriate up-gradient and down-gradient locations. Monitoring would commence as part of the pre-start works and be conducted at appropriate intervals throughout the construction phase and following completion.

Continuous surface water quality monitoring conducted during the construction phase would provide reassurance that construction activities do not have a negative impact on the Afon Teifi.

11.13 Difficulties and uncertainties

11.13.1 Difficulties

Existing information has been collated from reports produced by others; the contents of which are assumed to be an accurate representation of the prevailing site conditions.

It has been assumed that the sheet piled wall does not cut off groundwater flow to the river and the two would remain in hydraulic connectivity following completion of the Scheme.

Soft landscaping areas would be capped with a minimum thickness of clean imported fill. Alternatively, should site-won material be considered for reuse, a sampling and analysis programme to determine its suitability would be undertaken during the construction phase. Analysis would be to ensure that the soil meets WFD guidance.

11.13.2 Uncertainties

Information on baseline groundwater quality should be obtained prior to the start of the works. Previous investigations did not include groundwater quality information, so while it can be inferred from the low levels encountered in the soils that there is not a significant quantity of contamination in the groundwater, this has yet to be proven and would be proven through groundwater monitoring at the commencement of the Scheme. Sediment sampling in the estuary foreshore adjacent to the Scheme Area at a 100m spacing indicates low levels of contamination.

No sampling regime would guarantee that all contamination present on the site is detected. Not all areas were accessible at time of ground investigation (Bathroom centre showroom yard in Area 2). A watching brief for overt signs of contamination would be maintained during construction.

11.14 Summary of assessment

Four effects related to soil and land contamination have been identified in association with the Scheme. Following implementation of mitigation measures to be employed during construction of the Scheme, none of these are considered to have a significant effect on the relevant receptors.

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Zetica, 2024. *UXO Risk Assessment.* [Online] Available at: https://bit.ly/2DMxh9W [Accessed March 2022].

12 Cumulative Effects

12.1 Introduction

This chapter assesses the Likely Significant Effects from construction and operation of the Scheme, with respect to potential cumulative effects. This chapter details the baseline environment, assessment of Likely Significant Effects, and where necessary, mitigation measures to avoid, reduce or minimise significant effects are proposed.

Within the chapter, both inter-project and intra-project cumulative effects are considered and assessed. Inter-project cumulative effects refer to the combined environmental impacts from the Scheme interacting with other existing, planned, or future developments in the same area, which may lead to a greater overall effect. Existing developments form part of the environmental baseline, and as such inter-project cumulative interactions between the Scheme and those developments are considered as an intrinsic part of the topic-specific assessments in ES Chapters 5 to 11.

Intra-project cumulative effects can be defined as the combined effects which impact upon a single location or receptor from different aspects of the Scheme. Potential intra-project cumulative effects have been assessed within this chapter where identified.

12.2 Competent expert evidence

Myles Harding (BSc (Hons), MSc, PISEP) has over 4 years' experience coordinating and working on technical and non-technical Environmental Statement (ES) chapters. Myles has experience working on a broad range projects at Binnies including multiple flood defence projects.

David Johnson (BSc (Hons), MSc, CEnv) has over 14 years' experience coordinating and producing technical and non-technical Environmental Statement (ES) chapters, including on Population and Human Health, Land Use and Cumulative Effects. David authored the Socio-Economic chapter for the River Thames Scheme and the Land Use chapter for Bridgwater Tidal Barrier ES.

12.3 Planning policy and legislative context

12.3.1 Legislative context

The Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017

The Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017, under Schedule 4, paragraph 5(e), specify that an Environmental Statement should include a description of Likely Significant Effects resulting from the cumulation of effects with other existing and/or approved projects.

Under regulation 4(2), the EIA must *"identify, describe and assess in an appropriate manner, in light of each individual case, the direct and indirect significant effects of proposed development on [various factors] and the interaction between the factors listed"*.

The Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended)

Similarly, the Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended) under Schedule 3, paragraph 5(e), requires the Environmental Statement to include a description of Likely Significant Effects resulting from the cumulation of effects with other existing and/or approved projects.

Under Part 3, paragraph 21A, requires that a conclusion must be reached on the likely significant effects of the project on various factors and *"the interaction between the factors"* listed.

12.3.2 Local policy

Ceredigion County Council Local Development Plan (LDP) 2007 – 2022

Whilst the policies and objectives of the Ceredigion County Council Local Development Plan 2007-2022 (LDP) do not specifically mention cumulative effects in EIA, the plan does acknowledge that when considering whether a development will have a negative effect, the LPA is required to consider all direct, in-direct, in-combination and cumulative effects of the proposal.

12.4 Consultation

An email was sent to Ceredigion County Council on 06/01/2026 to provide an opportunity for the council to highlight any proposed developments within the Cardigan area which may be relevant and should be considered as part of the cumulative effects assessment. As of 20/03/2026, no response has been received.

12.5 Scoped in receptors and potential effects

Table 12-11 summarises the potentially significant environmental effects from both construction and operation which were scoped into the EIA.

Table 12-1 - Cumulative effects – potentially significant environmental effects (construction and operation)

Environmental Effect	Receptor
Potential for inter-project cumulative effects (from other projects).	To include as appropriate; local residents, businesses, recreational users, ecological receptors, local roads, historical receptors and landscape character areas.
Potential for intra-project cumulative effects (due to interactions between topics).	

12.6 Methodology

12.6.1 Identifying other relevant proposed developments

The purpose of this section is to describe how Likely Significant Effects relating to Cumulative Effects have been assessed. A more general explanation of assessment methodology used throughout the EIA is provided in Chapter 4: EIA Methodology.

The following sources were utilised to identify any proposed developments which have potential to lead to inter-project cumulative effects in combination with the Scheme:

- A search of Ceredigion County Council's planning website to identify projects with the potential for cumulative impacts
- Developments of National Significance Register
- List of marine licensable developments (71)
- Planning Policy (e.g. Local Development Plans, Transport Plans and National Policy Statements).

To identify and refine the list of proposed developments which could potentially lead to inter-project cumulative effects, the following selection criteria were used.

- Planning applications within 500m of the Scheme Area which have been validated and /or approved within the last three years.
    - Major developments which either required or did not require EIA were included.
    - Planning applications for minor residential developments were discounted due to their scale which makes them unlikely to result in any significant inter-project cumulative effects.
    - Any applications which had been refused by CCC were discounted.
- Any Marine Licensable Activities within 500m of the Scheme Area.

12.6.2 Identifying the potential for significant inter-project cumulative effects

The potentially relevant developments were initially screened in or out of the assessment on the basis of their spatial or temporal proximity to the Scheme. The greatest potential for cumulative impacts is from an overlap of construction stage effects, thus where this was the case, these developments were screened in for further consideration.

Developments identified as needing further consideration were then assessed for their potential to have Likely Significant Effects in combination with the Scheme. This assessment was undertaken by reviewing the residual effects identified in the preceding specific topic chapters of this ES against any residual environmental effects which were identified within the supporting planning documents of the other projects.

12.6.3 Identifying the potential for significant intra-project cumulative effects

To identify potential intra-project cumulative effects, the preceding topic chapters of the ES were reviewed, and any residual effects were then considered to check for potential cumulative interactions. ES topic chapter authors were consulted to highlight any effects which may lead to interactions with other topics.

12.6.4 Assessment of effects

Relevant developments that were deemed likely to be implemented before the start of the anticipated construction period for the Scheme were considered as future baseline. The effects of the Scheme were considered and assessed against the existing baseline and the likely change to the assessment values as a result of the future baseline conditions was described.

Relevant developments that are deemed likely to be implemented during the anticipated construction period of the Scheme were considered and assessed as construction phase cumulative effects.

Relevant developments that are deemed likely to be implemented after the anticipated construction period of the Scheme were considered and assessed as operational phase cumulative effects.

The identified effects were described and their significance assessed following the same criteria as for the effects of the Scheme (Chapter 4: EIA Methodology).

12.7 Baseline environment and likely future evolution

This section describes the baseline environment and its likely future evolution. The current baseline environment scenario refers to the current state of environmental characteristics within the Scheme Area.

12.7.1 Relevant developments

Application number: A240176 (A210510 for previous demolition activities)

This is a proposal for the construction of a mixed-use development which includes office workspace, café, residential development, storage building and associated works, located at the former Cardigan and District Hospital Pont-y-cleifion, Cardigan, Ceredigion, SA43 1DP. Ceredigion County Council approved the planning application subject to conditions on 17/09/2024. The proposal is located immediately east of Area 4 of the Cardigan Tidal Flood Risk Management Scheme, and south of the Northern Compound location.

Demolition of most of the former hospital building was carried out under a previously approved scheme for redevelopment of the site (A210510). The plans for redevelopment were then revised and approved under A240176. The timeline for the remainder of the demolition works and construction of the development as approved under A240176 is currently unknown but must start by September 2029 to be in accordance with the planning conditions.

12.8 Assessment of effects

12.8.1 Inter-project cumulative effects

This section describes the outcomes of the assessment, identifying the Likely Significant Effects resulting from inter-project interactions. Where Likely Significant Effects are reported, additional mitigation is described in section 12.9 with the residual effects described in section 12.10.

Application A240176 is the only proposed development which falls within the screening criteria and has potential to give rise to inter-project cumulative effects in combination with the Scheme.

Due to the close proximity of the development to the Northern Compound and the eastern end (Area 4) of the main Scheme Area, it is assumed that there may be potential for inter-project cumulative effects resulting from the combined construction traffic, noise and vibration and dust emissions. However, it is considered likely that any cumulative effects would mainly be limited to combined construction traffic effects along the Pont-Y-Cleifion and A487 access route. Depending on the nature of the works needed to construct the mixed-use development, there may also be potential for cumulative noise effects upon the properties located between the two developments.

Potential for inter-project effects related to the two developments is ultimately dependent upon whether the construction phases are programmed to be undertaken simultaneously. At the time of writing (20/01/2026), no information is available on the construction programme for Application A240176. Therefore, any potential inter-project cumulative effects cannot be fully assessed.

In the event that the two developments do take place simultaneously, it is considered unlikely that there would be any significant cumulative construction traffic effects, as no significant effects have been identified within this ES. However, construction traffic planning for the Scheme would need to take account of any works that are also happening at the former hospital site.

In the event that the two developments do take place simultaneously, it is recommended that the proposed construction noise mitigation should be reviewed to determine the need for further mitigation measures for properties located between the two developments.

12.8.2 Intra-project cumulative effects

No further intra-project cumulative effects have been identified based upon the assessments within topic chapters 5-11. All potential interactions have been identified and addressed within the individual chapters. Therefore, no further assessment of intra-project cumulative effects is required.

12.9 Mitigation measures

Mitigation is not required as there are currently no significant inter/intra-project cumulative effects.

12.10 Significance and duration of residual effects

No residual significant effects have been identified.

12.11 Monitoring

No monitoring is proposed as no residual significant effects have been identified.

12.12 Difficulties and uncertainties

Difficulties and uncertainties relative to the cumulative effects chapter are outlined below:

- Assessment of inter-project cumulative effects is partially dependant on the information available for other relevant developments. Where no further information is available, the assessment cannot be completed.

- Due to the timeframes associated with the Scheme programme, it is possible that other planning applications for work within its vicinity would be submitted before works commence or are completed. It would be the responsibility of the relevant developers to take the Scheme into account in their consideration of cumulative impacts, if the development requires a statutory EIA. Ceredigion County Council, as the Local Planning Authority, and where necessary the NRW Marine Licencing Team would advise developers of this requirement during the pre-application stage and/or the EIA screening and scoping consultation process.

12.13 Summary of assessment

No significant inter-project or intra-project cumulative effects were identified within this assessment. However, there is potential for inter-project construction traffic and noise cumulative effects to arise, depending upon whether the Scheme and other relevant developments (Application A240176) are undertaken simultaneously. In the event that further information on the proposed construction programme for application A240176 is made available, it may be necessary to review the proposed construction noise mitigation plan and construction traffic management for the Scheme.

12.14 References

Welsh Government, 2026. *Wales Marine Planning Portal.* [Online] Available at: https://lle.gov.wales/apps/marineportal/#lat=52.0888&lon=-4.6697&z=13&tgt=false&layers=390,231,405,407 [Accessed 11 03 2026].

13 Summary and Conclusions

13.1 Project background

Cardigan is located on the River Teifi (Afon Teifi) in Ceredigion, west Wales (Figure 1.1). The Strand area of Cardigan on the right bank (northern bank) of the River Teifi (Afon Teifi), which includes residential and commercial properties, is vulnerable to flooding. Flood events occurred in 2007, 2008, 2012 and 2014. In 2007 the lower quayside, including Strand and Cattle Market flooded with flood depths exceeding 0.5m. A tidal flood on 3 January 2014 inundated 29 properties on St Mary's Street. This area will become increasingly vulnerable with predicted future sea level rise.

The Cardigan Tidal Flood Risk Management Scheme (TFRMS), hereafter referred to as the 'Scheme', would comprise of a continuous flood defence structure of approximately 327m length between Cardigan Bridge (Castle Street) and Gloster Row car park.

The proposed flood defence would be composed of sheet piles, with a reinforced concrete wall for certain sections. This would be supported on the riverside by an engineered riverbank allowing for the adaptation of intertidal habitats to be more resilient to future sea level rise. Within the central area there is a proposed boat ramp to enable canoe/kayak access to the water for the Sea Scouts and Cardigan Bay Active. The existing slipway/river access points at Cardigan Bay Active and Gloster Row car park would be removed. Towards Cardigan Bridge, along Strand, there would be further improvements to the street scene.

The Scheme has been split into Areas 1, 2, 3 and 4. The alignment of the flood defence wall in Areas 1-3 would lead to the permanent loss of approximately 489m^2 of intertidal habitat, this would be mitigated through the setting back of flood defences in Area 4 which would create an equal area for the establishment of estuarine habitats. The construction of the engineered riverbank would lead to the adaptation of approximately 1,946m^2 of existing habitats.

Subject to obtaining all necessary consents, it is expected that works would commence in early 2027 and take approximately 18 months to complete. Construction durations are estimates and are dependent on the appointed contractor and their detailed construction method statement.

This Environmental Statement (ES) documents the findings of the Environmental Impact Assessment (EIA) carried out to assess the likely significant effects of the Scheme. Following a Scoping Opinion received from Ceredigion County Council and Natural Resources Wales Marine Licencing Team, a detailed assessment has been undertaken in relation to the following topics due to their potential to give rise to significant effects. These are reported in Chapters 5 to 12:

- Population and human health
- Biodiversity and nature conservation
- Historic environment
- Landscape and visual
- Traffic and transport
- Water environment

- Land use and soils
- Cumulative effects.

All other topics potentially considered under the EIA Regulations were scoped out of further assessment as they were not considered to have the potential to be significant.

13.2 Summary of significant environmental effects

'Significant effects' are classified as those identified as having a 'moderate' or 'major' impact, whether positive or negative (see Chapter 4: EIA Methodology).

Table 13-1 summarises the likely significant environmental effects with the application of embedded mitigation but prior to additional mitigation identified within the topic chapters of this ES. The identified additional mitigation measures required to prevent or reduce the significant effects are also shown in the table, along with the assessment of residual significance following application of the mitigation.

Mitigation measures to, as far as possible, prevent and reduce all the negative environmental effects identified throughout the ES are presented in an Environmental Action Plan (EAP) within Appendix 13.1. This summarises the actions required to implement the project in accordance with the ES during subsequent stages of the project. It is a live document that would be updated as the project progresses. It also details the roles and responsibilities of those involved.

The EIA has identified the following positive effects:

- Employment of local contractors and increase in trade for local shops and businesses during construction
- Reduction in flood risk to residents, businesses and heritage assets
- Enhancement of the public amenity area within Area 1
- Reduced potential for environmental pollution during and following a flood event
- Reduced anthropogenic disturbance to intertidal habitats
- Enhanced geomorphological diversity and long-term support to biodiversity due to the engineered riverbank enabling intertidal habitats to migrate upwards in response to sea level rise.

Table 13-1 Significant environmental effects identified by the EIA, mitigation measures and residual significance

Description of effect	Significance before mitigation	Mitigation	Residual significance
Population and human health			
Temporary (short-term) negative effect from noise during construction on residential receptor groups R26 (Teifi House, Gloster Row) and R29 (Caerhuan (adj. to St Mary's Church).	Major negative (significant) effect.	Additional mitigation measures have been outlined within section 9 of the Noise and Vibration Impact Assessment (Appendix 5.1). Additional mitigation measures would be agreed through further consultation and are anticipated to be included within the Construction Environmental Management Plan (CEMP).	Moderate negative (significant) effect.
Temporary (short-term) negative effect from noise during construction on residential receptor groups R23 (Rear of 1-3 Riverside Mews), R25 (26-32 St. Mary's Street), R27 (1-5 Gloster Row) and R28 (4-6 Church Street).	Moderate negative (significant) effect.		Moderate negative (significant) effect. If the more typical 10 dB reduction is achieved on site, it is likely that the residual effects at several of these locations would be further reduced to Minor negative (not significant).
Temporary (short-term) negative effect from vibration during construction on human receptors R18 (Castle View and 1-3 Carrier's Lane), R21 (13 Strand), R23 (Rear of 1-3 Riverside Mews), R25 (approx. 5 dwellings at 26-31 St Mary's Street), R26 & 27 (6 dwellings on Gloster Row, including Teifi House) and R28 & 29 (4-6 Church Street and Caerhuan).	Moderate negative (significant) effect.		It is anticipated that the effective application of these measures could reduce vibration levels below the moderate threshold at several locations (i.e. not significant).
Temporary (short-term) negative effect from vibration during construction on non-residential receptor groups R17 (Cardigan Bathroom Centre) and R22 (Old Forge Crafts / Cardigan Bay Active).	Major negative (significant) effect.	Vibration risk assessment would be undertaken for these specific buildings prior to piling works commencing.	It is anticipated that the effective application of these measures could reduce vibration levels below the threshold of risk of cosmetic damage (i.e. not significant).

Description of effect	Significance before mitigation	Mitigation	Residual significance
Temporary (short-term) positive effect from employment of a local contractor or contractors and an increase in trade for local shops and businesses during construction on the local economy.	Moderate positive (significant) effect.	No mitigation is required as the effect is positive.	Moderate positive (significant) effect.
Permanent positive effect from a reduction in flood risk during operation on residents and businesses.	Major positive (significant) effect.	No mitigation is required as the effect is positive.	Major positive (significant) effect.
Biodiversity and nature conservation			
Temporary (short-term) negative effect from aquatic noise and vibration on diadromous fish species (Atlantic salmon, river lamprey and sea lamprey) as key features of Afon Teifi SSSI, Afon Teifi SAC and Cardigan Bay SAC and West Wales Marine SAC during construction.	Moderate negative (significant) effect.	In water, augering and piling should not be undertaken between March and November inclusive. Augering and piling are permitted between March and November only during periods when the tidal level is below the level of the piling works area. In addition to the seasonal in water restrictions above, it is recommended that soft starts are used for piling activities.	Mitigation removes possibility of effect, therefore no effect predicted.
Temporary (short-term) negative effect from aquatic noise and vibration on diadromous fish species (Atlantic salmon, sea trout, European eels, river lampreys and sea lampreys) during construction.	Moderate negative (significant) effect.		Mitigation removes possibility of effect, therefore no effect predicted.
Historic environment			
Temporary (short-term) negative effect on visual setting and access, and permanent negative effect from unintentional direct impact to Cardigan Bridge CD003 during construction.	Minor/Moderate negative (potentially significant) effect.	No additional mitigation is proposed for effects on visual setting and access to Cardigan Bridge and Cardigan Conservation Area. Measures would be included in the CEMP to avoid works in close	Minor negative (not significant) effect.

Description of effect	Significance before mitigation	Mitigation	Residual significance
Temporary (short-term) negative effect on visual setting and access, and permanent negative effect from direct impacts on Cardigan Conservation Area during construction.	Minor/Moderate negative (potentially significant) effect.	proximity of Cardigan Bridge and other elements of the Conservation Area. Project Design for archaeological mitigation which includes archaeological monitoring and recording.	Minor negative (not significant) effect.
Permanent negative effect on visual setting of Cardigan Bridge CD003 during operation.	Minor/Moderate negative (potentially significant) effect.	Landscape design proposals for Area 1.	Minor negative (not significant) effect.
Permanent negative effect on visual setting of Cardigan Castle CD123 during operation.	Minor/Moderate negative (potentially significant) effect.		Minor negative (not significant) effect.
Permanent negative effect on visual setting of Cardigan Castle PGW (Dy) 72 (CER) during operation.	Minor/Moderate negative (potentially significant).		Minor negative (not significant) effect.
Landscape and visual			
Temporary (short-term) negative effect on landscape character during construction on landscape character area LCA2 River and intertidal habitat.	Major/moderate negative (significant) effect.	No additional mitigation proposed.	Major/moderate negative (significant) effect.
Permanent negative effect on landscape character during operation on landscape character area LCA2 River and intertidal habitat.	Major/moderate negative (significant) effect.	No additional mitigation proposed.	Major/moderate negative (significant) effect.
Temporary (short-term) negative effect on visual amenity during construction on residents of homes on the north bank of the Afon Teifi.	Major/moderate negative (significant) effect.	No additional mitigation proposed.	Major/moderate negative (significant) effect.
Temporary (short-term) negative effect on visual amenity during construction on pedestrians on Strand, Cardigan footbridge, Bridge	Major/moderate negative (significant) effect.	No additional mitigation proposed.	Major/moderate negative (significant) effect.

Description of effect	Significance before mitigation	Mitigation	Residual significance
Street and Prince Charles Quay.			
Temporary (short-term) negative effect on visual amenity during construction to individuals and groups using the river.	Major/moderate negative (significant) effect.	No additional mitigation proposed.	Major/moderate negative (significant) effect.
Permanent negative effect on visual amenity during operation to users of recreational and open spaces (limited to users of the Old Foundry site and open space at Gloster Row car park) on the north bank of the Afon Teifi.	Major/moderate negative (significant) effect.	No additional mitigation proposed.	Major/moderate negative (significant) effect.
Permanent neutral effect on visual amenity during operation to pedestrians on Strand, Cardigan footbridge, Bridge Street and Prince Charles Quay. A combination of positive and negative effects resulting in a net neutral change.	Major/moderate neutral (significant) effect.	No additional mitigation proposed.	Major/moderate neutral (significant) effect.
Traffic and transport			
No significant effects have been identified.			
Water environment			
Temporary (short-term) negative effect to the structure and substrate of the river bed from direct modification to habitat during construction.	Moderate negative (significant) effect.	Standard good practice for working in or near water would be applied and would likely include measures to avoid sediments entering the water and measures to minimise the area of bed impacted by the works. Measures would be included in the CEMP.	Moderate negative (significant) effect.
Temporary (short-term) negative effect to the intertidal zone from direct modification to habitat during construction.	Moderate negative (significant) effect.		Moderate negative (significant) effect.
Land use and soils			
Temporary (short-term) negative effect on the Teifi Estuary during construction	Moderate negative (significant) effect.	Silt or bubble curtains correctly installed to	Minor neutral (not significant) effect.

Description of effect	Significance before mitigation	Mitigation	Residual significance
from the mobilisation of metals or hydrocarbons in riverbed sediments.		manufacturer's recommendations.	
Temporary (short-term) negative effect on the Teifi Estuary during construction from made ground or industrial activity onsite in Area 4 to leach contamination into shallow groundwaters.	Moderate negative (significant) effect.	Testing groundwater and surface water samples collected prior to construction would confirm whether the potential sources have been realised. Whilst unlikely, if significant concentrations of contamination are present in the groundwater, the pollution linkage would need to be broken through undertaking an options appraisal and developing and implementing a suitable remediation strategy followed by verification. If negligible concentrations of contaminants are present within the groundwater / surface water, then it would be confirmed that there is no pollution linkage, and no further action is required.	None.
Temporary (short-term) negative effect on the Teifi Estuary during construction from unforeseen event of contaminated sediments entering the watercourse where open excavations in the intertidal zone are inundated at high tide.	Moderate negative (significant) effect.	Good practice and contingency plans. If trenches are to be excavated in Made Ground to remove obstructions ahead of sheet piling, they should be backfilled with suitable clean fill and excavated material removed and disposed	Minor negative (not significant) effect.

Description of effect	Significance before mitigation	Mitigation	Residual significance
		of appropriately off-site. Formal monitoring (using Rapid Screening Methods) of Made Ground and natural soils, and groundwater for potential contamination, with follow-up sampling and laboratory testing if contamination observed.	
Temporary (short-term) negative effect on human health during construction from direct contact with made ground or localised contamination associated with industrial activity on site (both current and historical) or contamination that has migrated onsite from offsite sources.	Moderate negative (significant) effect.	Standard Personal Protective Equipment (PPE), good personal hygiene and welfare facilities, procedures in place to manage dust and localised contamination. Complete asbestos in soils construction risk assessment to ensure risks are adequately assessed and control measures are implemented as necessary during the works.	Minor negative (not significant) effect.
Cumulative effects			
No significant effects have been identified.			

14 Glossary

Term	Definition
Above Ordnance Datum (AOD)	A measurement of elevation or level expressed relative to Ordnance Datum, the national vertical datum for Great Britain, which approximates mean sea level.
Additional mitigation	Mitigation measures that are identified as being required, to avoid, prevent, reduce or, if possible, offset significant environmental effects that have been identified through the technical assessments within the Environmental Statement (ES).
Baseline Studies or Survey	Collection of information about the environment which is likely to be affected by the project.
Competent expert	A person who, by a combination of training and experience, can demonstrate a level of expertise appropriate to perform a specific specialist role. Note the use of competent experts is required under the Environmental Impact Assessment (EIA) Regulations.
Construction Environmental Management Plan (CEMP)	A plan describing a series of measures which a developer has committed to during the construction phase of a development and that all contractors and associated parties should comply with. The plan should provide details of the legislation which construction activities will comply with, assign clear responsibilities and draw together the mitigation measures identified during the Environmental Impact Assessment (EIA) process to avoid or reduce the environmental effects of construction activities.
Embedded Mitigation	Mitigation measures that are inherent to the scheme design or methodology, and which form part of the proposed development before assessment, rather than being introduced as additional or stand-alone mitigation in response to identified impacts.
Environmental Impact Assessment	Environmental Impact Assessment (EIA) is a decision support tool used by environment and sustainability professionals to ensure that relevant environmental information is available to a decision-maker (usually a local authority or government department), before they decide whether to grant consent for a future development: for example, a major road, large housing estate, industrial facility, power station, etc.
Environmental Impact Assessment (EIA) Regulations	Town and Country Planning (Environment Impact Assessment) (Wales) Regulations 2017 as amended.
Environmental Statement	The document produced when Environmental Impact Assessment is formally required under the EIA Regulations.
Natura 2000 Sites	Special Areas of Conservation (SACs), Special Protection Areas (SPAs), and European Marine Sites that have been designated and protected under the EC Habitats Directive (Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora) and/or the EC Birds Directive (Council Directive 2009/147/EC on the conservation of wild birds). Sites in the UK form part of a larger European network called 'Natura 2000'.

Term	Definition
Flood and Coastal Erosion Risk Management	The strategic approach to reducing the likelihood and consequences of flooding and coastal erosion through the planning, delivery, and maintenance of structural measures that aims to manage risks to people, property, infrastructure, and the natural environment in a sustainable manner.
Future Wales: The National Plan 2040	The Welsh Government's national spatial development plan, providing strategic planning policy and direction for development and land use in Wales up to 2040, and forming part of the statutory development plan framework for significant infrastructure and development proposals.
Habitats Directive	Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora. The directive includes requirements that national governments establish and protect a network of sites to help preserve wild fauna and flora, and also that certain species receive strict protection.
Habitats Regulations	In England and Wales, these are the Conservation of Habitats and Species Regulations 2017 (as amended) (SI 2017/1012) and the Conservation of Offshore Marine Habitats and Species Regulations 2017 (as amended). They transpose the requirements of the EC Habitats Directive (Council Directive 92/43/EEC) into national law.
Habitats Regulations Assessment	An assessment undertaken in accordance with the Habitats Regulations to determine if a plan or project may affect the protected features of a Natura 2000 site, before deciding whether to undertake, permit or authorise it. As a matter of Welsh Government policy, Ramsar sites are treated as if they are Natura 2000 sites.
Land Contamination Risk Management	The process of identifying, assessing, and managing risks to human health, controlled waters, built structures, and the environment arising from land contamination, including the implementation of mitigation or remediation measures where necessary.
Likely Significant Effects	Effects arising from the proposed project which, either alone or in combination with other aspects, are considered likely to be significant and therefore require assessment under the Environmental Impact Assessment.
Local Development Plan	A statutory development plan prepared by a local planning authority setting out detailed policies for environmental protection and development. To be replaced by Local Development Documents.
Local Planning Authority	The local authority or council that is empowered by law to exercise planning functions. This is normally the local borough or district council, but in National Parks and some other areas there is a different arrangement.
Marine Works (Environmental Impact Assessment)	The Marine Works (Environmental Impact Assessment) Regulations 2007, as amended by the Marine Works and Marine Strategy Regulations 2018 (SI 2018/287), which apply to marine activities requiring a Marine License.

Term	Definition
Mitigation hierarchy	A systematic approach used to minimise adverse effects of a project or scheme on the environment and people. It is a series of steps or principles to guide decision-making and prioritise activity. The hierarchy comprises four stages, with the most desirable first: avoid, prevent, reduce and, finally, offset. The hierarchy indicates that avoidance is the priority and offsetting should only be relied on as a last resort.
Mitigation Measures	Steps that may be taken to minimise, eliminate or compensate the adverse effects of a development. Mitigation "should only be considered when all options for the avoidance of impacts have been exhausted or have been deemed to be impracticable. This may be achieved by examining alternatives (e.g. alternative equipment) or by the addition of mitigation measures to the existing proposal (e.g. bunds, odour abatement technology and tree planting)" (IEMA 2004).
Monitoring	The systematic and ongoing collection, analysis and evaluation of data related to the implementation and performance of a project or scheme. Monitoring is conducted to assess whether the project is being carried out in accordance with the conditions, commitments and requirements outlined in the consent or approval documents, as well as any associated mitigation measures and management plans. Monitoring plays a crucial role in ensuring the sustainable and responsible management of approved projects, facilitating transparency, accountability and the achievement of desired outcomes while minimising adverse effects.
Precautionary principle	A fundamental principle in environmental and public health policy emphasising taking preventative action in situations where knowledge of potential outcomes is incomplete. The key elements of the precautionary principle are: anticipatory action; proportionality; uncertainty; and reversibility. The principle is a guide for decision-making in situations where there are significant risks of harm, but uncertainty remains about the exact nature and magnitude of those risks. It prioritises prevention and protection, particularly in cases where irreversible harm to human health of the environment could result from inaction.
Receptor	A physical, biological, or human component of the environment that may be affected by a proposed development, including people, ecological features, water bodies, soils, air quality, cultural heritage assets, and material assets.
Site of Special Scientific Interest (SSSI)	An area of land of special interest by reason of its flora, fauna, geology or physiographical features notified under Section 28 of the wildlife and Countryside Act 1981 (as amended).
Source-Pathway-Receptor (SPR)	A framework used to assess environmental risks whereby a potential impact occurs only when all three elements are present: a source capable of causing harm, a viable pathway through which the impact can occur, and a receptor that may be adversely affected.

Term	Definition
Special Area of Conservation (SAC)	A site designated under the Conservation of Habitats and Species Regulations to protect habitats and species of European importance, forming part of the UK's National Site Network (formerly Natura 2000).
Water Framework Directive (WFD)	European legislation (Directive 2000/60/EC), transposed into UK law, which establishes a framework for the protection and improvement of surface waters, groundwater, transitional waters (including estuaries), and coastal waters. The WFD requires the prevention of deterioration in water body status and the achievement of at least Good Ecological Status, or Good Ecological Potential where waters are designated as heavily modified.
Zone of Influence (ZoI)	The spatial area over which a proposed development has the potential to cause environmental effects, either directly or indirectly, during construction, operation, and, where relevant, decommissioning.
Zone of Theoretical Visibility (ZTV)	The spatial area over which the proposed construction and operational activities or the components of the proposed development might be visible.

15 Abbreviations

Abbreviation	Description
AADT	Annual Average Daily Traffic
AAWT	Annual Average Weekly Traffic
ACM	Asbestos Containing Material
AEP	Annual Exceedance Probability
AOD	Above Ordnance Datum
ASIDOHL	Assessment of the Significance of the Impact of Development On the Historic Landscape
ATFL	Afon Teifi Fairways Ltd.
BGS	British Geological Society
BPM	Best Practicable Means
BS	British Standard
BUKL	Binnies UK Ltd.
CA	Competent Authority
CAR	Control of Asbestos Regulations
CCC	Ceredigion County Council
CEFAS	Centre for Environment, Fisheries and Aquaculture Science
CEMP	Construction Environmental Management Plan
CIEEM	Chartered Institute of Ecology and Environmental Management
CLEA	Contaminated Land Exposure Assessment
CMLA	Chartered Member of the Landscape Institute
CoPA	Control of Pollution Act
CRTN	Calculation of Road Traffic Noise
CSM	Conceptual Site Model
CTMP	Construction Traffic Management Plan
oCTMP	Outline Construction Traffic Management Plan
DCWW	Dŵr Cymru Welsh Water
DIN	Dissolved Inorganic Nitrogen
DMP	Dust Management Plan
DMRB	Design Manual for Roads and Bridges

Abbreviation	Description
DO	Dissolved Oxygen
EAP	Environmental Action Plan
ECoW	Ecological Clerk of Works
ECOR	Environmental Constraints and Opportunities Report
EHO	Environmental Health Officer
EIA	Environmental Impact Assessment
EnvCoW	Environmental Clerk of Works
EPA	Environment Protection Act
EqIA	Equality Impact Assessment
EQA	Environmental Quality Standards
ES	Environmental Statement
FCA	Flood Consequence Assessment
FCERM	Flood and Coastal Erosion Risk Management
FDL	Flood Defence Level
FRAP	Flood Risk Activity Permit
FRMP	Flood Risk Management Plan
GAC	Generic Assessment Criteria
GQRA	Generic Quantitative Risk Assessment
HAT	Highest Astronomical Tide
HDV	Heavy Duty Vehicle
HER	Historic Environment Record
HGV	Heavy Goods Vehicle
HIA	Health Impact Assessment
HMWB	Heavily Modified Water Body
HRA	Habitats Regulations Assessment
IAQM	Institute of Air Quality Management
IEMA	Institute of Environmental Management and Assessment (now ISEP)
INNS	Invasive Non-Native Species
ISO	International Organisation for Standardisation
ISEP	Institute of Sustainability and Environmental Professionals
LCA	Landscape Character Area

Abbreviation	Description
LCRM	Land Contamination Risk Management
LDP	Local Development Plan
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
LSE	Likely Significant Effect
LSOA	Lower Super Output Area
LVIA	Landscape and Visual Impact Assessment
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
NGR	National Grid Reference
NLCA	National Landscape Character Area
NMCA	National Marine Character Area
NMR	National Monuments Record
NRA	Navigational Risk Assessment
NRW	Natural Resources Wales (Cyfoeth Naturiol Cymru)
NVC	National Vegetation Classification
NVIA	Noise and Vibration Impact Assessment
OBC	Outline Business Case
ONS	Office for National Statistics
PAH	Polycyclic Aromatic Hydrocarbons
PDZ	Policy Development Zone
PFR	Property Flood Resilience
PIC	Personal Injury Collision
PPE	Personal Protective Equipment
PPV	Peak Particle Velocity
PPW	Planning Policy Wales
PRoW	Public Right of Way
RBMP	River Basin Management Plan
RPA	Root Protection Area
SAC	Special Area of Conservation
SLA	Special Landscape Area

Abbreviation	Description
SMNR	Sustainable Management of Natural Resources
SMP	Shoreline Management Plan
SMP2	West of Wales Shoreline Management Plan
SoNaRR	State of Natural Resources Report
SPG	Supplementary Planning Guidance
SPR	Source-Pathway-Receptor
SPZ	Source Protection Zone
SSSI	Site of Special Scientific Interest
TAN	Technical Advice Note
TFRMS	Tidal Flood Risk Management Scheme
UXO	Unexploded Ordnance
WAC	Waste Acceptance Criteria
WFD	Water Framework Directive
WIMD	Welsh Index of Multiple Deprivation
WNMP	Welsh National Marine Plan
ZoI	Zone of Influence
ZTV	Zone of Theoretical Visibility