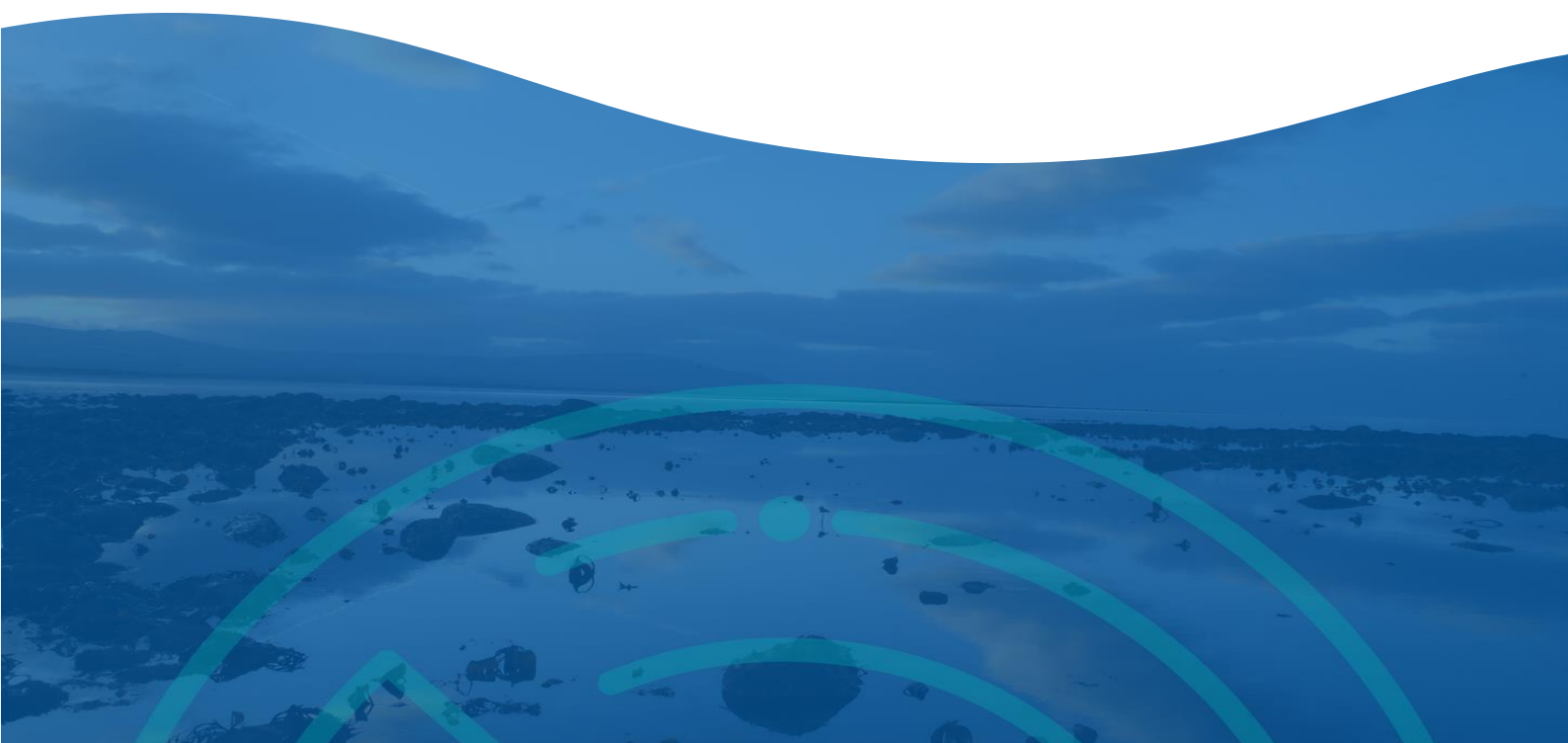


Binnies UK Ltd

Cardigan Tidal Flood Risk Management Scheme - Habitats Regulation Assessment



Client: Binnies UK Ltd

Address: 60 High Street,
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Project reference: P00011055

Date of issue: September 2026

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Record of a Habitats Regulations Assessment of a project

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Document Version	Date Published	Summary of Changes
1.0	17.07.2023	Draft HRA report
2.0	04.08.2023	Final HRA report
3.0	23.01.2024	Updates following NRW consultation meeting
4.0	23.10.2025	Updates following Scheme design freeze
5.0	09.12.2025	Updates following Project Description changes
6.0	22.09.2026	Updates following pre-application consultation

Record of a Habitats Regulations Assessment of a project

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1. Project Details

1(b): Project details where NRW is the project proponent/instigator	
NRW Project reference	Cardigan Tidal Flood Risk Management Scheme
Activity proposed	The lower quayside areas of Cardigan have been 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 return period of approximately 1:1 year annual chance of probability. It is thought that the onset of property flooding is near or at this level of probability with several properties having threshold levels of 3.100 m above ordnance datum (AOD) and below. The Cardigan Tidal Flood Risk Management Scheme (TFRMS) is proposed to address this risk of property flooding. 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 (approximately 327m). The flood defences would need to achieve a consistent level of 4.95 mAOD to provide the Scheme design standard of 1 in 200 years annual exceedance probability (AEP) with allowance for climate change, which would make the structures up to approximately 2 m above general ground level (though lower in many sections). The Scheme would have a design life of 100 years. The Scheme has been split into four Areas (1-4). The construction of the flood defence wall in Areas 1-3 would lead to the permanent loss of approximately 489m² 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. On the riverside of the flood defence wall, a new engineered riverbank would be created, extending approximately 10m into the river, to support the steel sheet pile wall. The construction of the new riverbank would lead to an adaptation of approximately 1,946m² of existing habitats, which would vary based on how regularly they are covered by the tide. The slope of new riverbank would allow for habitats to migrate upwards as sea level rises increasing the longevity of these habitats being present than if the new riverbank was not there. Elements of each area of the proposed Scheme are described in detail in Chapter 3 – Project Description of the Environmental Statement. The key information relevant to this HRA are summarised below. Area 1 Area 1 is located on the north bank of the Afon Teifi, immediately upstream of Cardigan Bridge and adjacent to Strand. The works in this area include the installation of sheet pile foundations (approximately 5.5m long piles) into the riverbed to support the new flood defence wall. The existing riverbank wall and sloped revetment would be removed or buried to facilitate construction. An engineered riverbank would be constructed on the foreshore, extending approximately 9-10m into the estuary, and comprising granular fill, a permeable geotextile membrane, and rip rap at the toe. Rock rolls would

be placed on the lower slope of the engineered riverbank 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 embankment.

Area 2

Area 2 extends east from the bathroom centre showroom to the east end of the bathroom centre warehouse. The works in this area include the installation of sheet piles (approximately 5.5m long) into the riverbed to form the flood defence wall. The new wall would be supported by the new engineered riverbank which would be constructed on the foreshore, extending approximately 9-10 m into the estuary. This engineered riverbank would replace the existing riverbed profile and would be formed using granular fill, a permeable geotextile membrane, and rip rap at the toe. Rock rolls would be placed on the lower slope of the engineered riverbank 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 riverbank.

Area 3

Area 3 spans the riverbank between the Seas Scouts boat house and the slipway at Gloster Row car park, encompassing several properties along Strand. The works include the installation of sheet piles ranging from 5.5m to 12.5m in length, sunk into the riverbed by up to 7.5m to form the new flood defence wall. The wall would be supported by the construction of the engineered riverbank approximately 9-10m into the estuary, constructed with granular fill, geotextile membrane, and rip rap at the toe. Rock rolls would be placed on the lower slope of the engineered riverbank 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 riverbank. The works would involve the closure of the existing slipway used by the Sea Scouts and other permitted organisations. A new up and over canoe/kayak access ramp is proposed to the south of the Old Foundry site which would retain access to the Afon Teifi for the existing users.

Area 4

Area 4 is situated between the Gloster Row slipway and the property boundary wall at the eastern end of the Gloster Row car park, including a small area of adjacent grassland. In this area, the flood defence wall would be set back inland to reduce direct impacts on the foreshore. The existing upper gabion wall would be removed, and the riverside land would be lowered and regraded to create new estuarine/riverine habitat. The lower section of gabion wall would be retained with existing habitat that has formed on them. The existing public slipway at Gloster Row car park would also

be permanently closed. It is anticipated that setting back the proposed flood defence wall would allow for the creation of approximately 489 m² of new estuarine/riverine habitat within Area 4.

Relevant Construction Activities

Installation of temporary haul road / piling platform

A temporary working platform would be constructed along the foreshore using compacted granular fill, comprising Class 6I and 6G inert material, in accordance with Specification for Highways works, placed over a geotextile separator to protect underlying soft sediments and minimise fine sediment migration. This 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, would be installed progressively from Area 1 upstream to Area 4 using tracked excavators and would provide access for piling rigs and material transport during construction. The platform would also serve as the primary haul route and would be incorporated into the engineered riverbank upon completion.

Piling

To enable sheet piling and construction of the flood defence wall, existing river walls and stone-filled gabions in Areas 1 and 2 would be removed where they conflict with the new pile line. These works would be carried out from the foreshore platform using excavators with hydraulic breakers, progressing in small sections to maintain stability. Due to variable ground conditions along the north bank of the Afon Teifi, obstruction management measures such as proof digging and pre-augering may be required to reduce the risk of pile refusal and ensure proper alignment. Piling would commence in Area 4 and proceed upstream to Area 1, using a combination of Movax side-grip and leader rigs depending on site constraints. Vibro-piling is the preferred method due to its flexibility and suitability for restricted working widths. The piling platform would be later incorporated into the engineered riverbank.

Concrete pours

Following sheet pile installation, a reinforced concrete toe would be cast at the base of the new wall to provide structural support and protection against scour, particularly at the tidal interface. This toe would also serve as the foundation for stone cladding. Concrete would be poured in sequential sections of approximately 6–8 m, timed to align with tidal working windows. Localised excavation would be required at the toe of the pile wall, especially where it is recessed into the foreshore or behind removed river walls, notably in Areas 1 and 3.

Regrade of 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.

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

Area 4 embankment regrading

At Area 4, the upper row of gabion baskets would be removed and the ground, including a portion of the car park, reprofiled to create an area for tidal inundation, allowing for estuarine/riverine habitats to establish. The lower gabions would be retained as they contain saltmarsh species. Stripping of topsoil would occur first, followed by excavation to formation level using an excavator working from the land side. Selected materials may be reused as fill in other areas or spread on site subject to environmental approval.

Construction programme

The works are anticipated to have a total duration of 18 months.

The anticipated duration of construction activities is as follows. Riverside works would be tide dependent.

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
	Landscaping	1 month
	Various reinstatements	2 weeks
	* Riverside / foreshore works	
All works would be undertaken by a contractor who would implement best practice techniques to control pollution and siltation. NRW would require the contractor to be required to prepare and comply with a Pollution Prevention Plan, including spill response plans, and a Biosecurity Risk Assessment. Works method statements would be agreed by NRW before works start. Best-practice guidelines (e.g. GPP5: Works and maintenance in or near water, Version 1.2, 2018) would be followed as a minimum to prevent potential adverse effects from pollution and the spread of Invasive Non-Native Species (INNS). 		
Statutory basis	The proposed Scheme falls within the jurisdiction of Ceredigion County Council as the Local Planning Authority. The Scheme includes works that constitute ‘development’ in accordance with the Town and Country Planning Act (1990),	

	and therefore the proposed Scheme is considered to require planning permission. An application for planning permission will need to be made to the Local Planning Authority. A marine licence is required for any marine licensable activity as defined in Section 66 of the Marine and Coastal Access Act 2009 in the marine licensable area. The marine licensable area extends seaward from the Mean High Water Springs (MHWS). The Scheme extends to areas below the MHWS and includes works which fall under the remit of Section 66 and as such it is considered that a marine licence is required. An application for a marine licence will be made to the NRW Marine Licensing Team.
Location	The Cardigan TFRMS is located towards the centre of Cardigan town in south west Wales and covers the north bank of the Afon Teifi. The Scheme is bound to the west by Castle Street and to the east by the A487 Pont Y Priordy, at approximate grid reference SN177458 to SN180459.
NRW team responsible for carrying out the project, and name of lead officer	Project Delivery Team, Bethan Hill (Lead Officer)
NRW team responsible for drafting this HRA report, and name of lead officer	Environmental Assessment Team, Heilyn Williams (Environmental Advisor/Assessor)
Project documents	Cardigan Tidal Flood Risk Management Scheme Environmental Constraints and Opportunities Record (ECOR) (123666-BUK-ZZ-00-RP-EN-00010) EIA Scoping Letter (4021883-BUK-ZZ-00-RP-EN-00001) WFD Assessment (4021883-BUK-ZZ-00-RP-EN-00022)
Environmental Statement	Cardigan Tidal Flood Risk Management Scheme Environmental Statement (BUKL, 2026)

2. Determining the need for a Habitats Regulations Assessment

2.1 Is the whole of the project directly connected with or necessary to the management of one or more Natura 2000 sites, for the purposes of conserving the habitats or species for which the Natura 2000 site(s) is/are designated?	No
2.2 Is there a possibility that the project could affect a different Natura 2000 site to the one(s) the project is intended to conserve?	N/A
2.3 Is it necessary to carry out an HRA?	Yes

3. Considering the likelihood of a significant effect (LSE)

3.1 Renewal of a permission on the same or more restrictive terms as the extant permission

Is this project a renewal of a current permission which complies with NRW approved criteria for ruling out significant effects of renewals (see section 6.2A of OGN 200) without conducting a project-specific LSE test?	No
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3.2 Likelihood of significant effects (LSE) test

3.2.1 Which Natura 2000 sites might be affected by the proposal?	Based on the project specification or information provided in the application, it is considered that the following Natura 2000 sites have features which could be affected by the project: • Afon Teifi Special Area of Conservation (SAC) (partially within the Scheme); • Cardigan Bay SAC (3.5 km downstream from the Scheme); and • West Wales Marine SAC (3.5 km downstream from the Scheme). In addition, in line with NRW’s position on the use of Marine Mammal Management Units (MMMU) in HRA, the following SACs with marine mammal features in Welsh waters have also been included in the Screening: • North Anglesey Marine SAC (harbour porpoise); • Bristol Channel Approaches (harbour porpoise); • Llyn Peninsular and the Sarnau SAC (bottlenose dolphin and grey seal); and • Pembrokeshire Marine SAC (grey seal). The potential for the project to affect the following Natura 2000 sites was also initially considered, but can be ruled out without further consideration: North Pembrokeshire Woodlands SAC located 7.8 km to the south west of the works. This site is designated for its old sessile wood habitats and barbastelle bats. There is no pathway for effects on this site. The works would not involve any loss of barbastelle foraging habitat.	
3.2.2 Screening assessment		
	Assessment of likelihood of significant effect	
	I Relevant conservation objectives	II Potential impact pathway
		<i>In light of the ruling of the CJEU in case C-323/17 ‘People over Wind’, avoidance measures should not be considered at this stage of HRA, so this column is left blank.</i>

Afon Teifi SAC For Conservation Objectives see: Core Management Plan including Conservation Objectives for Afon Teifi / River Teifi SAC (published by Countryside Council for Wales in April 2011).			
SAC interest feature 1: Watercourses of plain to montane levels with the <i>Ranunculus fluitantis</i> and <i>Callitriche-Batrachion</i> vegetation	(i) The natural range of the plant communities represented within this feature should be stable or increasing in the SAC. (ii) The area covered by the feature within its natural range in the SAC should be stable or increasing. (iii) The conservation status of the feature's typical species should be favourable.	These habitats are located above the tidal limit in slow flowing waters and are not present within or adjacent to the Scheme. Any pollution event or increase in suspended sediment concentrations would be highly unlikely to reach these habitats. As such, it is considered there is no impact pathway from the proposed works to the designated feature and no potential for LSE.	
SAC interest feature 2: Brook lamprey	(i) The population of the feature in the SAC is stable or increasing over the long term. (ii) The natural range of the feature in the SAC is neither being reduced nor is likely to be reduced for the foreseeable future. (iii) There is, and will continue to be, a sufficiently large habitat to maintain the feature's population in the SAC on a longterm basis.	Brook lamprey are an entirely freshwater species. The transitional water body ends approximately 4 km upstream of the proposed works just north of Cilgerran which is where the tidal influence of the estuary ends. As such, this species is not considered to be present in the vicinity of the proposed works. Any effects from underwater noise, pollution or suspended sediment concentrations are highly unlikely to affect the individuals and their supporting habitats at this distance. The works would require an excavator/piling rig in the intertidal zone. To minimise the possibility of a pollution incident, best practice guidance would be implemented when	

		working near water (GPP5: Works and maintenance in or near water) and a Pollution Prevention Plan would be required to be in place. The potential for effects from a pollution event is considered negligible. As such, it is considered there is no impact pathway from the proposed works to the designated feature and no potential for LSE.	
SAC interest feature 3: Bullhead		Bullhead are an entirely freshwater species. The transitional water body ends approximately 4 km upstream of the proposed works just north of Cilgerran which is where the tidal influence of the estuary would end. Fish monitoring data provided by NRW included a single record of bullhead identified approximately 1.5 km upstream of the proposed Scheme area in 2007, within the transitional water body. However, no further records of the species have been reported between 2008 and 2021. Bullhead are typically associated with clear, fast-flowing freshwater streams and rivers with coarse, rocky substrates, and are not generally found in estuarine or brackish environments. As such, this species is not considered to be present in the vicinity of the proposed works. Any effects from underwater noise, pollution or	

		suspended sediment concentrations are highly unlikely to affect individuals and their supporting habitats. The works would require an excavator/piling rig in the intertidal zone. To minimise the possibility of a pollution incident, best practice guidance would be implemented when working near water (GPP5: Works and maintenance in or near water) and a Pollution Prevention Plan would be required to be in place. The potential for effects from a pollution event is considered negligible. As such, it is considered there is no impact pathway from the proposed works to the designated feature and no potential for LSE.	
SAC interest feature 4: Sea lamprey		Sea lamprey could be present in the proposed Scheme area as the works are to be undertaken over an 18-month period, which would overlap with the sea lamprey upstream and downstream migratory periods (upstream: April to June; downstream: October to June). Underwater noise and vibration: The proposed works would generate underwater noise and vibration from vibropiling and augering. Due to the absence of a swimbladder, lack of otolith organs and gelatinous skeleton it is thought lampreys have poor hearing and are only sensitive to particle	

		velocity. During their migratory phase they adopt a benthic lifestyle crawling and swimming close to the substrate. Ground vibrations from augering and vibropiling may affect sea lamprey during migration through the works area so there is the potential for LSE. Barriers to migration: migratory fish are very susceptible to obstacles during their spawning run (Nunn <i>et al.</i> 2008¹). Physical structures such as weirs and dams can present permanent barriers to fish movements. The Scheme would result in the narrowing of the riverbed due to the construction of the engineered riverbank to protect the flood defence wall. The engineered riverbank would extend approximately 9-10 m into the river. The width of the river in this area is approximately 55 m. As such, there is no potential for the construction to present a physical barrier to fish movements and there is no potential for LSE from this impact pathway. Pollution and accidental spills: The works would require an excavator/piling rig in the intertidal zone. To minimise the possibility of a pollution incident, best practice guidance would be implemented when working near water (GPP5: Works and maintenance in or	
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¹ Nunn, A. D., Harvey, J. P., Noble, R. A. A., & Cowx, I. G. (2008). Condition assessment of lamprey populations in the Yorkshire Ouse catchment, north-east England, and the potential influence of physical migration barriers. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 18(2), 175-189.
www.naturalresources.wales

		near water) and a Pollution Prevention Plan would be required to be in place. Best practice measures would be in place to prevent accidental spills. Biodegradable hydraulic oil would be used when possible and no refuelling would be undertaken at the work site. Concrete pours pose a risk of water pollution through leaching of uncured material and accidental spillage. Concrete pours would be scheduled during low tide periods to minimise direct contact with water during curing. Marine grade concrete would 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 there is no potential for LSE from this impact pathway. Habitat loss: There would be permanent loss of intertidal habitat within the SAC due to the works. The installation of sheet piling and construction of the sea defence wall and associated engineered riverbank would result in the permanent loss of approximately 489 m² of intertidal mud habitat. Intertidal mud is not a supporting habitat for this species, as sea lamprey	
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		require clean gravels and areas of silt in freshwater for spawning and nursery areas. Therefore, the loss of intertidal mud in the area of the works would not have an LSE for sea lamprey. Changes in suspended solids (water clarity): When undertaken in water, the piling and augering activities and the placement of rip rap have the potential to cause sediment resuspension and increase suspended sediment concentrations causing a decrease in water clarity. 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. As such, there is no potential for LSE on sea lamprey from this impact pathway. Water flow (tidal current) changes: 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. Increased water velocities can make it more difficult for migratory fish to reach supporting habitats further upstream. Hydraulic modelling of the proposed Scheme has been undertaken to investigate the effect of the reduction in cross sectional area on	
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		water velocities (Binnies 2023a ²). The modelling concluded that the Scheme would have negligible impact on local water velocities. As such, there is no potential for LSE from this impact pathway.	
SAC interest feature 5: Atlantic salmon		Atlantic salmon have been recorded in the Teifi estuary and could be present in the proposed Scheme area as the works are due to be undertaken over an 18-month period, which would overlap with the salmon migration period (adult upstream migration: March to November; smolt downstream migration: March to May). Underwater noise and vibration: The proposed works would generate underwater noise from vibropiling and augering. The proposed works would generate underwater noise from vibropiling and augering. Sound pressure from these activities may lead to physiological effects occurring for fish with a swim bladder that is not involved in hearing, like Atlantic salmon. This could affect salmon as they are sensitive to underwater noise and there is the potential for LSE. Barriers to migration: migratory fish are very susceptible to obstacles during their spawning run (Nunn <i>et al.</i> 2008). Physical structures such as weirs and	

² Binnies 2023a. Geomorphology Technical Note
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		dams can present permanent barriers to fish movements. The Scheme would result in the narrowing of the riverbed due to the construction of the engineered riverbank to protect the flood defence wall. The engineered riverbank would extend approximately 9-10 m into the river. The width of the river in this area is approximately 55 m. As such, there is no potential for the construction to present a physical barrier to fish movements and there is no potential for LSE from this impact pathway. Pollution and accidental spills: The works would require an excavator/piling rig in the intertidal zone. To minimise the possibility of a pollution incident, best practice guidance would be implemented when working near water (GPP5: Works and maintenance in or near water) and a Pollution Prevention Plan would be required to be in place. Best practice measures would be in place to prevent accidental spills. Biodegradable hydraulic oil would be used when possible and no refuelling would be undertaken at the work site. Concrete pours pose a risk of water pollution through leaching of uncured material and accidental spillage. Concrete pours would be scheduled during low tide periods to minimise direct contact with water during curing. Marine grade concrete would be used to ensure quick curing, enhance	
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		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 there is no potential for LSE from this impact pathway. Habitat loss: There would be permanent loss of intertidal habitat within the SAC due to the works. The installation of sheet piling and construction of the sea defence wall and associated engineered riverbank would result in the permanent loss of approximately 489 m² of intertidal mud habitat. Intertidal mud is not a supporting habitat for Atlantic salmon, as they require clean gravels and areas of silt in freshwater for spawning and nursery areas. Therefore, the loss of intertidal mud in the area of the works would not have an LSE for Atlantic salmon. Changes in suspended solids (water clarity): When undertaken in water, the piling and augering activities and the placement of rip rap have the potential to cause sediment resuspension and increase suspended sediment concentrations causing a decrease in water clarity. This would be expected to be a very localised, short term and	
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		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. As such, there is no potential for LSE on Atlantic salmon from this impact pathway. Water flow (tidal current) changes: The installation of the 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. Increased water velocities can make it more difficult for migratory fish to reach supporting habitats further upstream. Hydraulic modelling of the proposed Scheme has been undertaken to investigate the effect of the reduction in cross sectional area on water velocities (Binnies 2023a). The modelling concluded that the Scheme would have negligible impact on local water velocities. As such, there is no potential for LSE from this impact pathway.	
SAC interest feature 6: River lamprey		River lamprey could be present in the proposed Scheme as the works are due to be undertaken over an 18-month period, which would overlap with the river lamprey migration period (adult upstream migration October to	

		December and transformer downstream from March to May). Underwater noise and vibration: The proposed works would generate underwater noise and vibration from vibropiling and augering. This could affect river lamprey. Due to the absence of a swimbladder, lack of otolith organs and gelatinous skeleton it is thought lampreys have poor hearing and are only sensitive to particle velocity. During their migratory phase they adopt a benthic lifestyle crawling and swimming close to the substrate. Ground vibrations from augering and vibropiling may affect river lamprey during migration through the works area so there is the potential for LSE. Barriers to migration: migratory fish are very susceptible to obstacles during their spawning run (Nunn <i>et al.</i> 2008³). Physical structures such as weirs and dams can present permanent barriers to fish movements. The Scheme would result in the narrowing of the riverbed due to the construction of the engineered riverbank to protect the flood defence wall. The engineered riverbank would extend approximately 9-10 m into the river. The width of the river in this area is approximately 55 m. As such, there is no potential for the	
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³ Nunn, A. D., Harvey, J. P., Noble, R. A. A., & Cowx, I. G. (2008). Condition assessment of lamprey populations in the Yorkshire Ouse catchment, north-east England, and the potential influence of physical migration barriers. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 18(2), 175-189.
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		construction to present a physical barrier to fish movements and there is no potential for LSE from this impact pathway. Pollution and accidental spills: The works would require an excavator/piling rig in the intertidal zone. To minimise the possibility of a pollution incident, best practice guidance would be implemented when working near water (GPP5: Works and maintenance in or near water) and a Pollution Prevention Plan would be required to be in place. Best practice measures would be in place to prevent accidental spills. Biodegradable hydraulic oil would be used when possible and no refuelling would be undertaken at the work site. Concrete pours pose a risk of water pollution through leaching of uncured material and accidental spillage. Concrete pours would be scheduled during low tide periods to minimise direct contact with water during curing. Marine grade concrete would 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 there is no	
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		potential for LSE from this impact pathway. Habitat loss: There would be permanent loss of intertidal habitat within the SAC due to the works. The installation of sheet piling and construction of the sea defence wall and associated engineered riverbank would result in the permanent loss of approximately 489 m² of intertidal mud habitat. Intertidal mud is not a supporting habitat for this species, as river lamprey require clean gravels and areas of silt in freshwater for spawning and nursery areas. Therefore, the loss of intertidal mud in the area of works would not have an LSE for river lamprey. Changes in suspended solids (water clarity): When undertaken in water, the piling and augering activities and the placement of rip rap have the potential to cause sediment resuspension and increase suspended sediment concentrations causing a decrease in water clarity. This would be expected to be a very localised, short term and temporary increase in suspended sediment concentrations that, given the nature of the local environment, would be unlikely to be detectable above background levels and would quickly disperse with tidal movements. As such, there is no potential for LSE on river lamprey from this impact pathway.	
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		Water flow (tidal current) changes: The installation of the 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. Increased water velocities can make it more difficult for migratory fish to reach supporting habitats further upstream. Hydraulic modelling of the proposed Scheme has been undertaken to investigate the effect of the reduction in cross sectional area on water velocities (Binnies 2023a). The modelling concluded that the Scheme would have negligible impact on local water velocities. As such, there is no potential for LSE from this impact pathway.	
SAC interest feature 7: Otter	(i) The population of otters in the SAC is stable or increasing over the long term and reflects the natural carrying capacity of the habitat within the SAC. (ii) The natural range of otters in the SAC is neither being reduced nor is likely to be reduced for the foreseeable future. (iii) The safe movement and dispersal of individuals around the	No otter holts were recorded within the Scheme area during the extended Phase 1 Habitat Survey undertaken in summer 2021 (Binnies 2023b⁴). However, there is a regular otter breeding site on the Teifi Marshes upstream of the proposed Scheme area and otter would regularly use the Afon Teifi as a commuting and foraging route.	

⁴ Binnies. 2023b. Cardigan TFRMS – Preliminary Ecological Appraisal
www.naturalresources.wales

	SAC is facilitated by the provision, where necessary, of suitable riparian habitats, and underpasses, ledges, fencing etc. at road bridges and other artificial barriers.	Loss of habitat: There would be a small loss of riparian habitats, specifically saltmarsh and intertidal mudflat. These areas are prone to regular changes in water height and as such do not provide suitable holt locations. They are considered to provide suitable commuting, foraging and resting habitat, however, there are extensive similar habitats available so the loss of a relatively small area of intertidal mud and saltmarsh is not considered to affect the ability of otter to forage or commute throughout their range. As such, there is no potential for LSE from this impact pathway. Underwater noise and vibration: The proposed works would generate underwater noise from piling and augering. This could cause disturbance to otters present or passing through the Scheme area during the works. Consequently, there is the potential for LSE. Above water noise: The proposed works would generate above water noise from piling and augering. This could cause disturbance to otters present or passing through the Scheme area during the works. Therefore, there is the potential for LSE.	
SAC interest feature 8: Floating water-plantain <i>Luronium natans</i>	(i) The floating water-plantain populations will be viable throughout their current	Suitable habitat for floating water plantain is not within the proposed Scheme boundary. This feature is	

	distribution in the SAC (maintaining themselves on a long-term basis). Each floating water-plantain population must be able to complete sexual and/or vegetative reproduction successfully. Potential for genetic exchange between floating water-plantain populations, in and/or outside the SAC, must be evident in the long-term. Dispersal of floating water-plantain must be unhindered. (ii) The SAC will have sufficient suitable habitat to support floating water-plantain populations within their current distribution. There will be no contraction of the current floating water-plantain distribution in the SAC.	known to be present within Teifi Pools and in the river around Tregaron which is located approximately 83 km upstream of the proposed Scheme area. The floating water-plantain habitat requires slow flow in shallow water which was not recorded at the location of the Works. Given the significant distance between the location of this feature and the Scheme area, it is considered there is no impact pathway from the proposed works to the designated feature. As such, there is no potential for LSE.	
SAC interest feature 9: Oligotrophic to mesotrophic standing waters with vegetation of the <i>Littorelletea uniflorae</i> and/or of the <i>Isoëto-Nanojuncetea</i>	(i) The <i>Littorelletea uniflorae</i> aquatic upland lake community will be present in all five of the Teifi Pools (Llyn Hir, Llyn Teifi, Llyn Egnant, Llyn y Gorlan and Llyn Bach), and will be self-maintaining on a long-term basis. (ii) A fully developed <i>Littorelletea</i> community will be present in Llyn Hir, including all of the component species typical of the SAC feature, as represented in the Afon Teifi SAC. (iii) For each of Llyn Teifi, Llyn Egnant, Llyn y Gorlan and Llyn Bach, the extent and species	<i>Littorelletea uniflorae</i> is an upland lake plant community, which is only present in the Teifi Pools and not in the main river. As such, there is no impact pathway from the proposed works to the designated feature and no potential for LSE.	

	composition of <i>the Littorelletea</i> community will be stable or increasing in range. There will be no deterioration in the conservation status of the feature as represented in these lakes.		
Cardigan Bay SAC For Conservation Objectives see: Cardigan Bay/ Bae Ceredigion Special Area of Conservation Advice provided by Natural Resources Wales in fulfilment of Regulation 37 of the Conservation of Habitats and Species Regulations 2017. Published by NRW in March 2018			
SAC interest feature 1: Sandbanks which are slightly covered by sea water all the time. SAC interest feature 2: Reefs. SAC interest feature 3: Submerged or partially submerged sea caves.	To achieve favourable conservation status all the following, subject to natural processes, need to be fulfilled and maintained in the long-term: - The overall distribution and extent of the habitat features within the site, and each of their main component parts is stable or increasing. - The physical biological and chemical structure and functions necessary for the long-term maintenance and quality of the habitat are not degraded. - The presence, abundance, condition and diversity of typical species is such that habitat quality is not degraded.	Introduction of invasive non-native species (INNS): All activities would follow best practice guidance for inspecting (Cook <i>et al.</i> 2015 ⁵), cleaning and maintenance of equipment and introduction of construction material (e.g. rip rap) (e.g. Check, Clean, Dry Protocol, NNSS 2024) to reduce the risk of spread or introduction of INNS. With the implementation of the above best practice measures, it is considered that there would be no LSE on the qualifying features of the SAC because of spread or introduction of INNS. Cardigan Bay SAC is located 3.5 km away from the Scheme area. Any pollution event or increase in suspended sediment concentrations would be highly unlikely to reach these habitats. As such, it is considered there	

⁵ Cook, E.J., Macleod, A. Payne, R.D., and Brown, S. (2014) edited by Natural England and Natural Resources Wales (2015). Marine Biosecurity Planning – Guidance for producing site and operation-based plans for preventing the introduction and spread of non-native species in England and Wales
www.naturalresources.wales

		is no impact pathway from the proposed works to the designated features and no potential for LSE.	
SAC interest feature 4: Bottlenose dolphin <i>Tursiops truncatus</i>	- The population is maintaining itself on a long-term basis as a viable component of its natural habitat. - The species population within the site is such that the natural range of the population is not being reduced or likely to be reduced for the foreseeable future. - The presence, abundance, condition and diversity of habitats and species required to support	Bottlenose dolphin is a feature of the Cardigan Bay SAC. The dolphins use the inshore coastal waters for both feeding and reproduction. They have been recorded in the outer estuary but there is no evidence of their occurrence further upstream (NBN Atlas Wales 2023 ⁶ ; Wales Marine Planning Portal 2023 ⁷). As such, it is considered highly unlikely that bottlenose dolphin would be present in the area during the works and there is no potential for LSE. Given this conclusion of no LSE on the bottlenose dolphin features of this site,	

⁶ NBN Atlas Wales. 2023. <https://wales.nbnatlas.org/>

⁷ Marine Planning Portal Wales. 2023. <http://lle.gov.wales/apps/marineportal/#lat=52.5145&lon=-3.9111&z=8&tgt=false&layers=231,390>
www.naturalresources.wales

	this species is such that the distribution, abundance and population dynamics of the species within the site and population beyond the site is stable or increasing.	it follows that the potential for LSE on the bottlenose dolphin features of the Lley Peninsular and the Sarnau SAC can also be ruled out.	
SAC interest feature 5: Sea lamprey <i>Petromyzon marinus</i>		Sea lamprey could be present in the proposed Scheme area as the works are to be undertaken over an 18-month period, which would overlap with the sea lamprey upstream and downstream migratory periods (upstream: April to June; downstream: October to June). Underwater noise and vibration: The proposed works would generate underwater noise and vibration from vibropiling and augering. Due to the absence of a swimbladder, lack of otolith organs and gelatinous skeleton it is thought sea lampreys have poor hearing and are only sensitive to particle velocity. During their migratory phase they adopt a benthic lifestyle crawling and swimming close to the substrate. Ground vibrations from augering and vibropiling may affect sea lampreys during migration through the works area so there is the potential for LSE. Barriers to migration: migratory fish are very susceptible to obstacles during their spawning run (Nunn <i>et al.</i> 2008⁸). Physical structures such as weirs and	

⁸ Nunn, A. D., Harvey, J. P., Noble, R. A. A., & Cowx, I. G. (2008). Condition assessment of lamprey populations in the Yorkshire Ouse catchment, north-east England, and the potential influence of physical migration barriers. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 18(2), 175-189.
www.naturalresources.wales

		dams can present permanent barriers to fish movements. The Scheme would result in the narrowing of the riverbed due to the construction of the engineered riverbank to protect the flood defence wall. The engineered riverbank would extend approximately 9-10 m into the river. The width of the river in this area is approximately 55 m. As such, there is no potential for the construction to present a physical barrier to fish movements and there is no potential for LSE from this impact pathway. Pollution and accidental spills: The works would require an excavator/piling rig in the intertidal zone. To minimise the possibility of a pollution incident, best practice guidance would be implemented when working near water (GPP5: Works and maintenance in or near water) and a Pollution Prevention Plan would be required to be in place. Best practice measures would be in place to prevent accidental spills. Biodegradable hydraulic oil would be used when possible and no refuelling would be undertaken at the work site. Concrete pours pose a risk of water pollution through leaching of uncured material and accidental spillage. Concrete pours would be scheduled during low tide periods to minimise direct contact with water during curing. Marine grade concrete would be used to ensure quick curing, enhance	
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		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 there is no potential for LSE from this impact pathway. Changes in suspended solids (water clarity): When undertaken in water, the piling and augering activities and the placement of rip rap have the potential to cause sediment resuspension and increase suspended sediment concentrations causing a decrease in water clarity. This would be expected to be a very localised, short term and temporary increase in suspended sediment concentrations that, given the nature of the local environment, would be unlikely to be detectable above background levels and would quickly disperse with tidal movements. As such, there is no potential for LSE on sea lamprey from this impact pathway. Water flow (tidal current) changes: The installation of the 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. Increased water velocities	
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		can make it more difficult for migratory fish to reach supporting habitats further upstream. Hydraulic modelling of the proposed Scheme has been undertaken to investigate the effect of the reduction in cross sectional area on water velocities (Binnies 2023a). The modelling concluded that the Scheme would have negligible impact on local water velocities. As such, there is no potential for LSE from this impact pathway.	
SAC interest feature 6: River lamprey <i>Lampetra fluviatilis</i>		River lamprey could be present in the proposed Scheme area as the works are due to be undertaken over an 18-month period, which would overlap with the river lamprey migration period (adult upstream migration October to December and transformer downstream from March to May). Underwater noise and vibration: The proposed works would generate underwater noise and vibration from vibropiling and augering. Due to the absence of a swimbladder, lack of otolith organs and gelatinous skeleton it is thought river lampreys have poor hearing and are only sensitive to particle velocity. During their migratory phase they adopt a benthic lifestyle crawling and swimming close to the substrate. Ground vibrations from augering and vibropiling may affect river lampreys during migration through	

		the works area so there is the potential for LSE. Barriers to migration: migratory fish are very susceptible to obstacles during their spawning run (Nunn <i>et al.</i> 2008⁹). Physical structures such as weirs and dams can present permanent barriers to fish movements. The Scheme would result in the narrowing of the riverbed due to the construction of the engineered riverbank to protect the flood defence wall. The engineered riverbank would extend approximately 9-10 m into the river. The width of the river in this area is approximately 55 m. As such, there is no potential for the construction to present a physical barrier to fish movements and there is no potential for LSE from this impact pathway. Pollution and accidental spills: The works would require an excavator/piling rig in the intertidal zone. To minimise the possibility of a pollution incident, best practice guidance would be implemented when working near water (GPP5: Works and maintenance in or near water) and a Pollution Prevention Plan would be required to be in place. Best practice measures would be in place to prevent accidental spills. Biodegradable hydraulic oil would be	
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⁹ Nunn, A. D., Harvey, J. P., Noble, R. A. A., & Cowx, I. G. (2008). Condition assessment of lamprey populations in the Yorkshire Ouse catchment, north-east England, and the potential influence of physical migration barriers. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 18(2), 175-189.
www.naturalresources.wales

		used when possible and no refuelling would be undertaken at the work site. Concrete pours pose a risk of water pollution through leaching of uncured material and accidental spillage. Concrete pours would be scheduled during low tide periods to minimise direct contact with water during curing. Marine grade concrete would 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 there is no potential for LSE from this impact pathway. Changes in suspended solids (water clarity): When undertaken in water, the piling and augering activities and the placement of rip rap have the potential to cause sediment resuspension and increase suspended sediment concentrations causing a decrease in water clarity. 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. As	
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		such, there is no potential for LSE on river lamprey from this impact pathway. Water flow (tidal current) changes: The installation of the 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. Increased water velocities can make it more difficult for migratory fish to reach supporting habitats further upstream. Hydraulic modelling of the proposed Scheme has been undertaken to investigate the effect of the reduction in cross sectional area on water velocities (Binnies 2023a). The modelling concluded that the Scheme would have negligible impact on local water velocities. As such, there is no potential for LSE from this impact pathway.	
SAC interest feature 7: Grey seal <i>Halichoerus grypus</i>		Grey seal is a feature of the Cardigan Bay SAC. They have been recorded in the outer estuary but there are no records further upstream in the vicinity of the Scheme area (NBN Gateway 2023; Wales Marine Planning Portal 2023). The nearest haul out site is over 4 km from the Scheme area at Ogof Groyn in the outer estuary. As such, it is considered highly unlikely that grey seal would be present in the area during the works and there is no potential for LSE.	

		Given this conclusion of no LSE on the grey seal features of this site, it follows that the potential for LSE on the grey seal features of the Lley Peninsular and the Sarnau SAC, and the Pembrokeshire Marine SAC, can also be ruled out.	
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West Wales Marine SAC

For Conservation Objectives see:

Harbour Porpoise (*Phocoena phocoena*) Special Area of Conservation: West Wales Marine / Gorllewin Cymru Forol Conservation Objectives and Advice on Operations Published by JNCC and NRW in March 2019

SAC interest feature 1: Harbour Porpoise <i>Phocoena phocoena</i>	To ensure that the integrity of the site is maintained and that it makes an appropriate contribution to maintaining Favourable Conservation Status (FCS) for harbour porpoise in UK waters.	Harbour porpoise is a feature of the West Wales Marine SAC and have been recorded in the inshore waters of the outer estuary. However, the encounter rate in this area is very low (0.038 animals per hour) and more important areas are known further west and offshore where encounter rates are significantly higher (3.7 – 4.7 animals per hour) (Wales Marine Planning Portal 2023). There are no records of harbour porpoise further upstream the Teifi river (NBN Atlas Wales 2023). As such, it is considered highly unlikely that harbour porpoise would be present in the area during the works and there is no potential for LSE. Given this conclusion of no LSE on the harbour porpoise features of this site, it follows that the potential for LSE on the harbour porpoise features of the North Anglesey Marine and Bristol Channel Approaches SACs can also be ruled out.	
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3.2.3 Screening decision of the project 'alone'

(c) If ANY rows in Column II of Table 3.2.2 are RED	The project is likely to have a significant effect on one or more Natura 2000 sites and therefore an appropriate assessment is required.

4. Appropriate assessment of the project when considered alone

4.1 Assessment of project as currently defined

Natura 2000 site feature (from Table 3.2.2 – RED rows only)	Impact pathway(s) (from Table 3.2.2)	Description of impacts	Assessment in view of conservation objectives	Can adverse effect on site integrity be ruled out?
Afon Teifi SAC				
Sea and river lamprey	Underwater noise and vibration	Vibropiling and augering works associated with the construction of the flood defence have the potential to generate and propagate underwater noise (as sound pressure motion) and vibration (as particle motion) and, as a result, have the potential to cause a range of effects on fish. Underwater noise may cause physical, physiological and behavioural effects on fish, as follows: Behavioural effects (e.g. changes in swimming behaviour and orientation, communication between individuals of the same species, and detection of predators/prey);	River lamprey migrate upstream primarily between October and December (NRW 2018¹²; Maitland 2003¹³) with young adults migrating downstream between March and May (NRW 2018). Sea lamprey migrate upstream from spring to early summer, typically between April and June, with spawning in June. Juvenile sea lamprey migration varies between rivers but is thought to occur between October and June (Silva <i>et al.</i> 2013¹⁴; NRW 2018). NRW fish counter data on the River Teifi confirms that lamprey migration is both at night and during daylight hours (Jason Jones (NRW) pers. comm., 2023). Fish monitoring data provided by NRW included two records of lamprey individuals in the vicinity of the Scheme in 2008 and 2014. However, the above additional fish	No

¹² National Resource Wales. (2018). Cardigan Bay/ Bae Ceredigion Special Area of Conservation: Advice provided by Natural Resources Wales in fulfilment of Regulation 37 of the Conservation of Habitats and Species Regulations 2017.

¹³ Maitland, P. S. (2003). Ecology of the river, brook and sea lamprey. *Conserving natura*, 52.

¹⁴ Silva, S., Servia, M.J., Vieira-Lanero, R. and Cobo, F. (2013). Downstream migration and hematophagous feeding of newly metamorphosed sea lampreys (*Petromyzon marinus* Linnaeus, 1758). *Hydrobiologia* 700, pp. 277-286

		• Masking effects (i.e. the reduction in the detectability of a given sound as a result of the simultaneous occurrence of another sound); • Temporary threshold shift (TTS) in hearing (i.e. short- or long-term changes in hearing sensitivity that may or may not reduce fitness); • Recoverable tissue injury (e.g. hair cell damage or minor internal or external hematoma); • Mortality and potential mortal injury (i.e. immediate or delayed death). Sea and river lamprey are sensitive to sound particle motion and show sensitivity to a narrow band of frequencies (Popper <i>et al.</i> 2014¹⁰; Mickle <i>et al.</i> 2019¹¹). In water vibropiling and augering would both be a direct source of noise and vibration during the works.	counter data suggest that lamprey presence in the Teifi is more significant than the data from the vicinity of the Scheme suggest. The works would require installation of sheet piles, undertaken by a Movax vibropiling rig. Vibropiling is generally considered to have less of an underwater noise impact than percussive piling. Pre-augering would be undertaken to reduce the duration of piling and further reduce the effects of underwater noise. The in-water near-source (10 m) unattenuated sound pressure generated from pre-augering has been recorded previously at a maximum of 184.5 dB Sound Exposure Level (SEL) (Erica <i>et al.</i> 2012¹⁵). Vibropiling has been recorded at a maximum of 182 dB Sound Pressure Level (SPL) and 165 dB SEL for 0.6 m sheet piles in 15 m water depth (Illingworth and Rodkin 2007¹⁶). This is deeper than the water in the Scheme area and noise levels here would be expected to be lower. Sound levels for Movax vibratory piling rigs in water are not available so these reported values are used as a precautionary approach. The SPL at which fish with no swim bladder (sea and river lamprey) may be affected physiologically is 186 dB SEL (Popper <i>et al.</i>	
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¹⁰ Popper, A. N., Hawkins, A. D., Fay, R. R., Mann, D. A., Bartol, S., Carlson, T. J. & Tavalga, W. N. (2014). Sound exposure guidelines (pp. 33-51). Springer International Publishing.

¹¹ Mickle, M.F., Miehl, S.M., Johnson, N.S. and Higgs, D.M., (2019). Hearing capabilities and behavioural response of sea lamprey (*Petromyzon marinus*) to low-frequency sounds. Canadian Journal of Fisheries and Aquatic Sciences, 76(9), pp.1541-1548.

¹⁵ Erica, D., Brittany, M., Shani, B., & Kathleen M, D. (2012). Assessment of underwater anthropogenic noise associated with construction activities in Bechers Bay, Santa Rosa Island, California. Journal of Environmental Protection, 2012.

¹⁶ Illingworth, R., & Rodkin, R. (2007). Compendium of pile driving sound data. Prepared for the California Department of Transportation, Sacramento, CA.

			2014). Neither auger drilling or vibropiling would exceed this threshold and so no physiological effects are likely to occur. There is a moderate risk of masking, the impairment of the ability to detect sounds, for river and sea lamprey within 100 m of the piling source. After 100 m the risk is low (Popper <i>et al.</i> 2014). There is a high risk of piling affecting the behaviour of river and sea lamprey within 100 m of the piling source. Within 100 m and 1 km there is a moderate risk. After one km the risk is low (Popper <i>et al.</i> 2014). The river is approximately 55 m wide at the location of the proposed works. This means that noise has the potential to create a barrier to lamprey migration. Changes in behaviour due to disturbance may cause disruption to lamprey migration. Given the 18-month duration of the works there is the potential for such effects to be over an extended period. The piling and augering works are scheduled to have a duration of approximately 2 months, which would be a significant period of time relative to the migratory periods of these species. As such, an adverse effect on site integrity without appropriate mitigation cannot be ruled out.	
Atlantic salmon	Underwater noise and vibration	Pile-driving and augering works associated with the construction of the flood defence have the potential	Atlantic salmon smolts generally migrate downstream between March to May, often at night although fish migrating later in the	No

		to generate and propagate underwater noise (as sound pressure motion) and vibration (as particle motion) and, as a result, have the potential to cause a range of effects on fish. Underwater noise may cause physical, physiological and behavioural effects on fish, as follows: • Behavioural effects (e.g. changes in swimming behaviour and orientation, communication between individuals of the same species, and detection of predators/prey); • Masking effects (i.e. the reduction in the detectability of a given sound as a result of the simultaneous occurrence of another sound); • Temporary threshold shift (TTS) in hearing (i.e. short- or long-term changes in hearing sensitivity that may or may not reduce fitness); • Recoverable tissue injury (e.g. hair cell damage or minor internal or external hematoma);	spring may move during both day and night. Adult Atlantic salmon return to their river of origin and can enter freshwater throughout the year with the primary period being between June to October. However, anecdotal rod fishing evidence suggests that in the Afon Teifi there are peak migration periods earlier in spring (March to May) and again in autumn. The timing and duration of the spawning migration depends on the population, the size and location of the river, and when the conditions in the river are favourable for upstream migration (Cefas 2023¹⁷). As such, there is potential for salmon to be migrating up the Afon Teifi between March and November. Data provided by NRW indicated that two Atlantic salmon individuals were recorded during surveys of the Teifi between 2007 and 2021. However, reported rod catches on the Teifi are higher and in 2021 catches were 31 for grilse and 28 for multi sea winter adults (Cefas / EA / NRW 2022¹⁸). The assessment for salmon stocks in England and Wales, undertaken jointly by Cefas, NRW and the Environment Agency (Cefas / EA / NRW 2022) reported that the returning stock estimates for the majority of rivers was lower in 2021 than the five year mean, and for the Afon Teifi the 2021 estimate was the lowest recorded in the time series (since 2010). There has been a general decline in	
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¹⁷ Cefas. 2023 <https://www.cefas.co.uk/iys/salmon-life-cycle/>

¹⁸ Cefas / EA / NRW. (2022a). Salmon Stocks and Fisheries in England and Wales in 2021. Preliminary Assessment Prepared for ICES, March 2022. Cefas, Lowestoft. 93pp. www.naturalresources.wales

		• Mortality and potential mortal injury (i.e. immediate or delayed death). In water vibropiling and augering would both be a direct source of noise and vibration during the works.	returning stock estimates in the Afon Teifi over this period. The works would require installation of sheet piles, undertaken by a Movax piling rig. The in-water near-source (10 m) unattenuated sound pressure generated from pre-augering has been recorded previously at a maximum of 184.5 dB Sound Exposure Level (SEL) (Erica <i>et al.</i> 2012). Vibropiling has been recorded at a maximum of 182 dB Sound Pressure Level (SPL) and 165 dB SEL for 0.6 m sheet piles in 15 m water depth (Illingworth and Rodkin, 2007). This is deeper than the water in the Scheme area and noise levels here would be expected to be lower. Sound levels for Movax vibratory piling rigs in water are not available so these reported values are used as a precautionary approach. The sound pressure level at which physiological effects may occur for fish with a swim bladder that is not involved in hearing (Atlantic salmon) is 186 dB SEL (Popper <i>et al.</i> 2014). Neither auger drilling or vibropiling would exceed this threshold and so no physiological effects are likely to occur. There is a moderate risk of masking, the impairment of the ability to detect sounds, for Atlantic salmon within 100 m of the piling source. After 100 m the risk is low (Popper <i>et al.</i> 2014). There is a high risk of piling impacting on the behaviour of Atlantic salmon within 100 m of	
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			the piling source. Within 100 m and 1 km there is a moderate risk. After one km the risk is low (Popper <i>et al.</i> 2014). The river is approximately 55 m wide at the location of the proposed works. This means that noise has the potential to create a barrier to migration. The majority of Atlantic salmon smolt migration is thought to occur at night when no noise or vibration would be generated by construction activities and the fish should be able to pass freely at this time. However, later in spring, smolt are also known to travel during the day (Cefas 2023). Adult salmon and smolt migrating during the day may experience masking effects (moderate risk) or behavioural effects (high risk) within 100 m of the noise source. Changes in behaviour due to disturbance may cause disruption to salmon migration both upstream and downstream. Given the 18-month duration of the works there is the potential for such effects to be over an extended period, across both adult and smolt migration periods. The piling and augering works are scheduled to have a duration of approximately 2 months, which has the potential to overlap with salmon migratory periods. As such, and with consideration of the declining stock estimates for the Afon Teifi, an adverse effect on site integrity without appropriate mitigation cannot be ruled out.	
Otters	Above water noise, Underwater noise.	Pile-driving and augering works associated with the construction of	The closest record of otters, from available baseline data in the Scheme area, was	Yes

		the flood defence have the potential to generate and propagate above water noise and underwater noise (as sound pressure motion) and vibration (as particle motion) and, as a result, have the potential to affect otters.	under the westernmost bridge that borders the Scheme area (Binnies 2023b). No holts were recorded within 1 km of the Scheme. There is a regular otter breeding on the Teifi Marshes upstream of the proposed Scheme. The Scheme area provides suitable habitat for otter foraging, resting and commuting. Otter typically feed and forage during the night. Given the piling and augering works would be limited to daylight hours, it is not expected that otters would be prevented from feeding, foraging or passing through the Scheme area, during the duration of the piling works. Otters have wide home ranges, up to 40 km along a river for males and up to half that for females and there is suitable habitat along the length of the Afon Teifi beyond the Scheme area. There are sparse data available for acoustic sensitivity and impacts of noise on otters. A study of captive sea otters, <i>Enhydra lutris</i>, found that under water, hearing was less sensitive than sea lions and other pinnipeds, especially at frequencies below 1 kHz (Ghoul & Reichmuth 2013¹⁹) suggesting that disturbance effects are more likely than physiological effects. If present, otters would be able to move away from the noise source if required. Given the ability of otters to move away from a noise source, the low likelihood of otters being excluded from the area due to the	
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¹⁹ Ghoul, A., & Reichmuth, C. (2013). Psychophysical studies of hearing in sea otters (*Enhydra lutris*). The Journal of the Acoustical Society of America, 134(5_Supplement), 4210-4210.

			works and the availability of suitable habitat throughout the SAC, it is considered that the population, range and safe movement of otters in the SAC would not be permanently affected by the works and there would be no adverse effects on site integrity in relation to otters and this impact pathway.	
Cardigan Bay SAC				
Sea and river lamprey	Underwater noise and vibration	Pile-driving and augering works associated with the construction of the flood defence have the potential to generate and propagate underwater noise (as sound pressure motion) and vibration (as particle motion) and, as a result, have the potential to cause a range of effects on fish. Underwater noise may cause physical, physiological and behavioural effects on fish, as follows: • Behavioural effects (e.g. changes in swimming behaviour and orientation, communication between individuals of the same species, and detection of predators/prey); • Masking effects (i.e. the reduction in the detectability of a given sound as a result of the simultaneous occurrence of another sound); Temporary threshold	Lamprey do not home to their natal river, so lamprey using the Cardigan Bay SAC are viewed as a protected component of a larger population covering the Bristol Channel and possibly a wider area (NRW 2018). Sea lamprey use the site as an access corridor between the open sea and their riverine habitat, primarily in the Afon Teifi and River Aeron. Adult river lamprey spend their time in estuaries and inshore waters and are assumed to be present in the SAC throughout the year. Direct effects on the SAC as a result of the works are not anticipated. Given the connectivity between the lamprey populations of the Cardigan Bay SAC and the Afon Teifi SAC, the potential effects of disturbance of lamprey as discussed above for the Afon Teifi SAC, also apply to the Cardigan Bay SAC. Any disruption of migration and subsequent effects on spawning success in the Afon Teifi may affect the distribution, abundance and population dynamics within the Cardigan Bay SAC. Given that underwater noise and	No

		shift (TTS) in hearing (i.e. short- or long-term changes in hearing sensitivity that may or may not reduce fitness); • Recoverable tissue injury (e.g. hair cell damage or minor internal or external hematoma); • Mortality and potential mortal injury (i.e. immediate or delayed death). Sea and river lamprey are sensitive to sound particle motion and show sensitivity to a narrow band of frequencies (Popper <i>et al.</i> 2014; Mickle <i>et al.</i> 2019). In water vibropiling and augering would both be a direct source of noise and vibration during the works.	vibration from the works may have a barrier effect on migrating lamprey, it is concluded that an adverse effect on site integrity cannot be ruled out for sea and river lamprey from this impact pathway.	
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4.2 Assessment of the project taking into account mitigating measures, conditions or restrictions

Natura 2000 Feature (from Table 4.1 – ‘NO’ rows only)	Description of adverse effect(s)	Can adverse effect(s) be mitigated?	Description of mitigation measures, and how they would be applied (e.g. contractual obligations, consent conditions)	Can adverse effect on site integrity be ruled out?
Atlantic salmon (Afon Teifi SAC).	Potential disruption to migration between	Yes	The upstream and downstream migratory periods of Atlantic salmon in the Afon Teifi extend across much of the year and it is recommended that in water augering and piling should not be undertaken between 1	Yes.

	river and marine habitats.		March and 30 November inclusive. Augering and piling are permitted between March and November where such activities are undertaken from a dry working platform in dry conditions, such that no augering or piling plant or equipment operates within the water column. For the avoidance of doubt, incidental contact between installed piles and groundwater or tidal water within the substrate shall not constitute in-water working. However, there is a period over winter, between 1 December and 28 February, when these seasonal restrictions would not apply and in water activities can be undertaken during the daytime only (defined as the period between sunrise and sunset), in line with the current proposals. This would avoid potential disturbance effects on designated fish features and allow periods of time when fish can pass safely through the Scheme area. 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.	
Sea and river lamprey (Afon Teifi & Cardigan Bay SACs).	Potential disruption to migration between river and marine habitats.	Yes	The upstream and downstream migratory periods of river lamprey in the Afon Teifi are between October and December and March and May, respectively. Sea lamprey migrate upstream between April and June with juvenile downstream migration between October and June. The mitigation measures identified for Atlantic salmon above can also be applied to lamprey, with such measures applied during the above lamprey migratory periods. Together with the salmonid mitigation, this would entail no in-water augering or piling between 1 March and 31 December inclusive. During this March to December period, augering and piling are permitted where such activities are undertaken from a dry working platform in dry conditions, such that no augering or piling plant or equipment operates within the water column. For the avoidance of doubt, incidental contact between installed piles and groundwater or tidal water within the substrate shall not constitute in-water working.	

			The above seasonal restrictions for lamprey and Atlantic salmon would not apply during between 1 January and 28 February only.	

4.3 Concluding the appropriate assessment of the project alone

(a) If the right hand column of Table 4.1 and Table 4.2 (if applicable) is 'YES' for all features	It has been ascertained that the proposal, when considered alone, would not adversely affect the integrity of any Natura 2000 sites.

(c) Are there any residual effects of the project (net of any mitigation measures identified) which, though insignificant on their own, could be significant if considered in combination with the effects of other plans or projects?	No – A review of projects or plans within the local vicinity has been performed. The projects or plans identified within the search radius were terrestrial in nature. It has been determined that there would be no significant residual effects when considered in combination with the effects of other plans or projects.
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6. Conclusion

HRA is not required because the whole of the project is directly connected with or necessary to the management of one or more Natura 2000/Ramsar sites, for the purposes of conserving the habitats or species for which the site(s) is/are designated, <u>and</u> the project is not likely to have a significant effect on any other Natura 2000/Ramsar sites. (As documented in section 2.1 and 2.2 of this form)	
HRA is not required because there is no conceivable impact pathway to any Natura 2000/Ramsar site (As documented in section 2.3 of this form)	
This project is a renewal of a current permission which complies with NRW agreed criteria for ruling out significant effects of a renewal without conducting a project-specific LSE test. Therefore it is considered not likely to have a significant effect on any Natura 2000/Ramsar sites, either alone or in-combination with other plans and projects. (As documented in section 3.1 of this form)	
The project has been screened for likelihood of significant effects and, taking account of the advice received from protected sites advisors, is considered not likely to have a significant effect on any Natura 2000/Ramsar site (As documented in section 3.2 of this form, or section 5 if applicable)	
In light of the conclusions of an appropriate assessment, and taking account of the advice received from protected sites advisors, it has been established that the project will not adversely affect the integrity of any Natura 2000/Ramsar site, taking into account any conditions or restrictions as applicable, either alone or in-combination with other plans and projects. (As documented in section 4 of this form, and section 5 if applicable)	X
In light of the conclusions of the appropriate assessment, it has <u>not</u> been ascertained that the project will not adversely affect the integrity of any Natura 2000/Ramsar site, as documented in section 4 of this form, and section 5 is applicable. Approval for the project <u>cannot</u> be given unless either: the project specification, and/or the terms under which it might be approved, are modified so as to remove the risk of adverse effects, and a revised HRA report is prepared, or+	

the project satisfies the requirements of Article 6(4) of the Habitats Directive, an Article 6(4) Statement of Case is prepared (OGN 200 Form 3) and submitted for consideration by the appropriate authority, normally Welsh Ministers	
Signed: Name: Position: Date:	

7. Consultation with protected sites advisor(s) and how sections 2, 3, 4 and 5 of this HRA report (as applicable) take into account that advice.

Relevant section of the HRA report	Date(s) of correspondence* and any meeting(s) with protected sites advisor(s)	Description of how the comments from protected sites advisors have been taken into account
3.2.1, 3.2.2	19.10.2023 - NRW consultation meeting. In accordance with NRW Position Statement on Marine Mammal Management Units all Welsh Marine Mammal SACs need to be scoped in since the development lies within the management unit for all 3 SAC features.	Additional marine mammal sites identified. Where effects on the sites closest to the works were ruled out, effects on the more distant sites with marine mammal features were also subsequently ruled out and were not considered further.
4	19.10.2023 - Appropriate Assessment River and Sea Lamprey –Little evidence to demonstrate Sea and River lamprey don't migrate during the day. Jason Jones noted NRW hold fish survey records that lamprey do migrate on the River Teifi during the day. Therefore, mitigation needs to be applied that ensures no pre-augering or Movax piling in the wet during lamprey migration periods. Together with the Salmonid mitigation, this would entail no augering or piling in the wet between March and December	Screening assessment updated to acknowledge daytime movement of lamprey species. Appropriate Assessment updated to indicate that AEoI without mitigation could not be ruled out. Mitigation, in line with that identified for Atlantic salmon, also applies to lamprey and has been added to Section 4.2, including extending the dates when piling and augering in the wet should be avoided.
3.2.2	19.10.2023 - NRW consultation meeting. NRW Fisheries survey data was used for the HRA baseline. The data presented low numbers which suggested the data was based on single site findings rather than multiple locations.	APEM provided the fish data to NRW. Data are from multiple locations, but NRW have indicated that data from other locations are also available. It is not considered that additional data would change the outcome of the assessment at screening or AA stage.

4.2	19.10.2023 - NRW consultation meeting. Appropriate Assessment Atlantic Salmon Mitigation: There was some confusion among attendees on whether the mitigation was March to November inclusive and whether Augering and Movax piling was only permitted at low tide even when in the dry.	Clarified and updated wording in section 4.2.
4	19.10.2023 - NRW consultation meeting. Attendees in agreement with the sites and interest features taken forward for Appropriate Assessment.	N/A
4	19.10.2023 - NRW consultation meeting. Appropriate Assessment Atlantic Salmon: Discussion was had on whether Salmon Kelts needed to be covered by the assessment. Acknowledgement that Kelts would not be present in great numbers and unlikely to be affected on the River Teifi. NRW were content there is not a need to specifically consider Salmon Kelts independently to the general assessment of Atlantic Salmon.	N/A
4	19.10.2023 - NRW consultation meeting. It was confirmed that the augering threshold exceeded the Salmon tolerance as well as the Movax piling. APEM advised that very precautionary figures were used for Movax Piling given there is no data available for the Movax piling rig.	N/A

8. Conservation Technical Specialist's comments

I have reviewed the HRA documented in this form and confirm that I agree/do not agree* with its findings.
(*strike out as applicable)

Additional comments (if any):

Signed:

Name:

Position:

Date: