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A494 RIVER DEE BRIDGE REPLACEMENT

Technical Appendix 7.B

Volume 3: Technical Assessment Report

Water Framework Directive Assessment

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1. Introduction

1.1.1 Mott MacDonald Ltd has been appointed by the North & Mid Wales Trunk Road Agent 'the Applicant' to develop the design and undertake environmental assessments for the A494 River Dee Bridge Improvement Scheme (hereinafter referred to as 'the Scheme'). This report has been produced to support the Environmental Impact Assessment (EIA) Volume 1, Chapter 7: Environmental Statement Road Drainage and Water Environment for the Scheme.

1.1.2 A Water Framework Directive (WFD) assessment is necessary in order to assess potential impacts on WFD elements, as a result of the Scheme, that may cause a deterioration in the status of a water body or prevent it from reaching good status or good ecological potential in the future.

1.2 Scheme location

1.2.1 The Scheme is located in North Wales on a tidally influenced reach of the River Dee (National Grid Reference (NGR) SJ 32420 68583). A detailed description of the Scheme is provided in EIA Volume 1, Chapter 2: The Project.

1.2.2 The Scheme comprises the replacement of an existing road bridge that crosses the tidal River Dee with a new bridge upstream (see Figure 7.2). The new bridge would be approximately 36.5 m wide and would span approximately 140m, to carry two lanes of eastbound and westbound traffic, hard shoulders and a shared use path. The bridge would be located approximately 6.65m to the southeast of the existing A494 river bridge and would be supported by two sets of river piers.

1.2.3 Upon completion of the bridge, the existing A494 River Dee bridge is to be dismantled with the bridge deck removed, abutments demolished, and the piers left in place.

1.2.4 The Scheme includes the diversion of the 'Queensferry Drain' (main river) including creation of new sections of open channel.

1.2.5 The Scheme includes changes to the existing road drainage network incorporating Sustainable Drainage Systems (SuDS), creation of a new drainage outfall to the

River Dee and a new Queensferry Drain Pumping Station facility to the west of the River Dee.

1.2.6 Further details on ecological mitigation and biodiversity enhancement are provided in EIA Volume 1, Chapter 8: Terrestrial Biodiversity, including wildflower seeding and tree planting.

1.3 Purpose of this report

1.3.1 This assessment considers the potential impacts associated with the Scheme activities on WFD water bodies and their current status and objectives. It comprises of the following steps:

a) Baseline and screening assessment – to identify which Scheme activities could potentially affect WFD water bodies, and to determine which WFD water bodies and associated protected areas might be impacted and therefore require screening in for further assessment. The report summarises information on the WFD baseline conditions for screened in WFD water bodies.

b) Scoping assessment – to assess the potential WFD effects and the overall compliance risks of the Scheme, for both the construction and operational phases.

1.3.2 The WFD assessment considers the potential for the Scheme to lead to non-compliance with the objectives of the WFD and provides details of mitigation to alleviate any potential adverse effects identified.

2. Legislation and Policy Framework

2.1.1 The WFD is originally European legislation which aims to protect and improve the water environment within river catchments. Following the United Kingdom's exit from the European Union (EU), the WFD was transposed into UK law and therefore still applies. It is transposed into UK law by the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017[1].

[1] The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017. Available online at: The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017. Accessed February 2025.

2.1.2 Natural Resources Wales (NRW) is the statutory body responsible for implementing the WFD in Wales. The Environment Agency (EA) is the statutory body responsible for implementing the WFD in England.

2.1.3 The WFD requires objectives to be identified and set to protect and improve the status of all 'water bodies'. Water bodies include: rivers, stream, lakes, reservoirs, estuaries, coastal waters, canals and groundwaters. The standard objective is to achieve 'good status', or 'good potential' (if the water body is artificial or is heavily modified). Further to this, the WFD must prevent deterioration in status for all water bodies. The original target date for all water bodies to achieve 'good status' was 2015; however, this was extended to either 2021 or 2027.

2.1.4 Good 'status' or 'potential' is designated based on the assessment of ecological and chemical components in surface waters. Ecological status consists of biological quality elements, physico-chemical supporting elements and hydromorphological supporting conditions. For groundwaters, status consists of quantitative and qualitative elements.

2.1.5 The WFD environmental objectives are outlined in Table 2-1.

Table 2-1 WFD environmental objectives

Environmental objectives (Regulation 13)	Reference and Description
(2) Surface water	Prevent deterioration of the status of each body of surface water.
	Protect, enhance and restore each body of surface water (other than an artificial or heavily modified water body) with the aim of achieving good ecological status and good surface water chemical status, if not already achieved, by 22nd December 2021.
	Protect and enhance each artificial or heavily modified water body with the aim of achieving good ecological potential and good surface water chemical status, if not already achieved, by 22nd December 2021.
	Aim progressively to reduce pollution from priority substances and aim to cease or phase out emissions, discharges and losses of priority hazardous substances.
(5) Groundwater	Prevent deterioration of the status of each body of groundwater.

Environmental objectives (Regulation 13)	Reference and Description
	Prevent or limit the input of pollutants into groundwater.
	Protect, enhance and restore each body of groundwater, and ensure a balance between abstraction and recharge of groundwater, with the aim of achieving good groundwater chemical status and good groundwater quantitative status, if not already achieved, by 22nd December 2021.
	Reverse any significant and sustained upward trend in the concentration of any pollutant resulting from the impact of human activity in order to progressively reduce pollution of groundwater.
	Prevent deterioration of the status of each body of groundwater.

Source: Water Environment (Water Framework Directive) (England and Wales) Regulations 2017.

2.1.6 River Basin Management Plans (RBMPs) set out how organisations, stakeholders and communities will work together to improve the water environment. There are three RBMPs covering the 3 River Basin Districts (RBDs) in Wales. RBMPs report the baseline status of water bodies within each RBD, corresponding to WFD reporting cycles. The first RBMPs were published in 2009 for RBMP Cycle 1 and were updated for Cycle 2 in 2015 and Cycle 3 in 2022.

2.1.7 The Scheme lies within the Dee RBD which is reported within The Dee RBMP[2]. NRW and the EA work jointly in the Dee RBD as some water bodies form the boundary or cross between Wales and England. Information on how the water environment is managed in the English part of the Dee River Basin District is available from the EA[3].

3. Assessment Methodology

3.1 Methodology

3.1.1 This WFD assessment has been completed based on the available Scheme information provided (details in Section 1.2). The assessment has been

[2] National Resources Wales and Environment Agency, 2022. Dee River basin management Plan 2021- 2027 Summary. Available online at: Dee RBMP 2021-2027 Summary Accessed: 30/05/2025.
[3] Environment Agency, 2024. Policy Paper Dee River Basin Management Plan. Available online at: Dee River Basin Management Plan - GOV.UK Accessed: 30/05/2025.

undertaken using the Clearing the Waters for All guidance[4] which describes an approach for transitional water bodies, with reference to NRW guidance[5] for marine water bodies. There are three stages of assessment:

i) **Stage 1: WFD Screening** – identifies the relevant water bodies and designated areas. An overview of the current baseline is provided in relation to the water environment. In addition, activities and characteristics of the project in the construction and operational phases and their potential generic impacts are identified. This helps establish the risk from project activities to the water bodies and their WFD elements. Activities are either screened in for further assessment or screened out if they do not require further assessment (Stage 2 and 3).

ii) **Stage 2: WFD Scoping** – identifies the receptors that are potentially at risk from the planned activity and the need for impact assessment.

iii) **Stage 3: WFD Impact Assessment** – considers the potential impacts of the activity, identifies ways to avoid or minimise impacts, and shows if your activity may cause deterioration or jeopardise the water body achieving good status.

3.2 Study Area

3.2.1 For the purpose of this assessment, the study area extends 2 km upstream and downstream of the Scheme boundary as shown in Figure 7.2.

3.2.2 In line with NRW guidance[6], the chemical status of WFD water bodies has been considered for up to 12 nautical miles (22.2km) within the tidally influenced area (Hilbre Island at the estuary mouth downstream of the Scheme to Chester Weir upstream of the Scheme).

3.3 Data Sources

3.3.1 The WFD assessment has been informed by a desk-based analysis of publicly available information which are listed below:

[4] Environment Agency 2016. How to assess the impact of your activity in estuarine (transitional) and coastal waters for the Water Framework Directive (WFD). Clearing the Waters for All. Available online at: Water Framework Directive assessment: estuarine and coastal waters - GOV.UK (www.gov.uk) (Accessed January 2025).
[5] NRW, 2024. How to carry out a Water Framework Directive (WFD) assessment for a marine licence application. Available online at: https://naturalresources.wales/permits-and-permissions/marine-licensing/marine-licensing-and-the-water-framework-directive/?lang=en Accessed January 2025.
[6] NRW, 2024. How to carry out a Water Framework Directive (WFD) assessment for a marine licence application. Available online at: https://naturalresources.wales/permits-and-permissions/marine-licensing/marine-licensing-and-the-water-framework-directive/?lang=en Accessed January 2025.

a) National Library of Scotland historical georeferenced OS maps[7]

b) British Geological Survey (BGS) Geology of Britain Viewer[8]

c) Catchment Data Explorer[9]

d) Magic Maps[10]

e) Data Map Wales[11]

f) National River Flow Archive[12]

g) Cycle 3 (2021) Rivers and Waterbodies Map[13]

h) Bing Ordnance Survey (OS) mapping[14] .

3.3.2 Available project information was also used including:

a) Surveyed currents, salinity, and suspended solids measurements[15]

b) Bathymetry data (collected by Partrac Ltd. on 9th September 2021; 28th September 2021; 3rd December 2021; 25th January 2022; 31st March 2022 and 26th May 2022)[15].

c) Surface water site walkover (19 November 2024).

d) 6 months (November 2024 to April 2025) of spot sampling water quality monitoring[16].

3.4 Limitations and Assumptions

3.4.1 This WFD assessment has been undertaken in line with the following assumptions and limitations:

a) The assessment has been based on currently available WFD baseline data and design information for the Scheme. Conclusions should be reviewed if NRW update or provide additional WFD baseline data for the relevant water bodies, or if significant changes to the nature, spatial extent, scale or construction methods of the Scheme are made.

[7] National Library of Scotland, 2024. Side by Side. Available online at: Side by side georeferenced maps viewer - Map images - National Library of Scotland (nls.uk). Accessed January 2025.
[8] British Geological Survey (BGS), 2024. Geology of Britain Viewer. Available online at: https://www.bgs.ac.uk/map-viewers/geoindex-onshore/. Accessed January 2025.
[9] Environment Agency, 2024. Dee Estuary Operational Catchment. Available online at: Dee Estuary Operational Catchment | Catchment Data Explorer. Accessed January 2025.
[10] DEFRA, 2024. Magic Map Viewer. Available online at: Magic Map Application (defra.gov.uk). Accessed January 2025.
[11] Welsh Government, 2025. Data Map Wales. Available online at: New map | DataMapWales. Accessed January 2025.
[12] NFRA, 2024. Station Data. Available online at: NRFA Station Data for 67027 - Dee at Ironbridge (ceh.ac.uk). Accessed January 2025.
[13] NRW, 2024. Cycle 3 (2021) Rivers and Waterbodies Map. Available online at: https://waterwatchwales.naturalresourceswales.gov.uk/en/. Accessed January 2025.
[14] Microsoft Bing, 2024. Maps. Available online at: Bing Maps - Directions, trip planning, traffic cameras & more. Accessed January 2025.
[15] Partrac Ltd. 2021. A494 Dee Survey Data Report. Document reference: M5006.05.03.D01.V01.
[16] Mott MacDonald, 2025. Volume 3, Technical Appendix 7.A: Water Quality Monitoring Plan.

b) This assessment has been undertaken using a precautionary approach.

c) Information provided by third parties, including publicly available information and databases, are considered correct at the time of publication.

d) Cumulative effects on WFD water bodies (for both intra and inter) have been excluded from this assessment.

4. WFD Baseline and Screening Assessment

4.1 Baseline Conditions

Hydrology

4.1.1 The headwaters of the River Dee originate in Eryri National Park and descend into Llyn Tegid and the valleys of Corwen and Llangollen. The River Dee then meanders northwards through the Cheshire Plain. The river is modified downstream of Chester where it has been historically canalised in the tidal reach during the 1730s. It discharges into the River Mersey estuary.

4.1.2 The River Dee has a total catchment area of approximately 2,251km^2. The A494 River Dee Bridge currently crosses the River Dee, at National Grid Reference (NGR) SJ323685, where the river is tidally influenced.

4.1.3 The '67033 – Dee at Chester Suspension Bridge' is the closest National River Flow Archive (NRFA) gauging station to the Scheme and is located 10km upstream at Chester Weir, this marks the tidal limit of the River Dee. The gauge has not recorded daily flow data since September 2013 due to issues with ultrasonics.

4.1.4 The '67027 – Dee at Ironbridge' NRFA gauging station is located a further 10km upstream of the Scheme beyond the tidal limit of the River Dee and holds daily flow data from 1993 to 2023.

Geology and hydrogeology

4.1.5 Detailed information on geology is available in EIA Volume 1, Chapter 6: Geology and Soils. In summary, the Scheme is underlain by mudstone and sandstone

dominated bedrock consisting of bands of the Etruria Formation east of the Scheme and Pennine Coal Measures (Middle Coal Measures and Lower Coal Measures) interbedded grey mudstone, siltstone and sandstone with coal seams[8].

4.1.6 The superficial deposits underlying the River Dee and adjacent areas are predominantly tidal flat deposits consisting of clay, silt, sand and gravel anticipated to be approximately 15m thick underlying the proposed bridge[17]. The south-western region of the study area consists of Till (Devensian- diamicton) and some localised glaciofluvial deposits (Devensian - sand and gravel)[8].

4.1.7 The Scheme is underlain by a Secondary A bedrock aquifer and Secondary (undifferentiated) superficial aquifer which are classified as a 'High' groundwater vulnerability. This suggests that the aquifers are capable of supporting water supplies at a local rather than strategic scale and, potentially forming an important source of base flow to rivers. There is likely to be some horizontal movement of groundwater through permeable sand and gravel layers. Vertical movement of the groundwater would be impeded by impermeable clay layers that are interbedded with the granular material. Bedrock is likely to be impermeable through the mudstone. There is common faulting in the area that could act as groundwater pathways.

Hydromorphology

4.1.8 The River Dee is a WFD estuarine and coastal water body (Dee, North Wales) which has extensive anthropic influence including abstractions and impoundment upstream of the study area and canalisation and flood defence embankments in the reach located within the study area.

4.1.9 The Scheme is located within the Afon Dyfrdwy (River Dee) SSSI which is of special interest for its fluvial geomorphology, carboniferous geology, range of river habitat types, saltmarsh transition habitats and species of interest.

[17] Mott MacDonald. 2018. A494 River Dee Bridge Improvement – Preliminary Sources Study Report, ref. 395318-0044-B, dated 06/09/2018

4.1.10 Within the study area at the bridge location, the banks on both sides are steep with the inter tidal areas consisting primarily of saltmarsh habitat dominated by fine sediment.

4.1.11 The transport of sediments upstream by the flood tide dominates when the river discharge is low. The flood tide dominance is reversed when the river discharge is high, leading to net downstream sediment transport and erosion. Flood tidal current speeds are higher than the ebb currents in the Dee Estuary. This asymmetry results in the net importation and retention of sediment within the tidal reach.

4.1.12 The water body has a dynamic regime with rapid bed adjustment recorded in recent bathymetry surveys. Around the existing piles localised bed elevation changes of +/-1.8 m were observed over a relatively short period. Existing scour holes were observed up to 3 m below the bed level in the main channel.

Aquatic ecology

4.1.13 Volume 1, EIA Chapter 16: Marine Ecology provides detail on the baseline conditions, designations and potential impact on the habitats and species within the Dee Estuary. In summary, the Dee has multiple designations (Ramsar, Special Area of Conservation (SAC), Special Protection Area (SPA), Site of Special Scientific Interest (SSSI)) within the study area and supports a diverse array of marine life including fish and invertebrates, particularly within its extensive intertidal mudflat and sandflat habitats.

4.1.14 These areas within the intertidal habitats are used for roosting, foraging and refuge and adjacent fields and sand bars are used for high tide refuge, depending on food availability and the state of the tide by species of interest including breeding waterfowl and waders.

4.1.15 Fish species migrating through the study area on the Dee include those which are features of interest of the protected areas. This includes Atlantic salmon (*Salmo salar*), sea lamprey (*Petromyzon marinus*), river lamprey (*Lampetra fluviatilis*) and European smelt (*Osmerus eperlanus*).

4.1.16 No Invasive Non-Native Species (INNS) were identified during intertidal walkover surveys conducted in March 2025. However, Chinese mitten crab (*Eriocheir sinensis*) was recorded previously within 2km of the Scheme in Wepre Brook, NRW have previously stated there is thought to be a substantial population of Chinese mitten crab on the River Dee, however this is based on anecdotal evidence[18].

4.2 WFD receptor screening

4.2.1 The following sections assess which WFD water bodies and protected area receptors have been screened in for further assessment.

WFD water body screening

4.2.2 Several WFD water bodies are located within 2 km of the Scheme or are hydrologically connected to it. These are summarised in Table 4-1.

4.2.3 Queensferry Drain is not a designated WFD surface water body, however potential construction and operational impacts have been assessed within EIA Volume 1, Chapter 7: Road Drainage and the Water Environment. For this WFD assessment, Queensferry Drain has considered as part of the assessment of the Dee (N. Wales) WFD transitional water body, as it is a tributary and is hydrologically connected to it.

[18] Falkingham et al., 2016. Monitoring of Chinese Mitten Crabs (*Eriocheir sinensis*) on the River Dee. Report No. 154. Available online at: https://naturalresourceswales.gov.uk/media/684745/evidence-report-154-chinese-mitten-crabs-eriocheir-sinensis-river-dee.pdf. Accessed July 2025.

Table 4-1 Summary of WFD water bodies within 2 km of the Scheme or hydrologically connected

Water body name	Type	Statutory Authority	Screening outcome	Justification
Dee (N. Wales)* (ID: GB531106708200)	Transitional water body	NRW	Screened in	The Scheme is located on a tidal reach of the River Dee and the water body could potentially be impacted. The water body has therefore been screened in for further assessment.
Garden City Drain (ID: GB111067056960)	Surface water body	EA	Screened out	Garden City Drain discharges to the Dee (N. Wales) WFD water body approximately 0.6km downstream of the existing A494 River Dee Bridge. This water body is unlikely to have significant tidal influence in its lower reaches due to its flapped outlet to the River Dee and is unlikely to be impacted from activities associated with the Scheme. No permanent in-channel modifications are proposed to the water body as part of the Scheme. Operational activities could increase drainage discharge within the Garden City Drain WFD catchment which could potentially impact the water body downstream of activities. Risks to water quality from pollution and routine runoff associated with the operation of the Scheme are assessed within the EIA, Volume 1, Chapter 7: Road Drainage and the Water Environment. Any impact on drainage or water quality is likely to be highly localised and will not have an impact at the WFD water body scale, therefore this water body has been screened out of the assessment.
Dee Carboniferous Coal Measures (ID: GB41102G204800)	Groundwater body	NRW	Screened in	The water body is directly underlying the Scheme and activities including excavations and piling into the river and/or banks which could potentially impact the water body. The water body has therefore been screened in for further assessment.
Sandycroft Drain (ID: GB111067052160)	Surface water body	NRW	Screened out	The water body is located within the study area and discharges to the River Dee approximately 1.5 km upstream of the Scheme. The Scheme activities do not include physical modifications of this water body. Furthermore, it is unlikely that the water body's status or objectives will be impacted by the Scheme activities even in the lower reaches which may be tidally influenced due to the distance upstream. Therefore, this water body has been screened out of the assessment.
Wepre Brook (ID: GB111067056880)	Surface water body	NRW	Screened out	It is unlikely that the water body's status or objectives will be impacted by the Scheme activities even in the lower reaches which may be tidally influenced as the water body confluence with the River Dee is greater than 2km downstream of the Scheme. The Scheme activities do not include physical modifications of this water body or works within the catchment.
Finchetts Gutter Water Body (ID:)	Surface water body	EA	Screened out	The water body is located within the study area and discharges to the River Dee approximately 1.5 km upstream of the Scheme. The Scheme activities do not include physical modifications of this water body. Furthermore, it is unlikely that the water body's status or objectives will be impacted by the Scheme activities even in the lower reaches which may be tidally influenced due to the distance upstream. Therefore, this water body has been screened out of the assessment.
North Wales (ID:)	Coastal water body	NRW	Screened out	The water body is located at a distance greater than 12 nautical miles downstream of the Scheme. At this distance it is unlikely the water body status or objectives will be impacted by the Scheme. The WFD guidance[4] indicates that chemical status should be considered for water bodies up to 12 nautical miles and therefore this water body has been screened out of the assessment.
Mersey Mouth (ID:)	Coastal water body	EA	Screened out	The water body is located at a distance greater than 12 nautical miles downstream of the Scheme. At this distance it is unlikely the water body status or objectives will be impacted by the Scheme. The WFD guidance[4] indicates that chemical status should be considered for water bodies up to 12 nautical miles and therefore this water body has been screened out of the assessment.

*Note: Assessment of Dee (N. Wales) incorporates Queensferry Drain.

4.2.4 Two WFD water bodies with potential to be impacted by the Scheme have been identified and screened in for further assessment:

a) Dee (N. Wales) (water body ID: GB531106708200) transitional water body and is designated as a heavily modified water body. At RBMP Cycle 3, the overall status was ‘Moderate’.

b) Dee Carboniferous Coal Measures (water body ID: GB41102G204800) groundwater body. At RBMP Cycle 3, the overall status was ‘Poor’.

4.2.5 Full WFD status classification data for both screened in water bodies are included in Appendix A.

WFD Protected Area Screening

4.2.6 WFD Protected Areas are those designated under other EU Directives that have been transposed to the main WFD legislation and those designated under the Habitats and Species Regulations 2017. Several protected areas are located within site boundary of the Scheme or within the 2km study area (see Table 4-2 and shown in EIA Volume 2, Figure 16.1 Marine Environment Zones of Interest).

Table 4-2 Protected areas within 2km or hydrologically connected to the Scheme

Site	Designation	Reasons for designation	Distance from Scheme	Screening outcome	Justification
River Dee and Bala Lake/ Afon Dyfrdwy a Llyn Tegid	SAC - UK	Designated for its coastal habitats and fish species.	Within the Scheme site boundary.	Screened In	Due to the nature of the works proposed, the Scheme has the potential to impact the protected area.
River Dee/ Afon Dyfrdwy	SSSI	Designated for its fluvial geomorphology, carboniferous geology, range of river habitat types and fish species.	Within the Scheme site boundary.	Screened In	Due to the nature of the works proposed, the Scheme has the potential to impact the protected area.
Shotwick Brook NVZ	Nitrate Vulnerable Zone	Area at risk from agricultural nitrate pollution.	Within the Scheme site boundary.	Screened In	Due to the nature of the works proposed, the Scheme has the potential to impact the protected area.
Dee Carboniferous Coal Measures	Groundwater Drinking Water Protected Areas (DWPA)	Area not at risk (2020).	Underlying the Scheme site boundary.	Screened In	Due to the nature of the works proposed, the Scheme has the potential to impact the protected area.
The Dee Estuary	Ramsar Site	Designated for its bird species, wetland habitat saltmarsh, intertidal mudflats and sandflats.	Located within the 2km study area, approximately 1 km northwest of the Scheme (tidally linked).	Screened in	Due to the nature of the works proposed, the impacts as a result of the Scheme have the potential to propagate downstream.

Site	Designation	Reasons for designation	Distance from Scheme	Screening outcome	Justification
The Dee Estuary	SPA - UK	Designated for its wintering, breeding and migratory bird assemblages.	Located within the 2km study area, approximately 1 km northwest of the Scheme (tidally linked).	Screened in	Due to the nature of the works proposed, the impacts as a result of the Scheme have the potential to propagate downstream.
Dee Estuary/ Aber Afon Dyfrdwy	SAC - UK	Designated for its mudflats, coastal habitats and fish species.	Located within the 2km study area, approximately 1 km northwest of the Scheme (tidally linked).	Screened in	Due to the nature of the works proposed, the impacts as a result of the Scheme have the potential to propagate downstream.
Dee Estuary/ Aber Afon Dyfrdwy	SSSI	Designated for its wintering bird populations and coastal habitat.	Located within the 2km study area, approximately 1 km northwest of Scheme (tidally linked).	Screened in	Due to the nature of the works proposed, the impacts as a result of the Scheme have the potential to propagate downstream.
Dee West	Urban Wastewater Treatment Regulations sensitive shellfish waters	Sensitive shellfish waters.	Approximately 9km northwest of the Scheme (tidally linked).	Screened out	Due to the nature of the works proposed, it is not anticipated the impacts will propagate that far downstream.

4.2.7 A Habitats Regulations Assessment (HRA) screening report[19] was carried out which concluded that with consideration to the objectives of screened in protected sites, likely significant effects on qualifying features could not be ruled out at this stage in the absence of appropriate mitigation during construction and operation. An Appropriate Assessment is required on the qualifying features of the River Dee and Bala Lake SAC, Dee Estuary SAC, SPA and Ramsar sites.

Higher sensitivity habitats present

4.2.8 Higher sensitivity habitats are present within the 2km study area. They have a low resistance to, and recovery rate from, human pressures. These include:

a) Saltmarshes (2648 ha): on River Dee banks at the location of the Scheme and downstream.

b) Mussel beds (36.77 ha): within Dee Estuary located approximately 16km downstream of the Scheme.

Lower sensitivity habitats present

4.2.9 There are four lower sensitivity habitats within the Scheme boundary. These include:

a) Gravel and Cobbles (4.3 ha): within the Dee Estuary, approximately 15km downstream of Scheme.

b) Intertidal soft sediments (8240 ha): on river banks at the Scheme, downstream and within the Dee Estuary.

c) Subtidal soft sediment (680 ha): within Dee Estuary, approximately 6.5km downstream of the Scheme.

d) Rocky shore (44 ha): on river banks at the Scheme, downstream and within the Dee Estuary.

Summary

4.2.10 Following the screening process, the following WFD receptors have been screened in for further assessment:

[19] Llywodraeth Cymru / Welsh Government, 2025. Habitat Regulations Assessment, Document Reference:

a) Dee (N. Wales) transitional WFD water body and the associated protected areas: Dee Estuary Ramsar Site, SAC, SPA, and SSSI.

b) Dee Carboniferous Coal Measures groundwater WFD body.

c) Protected areas (River Dee and Bala Lake/ Afon Dyfrdwy SSSI; River Dee/ Afon Dyfrdwy SSSI; Dee Estuary/ Aber Afon Dyfrdwy SSSI, SAC, SPA and Ramsar; Shotwick Brook NVZ and Dee Carboniferous Coal Measures groundwater DWPA.

4.3 Activities Screening (Stage 1)

4.3.1 Table 4-3 details the construction activities which will be confirmed by the Contractor at the detailed design stage.

Table 4-3 Summary of the construction activities

Construction activity	Description
Replacement bridge	• Construction of a temporary crane platform on the eastern river bank to enable the jack up barge and service barge to be mobilised and allow plant (e.g., cranes and piling equipment and material and waste to be transferred from and to land to the jack up barge and service barge. • The temporary pier will have up to six temporary 600mm diameter steel tubes vibrated into the river bank to support a structural steel deck. • The intention would be to undertake all barge movements during high tide removing the need for silt removal from within the river.
River piers	• Mobilisation of 'jack-up' barge and loading of equipment to the position of the new pier and installation of temporary anchor piles on river banks, if required to provide fixed points for tethering floating barge(s). • From the jack up barge, steel casing tubes will be inserted into river bed to depth sufficient to achieve stability and a seal to minimise water ingress and contain disturbed silts. The casings are expected to be installed into the glacial till to an estimated total depth below river bed level of approximately 13m. Tubes to be lifted by crane from floating support barge alongside and lowered to position to be oscillated or driven in with vibration. Drilling fluid, Polymer or Bentonite will be introduced to stabilise the ground. • Using a piling rig positioned on the jack-up barge, rotary boring within the steel tubes will be used to remove river bed silt and underlying glacial till deposits to full pile depth required (approximately 34m below river bed level, assuming river bed level is at 0m AOD) and reinforcement inserted. Arisings will be captured from auger rotary bore and removed to land, minimising any loss of material into the river. • Concrete will be prepared on land and to be placed using a tremie pipe (watertight pipe) to form the piles and displaced drilling fluid will be pumped off for recycling.

Construction activity	Description
	• It is anticipated that the piles will be installed in groups of two and the jack up barge will move between the east and west piers to enable strength to be gained within newly formed piles to minimise in-channel work programme timescales. • Temporary formwork or a precast concrete caisson will be installed at the top of piles above river bed level and reinforcement and pumped concrete will be placed to form a continuous pile cap and piers.
Abutments and construction	• The Queensferry Drain, River Pumping Station and outfall will be replaced with a new pumping station and outfall. • Services within the banks will be protected or diverted. • For construction of the abutments, excavation in the banks is required down to formation level and temporary sheet piles will be installed within the river bank (outside 'wet' zone) to maintain the integrity of flood bank level. These are anticipated to be temporarily installed to a depth of approximately 10m below ground level. • Piles will be installed within the formation and cropped to fit the abutment which will be in-situ cast concrete. The abutment will then be backfilled to allow the placement of bridge beams. The temporary riverbank support piles will be removed and the river bank regraded to restore it to the original levels. • Removal of the temporary riverbank support piles and regrading the river bank. New earthwork embankment approaches to new abutments will be constructed. • Temporary crane support platforms will be constructed either on or immediately to the rear of the new bridge abutments to allow the installation of side-span bridge beams. Central beams will be installed either from bank-based cranes. • Permanent formwork and reinforcement will be fixed to the beams and concrete pumped to form the bridge deck incorporating pre-cast edge beams. • The new deck will be finished with waterproof spray-applied bitumen system, apply bitumen-macadam / asphalt carriageway surfacing and lining and installing barriers, services and street lighting columns.
Earthworks	• Earthwork embankment approaches to new abutments will be constructed. Other movements of natural earth and made ground would be needed to construct the new drainage system, including ditches and attenuation ponds, and for the construction of new structures. There would also be a requirement for earth movement for initial site clearance e.g., stripping and storing topsoil and for final landscaping throughout the works area. • Outline plans for environmental protection during earthworks are set out in the Outline Construction Environmental Management Plan (CEMP) which forms Technical Appendix 17.A to the EIA.

Construction activity	Description
Existing bridge demolition	• Diversion and removal of existing sewers crossing river on the pipe bridge below the road bridge structure. • A temporary 'crash deck' platform will be installed under the existing bridge, mounted on existing abutments and piers and steel beams, to capture any loose materials. Progressively the surfacing, deck and any other equipment will be removed for recycling. • Using the crane(s) positioned on banks, the centre span steel beams and side-span beams will be removed and place on barge(s) in river or onto river banks. Abutments will be demolished and material removed for recycling. • Existing river piles will remain in-situ. • Landscaping will be carried out along the river banks upon completion of the bridge removal.

4.3.2 The Scheme will be operational as a road traffic and shared use bridge with associated drainage, services and ongoing maintenance.

4.3.3 Associated drainage includes a new outfall for road runoff into Queensferry Drain and a replacement pumping station on the west side of the bridge. On the east side of the bridge a drainage connection will discharge road runoff via a swale to Garden City Drain. All drainage will eventually discharge to the River Dee.

4.3.4 Professional judgment has been used to determine whether an activity has been screened in or out of this assessment depending on whether it is considered to impact the screened in WFD water bodies or Protected Areas identified in Section 4.2 WFD receptor screening.

Scheme activities – screened out

4.3.1 The WFD assessment: estuarine and coastal waters guidance[4] lists the following activities relevant to the Scheme which are considered low risk activities. The following activities have therefore been screened out from further assessment:

a) Maintaining pumps at pumping stations – avoid low dissolved oxygen levels during maintenance and minimise silt movement when restarting the pumps.

b) Removing blockages or obstacles like litter or debris within 10m of an existing structure to maintain flow.

c) Replacing or removing existing pipes, cables or services crossing over a water body – but not including any new structure or supports, or new bed or bank reinforcement.

Scheme activities – screened in

4.3.2 Some of the main activities for the Scheme are not contained within the low risk activity list and professional judgement has been used to determine whether they should be scoped in for further assessment.

4.3.3 The following activities are not considered to be low risk and have therefore been screened in for further assessment:

a) Disturbance to the bed and banks during construction of the Scheme (including piling works, excavations, bank reprofiling and embankments).

b) Construction of temporary platforms and associated piling.

c) Noise and vibration disturbance to habitats during construction activities (e.g., piling and use of jack up barge).

d) New drainage system and increased surface water run-off from new carriageway and other new areas of hard standing.

e) Potential dewatering during construction activities.

f) Temporary construction compounds and working areas.

g) Disturbance and changes to inter-tidal habitats and vegetation management.

h) New outfall structure discharging road drainage runoff to the River Dee.

i) Permanent in-channel operational activities (piers and abutments)

Summary

4.3.4 Professional judgement has been used to screen in several activities associated with the construction and operation phases for further assessment.

5. WFD Scoping Assessment (Stage 2)

5.1 Overview

5.1.1 This stage considers the receptors that should be considered in the impact assessment.

5.1.2 Receptors are based on the WFD water body quality elements for screened in water bodies that define the overall water body status. The surface water receptors include the following WFD elements:

i) hydromorphology
ii) biology – habitats including protected sites
iii) biology – fish
iv) water quality
v) protected areas

5.1.3 INNS are also considered at the scoping stage.

5.1.4 The groundwater receptors include the following WFD elements:

i) Chemical
ii) Quantitative

5.1.5 The WFD baseline for Cycle 3 (2021) elements for the screened in water bodies is detailed in Appendix A.

5.1.6 The risks from the Scheme activities to each scoped in receptor are discussed in the WFD impact assessment in Section 6.

6. WFD impact assessment (Stage 3)

6.1 Overview

6.1.1 This stage considers the potential impacts of both construction and operation of screened in Scheme activities and water bodies for the scoped in receptors. Consideration is given to the mitigation measures that reduce or avoid potential impacts on the two identified water bodies. The assessment concludes if the activity may cause deterioration or prevent any quality element within any water body achieving good status/potential and any additional mitigation that may be required.

6.2 Dee (N.Wales)

Construction

6.2.1 Table 6-1 identifies potential effects of the Scheme construction activities on hydromorphological, physio-chemical and biological quality elements, protected areas and INNS for the Dee (N. Wales) transitional water body.

Table 6-1 Summary of Scheme construction methods on the Dee (N. Wales) transitional WFD water body

Quality element/receptor	Construction activities potential impact(s)	Embedded design and good practice mitigation measures(s)	Assessment outcome	Additional mitigation required
Hydromorphological supporting conditions Hydrological regime Morphological conditions	Use of the jack up barge and in-channel construction works (abutments, piers etc.,) may disturb morphological conditions and mobilise potentially contaminated sediment and cause disturbance to the river bed and sediment plumes. This may potentially impact sediment transport and affect scour. In-channel works including piling for installation of the new bridge piers will alter river flows and will result in localised permanent disturbance to the bed morphology and silt. Excavation and temporary sheet piling to install the abutments on both banks including adjacent intertidal areas and shoreline areas will likely cause disturbance to the bank morphology. In addition, temporary platforms and associated piles installed in the banks will result in temporary disturbance to bank morphology and silt. Disturbance and permanent removal of vegetation, intertidal habitat such as saltmarsh and trees for access and construction works (if not reinstated).	All barge movements are planned to occur during high tide to minimise disturbance of silt. Temporary piling for the temporary platform will be carried out during low tide conditions to minimise silt disturbance. Use of the jack up barge and temporary platform for piling and construction of piers will allow the containment of any arisings without the need to form dry working areas around the piers. This will minimise disruption to flows. Piling activities will be carried out in line with a piling risk assessment to minimise disturbance to the water body's hydromorphological supporting conditions. Temporary sheet piling is anticipated during installation of the abutments to separate the construction works from the watercourse and prevent sediment entering the watercourse. The contractor will manage construction works in accordance with good practice guidance as detailed in the CEMP (EIA, Volume 3, Technical Appendix 17.A) to manage pollution risk and potential release of sediment. The CEMP incorporates guidance from the Guidance for Pollution Prevention (GPPs) including: GPP 1: Understanding your environmental responsibilities - good environmental practices20; Works and maintenance in or near water21; and GPP 6: Working at construction and demolition sites22. Where possible, like for like or improved habitat will be reinstated following construction to support morphological conditions.	The Dee (N. Wales) WFD water body is a heavily modified water body with a hydrological regime of 'not high'. No information is allocated for the morphology. The water body has a dynamic regime with rapid bed adjustment as supported by the bathymetry surveys undertaken in 2021/2022. Impacts from construction of the Scheme on the hydromorphology of the river are anticipated to be localised and are unlikely to cause deterioration of the water body with adherence to good practice. There is potential for short term impacts, however there would be no permanent impact to the WFD status.	No additional mitigation and no further WFD assessment is required.

[20] Scottish Environment Protection Agency (2021) Guidance for Pollution Prevention. Understanding your environmental responsibilities- good environmental practices GPP1. Version 1.2 (accessed December 2024), accessible from: guidance-for-pollution-prevention-1-2022-update.pdf
[21] Scottish Environment Protection Agency (2018) Guidance for Pollution Prevention. Works and maintenance in or near water GPP5. Version 1.2 (accessed November 2024), accessible from: gpp-5-works-and-maintenance-in-or-near-water.pdf
[22] Scottish Environment Protection Agency (2023b) Guidance for Pollution Prevention: Working at construction and demolition sites: GPP 6. Version 1 (accessed December 2024), accessible from: gpp6-working-on-construction-and-demolition-sites.pdf

Quality element/receptor	Construction activities potential impact(s)	Embedded design and good practice mitigation measures(s)	Assessment outcome	Additional mitigation required
Water quality Physico-chemical Ammonia Biochemical Oxygen Demand Dissolved inorganic nitrogen Dissolved oxygen pH Temperature Phosphate Total Nitrogen Total Phosphorous Salinity Chemical Specific pollutants, other pollutants, priority substances and priority hazardous substances	There is potential that the Scheme activities could affect local water turbidity, temperature, salinity, oxygen levels, nutrients or microbial patterns continuously for longer than a spring neap tidal cycle (about 14 days). Where construction activities are planned in close proximity to or in water (e.g., bridge deck construction) there is a greater risk of sediment loading and contaminants being rapidly transported into the water body. Mobilisation of silt and potentially contaminated sediment may occur as a result of construction activities involving earthworks and piling. This has the potential to impact on WFD elements for water quality. Generation of dust and debris, chemical spills, siltation, hazardous substances (concrete) and contamination from released sediment (e.g., heavy metals and pesticides) as a result of construction activities (earthworks and piling) may impact water quality concentrations of WFD elements. There is potential for surface water and groundwater interactions. The underlying WFD groundwater body status is Poor. There is a risk that poor quality groundwater during dewatering activities associated with piling could impact the overlying surface water body quality.	Good practice measures including sediment management and pollution prevention are detailed in the Outline CEMP (EIA Volume 3, Technical Appendix 17.A). Adherence to these will reduce the potential for contaminated sediment to be mobilised during construction activities (including earthworks and piling) and from pollution from runoff or leaching contaminants from exposed soils and accidental spills. Concrete will be placed for the permanent piles in precast units sealed to prevent loss into water and concrete will be delivered to the piles using a tremie (watertight) pipe to prevent concrete from contaminating the water body and impacting water quality parameters such as pH. The Outline CEMP (EIA Volume 3, Technical Appendix 17.A) will state that fuel and chemicals will be stored in designated bunded areas to contain any spills and the Contractor will ensure that emergency spill kits are available during construction.	The contractor will manage construction works in accordance with good practice as detailed in the Outline CEMP (EIA Volume 3, Technical Appendix 17.A) to manage pollution risk and potential release of sediment to prevent a deterioration to water quality. Any temporary impacts from construction of the Scheme are anticipated to be minimal, and unlikely to result in permanent deterioration of the water quality elements at a WFD water body scale.	No additional mitigation and no further WFD assessment is required.

Biological quality elements Invertebrates Macroalgae Fish Angiosperm Phytoplankton Infaunal Quality Index Opportunistic macroalgae Fuciod extent Rocky shore macroalgae Imposex	Construction activities such as piling have the potential to generate noise and vibration and light pollution which might impact fish and aquatic life within the water body. Biological quality elements are at risk of being impacted through generation of dust and debris, siltation, hazardous substances (concrete) and contamination from released sediment (e.g. heavy metals and pesticides) as a result of construction activities (earthworks and piling). Hydrocarbons may form a film on the surface of the water body and may deplete oxygen levels. Concrete is highly alkaline and can impact fish (physically damaged and gills blocked) and habitats. High sediment loading may have a direct adverse effect on the water body elements through increasing turbidity (reducing light penetration and plant growth) and smothering vegetation and bed substrates which may impact on invertebrate and fish communities (disturbance of feeding areas, refuges and breeding / spawning areas). Excessive fine sediment and pollution can harm fish, such as salmonids and lampreys, by reducing oxygen levels and hindering migration. This can lead to population losses in upstream habitats. In addition, the Dee Estuary hosts various marine invertebrates, especially in its intertidal mudflat and sandflat habitats, which serve as food for fish and waders. Exposure to underwater sound affects fish behaviour based on their hearing abilities. Due to significant differences in ear anatomy and physiology among species, fish detect sound in various ways. The most sensitive period is February to April for river lamprey and from May to September inclusive for sea lamprey and salmonids. Both species are features of interest within the SSSI, SPA and SAC and rely on good water quality. Construction can impact migratory fish through chemical spills, increased sediment movement, noise and vibration during migration seasons, and temporary lighting. Further information is included within EIA, Volume 1, Chapter 16: Marine Ecology.	In-river working including the installation of pile casings will be undertaken in the period November to February or during period March to October observing 0800 to 1700hrs working hours limit and no work in the 3hr period leading up to high tide at Chester weir as agreed with Marine Area Advice and Management Team to minimise disturbance to migrating fish (particularly at night when migration activity is generally higher). The construction methodology employs the use of a jack up barge which will reduce the disruption of river flows for fish passage and removes the need for channel constriction and caissons to form dry working areas around the bridge piers. When the piled steel tubes for the bridge piers reach the required depth, bored piles will be constructed by positioning an auger inside the steel tube. This way the disturbance of the silt and vibration at the riverbed will be kept to a minimum and restricted only to the steel tube-driving operations thus reducing the quantity of suspended particulates and noise within the water course which may indirectly affect fish. An underwater noise assessment was carried out to inform the impact assessment in EIA, Volume 1, Chapter 16: Marine Environment. Lighting for works will be switched off outside working hours (8am to 5pm), and security lighting minimised to avoid deterring fish movement and the passage of otters. In addition, soft-start approach will be undertaken to minimise the risk of disturbance to migrating fish. Pre-construction site walkovers and any necessary surveys would be carried out. Site clearance would consider the seasonal environmental constraints The diversion of Queensferry Drain would be considered during the construction phase in case eels (*Anguilla anguilla*), or other fish species may inhabit the drain, flounders have been recorded within the drain. Should eels or other fish species be identified as present the contractors should halt works halt works and consult the	Potential impacts include localised noise, vibration and light disturbance which will be short term during construction programme and adherence to mitigation measures will ensure that no deterioration of element status will occur at a WFD water body scale or prevent qualifying features of designated sites to maintain their condition status.	No additional mitigation and no further WFD assessment is required.

Quality element/receptor	Construction activities potential impact(s)	Embedded design and good practice mitigation measures(s)	Assessment outcome	Additional mitigation required
		Ecological Clerk of Works (ECoW) to determine if fish rescue should be carried out. With adherence to standard good practice (detailed in the CEMP), sediment and chemical pollution will be avoided. In the event of a pollution incident including a concrete spill, the Contractors will follow emergency response procedures as detailed in the PPP. This will minimise potential impacts from construction pollution on biological quality elements. Further information is included within EIA Volume 1, Chapter 16: Marine Ecology.		
Protected Areas River Dee and Bala Lake/ Afon Dyfrdwy SSSI River Dee/ Afon Dyfrdwy SSSI Dee Estuary/ Aber Afon Dyfrdwy SSSI, SAC, SPA and RAMSAR Shotwick Brook NVZ **Biological quality- habitats** Saltmarsh Sea grass Sensitive habitats	Sensitive habitats are present within the study area and are at risk of physical damage from siltation and contamination from released sediment and surface runoff. Physical disturbance and overshadowing could lead to deterioration and permanent removal of saltmarsh due to enabling construction works (temporary platform) and the replacement bridge including abutments (if not reinstated). The replacement and demolition of the existing bridge will lead to the loss and disruption of intertidal and saltmarsh habitats. Temporary structures such as platforms to facilitate construction will cast additional shade, further affecting these areas. In addition, construction will impact a saltmarsh on the eastern bank of the River Dee.	Efforts have been made to minimise disturbance and removal of saltmarsh and sensitive habitat through following the avoidance design principal. Contractors will adhere to good practice construction guidance for pollution prevention to minimise release of sediment and habitat disturbance as per the Outline CEMP (EIA, Volume 3, Technical Appendix 17.A). The north-eastern bank of the river beneath the existing bridge is a concrete revetment currently devoid of any vegetation. This would be either removed or adapted to encourage a growing medium to form and encourage natural recolonisation of plants from the adjacent riverbank. Localised excavation or formation of pockets by mechanical coring would be required with the use of geotextiles to secure the growing medium to prevent washout during periods of high spring tides. The proposals aim to preserve and monitor the area for natural saltmarsh colonisation by removing the old embankment rubble. If needed, manual enrichment may be implemented to enhance species, while ensuring the greenspace remains intact and public recreational rights are maintained.	Localised permanent habitat disturbance and loss is anticipated. The total area of saltmarsh likely to be affected is anticipated to be around 0.015 hectares which represents roughly 0.000095% of the wider SAC that covers a total area of 15,805 hectares. Removing the existing bridge is expected to improve conditions over time, allowing saltmarsh to thrive in sunlight. Also, establishing pioneer saltmarsh species may take two to three years, while reaching a mature saltmarsh could take decades. Therefore, this area should be included in an environmental monitoring and management plan following construction. There is a localised risk of deterioration to qualifying features from habitat loss and shading during construction. This does not align with the protected sites objectives of maintaining and restoring the qualifying features including extent and distribution, therefore additional mitigation is required.	Additional mitigation has been to ensure that the Scheme aligns with the protected sites objectives. Additional off-site mitigation is proposed at an area called “Greenfield Marsh” which located about fifteen kilometres northwest of the Scheme in the Dee Estuary Further information is provided in Section 6 Additional Mitigation.

Quality element/receptor	Construction activities potential impact(s)	Embedded design and good practice mitigation measures(s)	Assessment outcome	Additional mitigation required
INNS	Construction activities occurring in, over or adjacent to water bodies creates a risk of potential for spread of INNS associated with aquatic, marine and riparian habitats. The jack-up barge and other equipment may have had contact with other water bodies which could introduce INNS to the River Dee. Vegetation management vegetation (both riparian and aquatic) will be required during construction activities adjacent to the water body.	The Outline CEMP (EIA, Volume 3, Technical Appendix 17.A) will include a biosecurity plan for construction activities. Introduction and spreading of INNS will be avoided through the following clean, check and dry biosecurity measures including: clean and drying equipment that has come into contact with other water bodies including removal of any visible mud, plants, fish, or animals before transporting equipment to the River Dee, following the International Maritime Organization (IMO) ballast water management [23]. Vegetation clearance will only be undertaken following an ecological assessment of habitats and their ability to support protected species (e.g. nesting birds etc.,) and the risk posed by INNS. Further information about vegetation management is presented in the EIA Volume 1, Chapter 8: Terrestrial Biodiversity.	No INNS were identified during the 2025 intertidal walkover surveys. With adherence to the mitigation detailed and following biosecurity measures the risk of introducing and spreading INNS is low.	No additional mitigation required and no further WFD assessment is required.

Operation

6.2.2 Table 5-2 identifies potential effects of the Scheme operation activities on hydromorphological, physio-chemical and biological quality elements, and protected areas for the Dee (N. Wales) transitional water body. INNS have not been included in the scoping assessment for the operation phase.

[23] Compilation of relevant Guidelines and guidance documents - 2025-05.pdf

Table 6-2 Summary of Scheme operation methods on the Dee (N. Wales) transitional WFD water body

Quality element/receptor	Construction activities potential impact(s)	Embedded design and good practice mitigation measures(s)	Assessment outcome	Additional mitigation required
Hydromorphological supporting conditions Hydrological regime Morphological conditions	The Dee (N. Wales) WFD water body is a heavily modified water body with a hydrological regime of 'not high'. Changes to flow, velocity or sediment dynamics within the River Dee as a result of the presence of the proposed bridge piers. No information is allocated for the WFD morphology element. Potential for changes to the morphology of the River Dee system including adjacent intertidal areas and shorelines in the long term. Potential for riverbed primary and secondary scour around the bridge supports over medium to long term. An area of road drainage runoff will be captured and diverted into the Queensferry Drain during and following rainfall events. The Queensferry Drain is estimated to have a baseflow of 0.02m^3/s which will create a constant discharge. The Queensferry Drain will pass through a pumping station and discharge to the River Dee via a new outfall.	The new pier design and alignment is consistent with the existing piers to minimise flow disruption. Abutments will be set back from the bank which will minimise the impact on the bank morphology through embedded design. The water body has a dynamic regime with rapid bed adjustment as supported by findings from bathymetry surveys (2021 to 2022). Scour protection has not been included in the design to allow the riverbed to maintain its natural mobility without artificial constraints. Discharge from the new outfall (maximum rate is 2.275m^3/s for 1 in 100 year event plus 40% climate change allowance) will contribute a minimal indiscernible increase to the hydrological flow in the River Dee. The design of the outfall will be confirmed at the detailed design including provision for scour protection if required.	Hydrodynamic and sediment transport assessment considered the flow effects, scour and distribution of sediment that could arise as a result permanent structures in the River Dee. The findings indicate the Scheme will not significantly alter water levels but will lead to localised changes in current speeds and flow patterns near the bridge piles, the broader impact on tidal regime and sediment transport will be limited and there will be no permanent impact at the WFD water body scale. Impacts from operation of the Scheme on the hydromorphological supporting conditions of the river are anticipated to be localised and are unlikely to cause deterioration at a water body scale.	No additional mitigation and no further WFD assessment required.

Quality element/receptor	Construction activities potential impact(s)	Embedded design and good practice mitigation measures(s)	Assessment outcome	Additional mitigation required
Water quality **Physico-chemical** Ammonia Biochemical Oxygen Demand Dissolved inorganic nitrogen Dissolved oxygen pH Temperature Phosphate Total Nitrogen Total Phosphorous Salinity **Chemical** Specific pollutants, other pollutants, priority substances and priority hazardous substances	Road drainage runoff has the potential to cause pollution through increasing parameter concentrations of WFD chemical pollutants where insufficient treatment is in place which could lead to a deterioration of water quality in the water body for longer than a spring neap tidal cycle (14 days). Algae blooms can be caused by an increase in nutrients from the wider catchment which can be transported in runoff via drainage channels. The water body has a phytoplankton WFD status of Good, however, the Dee has a history of harmful algae blooms.	The incorporation of SuDS in the drainage network will positively impact water quality in the River Dee. A vortex separator or similar has been proposed to treat surface flows which have been captured along the Riverside Way access road. Penstock devices are currently proposed for the highway drainage networks which can prevent contaminants reaching the water body. Non return flap valve on the Queensferry Drain outfall to prevent tidal ingress upstream to the pumping station. Further consultation required with NRW and Dŵr Cymru Welsh Water at detailed design on the outfall design. The existing Queensferry Drain watercourse will be reinstated from a culvert to vegetated open channel providing approximately 60m length of additional open channel. This will provide additional filtration of sediments prior to discharge to the WFD water body immediately downstream.	Operational embedded drainage design will provide an improvement on the baseline of some water quality WFD elements through the proposed treatment train which includes swales and pollution control devices. The HEWRAT assessment included a spillage risk assessment which concluded that no mitigation is required for spillage risk for the parameters assessed including WFD element copper. The River Dee provides significant dilution potential for the treated road runoff discharges. The Scheme operation will not result in deterioration of the WFD water body water quality elements.	No additional mitigation required and no further WFD assessment is required.

Quality element/receptor	Construction activities potential impact(s)	Embedded design and good practice mitigation measures(s)	Assessment outcome	Additional mitigation required
Biological quality elements Invertebrates Macroalgae Fish Angiosperm Phytoplankton Infaunal Quality Index Opportunistic macroalgae Fuciod extent Rocky shore macroalgae Imposex	Algae blooms can be caused by an increase in nutrients from the wider catchment which can be transported in runoff via drainage channels. The water body has a phytoplankton WFD status of Good, however, the River Dee has a history of harmful algae blooms. The species most likely affected are demersal species, such as flounder, sole, and plaice, along with elasmobranchs like the tope shark and thornback ray. However, these mobile species can easily relocate away from the impacted area. A permanent loss or disturbance of benthic habitat in the River Dee could lead to a decrease in infaunal and epibenthic marine invertebrates, reducing food availability for fish and affecting local fish populations. The replacement pumping station on Queensferry Drain includes a debris screen at the pumping station inlet which creates a risk of entrapment to aquatic species.	The proposed changes to the drainage network include several treatment measures including sections of open channel vegetated swales. This will provide additional filtration of sediments prior to discharge to the WFD water body immediately downstream. This is anticipated to improve the current water quality discharged from the Queensferry Drain. New bridge piers will not result in a physical barrier to prevent fish migration due to their positioning away from the centre of the channel. As concluded in the Volume 1, Chapter 16: Marine Environment, noise and vibration from the operational Scheme is not anticipated to impact on normal fish behaviour subject to embedded mitigation detailed in the Outline CEMP (Volume 3, Technical Appendix 17.A) being adhered to. Fish pass will be considered for trash screen design (appropriate mesh size and spacing) and water intake velocities should be kept low to minimise risk of fish being pulled to screen. As the Queensferry Drain channel is likely to be shallow depth most of the time it is considered to have limited suitability for fish habitat.	Proposed drainage design will improve the current water quality discharged from the Queensferry Drain and therefore would not cause deterioration of the water quality elements or increase sediment which could impact on biological quality elements like fish. The benthic habitat is common in the intertidal and subtidal zones and removing it will not significantly affect the overall extent, as the removal area is only 0.019% of the total habitat in the River Dee and Bala Lakes SAC, SSSI. The habitat lost is outside the boundary of the Dee Estuary SAC, which is situated 1km away. Key species can quickly recruit and recolonise disturbed areas, enabling rapid recovery. While migratory fish have high conservation value, they are unlikely to be sensitive to this impact due to their ability to avoid the demersal area and their minimal reliance on the small habitat that will be lost. The affected benthic area is small and surrounded by large suitable habitat. And is therefore unlikely to have an impact at the WFD water body scale.	No additional mitigation required and no further WFD assessment is required.

Quality element/receptor	Construction activities potential impact(s)	Embedded design and good practice mitigation measures(s)	Assessment outcome	Additional mitigation required
Protected Areas – River Dee and Bala Lake/ Afon Dyfrdwy SSSI River Dee/ Afon Dyfrdwy SSSI Dee Estuary/ Aber Afon Dyfrdwy SSSI, SAC, SPA and Ramsar Shotwick Brook NVZ **Biological quality- habitats** Saltmarsh Sea grass Sensitive habitats	Sensitive habitats are present within the study area and are at risk of physical damage from siltation and contamination from road drainage runoff. Overshadowing of saltmarsh habitat potentially leading to deterioration and permanent removal of saltmarsh associated with abutments.	Disturbance and removal of saltmarsh and sensitive habitat will be minimised where possible. The north-eastern bank of the River Dee beneath the existing bridge is a concrete revetment currently devoid of any vegetation. The concrete revetment would be either removed or adapted to encourage a growing medium to form and encourage natural recolonisation of plants from the adjacent riverbank. Localised excavation and mechanical coring would be required as part of the concrete revetment removal. Geotextiles would be used to secure the growing medium to prevent washout during periods of high spring tides.	Localised permanent habitat disturbance and loss is anticipated. The total area of saltmarsh likely to be affected is anticipated to be around 0.015 hectares. which represents roughly 0.000095% of the wider SAC that covers a total area of 15,805 hectares. There is a localised risk of deterioration to qualify features. This does not align with the protected sites objectives of maintaining and restoring the qualifying features including extent and distribution, therefore compensatory habitat creation is required.	Habitat creation has been proposed to ensure that the Scheme aligns with the protected sites objectives. Further information is provided in Section 6 Additional Mitigation.

Summary

6.2.3 There are several activities identified for the construction and operation phases of the Scheme that could impact on the quality elements of the Dee (N. Wales) transitional WFD water body and the associated protected areas. However, in most cases, the potential impacts would be highly localised and would not have an impact at the WFD water body scale. In these instances, no additional mitigation is required.

6.2.4 Nevertheless, the loss of saltmarsh habitat associated with the construction of the new bridge does not align with the objectives of the protected sites. Additional habitat creation has been proposed to ensure the Scheme does not adversely impact the protected sites or have a detrimental impact at the WFD water body scale. Further information can be found in Section 7.

6.3 Dee Carboniferous Coal Measures

Construction

6.3.1 Table 6-3 details the scoping assessment for the screened in WFD groundwater body Carboniferous Coal Measures. The assessment considers the potential construction impacts on WFD elements and potential mitigation.

Table 6-3 Summary of Scheme construction methods on the Dee Carboniferous Coal Measures groundwater WFD water body

Quality element	Construction activities and potential impact(s)	Embedded design and mitigation measure(s)	Assessment outcome	Additional mitigation
Chemical Chemical Groundwater tests Chemical Drinking Water Protected Area General Chemical Test Chemical Groundwater Dependent Terrestrial Ecosystems test Chemical Dependent Surface Water Body Status Chemical Saline Intrusion Trend Assessment - Groundwater supporting element	Temporary sheet piling for abutments, piling for the temporary platform and piling for bridge piers construction have the potential to create vertical preferential pathways for pollution (sediment; chemical e.g., alkalinity increased by concrete spills; or saline intrusion resulting in deterioration of groundwater WFD status for quality elements. Potential for leaching and migration of contaminants from soils excavated during construction and reused/stored on site e.g., for embankments.	Embedded design measures and construction good practice as detailed in the Outline CEMP (EIA, Volume 3, Technical Appendix 17.A) e.g., concrete will be contained during construction within precast units sealed to prevent loss into water and delivered to the pile locations by watertight tremie pipe. Other good practice measures include stockpile management and contamination pollution prevention measures. Temporary piles for the temporary platform and jetty will be removed and capped. A piling risk assessment will be undertaken by the Contractor prior to carrying out works. The Contractor will obtain a discharge permit for groundwater dewatering activities.	Previous ground investigations which reached a depth of 34m bgl did not encounter the boundary between the overlying superficial deposits and the Coal Measures. Piles are anticipated to be installed to a depth of approximately 34m and it is possible that the WFD groundwater body may be reached. With consideration to the scale of the Carboniferous Coal Measures groundwater body in comparison to the footprint of the piling activities for construction, and adherence to good practice mitigation measures, any changes in groundwater quality are anticipated to be localised and negligible. A change or deterioration at the water body scale (which currently has a WFD groundwater chemical status of poor) is unlikely.	None required and no further WFD assessment is required.
Quantitative Groundwater quantitative tests Quantitative Groundwater Dependent Terrestrial Ecosystems test Quantitative Dependent Surface Water Body Status Quantitative Saline Intrusion Quantitative Water Balance	Permanent piling for bridge piers (concrete cast in-situ) has the potential to disrupt groundwater flows. Dewatering activities could potentially disrupt groundwater flows locally.	The Contractor will obtain a discharge permit for groundwater dewatering activities. A piling risk assessment will be undertaken by the Contractor prior to carrying out works.	Dewatering will be highly localised at the pile locations. With adherence to best practice any impact will be minimised. Any impact is anticipated to be temporary and highly localised. As a result of substrate material compression surrounding the sheet piles structure this is unlikely to result in a significant preferential pathway, and it is not anticipated that there would be an impact at the WFD waterbody scale.	None required and no further WFD is assessment required

Operation

6.3.2 Table 5-4 details the scoping assessment for the screened in WFD groundwater body Carboniferous Coal Measures. The assessment considers the potential operational impacts on WFD elements and potential mitigation.

Table 6-4 Summary of Scheme operation methods on the Dee Carboniferous Coal Measures groundwater WFD water body

Quality element	Construction activities and potential impact(s)	Embedded design and mitigation measure(s)	Assessment outcome	Additional mitigation
Chemical Chemical Groundwater tests Chemical Drinking Water Protected Area General Chemical Test Chemical Groundwater Dependent Terrestrial Ecosystems test Chemical Dependent Surface Water Body Status Chemical Saline Intrusion Trend Assessment - Groundwater supporting element DWPA	Permanent presence of bored piles reaching a depth of approximately 34m could create vertical pathways for contaminants or allow saline intrusion to reach the WFD groundwater body. This could result in deterioration of groundwater WFD status for quality elements.	The proposed bridge design sought to minimise the number of piers and to align with the existing bridge piles to minimise the disruption to groundwater flow pathways. The permanent piles will be capped upon completion of construction which will reduce the risk of preferential pathways for contaminants.	Previous ground investigations which reached a depth of 34m bgl have not encountered the boundary between the overlying superficial deposits and the Coal Measures. Piles are anticipated to be installed to a depth of approximately 34m and it is possible that the groundwater body may be reached. With consideration to the scale of the Carboniferous Coal Measures groundwater body in comparison to the footprint of the permanent piles for operation, any changes in chemical groundwater receptors are anticipated to be localised and negligible and would not result in a change or deterioration at the WFD water body scale.	None required and no further WFD assessment is required.
Quantitative Groundwater quantitative tests Quantitative Groundwater Dependent Terrestrial Ecosystems test Quantitative Dependent Surface Water Body Status Quantitative Saline Intrusion Quantitative Water Balance DWPA	Permanent presence of bored piles has the potential to locally impact groundwater flows.	The proposed bridge design sought to minimise the number of piers and to align with the existing bridge piles to minimise the disruption to groundwater flows.	Previous ground investigations which reached a depth of 34m bgl have not encountered the boundary between the overlying superficial deposits and the Coal Measures. Piles are anticipated to be installed to a depth of approximately 34m and it is possible that the groundwater body may be reached. With consideration to the scale of the Carboniferous Coal Measures groundwater body in comparison to the footprint of the permanent piles for operation, any changes in quantitative groundwater receptors are anticipated to be localised and negligible and would not result in a change or deterioration at the WFD water body scale.	None required and no further WFD assessment is required.

Summary

6.3.3 There are several activities identified for the construction and operation phases of the Scheme that could impact on the quality elements of the Dee Carboniferous Coal Measures groundwater WFD water body. The potential impacts would be highly localised and would not have an impact at the WFD water body scale, therefore no additional mitigation is required.

7. Additional Mitigation

7.1.1 There is anticipated to be localised permanent saltmarsh habitat disturbance and loss during the construction and operation phases associated with the following activities:

a) Construction activities:

i) Siltation and contamination from released sediment and surface runoff.

ii) Physical disturbance and overshadowing due to enabling construction works e.g., temporary platforms.

iii) Demolition of the existing bridge.

iv) Habitat disturbance and loss.

b) Operation activities:

v) Siltation and contamination from released sediment and surface runoff.

vi) Overshadowing of the saltmarsh habitat by the new bridge.

7.1.2 The potential impact on saltmarsh habitats could adversely impact the Dee Estuary SSSI which is a protected site within the Dee (N. Wales) transitional WFD water body. This does not align with the protected sites objectives of maintaining and restoring the qualifying features including extent and distribution. Therefore, additional habitat creation has been incorporated.

7.1.3 A suitable offsite area of 1.35 hectares at Greenfield Marsh (15 km downstream of the Scheme near Walwen) has been selected for compensation for saltmarsh loss. The selected area contains areas of saltmarsh habitat of variable condition and has patches of rubble left as vestiges from an old tip. The patches of rubble will be removed and disposed of in line with relevant waste management to encourage the natural colonisation of the habitat. The Welsh Government will

collaborate with Flintshire County Council (FCC) and NRW to progress with these proposals should the Scheme be consented. More information on the compensation measures at Greenfield Marsh is presented in EIA Volume 1, Chapter 8: Terrestrial Biodiversity.

7.1.4 The offsite area is located immediately outside of the Dee (N. Wales) transitional WFD water body boundary, however it is assumed that any betterment created as a result of the establishment of the habitat would impact the Dee (N. Wales) water body due to its proximity.

8. Conclusions and recommendations

8.1.1 The WFD screening and scoping assessment has been undertaken to establish if the Scheme could cause WFD compliance risk to the impacted water bodies and protected areas.

Screening assessment outcomes (Stage 1)

8.1.2 The screening assessment identified one transitional WFD water body and associated protected areas and one groundwater WFD body and an associated protected area that could be impacted by the screened in construction and operation activities. The following WFD receptors were scoped in for further assessment:

i) Dee (N. Wales) transitional WFD water body.

ii) Dee Carboniferous Coal Measures WFD groundwater body.

iii) Protected areas (River Dee and Bala Lake/ Afon Dyfrdwy SSSI; River Dee/ Afon Dyfrdwy SSSI; Dee Estuary/ Aber Afon Dyfrdwy SSSI, SAC, SPA and Ramsar; Shotwick Brook NVZ and Dee Carboniferous Coal Measures groundwater DWPA.

Scoping assessment outcomes (Stage 2)

8.1.3 WFD receptors were identified based on the WFD water body quality elements for screened in water bodies that define the overall water body status. Those potentially at risk from screened in activities were taken forward for further assessment.

WFD impact Assessment (Stage 3)

8.1.4 The WFD impact assessment involved assessing the potential impacts on the scoped in receptors for hydromorphological, physico-chemical water quality and biological quality elements for the transitional water body, qualitative and chemical groundwater elements for the groundwater body, and the scoped in protected areas.

Construction

8.1.5 The impact assessment identified potential construction impacts on WFD receptor elements including water quality and hydromorphology from activities resulting in silt mobilisation, pollution and disturbance. These impacts are not anticipated to cause any deterioration at a water body scale with adherence to good practice mitigation measures detailed (including adherence to the EIA, Volume 3, Technical Appendix 17.A Outline CEMP). No additional mitigation is required.

8.1.6 Potential construction impacts on WFD receptor elements on biology elements (fish, habitats and protected sites) from activities resulting in sedimentation, pollution noise and habitat disturbance were identified. Sedimentation, pollution and noise will be managed through mitigation measures and no deterioration at a water body scale is anticipated and no additional mitigation is required.

8.1.7 There is potential for permanent disturbance to sensitive habitats including saltmarsh during construction. Additional habitat creation has been proposed which involves restoration of 1.35 hectares of existing saltmarsh habitat at Greenfield Marsh 15k downstream of the Scheme.

8.1.8 No additional mitigation is proposed for groundwater assuming adherence to good practice construction measures during construction and no impacts are anticipated at a WFD water body scale.

8.1.9 INNS do not pose a risk to the River Dee, assuming mitigation measures are followed which will prevent potential cross-contamination of equipment from other water bodies during the construction phase.

Operation

8.1.10 The Scheme is unlikely to impact on the hydromorphological WFD elements of the River Dee during the operational phase. Modelled sediment transport results indicate that while the new bridge influenced localised flow conditions, its broader impact on tidal regime and sediment transport remained limited.

8.1.11 Water quality WFD elements of the River Dee are anticipated to receive beneficial impacts from the Scheme due to drainage design improvements. This is not anticipated to result in deterioration of water quality and therefore no impact on salmon and lamprey supporting conditions. Details of embedded mitigation measures for drainage and information on the water environment can be found in the EIA Volume 1 Chapter 7: Drainage and the Water Environment.

8.1.12 There is a localised risk of deterioration to qualifying biological features from the operational period associated with permanent loss of habitat and shading causing disturbance to saltmarsh habitat. This does not align with the protected sites objectives of maintaining and restoring the qualifying features including extent and distribution, therefore compensation has been proposed in the form of off-site habitat creation. Other biological elements are not anticipated to be at risk from deterioration at a water body scale.

8.1.13 With consideration to the nature and highly localised impacts of potential operational impacts on groundwater, no deterioration is anticipated at a WFD water body scale.

8.1.14 Assuming mitigation measures are followed which will prevent potential cross-contamination of equipment from other water bodies during maintenance in the operational phase, INNS are not considered a significant risk for WFD.

9. Appendix A

9.1.1 The WFD baseline for Cycle 3 (2021) for the screened in water bodies is detailed in Tables 8-1 and 8-2.

Table 9-1 Cycle 3 WFD Classification for the Dee (N. Wales)

WFD Classification	Dee (N. Wales)
Water body ID	GB531106708200
Water body category	Transitional
Area	109 km^2
Hydromorphological Designation	Heavily Modified
Overall water body status	Moderate
Ecological	Good
Eco-bio	Good
Eco-gen	Good
Biological quality elements	Good
Invertebrates	Good
Fish	Good
IQI	Good
Salt Marsh	Good
Phytoplankton	Good
Angiosperm	Good
Macroalgae	Good
OppMac_Sub	High
Fucoid extent	Good
Hydrological regime	Not High
Mitigation measures assessment	Good
Hydromorph	Not high
Physico-chemical quality elements	Moderate
Dissolved oxygen	High
Dissolved Inorganic Nitrogen	Good
Specific Pollutants	High
Arsenic	High
Copper	High
Iron	High
Manganese	High
Toulene	High
Zinc	High

WFD Classification	Dee (N. Wales)
Anthracene	High
BDPE	Moderate
Cadmium	High
Chemical C	Moderate (PAH and BDPEs are reported as "moderate" whilst all other chemical sub-elements are "high")

Table 9-2 Cycle 3 WFD classification for Dee Carboniferous Coal Measures

WFD Classification	Dee Carboniferous Coal Measures
Water body ID	GB41102G204800
Water body category	Groundwater
Hydromorphological designation	Natural
Overall water body status	Poor
Groundwater Chemical	Poor
Chemical Drinking Water Protected Area	Good
General Chemical Test	Poor
Chemical Groundwater Dependent Terrestrial Ecosystems test	Good
Chemical Dependent Surface Water Body Status	Poor
Chemical Saline Intrusion	Good
Trend Assessment - Groundwater supporting element	Moderate
Groundwater Quantitative Tests	Good
Quantitative Groundwater Dependent Terrestrial Ecosystems Test	Good
Quantitative Dependent Surface Water Body Status	Good
Quantitative Saline Intrusion	Good
Quantitative Water Balance	Good