Contract Ref	IW01412	**Revision:**	01
Contract Name:	Dovey Junction Viaduct Repairs		

WATER FRAMEWORK DIRECTIVE (WFD) ASSESSMENT REPORT

FOR

Dovey Junction Viaduct Repairs

OSGR: SN 69469 97893

Report Date: 05/05/2022

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Distribution List

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1. Introduction

1.1 Purpose of this Report

The Directive 2000/60/EC, known as the Water Framework Directive (WFD), came into force in 2000 and represents a substantial piece of water resources legislation. This directive establishes a legislative framework for the protection of inland surface waters (rivers and lakes), transitional waters (estuaries), coastal waters and groundwater. The EU Water Framework Directive was introduced as law in England and Wales by the Water Environment (Water Framework Directive) Regulations 2003. It provides an opportunity to plan and deliver a better water environment, focussing on ecology. The overall requirement of the Directive is to ensure that all water bodies throughout achieve 'Good Status' in terms of low levels of chemical pollution as well as healthy ecosystems.

Any schemes or development that have the potential to significantly impact any surface or groundwater body, should undertake a Water Framework Directive Assessment to determine the effects of the proposed scheme. Considerations must be given to the effects on ecological quality, chemical quality and hydro-morphology. The assessment must identify any potential impacts, which could cause deterioration in the status of the water body, or connected water bodies, or could hinder the water body from reaching its WFD objectives.

In summary, a WFD Assessment should:

- Include any component of the scheme which interacts with or poses a risk to a water body, and provide a description of the specific scheme component being assessed for 'potential impacts';
- Identify all potentially impacted water bodies (surface and sub-surface) and provide baseline information;
- Assess the impact of each scheme component on the relevant water body, with regard to the objectives in the Water Framework Directive;
- If the assessment identifies components which are not compliant with the WFD objectives, mitigation must be detailed; and
- Finally, if the assessment concludes that any aspect of the proposed scheme causes deterioration, or prevents a WFD status being reached, the scheme should be reviewed.

Dovey Junction Viaduct is located on the Dovey Junction to Pwllheli line (DJP) over the Afon Dyfi (River Dovey) approximately 5 miles south-west of Machynlleth.

The proposed Scheme involves refurbishing the viaduct by replacing 19 piles, replacing 11 lower horizontal wailings and 19 diagonal wailings. All associated metallic fixings and straps will be replaced including steel work repairs to the metallic spans and a full grit blast and paint system to achieve a 25-year design life.

The works have the potential for impacts on the Afon Dyfi and this assessment considers the potential effects caused by the project on the WFD objectives and will be submitted as part of the Marine Licence application.

1.2 Background

The implementation of the WFD is based on six-year management cycles defined as follows: 2009-2015, 2015-2021 and 2021-2027 being respectively the first, second and third planning cycle for achieving the Directive's ambitious targets. The WFD initial objectives required to 'aim to achieve' good status by 2015. In certain cases, this target has not been achieved, and alternative objectives have been set. The deadline for achieving the WFD objectives has hence been extended to further planning cycles: 2021 and 2027. Alternative objectives must be justified, generally for reasons of disproportionate cost or the technical feasibility of restoration measures, provided that the water body is protected from further deterioration taking place.

New developments which have the potential to affect waterbodies should be assessed against the Directive's environmental objectives to determine whether they have the potential to prevent these objectives from being met. The EA are the 'competent authority' responsible for implementation of the WFD.

The WFD sets a number of different objectives, in summary, the environmental objectives are:

- To prevent deterioration of the status of surface waters and groundwater
- To achieve objectives and standards for protected areas
- To aim to achieve good status for all water bodies or, for heavily modified water bodies and artificial water bodies, good ecological potential and good surface water chemical status
- To reverse any significant and sustained upward trends in pollutant concentrations in groundwater
- The cessation of discharges, emissions and loses of priority hazardous substances into surface waters
- Progressively reduce the pollution of groundwater and prevent or limit the entry of pollutants

1.3 Site Description

The Dovey Junction Viaduct scheme lies within the Western Wales River Basin District. An updated version of the South West River Basin Management Plan was published in December 2015 and replaces the RBMP published in 2009.

Dovey Junction Viaduct spans the Afon Dyfi, which is located within the County of Gwynedd. The bridge is located at Ordnance Survey National Grid Reference (OSNGR) SN 69469 97893 and is a single-track structure comprising of 17 timber spans, 17 timber trestles, 4 steel spans and 5 cast-iron trestles. It is approximately 100 m in length.

The Scheme is located adjacent or within the following statutory nature conservation designations:

- National Nature Reserve
- Ramsar
- Site of Special Scientific interest (SSSI)
- Special Area of Conservation (SAC)
- Special Protection Area (SPA)

The Viaduct extent is shown as red bordered object in the map below.

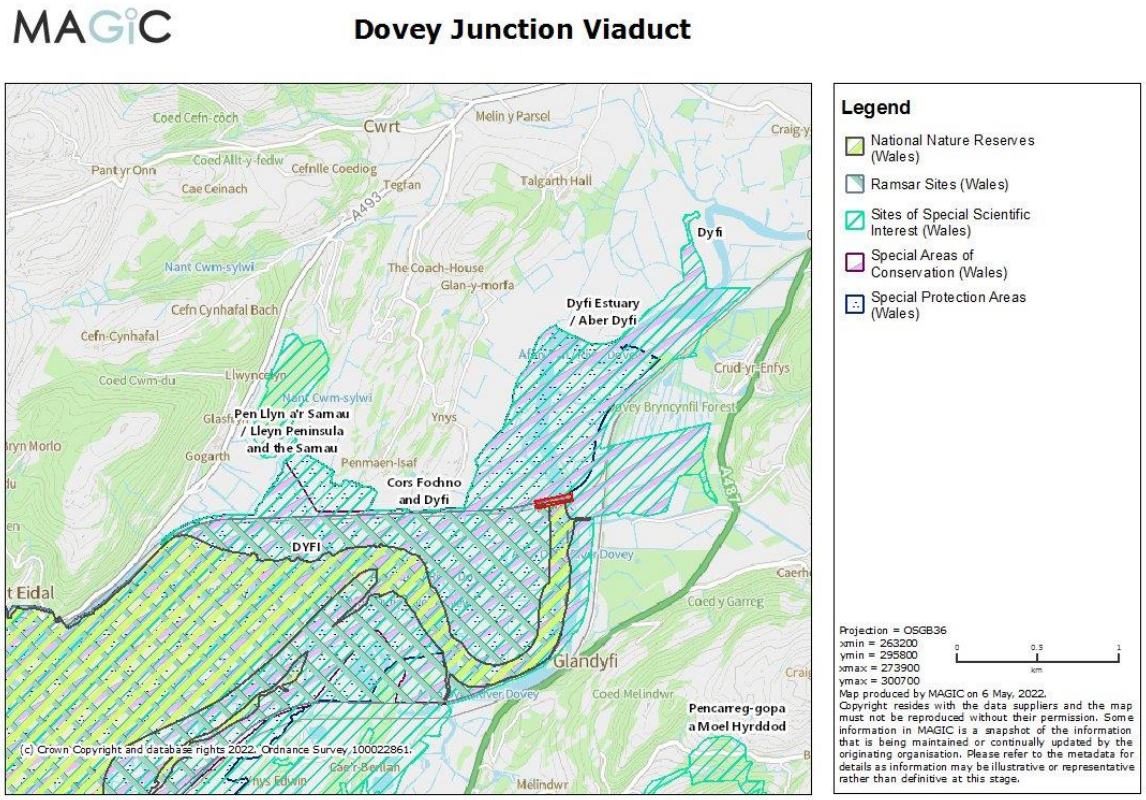

Figure 1: Dovey Junction Viaduct Location and Statutory Designated Sites.

Dovey Junction Viaduct is a 21-span viaduct, comprising 17 No Timber spans and 4 No Metallic spans. The viaduct carries a single bi-directional track from Dovey Junction to Pwllheli over a tidal water course.

The project scope is to deliver a superstructure refurbishment / element replacement to the timber section and metallic section of the viaduct.

2. Assessment Methodology

2.1 'Clearing the Waters for All' guidance

Natural Resources Wales (NRW) is the lead authority for the implementation of the WFD in Wales. The Environment Agency (EA) has developed guidance to support carrying out WFD assessments for new schemes in estuarine and coastal waters - "Clearing the Waters for All" (Agency, 2016), published on www.gov.uk. This guidance can be utilised in WFD assessments in Wales and is applicable to activities in the marine environment up to 1 nautical mile out to sea. This guidance recommends a three-staged process to the WFD Assessment, comprising:

- Screening – to exclude any activities that do not need to go through the scoping or impact assessment stages;
- Scoping – to identify the receptors that are potentially at risk from the proposed activity and need impact assessment; and
- Impact assessment – considers the potential impacts of the proposed activity, identifies ways to avoid or minimise impacts, and shows if the activity may cause deterioration or jeopardise the water body achieving good status.

The guidance also recommends that all activities are considered, including each relevant stage (e.g. construction, operation and decommissioning), and that all waterbodies that could both directly and indirectly be affected by the activities are included. This WFD assessment has broadly followed the principles outlined in the 'Clearing the Waters for All' guidance.

This assessment aims to identify any potential impacts from the Dovey Junction Viaduct scheme on the WFD objectives, via the ecological, chemical and quantitative status elements for the waterbody. It will consider any non-temporary impacts to any of the quality elements, which may be enough to cause deterioration in water body status.

Ecological status is particularly important and assessing the impact of the project on the biological elements (fish, invertebrate and aquatic fauna), either directly or in-directly via impact on the physico-chemical or hydro-morphological supporting elements, is key.

Following initial assessment, any part of the project which does not pose any risk will be scoped out and will not be considered further.

The collection of waterbody baseline data considers the project location other applicable waterbodies and the current status of those waterbodies using the following receptors:

- Hydromorphology
- Biology – habitats
- Biology – fish
- Water quality
- Protected areas
- Invasive Non-Native Species

The assessment considers each of the scheme activities and associated impact on these receptors ultimately evaluating the implications of the scheme on the status of the relevant waterbodies.

If it is shown that the project will cause deterioration in the water body status or will impede the water body from reaching its objective status, then the scheme must be revised.

2.2 Data Collection

Where relevant, any surveys and assessments that have been carried out to inform the development of the Scheme have been used to inform this WFD assessment. Online sources of information have also been used. The key data sources that have helped inform the risk assessment process:

- Current WFD status classification data from Water Watch Wales (Natural Resources Wales, 2021)
- Western Wales River Basin Management Plan (Environment Agency, 2015)
- Wales Water Body Objectives and measures update 2017 (Natural Resources Wales, 2017)
- Magic Map Defra

3. Proposed Scheme

The construction methodology deals with the following:

- ✓ 19 No piles replace
- ✓ 11 No lower horizontal wailings replaced
- ✓ 19 No Diagonal wailings replaced
- ✓ All associated metallic fixings and straps replaced
- ✓ Capacity and condition led steel work repairs top metallic spans
- ✓ Full grit blast to SA2.5 and apply paint system to achieve a 25-year design life.

The repair strategy will be as follows:

- ▶ Accessing site predominantly from High Mileage area
- ▶ Carry out Scaffold installation to full structure ahead of abnormal possession
- ▶ Replace horizontal and diagonal wailings under live load ahead of possession

Prep steelwork ahead of abnormal possession

The sequence of works can be summarised below:

1. **Pre-Abnormal Possession**
    a. Establish site compounds to the high and low mileage of the bridge, satellite to low, main to high
    b. Use Road Rail Vehicles (RRV) in Rules of Route possessions to transfer temporary works material to site
    c. Install temporary works and change piles (outside only), diagonal and horizontal wailings with trains running
    d. Install scaffold access to the full structure and encapsulation to the metallic section
    e. Grit blast and paint outside beams
    f. Install lateral restraint temporary works between crossheads
2. **During Abnormal Possession**
    a. RRVs access site to high and low mileage of structure
    b. Change piles 3 and 4 across structure where required
    c. Grit blast and paint track element of steel spans
3. **Post Abnormal Possession**
    a. Remove temporary works
    b. Carry out any finishing works

c. Site demobilization

3.1 Outline Construction Programme

The works to the Viaduct are scheduled to commence in September 2022 and be completed by 17th November 2022, a duration of 2.5 months. Initial site activities involve site compound set up and will conclude with removal of scaffolding to the Viaduct and site compound. The construction timescale for each phase of the works has been presented in the table below.

Activity	Duration
Site set-up; inc. compound, dilap and utilities surveys	From 14th to 29th July 2022; 2-weeks
Pontoon installation	From 2nd September to 8th September 2022; 1-week
Scaffold installation	From 2nd September to 29th September 2022; 4-weeks
Blockade works to replace timber elements	From 11th September to 6th October 2022; 3.5-weeks
Grit blast and paint metallic structure elements	From 30th September to 16th November 2022; 6.5-weeks
Scaffold removal	From 17th November 2022 or after 14th April 2023* (removal would take up to 2-weeks).

**If unable to implement appropriate mitigations for Greenland White Fronted Geese.*

3.3 Operation and Decommissioning

Once construction works are completed and blockade ends, the Viaduct will reopen as an operational railway and will exist and function as it does currently, therefore operational effects have not been considered within this assessment.

No decommissioning of the Viaduct is required or proposed as part of the Scheme and therefore decommissioning effects have not been considered within the assessment.

4. Screening

4.1 Stage 1 – WFD Screening Assessment

4.1.1 Surface waterbodies

A screening exercise was completed to identify waterbodies that are relevant to Scheme. A study boundary also known as zone of influence was set for the screening, which was the immediate footprint of the works, plus one waterbody upstream and one downstream of the site (for surface waters). For groundwater, only immediately underlying groundwater bodies were included in the screening, as individual groundwater bodies are designated as "hydraulically coherent" systems that do not have interactions with other groundwater bodies.

Dovey Junction Viaduct is within the Western Wales River Basin District (RBD) and the management strategies for this district are stated in the Western Wales River Basin Management Plan (RBMP). The first RBMP was published in 2009 and set out the management plan for the first cycle of six years 2009-2015. The plan was updated in 2015 to cover the second cycle 2015-2021 and a summary of responses on the consultation to update the river basin management plans was issued in September 2021 (full report yet to be published), for the next cycle (2021-2027). The purpose of the RBMP is to protect and improve the water environment for the wider benefits to people and wildlife – to achieve 'Good' status. The majority of baseline data within the study area was obtained from Natural Resources Wales (NRW) Water Watch Wales. In the Western Wales RBD, the following surface water bodies, from upstream to downstream, are classified as within the zone of influence:

- Dyfi - tidal limit to Twymyn (ID: GB110064048390) – River
- Dyfi & Leri – (ID: GB511006407000) - Transitional
- Cardigan Bay North – (ID: GB621009600000) – Coastal

Dyfi - tidal limit to Twymyn (ID: GB110064048390) is a river water body. Its most recent ecological status is classified as 'Moderate' and chemical status is classified as 'High. Dyfi – tidal limit to Twymyn waterbody has been screened out, due to the scale of the works, the ability for impacts to travel upstream are limited and the distance of the waterbody from the Scheme.

Dyfi & Leri – (ID: GB511006407000) is a transitional waterbody. The works will take place within this waterbody. Its most recent ecological status is classified as 'Good' and chemical status is classified as 'Moderate.

Cardigan Bay North – (ID: GB621009600000) is a coastal waterbody that lies over 10 km downstream of the scheme. The Deri & Leri connects to the Cardigan Bay North at the mouth of the Dyfi Estuary. Cardigan Bay North eventually flows out into the Irish Sea. Cardigan bay North's 0most recent ecological status is classified as 'Moderate' and its chemical status is classified as 'Fail. This waterbody has been screened out from further assessment due to the scale of the works and its distance from the Scheme.

4.1.2 Groundwater Bodies

The groundwater body underlying Dovey Junction is the Meirionnydd groundwater body (ID: GB41002G203200). Under the Western Wales RBD, all groundwater forms part of a Drinking Water Protected Area (DWPA). Meirionnydd groundwater body's quantitative status has been classified as 'Good' and its chemical status as 'Poor', achieving an overall status of 'Poor'. The RBMP determined some of the following sources that can impact on groundwater bodies and prevent them from being able to achieve 'Good' status, such as:

• Pollution from towns, cities and transport;

• Changes to the natural flow and level of water;

• Pollution from rural areas e.g. excessive use of nitrates; and

• Pollution from abandoned mines.

The Meirionnydd groundwater waterbody has been screened out, as no new ground-penetrating works will be undertaken. The timber pile replacement works use a temporary works support to transfer the load from the crosshead to the wailings and the A specialist chain saw in then used to cut off the existing pile at the top of the proposed splice. The new timber will be lifted from the pontoon and into place using the block and tackle, therefore, there is no hydrological connection between the works and Meirionnydd which may prevent the ground waterbody from achieving 'Good' status. Furthermore, any potential pollution impacts will be suitably mitigated by implementing Guidance on Pollution Prevention (GPPs), in particular *GPP5 Work in or Near Water*, and the Construction Industry Research and Information Association (CIRIA) guidance on the control of water pollution from construction sites.

4.2 Screening Summary

The following WFD waterbody has been screened in for further assessment:

• Dyfi & Leri – (ID: GB511006407000)

4.3 Screening of Relevant Scheme Activities

For the waterbody screened in for further assessment, activities that could impact on its status were identified for construction stages. The activities that should be screened in for further assessment are detailed in Table 4-3.

Table 4-3 Screening of Scheme Activities: Construction Stage

Scheme Element	Activities	Screening Rationale
Site set-up and compound establishment	Site establishment including welfare facilities, office cabins, material storage and access routes.	**Screen out** – All works associated with site establishment will be undertaken away from the watercourse. There will be no direct pathways for site compound activities

		resulting in water quality impacts to surrounding surface water bodies.
Installation of temporary works e.g. pontoon	Installation of floating pontoons on Afon Dyfi from shore line.	**Screen out** – The use of floating pontoons will sit on top of the water column to allow transportation of materials and operatives. The pontoons will be cleaned before being placed in the water so as not to introduce any substances into the watercourse. As the structures are floating there will be no direct impacts to hydromorphological or biological quality elements.
Installation of temporary works e.g. suspended scaffolding and encapsulation	Installation of suspended scaffolding and encapsulation to viaduct	**Screen out** – All works associated with the installation of scaffolding and encapsulation will be undertaken above the water column with no contact to the waterbody below. There will be no direct pathways for these works resulting in water quality impacts to the surrounding surface water bodies.
Removal of existing and replacement of new timber elements	Change of horizontal and diagonal wailings	**Screen out** – All works associated with new horizontal and diagonal timber elements can occur above the water column. There will be no direct pathways for these works resulting in water quality impacts to the surrounding surface water bodies.
Pile replacements	Splice and cut existing timbers and replace with new timber elements	**Screen in** – The use of specialist dive teams to carry out splice cuts into the exiting pile will be carried out underwater, which has the potential to impact on the physio-chemical quality elements.
Metal structure refurbishment	Grit blast and painting	**Screen in** – The use of high pressure equipment to remove existing paint/coatings on viaduct has the potential to enter the watercourse and may impact

		on the physio-chemical quality elements.
Site demobilisation	Removal of welfare facilities, office cabins, material storage and access routes.	**Screen out** – All works associated with site establishment will be undertaken away from the watercourse. There will be no direct pathways for site compound activities resulting in water quality impacts to surrounding surface water bodies.

5. Scoping

5.1 Waterbody Baseline Data

The waterbody data in Table 5-1 below has been taken from the Wales Classification Data C3 2021 data.

Table 5-1: WFD Status Dyfi & Leri (surface waterbody)

Waterbody – Dyfi & Leri Overall status: Moderate Ecological status: Good Chemical status: Moderate Mitigation measures: Not yet assessed		
Biological quality elements	**Physico-chemical elements**	**Hydromorphological supporting elements**
Fish: Not assessed	Temperature:	Hydrological regime: Not high
Invertebrates: Good	pH:	Morphology: Not assessed
Macroalgae Good	Dissolved oxygen: High	Flow: Pass
Phytoplankton: Not assessed.	Dissolved Inorganic Nitrogen: High	HMWB: No
	All metal assessed: Not assessed	

The extent of the designated WFD Dyfi & Leri waterbody reaches approximately 4.3 km upstream of the Scheme near Derwenlas, where its tidal limit also ends and transitions into the Dyfi - tidal limit to Twymyn.

5.2 Protected Areas and Sensitive Habitats

The WFD Protected Areas and WFD sensitive habitats within a 2km proximity to the site are summarised in Table 5-2.

Table 5-2 Summary of WFD Protected Areas and Sensitive Habitats

WFD Protected Areas	Location in Relation to the Scheme
Ramsar	Cors Fochno and Dyfi – 25.08km^2 The scheme lies within this Ramsar.
Special Areas of Conservation (SAC)	Pen Llyn a'r Sarnau - 1460.35km^2 The Scheme lies within this SAC
Special Areas of Conservation (SPA)	Dyfi Estuary The Scheme lies within this SPA
Sites of Special Scientific Interest (SSSI)	Dyfi – 37.95km^2 The Scheme lies within this SSSI
National Nature Reserve (NNR)	Dyfi – 22.9km^2
WFD Sensitive Habitats	
Salt marsh and subtidal sea grass (Higher sensitivity)	

5.3 Scoping of Scheme Activities

A Scoping exercise has been undertaken to identify the potential risks of each Scheme activity that was screened in for further assessment.

The Scoping process has followed the Environment Agency's 'Clearing the Waters for All' guidance, and has considered the risks of the Scheme activities during the construction and operation stages (as screened in in Section 4) to the following receptors for surface water bodies:

• Hydromorphology;

• Biology – habitats;

• Biology – fish;

• Water quality (physico-chemical); and

• Protected Areas.

Table 5-3 presents the summary results of the identified risks and receptors that have been taken forward to the assessment stage for the Deri and Leri waterbody.

Table 5-3 – Scoping for Deri & Leri Waterbody

Receptor	Potential risk to receptor?	Note the risk issue(s) for impact assessment
Hydromorphology	No	Almost all works take place outside of the waterbody. The only interaction within the waterbody is by floating pontoons and a diver that will interact with the timber structure for a short period of time only. There are no anticipated risks to the local hydromorphological supporting elements.
Biology: habitats	No	Nearly all of the works are taking place outside of the waterbody. The total footprint of the works is approximately 0.005km^2 which is less than 1% of the higher sensitivity habitats found within the 2km of the Scheme.
Biology: fish	No	Nearly all of the works are taking place outside of the waterbody. It is unlikely that the nature of the works will impact on normal fish behaviour. No works within the watercourse beyond 6th October to avoid impacts on migration.
Water quality (physio-chemical)	Yes	There is potential for paints and coatings from blasting and painting activities to enter the watercourse and impact the physico-chemical quality elements.

Protected areas	Yes	The Scheme is located within four Protected Areas.

5.4 WFD Assessment of Impacts

Table 5-4 presents the results of the WFD assessment for the Deri & Leri surface waterbody. This assessment considers the effects of the Scheme during the construction phase on the scoped in WFD quality elements of the waterbody. Where necessary, mitigation measures are proposed to support good practice and address potential residual risks.

Table 5-4: Assessment of Impacts on the Deri & Leri Waterbody

Hydromorphology	Biology (Habitats and fish)	Physico-chemical	Protected Areas	Control Measures that will be employed throughout the works
Assessment of Impact	Assessment of Impact	Assessment of Impact	Assessment of Impact	
Almost all works take place outside of the waterbody There are no anticipated risks to the local hydromorphological supporting elements.	Nearly all of the works are taking place outside of the waterbody. The total footprint of the works is approximately 0.005km^2 which is less than 1% of the higher sensitivity habitats found within the 2km of the Scheme. It is unlikely that the nature of the works will impact on normal fish behaviour. No works within the watercourse beyond 6th October to avoid impacts on migrating fish.	The proposed scheme has the potential to impact on physico-chemical supporting elements of the Deri & Leri waterbody during grit blasting and painting activities. The scaffolding will be double boarded and encapsulated to prevent contamination from entering the watercourse by containing arisings within the encapsulation. It will also contain dusts from escaping. Further control measures will be employed to prevent water contamination: • All gaps around scaffolding will be sealed prior to blasting operations to ensure no release of materials into the environment.	The works are being undertaken above and within the Afon Dyfi. This location falls within four protected sites; Ramsar, SAC, SPA and SSSI. A Habitats Regulations Assessment has been undertaken to assess whether the Scheme would be likely to result in any significant effects on any of the qualifying features of the European Protected Sites as required by the Conservation of Habitats and Species Regulations 2017 (as amended). Results from the HRA determine that the scheme will not have an adverse effect if the following mitigation measures are implemented:	• Site compound, materials and equipment are stored at suitable distance from watercourse. Secured and fenced off. • All equipment and materials will be in a clean condition prior to arrival on site and will be cleaned before leaving site. • Plant and machinery will be well maintained and in good condition. • Refuelling areas will be suitably distanced from the watercourse will spill measures in place. • Secondary containment will be in use for all fuel based equipment. • Guidance on Pollution Prevention, in particular GPP5 Work

		• The scaffold boards will be lined with additional terram or plywood sheeting to provide an additional layer of protection between the works and the watercourse. • The scaffolding encapsulation will be checked daily as per temporary works check sheet and Permit to Work in/over Water. • On completion of work all the sheeting and encapsulation material will be carefully removed and bagged up for correct disposal.	• Guidance on pollution prevention implemented including measures as discussed under Physico-Chemical section. • Track matting is used on access routes to and from compound areas. • An otter survey will be undertaken at least 100m upstream and downstream of the Scheme. No Holts have been found to date, but if a Holt is found measures, including obtaining a Licence from NRW will be in place before works begin. • An endoscope survey of a structure by eastern abutment of Viaduct occurs prior to works starting to check for presence of bats. If bats are found measures, including obtaining a Licence from NRW will be in place before works begin.	in or near Water, and the Construction Industry Research and Information Association (CIRIA) guidance on the control of water pollution from construction sites will be followed.

The proposed Scheme will not result in any deterioration to hydromorphological supporting elements.	The proposed Scheme will not result in any deterioration to biological supporting elements.	The proposed Scheme will not result in any deterioration to physico-chemical supporting elements.	The proposed Scheme will not result in any deterioration to protected areas that could affect the integrity of them.	
The proposal is deemed compliant with this WFD quality element.	The proposal is deemed compliant with this WFD quality element.	The proposal is deemed compliant with this WFD quality element.	The proposal is deemed compliant with this WFD quality element.	

6. Conclusion

This report details the WFD assessment carried out for the proposed Dovey Junction Viaduct refurbishment Scheme. It has assessed the Scheme against the hydromorphological, biological, physico-chemical quality elements and Protected Areas of the Deri & Leri surface waterbody.

The Scheme will not result in deterioration to any of the elements for the waterbody assessed if the recommended mitigation measures are implemented. To further support this, it is recommended that all control measures provided are also implemented before and during construction activities.