

Natural Resources Wales
**Salmon for Tomorrow 2 -
Clywedog Weir Removal**
WFD Assessment

290013-ARP-XX-CL-RP-NX-0001

P03 | 20 May 2022

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

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1 Introduction

Ove Arup and Partners Ltd (Arup) has been commissioned by Natural Resources Wales to undertake a Water Framework Directive compliance assessment of works to remove a redundant river gauging weir on the Afon Clywedog. The weir is located to the north-west of Llanidloes at National Grid Reference: *SN94432 85506* (Figure 1). Works are being considered to enable access for migratory fish to 3.5km of suitable spawning and juvenile salmonid habitat upstream and are likely to consist of weir removal and stabilisation and enhancement of the surrounding riverbed and banks.

The Water Environment (Water Framework Directive) Regulations 2017 in England and Wales establishes the need for a water environment assessment to support consent applications. It establishes a legislative framework for the protection of surface waters and groundwater, and its aims are to:

- enhance the status and prevent further deterioration of surface water bodies, groundwater bodies and their ecosystems
- ensure progressive reduction of groundwater pollution
- reduce pollution of water
- contribute to mitigating the effects of floods and droughts
- achieve at least good surface water status for all surface water bodies and good chemical status in groundwater bodies (or good ecological potential in the case of artificial or heavily modified water bodies); and
- promote sustainable water use.

All proposed schemes with the potential to interact with the water environment must be assessed to ensure that the aims of the WFD are being met. Where a scheme is shown to contravene the WFD, an Article 4.7 derogation would need to be sought from the relevant authority.

This report follows guidance and a template produced by NRW¹ to produce a WFD Compliance Assessment report which identifies the activities related to the scheme that may cause deterioration or prevent a water body from meeting its objectives.

¹ Natural Resources Wales, Operational Guidance Note 72: Complying with the Water Framework Directive Regulations 2017: how to assess and appraise projects and activities. Version 3: June 2021

2 Screening

2.1 Proposal details.

Project details where NRW is the project proponent/instigator (Project manager to complete)	
NRW Project reference	Not known
Type of scheme	Removal of redundant asset to improve fish passage and minimise maintenance liability.
What ongoing maintenance work will be required? All structures will require maintenance	The works will seek to minimise any requirement for maintenance. Monitoring of the riverbed and banks post weir removal is proposed to ensure no adverse impacts occur. Specific maintenance activities are not planned but some remedial works to correct unwanted scour/deposition may be required.
Breakdown of physical works involved (e.g. new weir, bank reinforcement, riparian vegetation management)	<p>The works are anticipated to comprise:</p> <ul style="list-style-type: none"> • creation of a temporary river access ramp to undertake the works. This will be removed, and the bank reinstated upon completion. The ramp will be formed of river gravels sourced from downstream or imported clean stone. • demolition of existing weir, including removal of the reno mattress bed/bank protection upstream of the structure. • stabilisation of the surrounding riverbed and banks.
Location of activity	National Grid Reference: <i>SN94432 85506</i> .
Length / size of works (m)	Across full width of the channel surrounding the weir. The reno mattresses extend approximately 15m upstream of the structure.
Estimated extent of footprint/impact of the works	Works are required to the immediate weir structure and the ~15m of reno mattress bed upstream. The working area may be extended beyond this if wider stabilisation works are determined to be required during the design for the weir removal.
Timing of works	Construction programme to be confirmed. Anticipated start Autumn/Winter 2022. Construction during autumn/winter is proposed as levels in the Clywedog can be managed by controlling releases from the dam upstream and potential impacts from noise / dust / vibration to the adjacent caravan park are minimised.

Map of site included and scaled plan	Yes – see drawing pack: 290013-ARP-IZ-CL-DR-ZX-0001 Site & Location Plan 290013-ARP-IZ-CL-DR-ZX-0002 Proposed Works General Arrangement
Project documents	Available from NRW Project Delivery team
NRW team	Senior User: Jason Jones Project Executive: Melissa Mahavar Snow
Lead officer	Completed on behalf of NRW by Arup.
Date of assessment	May 2022

2.2 Collate baseline information on all water bodies at risk from the proposal.

Date of classification information: 2018 Interim classification

Water body ID	Water body name	Water body type	HMWB	Overall water body status	Morphology status*	Relevance to the proposal
GB109054044760	Afon Clywedog - tributary of the River Severn	River	Yes	Moderate	N/A	Proposal is in the water body
GB109054049310	Severn - conf Afon Dulas to conf R Camlad	River	Yes	Moderate	N/A	Water body is downstream of proposals and will receive sediment from the reach.

*where there is no information, or a null value then assume it is at good status for morphology (or hydromorphology for TraC water bodies) or, if the water body is designated HMWB the morphological status is **not applicable (please be aware that these water bodies are still sensitive to physical modifications)**.

2.3 Risk Screening - complete for each water body listed above that is either in the water body or hydrologically linked with potential risk

Water body name: Afon Clywedog - tributary of the River Severn Water body ID: GB109054044760			
Question number	Risk screening questions	Name of activity	Screening decision – delete as appropriate
Q1.1	Is the proposal in a water body at high status or high status for morphology or hydromorphology?	N/A	No – go to Q1.2

Water body name: Afon Clywedog - tributary of the River Severn Water body ID: GB109054044760			
Question number	Risk screening questions	Name of activity	Screening decision – delete as appropriate
Q1.2	Is the activity listed in Annex D as a green activity? Complete new row for each activity	Removal of Weir	No – complete scoping assessment for each water body
		Stabilisation of the surrounding riverbed and banks.	No – complete scoping assessment for each water body
		Temporary river access creation	No – complete scoping assessment for each water body
Q1.3	Are there any potential cumulative/in combination impacts? Or is there Local Expert Override?	No	No – go to Q1.4
Q1.4	Is the water body at Good overall status?	No	No - Go to Q1.5
Q1.5	Record best practice measures that the works include to help achieve the objectives of the water body.	Removal of a significant barrier will improve fish passage and re-establish some sediment transport downstream, albeit the major pressure in the water body, the Clywedog Reservoir, will remain. The reinstatement of sediment transport will improve the availability of clean gravels downstream of the weir, which would benefit ecological habitat and function through the provision of refugia, hyporheic exchange etc.	

Water body name: Severn - conf Afon Dulas to conf R Camlad			
Water body ID: GB109054049310			
Question number	Risk screening questions	Name of activity	Screening decision – delete as appropriate
Q1.1	Is the proposal in a water body at high status or high status for morphology or hydromorphology?	N/A	No – go to Q1.2
Q1.2	Is the activity listed in Annex D as a green activity? Complete new row for each activity	Removal of Weir and reinstatement of sediment transport to this reach	No – complete scoping assessment for each water body
Q1.3	Are there any potential cumulative/in combination impacts? Or is there Local Expert Override?	No	No – go to Q1.4
Q1.4	Is the water body at Good overall status?	No	No - Go to Q1.5
Q1.5	Record best practice measures that the works include to help achieve the objectives of the water body.	Reinstatement of sediment transport from the Clywedog should be a benefit to the morphology of this reach. Although the main barrier to sediment in the Clywedog catchment (the reservoir) remains.	

3 Scoping Assessment

3.1 Relate activity to water body quality elements

Water body name: Afon Clywedog - tributary of the River Severn Water body ID: GB109054044760			
Elements	Applicable	Potential Impact (include direct and indirect potential impacts)	Avoidance measures included in the proposal
Hydromorphology – hydromorphology constitutes both ‘hydrology’ and ‘geomorphology’ and describes the physical characteristics and processes of a water body. Could the proposal lead to:			
changes to flows, for example, changes to wetted width or depth profile, abstraction of water (changes to quality and dynamics of water flow), changes the physical form including structure and substrate of the river/lake bed or connection to groundwater, or alter the process of sediment transport (erosion, deposition or transfer)?	Direct & Indirect	Weir removal will result in a direct change in hydromorphology to the reach surrounding the structure. There is also the potential for a knickpoint to be initiated that would progress upstream until the channel reaches an equilibrium. The reinstatement of sediment transport will also likely result in a more gradual change in the hydromorphology of the reach downstream of the structure.	This is one of the main benefits of the scheme but also has the potential to result in adverse impacts. It is therefore scoped in.
Is the proposal in a HMWB?	Yes		Scoped in
Water quality An activity can modify the flow of water, introduce artificial materials or remove sediment and/or vegetation. These can all affect the water quality – particularly physico-chemical aspects of water quality - such as levels of dissolved oxygen, nutrients and ammonia. Include water quality in the detailed assessment if the activity could affect:			
water clarity (turbidity or suspended particulate matter concentration)	Direct & Indirect	Temporary impact on water clarity and potentially nutrient levels during construction works and	Scoped in

<p>Water body name: Afon Clywedog - tributary of the River Severn Water body ID: GB109054044760</p>			
Elements	Applicable	Potential Impact (include direct and indirect potential impacts)	Avoidance measures included in the proposal
<p>temperature oxygen levels nutrients: total phosphorus concentration (Lakes); soluble reactive phosphorus concentration (Rivers). salinity/conductivity acidification status</p>		<p>initial reworking of sediment stored upstream of the weir. The weir removal may have a limited benefit to oxygenation during lower flows, although the large reservoir upstream is likely to be a much more significant contributor to this. Reinstatement of sediment transport downstream of the weir may alter vegetation structure which could indirectly impact upon water clarity.</p>	
<p>Chemicals - A detailed assessment will also be required if the activity uses or releases chemicals, for example, through sediment disturbance or building works. This is necessary when either the:</p>			
<p>chemicals are on the Environmental Quality Standards Directive (EQSD) list or, if the activity releases chemicals on the EQSD list and has a mixing zone, like a discharge pipeline or outfall, follow the Environment Agency's surface water pollution risk assessment guidance. This is part of the Environmental Permitting Regulations guidance.</p>	<p>Direct</p>	<p>Sediment stored behind the weir may hold elevated levels of chemical on the EQSD list. Removal of the weir has the potential to release these downstream in an uncontrolled manner.</p>	<p>Scoped in</p>
<p>Biology Expert judgement will be required to consider whether any changes to the hydromorphology or water quality brought about by the project will potentially impact upon the Biological Quality Elements (BQEs) and may cause deterioration in status. Identify if the activity or project could impact on the abundance or composition of the following biological elements: benthic invertebrates, phytoplankton, macrophytes and phytobenthos or fish.</p>			

Water body name: Afon Clywedog - tributary of the River Severn Water body ID: GB109054044760			
Elements	Applicable	Potential Impact (include direct and indirect potential impacts)	Avoidance measures included in the proposal
Could the proposal lead to:			
<input type="checkbox"/> changes to the composition and abundance of aquatic flora, and or; <input type="checkbox"/> changes to the composition and abundance of benthic invertebrate fauna?	Direct & Indirect	Weir removal will result in a direct change in hydromorphology to the reach surrounding the structure. This will result in a change in habitat type and availability for aquatic flora and fauna. The reinstatement of sediment transport will also likely result in a more gradual change in the hydromorphology of the reach downstream of the structure.	This is one of the main benefits of the scheme but also has the potential to result in adverse impacts. It is therefore scoped in.
Fish fauna: could the proposal lead to:			
<input type="checkbox"/> changes to the composition, abundance and age structure of fish fauna, <input type="checkbox"/> an impact on normal fish behaviour like movement, migration or spawning (for example creating a physical barrier, noise, chemical change or a change in depth or flow), <input type="checkbox"/> entrainment or impingement of fish, <input type="checkbox"/> refuge/predation areas?	Direct & Indirect	Weir removal will enable fish to freely move along this section of river to feed and spawn. There will also be a direct impact on fish habitat locally surrounding the weir and an indirect impact on habitat types available downstream as a result of the reinstatement of sediment transport.	This is the driving benefit of the scheme but also has the potential to result in adverse impacts. It is therefore scoped in.

Scoping table for River and Lake water bodies			
Water body name: Severn - conf Afon Dulas to conf R Camlad			
Water body ID: GB109054049310			
Elements	Applicable	Potential Impact (include direct and indirect potential impacts)	Avoidance measures included in the proposal
<p>Hydromorphology – hydromorphology constitutes both ‘hydrology’ and ‘geomorphology’ and describes the physical characteristics and processes of a water body. Could the proposal lead to:</p>			
<p>changes to flows, for example, changes to wetted width or depth profile, abstraction of water (changes to quality and dynamics of water flow), changes the physical form including structure and substrate of the river/lake bed or connection to groundwater, or alter the process of sediment transport (erosion, deposition or transfer)?</p>	Indirect	The reinstatement of sediment transport along the Afon Clywedog will result in an increase in sediment supply to the River Severn at its confluence with the Clywedog, approximately 1.4km downstream of the weir.	This is one of the main benefits of the scheme but also has the potential to result in adverse impacts. It is therefore scoped in.
Is the proposal in a HMWB?	Yes		Scoped in
<p>Water quality An activity can modify the flow of water, introduce artificial materials or remove sediment and/or vegetation. These can all affect the water quality – particularly physico-chemical aspects of water quality - such as levels of dissolved oxygen, nutrients and ammonia. Include water quality in the detailed assessment if the activity could affect:</p>			
<p>water clarity (turbidity or suspended particulate matter concentration) temperature oxygen levels nutrients: total phosphorus concentration (Lakes); soluble reactive phosphorus concentration (Rivers). salinity/conductivity acidification status</p>	Direct	Temporary impact on water clarity and potentially nutrient levels during construction works and initial reworking of sediment stored upstream of the weir.	Contractor would implement best practice pollution prevention measures when working in the channel – e.g. silt mats, reducing excavator movements. This waterbody is 1.4km downstream of the works meaning that changes are unlikely but it is still scoped in.

Scoping table for River and Lake water bodies			
Water body name: Severn - conf Afon Dulas to conf R Camlad			
Water body ID: GB109054049310			
Elements	Applicable	Potential Impact (include direct and indirect potential impacts)	Avoidance measures included in the proposal
Chemicals - A detailed assessment will also be required if the activity uses or releases chemicals, for example, through sediment disturbance or building works. This is necessary when either the:			
chemicals are on the Environmental Quality Standards Directive (EQSD) list or, if the activity releases chemicals on the EQSD list and has a mixing zone, like a discharge pipeline or outfall, follow the Environment Agency's surface water pollution risk assessment guidance. This is part of the Environmental Permitting Regulations guidance.	Direct	Sediment stored behind the weir may hold elevated levels of chemical on the EQSD list. Removal of the weir has the potential to release these downstream in an uncontrolled manner.	Sediment sampling and testing for likely chemical is proposed prior to construction. If elevated levels of chemicals on the EQSD list are found, then additional construction mitigations would be implemented to minimise the mobilisation of any contaminants. Scoped in.
Biology Expert judgement will be required to consider whether any changes to the hydromorphology or water quality brought about by the project will potentially impact upon the Biological Quality Elements (BQEs) and may cause deterioration in status. Identify if the activity or project could impact on the abundance or composition of the following biological elements: benthic invertebrates, phytoplankton, macrophytes and phytobenthos or fish. Could the proposal lead to:			
<input type="checkbox"/> changes to the composition and abundance of aquatic flora, and or; <input type="checkbox"/> changes to the composition and abundance of benthic invertebrate fauna?	Indirect	The reinstatement of sediment transport may result in a gradual change in the hydromorphology of this waterbody. This would result in a change in habitat availability for macrophytes and invertebrates.	This is one of the main benefits of the scheme but also has the potential to result in adverse impacts. It is therefore scoped in.
Fish fauna: could the proposal lead to:			

Scoping table for River and Lake water bodies			
Water body name: Severn - conf Afon Dulas to conf R Camlad			
Water body ID: GB109054049310			
Elements	Applicable	Potential Impact (include direct and indirect potential impacts)	Avoidance measures included in the proposal
<ul style="list-style-type: none"> <input type="checkbox"/> changes to the composition, abundance and age structure of fish fauna, <input type="checkbox"/> an impact on normal fish behaviour like movement, migration or spawning (for example creating a physical barrier, noise, chemical change or a change in depth or flow), <input type="checkbox"/> entrainment or impingement of fish, <input type="checkbox"/> refuge/predation areas? 	Indirect	The reinstatement of sediment transport may result in a gradual change in the hydromorphology of this waterbody. This would result in a minimal change in habitat availability for fish.	This is one of the main benefits of the scheme but also has the potential to result in adverse impacts. It is therefore scoped in.

Invasive Non-Native Species	
<p>Refer to the Check Clean Dry campaign to help prevent the spread of invasive plants and animals in British waters. You can find out more about INNS and biosecurity on the GB Non-native Species Secretariat website and on the INNS and Biosecurity section of the NRW Intranet.</p> <p>For additional information about INNS distribution check the following: NBN Atlas Wales INNS Portal</p>	
Does the proposal have the potential to introduce or spread INNS?	<p>Yes – potential to introduce or spread INNS via plant/machinery during construction. Removal of the weir may also enable INNS (e.g. signal crayfish) to spread upstream more easily.</p> <p>Contractor to produce a Biosecurity Risk Assessment prior to construction.</p>

WFD Protected Areas

If the proposed activity is within, or hydrologically connected to, a Protected Area. If the activity is hydrologically linked, then as a general rule those Protected Areas within 2 km of the proposed activity will be most at risk.

Protected Areas and Critical sensitive habitats/species		
Consider if Protected Areas are at risk from the proposal. These include:	Applicable	How have you considered the potential impacts?
Protected Areas:		
<input type="checkbox"/> SACs	No	
<input type="checkbox"/> SPAs	No	
<input type="checkbox"/> RAMSAR	No	
<input type="checkbox"/> Bathing Waters	No	
<input type="checkbox"/> Shellfish Waters	No	
<input type="checkbox"/> Surface Water Drinking Water Protected Areas	No	
<input type="checkbox"/> Ground Water Drinking Water Protected Areas	No	
<input type="checkbox"/> Urban Waste Water Treatment Directive: designated Nutrient Sensitive Area	No	
<input type="checkbox"/> Nitrate Vulnerable Zones	No	
Other Protected and Priority habitats and species.		
<input type="checkbox"/> Nationally or locally protected areas e.g. SSSI, NNR etc	No	
<p>Section 6 Biodiversity and resilience of ecosystems duty (Environment (Wales) Act 2016) here - other Protected and Priority habitats and species.</p> <p>The S6 duty requires that public authorities must seek to maintain and enhance biodiversity so far as consistent with the proper exercise of their functions and in so doing promote the resilience of ecosystems.</p> <p>Identify if there is a risk that the activity/project could impact on a water dependant priority habitat and or species which are either critical to the ecological health of the water body or sensitive to changes proposed on the water body.</p>		

Protected Areas and Critical sensitive habitats/species		
Consider if Protected Areas are at risk from the proposal. These include:	Applicable	How have you considered the potential impacts?
Section 7 list of priority <u>habitats</u> e.g. wetlands	No	
Section 7 list of priority <u>species</u> e.g. water voles	No	PEA (including walkover survey) undertaken which did not identify any protected species at risk as a result of the works.
Ecosystem Resilience The Environment (Wales) Act 2016, Section 3 states that the objective of the sustainable management of natural resources is to maintain and enhance the resilience of ecosystems and the benefits they provide now and for future generations		
Consideration of ecosystem resilience – diversity, extent, condition, connectivity, adaptability.	Yes	The project aim is to increase available spawning habitat for migratory salmonids and other fish species. This will increase their resilience against future change.

Summary of step 1 scoping

Q2.1 Is there a risk that a component of the proposal may cause deterioration of any element that makes up water body status?	Yes - all potential impacts have been assessed considering the avoidance measures already included in the proposal and there is still a potential risk to a water body quality element or risk of deterioration.
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Summary of scoping decision of the project ‘alone’

Q2.2 Is there a risk that a component of the proposal may prevent the water body or Protected Area from achieving its objectives in the future?	Yes - all potential impacts have been assessed considering the avoidance measures already included in the proposal and there is a potential risk any water body or protected area from achieving its objects in the future.
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3.2 Assessing potential in combination and/or cumulative impacts

Avoidance measures already included in the project

<p>Are there any activities or projects which may act in combination and/or cumulative? <i>If none, put 'N/A'</i></p>	<p>Nature of the in-combination/cumulative effect (if any)</p>	<p>Avoidance measures Include details of how measures already included in the proposal would be applied, and who would be responsible for applying them.</p>	<p>Can the risk of deterioration or prevention of achieving water body objectives from in combination/ cumulative effects be ruled out? 'YES' (or N/A) <i>or</i> 'NO' (where there is any uncertainty then add 'Don't know/uncertain')</p>
N/A			
Scoping decision of the project cumulatively or 'in combination'		Potential cumulative/in combination impacts conclusion	
Q2.3 Can the risk of deterioration or prevention of achieving water body objectives from in combination and or cumulative effects be ruled out?		It can be concluded that potential deterioration or prevention of achieving water body objectives from in combination / cumulative effects can be ruled out	

3.3 Overall scoping decision

<p>Overall scoping decision</p> <p>Q2.4 Is there a potential risk that the proposal may cause deterioration or prevent a water body from meeting its objectives either alone or in combination?</p>	<p>There is a potential risk the proposal may cause deterioration or prevent the water body from meeting its objectives and therefore a detailed compliance assessment is required.</p>
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4 Detailed Assessment

4.1 Avoidance measures

List legally binding avoidance measures	How will the measure be applied	Who will be responsible for applying them?	Will this remove the risk of deterioration or prevent the achievement of water body objectives.
N/a			

There **is a risk** the proposal may cause deterioration or prevent the water body from meeting its objectives and therefore a detailed compliance assessment is required. There are **no legally binding avoidance** measures that can be included at this stage.

Given the scale of the project, the detailed assessment is contained within the summary table below, which details the anticipated steps required during the detailed design and construction to ensure that there is no risk to the WFD water bodies considered in this assessment. This assessment should be treated as a ‘live’ document and updated during the design and construction to ensure that the project remains compliant with the objectives of the WFD.

Water body name & ID	WFD element/s scoped in	Description of impacts; include a list of all evidence documents to inform the detailed assessment	Is there a risk the proposal may cause deterioration?	Is there risk of the activity preventing the water body/ PA from meeting its objectives?
Afon Clywedog - tributary of the River Severn - ID: GB109054044760	Hydromorphology – changes to physical form and sediment transport	Weir removal will result in a direct change in hydromorphology to the reach surrounding the structure. There is also the potential for a knickpoint to be created that would progress upstream until the channel reaches an equilibrium. The reinstatement of sediment transport will also likely result in a more gradual change in the hydromorphology of the reach downstream of the structure.	No – provided the reinstatement of the channel surrounding the weir is informed by hydraulic modelling and designed to work with natural processes.	No

	<p>These changes have the potential to result in a significant improvement in hydromorphological condition, although the reinstatement of sediment transport is moderated by the presence of the Clywedog dam, a much larger structure ~3.9km upstream of the weir.</p> <p>The design of the weir removal will use hydraulic modelling and a geomorphologists professional judgement to consider the potential for erosion and deposition surrounding the structure and seek to create a stable channel using natural materials (e.g. stone, large wood, vegetation) where possible.</p> <p>A geomorphological walkover study has been undertaken² which has made recommendations to be incorporated into the scheme design.</p> <p>The water body is designated as highly modified due to its regulated flow from the Clywedog Reservoir ~3.9km upstream of the weir. The scheme will not address this, but the removal of the weir will be of benefit to the sediment transport regime, although the benefit will be moderated by the presence of the much larger structure upstream.</p>		
Water quality – clarity & nutrients	<p>A moderate amount of sediment has accumulated upstream of the weir during its lifespan. The works will result in the sediment being re-mobilised during the construction activities and by river processes as the sediment transport regime is re-established.</p> <p>This may result in a temporary impact on water clarity and potentially nutrient levels.</p> <p>The Contractor will develop and implement a Construction Environmental Management Plan for the works, which will include best practice pollution prevention measures when working in the channel – e.g. silt mats, reducing excavator movements. This will minimise sediment disturbance during the works.</p> <p>Sediment sampling and testing is also proposed prior to construction to establish if there are elevated levels of nutrients in the sediment stored behind the weir. Additional mitigations will be implemented to manage the release of silt should high levels of nutrients be found.</p>	No	No
Chemicals	<p>Sediment stored behind the weir may hold elevated levels of chemical on the EQSD list. Removal of the weir has the potential to release these</p>	No	No

² Clywedog Geomorphology Assessment, NRW (produced by Arup), May 2021.

		<p>downstream in an uncontrolled manner. The water body is currently failing due to zinc from abandoned mining upstream of the weir, so there is reasonable potential for elevated levels of heavy metals in the sediment upstream of the weir.</p> <p>Sediment sampling and testing for likely chemicals is proposed prior to construction. If elevated levels of chemicals on the EQSD list are found then additional construction mitigations would be implemented to minimise sediment disturbance.</p>		
	<p>Biology – changes in physical habitat that may affect macrophytes, invertebrates and fish</p>	<p>Weir removal will result in a direct change in hydromorphology to the reach surrounding the structure. This will result in a change in habitat type and availability for aquatic flora and fauna.</p> <p>The reinstatement of sediment transport will also likely result in a more gradual change in the hydromorphology of the reach downstream of the structure.</p> <p>The works are anticipated to be a benefit to the aquatic flora and fauna in this section of river. As covered in the hydromorphology section, the work will seek to create a stable channel with a diverse range of aquatic habitat. No additional mitigation is deemed necessary.</p>	No	No
	<p>Biology – changes in fish behaviour</p>	<p>Weir removal will enable fish to freely move along this section of river to feed and spawn.</p> <p>There will also be a direct impact on fish habitat locally surrounding the weir and an indirect impact on habitat types available downstream because of the reinstatement of sediment transport.</p> <p>The works are intended to be a benefit to the fish (especially migratory salmonids) in this section of river. As covered in the hydromorphology section, the work will seek to create a stable channel with a diverse range of aquatic habitat. No additional mitigation is deemed necessary.</p>	No	No
<p>Severn - conf Afon Dulas to conf R Camlad – ID - GB109054049310</p>	<p>Hydromorphology – changes to physical form and sediment transport</p>	<p>The reinstatement of sediment transport will likely result in a gradual change in the hydromorphology of the confluence between the Clywedog and the Severn, although at present it is thought that much of the sediment accumulation downstream of this confluence is sourced from the Severn rather than the Clywedog, which has a limited sediment supply as a result of the large reservoir in its headwaters².</p> <p>These changes have the potential to result in a minor improvement in hydromorphological condition to the water body, as an increase in</p>	No	No

		mobile sediment will promote natural geomorphological processes and diversify habitat.		
	Water quality – clarity and nutrients	<p>A moderate amount of sediment has accumulated upstream of the weir during its lifespan. The works will result in the sediment being re-mobilised during the construction activities and by river processes as the sediment transport regime is re-established.</p> <p>This may result in a temporary impact on water clarity and potentially nutrient levels, although as this water body is ~1.4km downstream of the weir, significant impacts are unlikely.</p> <p>The Contractor will develop and implement a Construction Environmental Management Plan for the works, which will include best practice pollution prevention measures when working in the channel – e.g. silt mats, reducing excavator movements. This will minimise sediment disturbance during the works.</p> <p>Sediment sampling and testing is also proposed prior to construction to establish if there are elevated levels of nutrients in the sediment stored behind the weir. Additional mitigations will be implemented to manage the release of silt should high levels of nutrients be found.</p>	No	No
	Chemicals	<p>Sediment stored behind the weir may hold elevated levels of chemical on the EQSD list. Removal of the weir has the potential to release these downstream in an uncontrolled manner.</p> <p>Sediment sampling and testing for likely chemicals is proposed prior to construction. If elevated levels of chemicals on the EQSD list are found then additional construction mitigations would be implemented to minimise sediment disturbance.</p>	No	No
	Biology – changes in physical habitat that may affect macrophytes, invertebrates and fish	<p>The reinstatement of sediment transport will likely result in a gradual change in the hydromorphology at the confluence between the Clywedog and the Severn.</p> <p>The works are anticipated to be a benefit to the aquatic flora and fauna in this section of river. As covered in the hydromorphology section, an increase in sediment transport would likely benefit aquatic species. No additional mitigation is deemed necessary.</p>	No	No

5 Conclusion

In light of the conclusions of a detailed compliance assessment (Stage 3), and taking account of the advice received from technical specialist advisors, it has been established that the activity/project has **no potential to cause deterioration of any water body or prevent a water body or WFD Protected Area from meeting its objectives**, taking into account the mitigations described in this assessment, either alone or in-combination with other activities.

Given the project is at an early stage (outline design), a high-level assessment which details the anticipated steps required during the design and construction has been undertaken. In summary these are:

Design mitigations:

- Design of the weir removal to be informed by hydraulic modelling to better understand potential areas of erosion and deposition.

Construction mitigations:

- The Contractor will develop and implement a Construction Environmental Management Plan for the works, which will include best practice pollution prevention measures when working in the channel (GPP5 to be followed at a minimum) – e.g. silt mats, reducing excavator movements.
- Sediment sampling and testing will be carried out prior to construction to establish if there are elevated levels of contaminants in the sediment stored behind the weir. Heavy metal pollution is of particular concern given the evidence of historic mining in the catchment upstream.

This assessment should be treated as a ‘live’ document and updated during the design and construction to ensure that the project remains compliant with the objectives of the WFD.

6 Consultation with technical advisors/specialists

Relevant section of the WFD compliance assessment	Date(s) of correspondence and any meeting(s) with technical advisor(s) and include the name of the technical advisor	Description of how the comments from technical advisors have been considered
Appended Geomorphology Study	11 th February 2021 - Telecon to discuss approach to geomorphology study with Oly Lowe (NRW Geomorphologist)	Discussed pressures in the catchment, chiefly the Clywedog Reservoir in the headwaters and sediment accumulation downstream of the Clywedog-Severn confluence. OL provided a previous geomorphology walkover report for the catchment.
Site visit with Fisheries Officer & Geomorphologist – Jason Jones and Oly Lowe	Site meeting 9 th December 2021	Senior users for the project. Supportive of proposals – involved throughout project to date.