A66 Northern Trans-Pennine Project
TR010062

3.4 Environmental Statement
Appendix 14.1
WFD Compliance Assessment

APFP Regulations 5(2)(a)

Planning Act 2008

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

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The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

A66 Northern Trans-Pennine Project Development Consent Order 2022

3.4 ENVIRONMENTAL STATEMENT
APPENDIX 14.1 WFD COMPLIANCE ASSESSMENT

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14.1 WFD Compliance Assessment

14.1.1 Introduction

Background

14.1.1.1 This document reports on the compliance of the Project with the objectives of the Water Framework Directive (WFD) 2000/60/EC as transposed in England and Wales via the Water Environment Regulations.

14.1.1.2 The Water Environment Regulations are described in Environmental Statement (ES) Chapter 14: Road drainage and the water environment (Application Document 3.2). The regulations set out a number of key objectives including:

- preventing deterioration of the WFD status of waters
- protecting, enhancing and restoring all bodies of surface water and groundwater
- progressively reducing discharges of priority substances and ceasing, or phasing discharges, of priority hazardous substances for surface waters
- ensuring progressive reduction of groundwater pollution
- mitigating the effects of floods and droughts
- ensuring sufficient supply of water.

14.1.1.3 Regulation 5(2) (l) (iii) of the Infrastructure Planning Regulations 2009[1] (as amended) requires Nationally Significant Infrastructure Projects to provide an assessment of effects upon water bodies in a River Basin Management Plan (RBMP) alongside their application.

Purpose

14.1.1.4 The purpose of this report is to:

- identify water bodies in a RBMP that are of relevance to the Project
- assess the potential for effects on water bodies
- highlight any mitigation required to ensure compliance with WFD legislation.

14.1.1.5 This assessment and report covers the entire Project, considering all relevant watercourses and associated impacts from all individual schemes within the Project.

Assumptions and limitations

14.1.1.6 The WFD water body classification data in this assessment has been taken from the Environment Agency 2019 Cycle 2 River Basin Management Plan data (Environment Agency, 2022)[2]. These classifications are considered to provide the current best estimate of status and are the formal baseline against which the Environment Agency will assess compliance with the 'no deterioration' objective in 2021. The assessment will be reviewed and updated during detailed

[1]Legislation Gov UK. Regulation 5(2) (l) (iii) of the Infrastructure Planning Applications: Prescribed Forms and Procedure.
[2] Environment Agency (2022) Catchment Data Explorer

design following the publication of the Environment Agency Cycle 3 RBMP in 2022 (currently only in draft form for consultation).

14.1.1.7 Where limited baseline data on low flow hydrology at this stage has resulted in it not being possible to categorically screen-out watercourses using the criteria outlined in Table 1, some watercourses have remained screened-in. This screening exercise will therefore be reviewed at the detailed design stage when more flow information is available, to confirm whether these watercourses have the baseflow required to support key ecological habitats.

14.1.1.8 The WFD assessment takes into account the embedded mitigation included in the design as summarised in Table 2: Summary of mitigation embedded in design per scheme component type and outlined in the Environmental Management Plan (EMP) (Application Document 2.7). Where scheme components require further design and currently there is not enough information to determine the exact extent of impact, it is assumed that embedded mitigation required to minimise impact will be applied (as detailed in the Project Design Principles (PDP) (Application Document 5.11)) and the length of affected watercourse has been estimated using scheme design drawings and professional judgement.

14.1.1.9 Where additional mitigation to offset the potential impacts of the Project is identified, it is assumed that the additional mitigation can be undertaken within the Project Order limits, within the catchment of the relevant WFD water body. Additional mitigation will be undertaken on a watercourse of equivalent value to the affected watercourse. Any additional mitigation required are presented in this document and are also set out in the EMP (Application Document 2.7).

14.1.1.10 All impacts relating to water quality have been reported within the Highways England Water Risk Assessment Tool (HEWRAT) and any mitigation required has been embedded within the HEWRAT assessment reporting (ES Appendix 14.3: Water Quality Assessment (Application Document 3.4)). The drainage strategy has ensured the incorporation of suitable drainage systems (including balancing ponds) to intercept, attenuate and discharge runoff from the highway and other proposed infrastructure in a manner that will not significant adversely impact upon the existing flow regime or water quality of the receiving watercourse.

14.1.1.11 All impacts relating to WFD groundwater bodies have been reported within ES Appendix 14.7: Groundwater Dependent Terrestrial Ecosystem Assessment (Application Document 3.4).

14.1.1.12 It should be noted that the WFD assessment is a standalone assessment using the methodology described in section 14.1.2, and does not follow the assessment criteria outlined in the ES Volume 3 (Application Document 3.4). The terminology defining the magnitude of effect for this WFD assessment is outlined in section 14.1.6 and Annex D: Magnitude of Effects Assumptions.

14.1.1.13 The findings of this report should be read in conjunction with the detailed Habitats Regulation Assessment Stage 1: Likely Significant Effects Report (Application Document 3.5), Habitats Regulations

Assessment Stage 2: Statement to Inform Appropriate Assessment (Application Document 3.6) and the following Appendices to ES Chapter 14: Road Drainage and the Water Environment (Application Document 3.2):

- ES Appendix 14.2: Flood Risk Assessment and Outline Drainage Strategy (Application Document 3.4)
- ES Appendix 14.3: Water Quality Assessment (Application Document 3.4)
- ES Appendix 14.4: Hydromorphology Assessment (Application Document 3.4)
- ES Appendix 14.5: Spillage Risk Assessment (Application Document 3.4)
- ES Appendix 14.6: Hydrogeological Impact Assessment (Application Document 3.4)
- ES Appendix 14.7: Groundwater Dependent Terrestrial Ecosystem Assessment (Application Document 3.4)
- ES Appendix 14.8: Desk Study Karst Risk Assessment (Application Document 3.4)
- ES Appendix 14.9: Detailed Geomorphological Modelling (Application Document 3.4)
- ES Appendix 14.10: Assessment of Value (Application Document 3.4)
- ES Appendix 14.11: Non-Significant Effects (Application Document 3.4)

14.1.1.14 All elements of the design and further details of these elements are to be confirmed at the detailed design stage, within the parameters set by the Development Consent Order (DCO) Order Limits and Limits of Deviation (as defined in the DCO Works Plans (Application Document 5.16)), and will be in accordance with the commitments contained within the PDP (Application Document 5.11) and the EMP (Application Document 2.7).

14.1.1.15 As set out in the approach detailed below, the assessment reported in this WFD compliance assessment is based on a precautionary worst case scenario. As such, the mitigation identified in this assessment as being required to mitigate the likely significant effects reported are based on this worst case scenario. It may be the case that as detailed design of the Project evolves, it becomes apparent that a lesser form of mitigation is required to achieve the same outcome. As such, the EMP (Application Document 2.7) secures the 'maximum' extent of mitigation required (as identified in this assessment) but also, where appropriate, includes mechanisms (e.g. by way of further surveys or modelling) to establish, pre-construction and during detailed design, whether the identified mitigation can be refined such that a lesser extent is required to achieve the outcome reported in this assessment. The fundamental point is that the mitigation identified in this assessment is secured by the EMP, where required to achieve the outcome reported in this assessment.

14.1.2 Methodology

Guidance

14.1.2.1 This report has followed guidance (The Planning Inspectorate, 2017)[3] (Environment Agency and Department for Environment, Food and Rural Affairs, 2009)[4,] produced by the Planning Inspectorate (PINS), the Environment Agency and the Department for Environment, Food and Rural Affairs (Defra) to:

- document the baseline condition of the water environment that may be impacted by the proposed works and identify potential receptors
- screen the proposed activities for impact pathways to WFD quality elements
- scope the potential risks to WFD quality elements from the activities screened into the assessment
- carry out a detailed assessment where activities have been identified as posing a risk to the current status or future potential of WFD quality elements
- identify the need for additional mitigation to address any adverse effects and assess the residual effects to the current status or future potential of WFD quality elements
- if risks of deterioration in current status and/or prevention of attainment of status objectives cannot be mitigated, carry out a Regulation 19 exemption assessment.

14.1.2.2 Unlike in estuarine or coastal environments, there is no specific or prescribed format or process to follow for fluvial or groundwater WFD compliance assessments. This absence of prescribed approach promotes flexibility to applicants and enables them to undertake a proportionate approach.

14.1.2.3 The WFD assessment comprises the following stages:

- Stage 1: baseline assessment (screening)
- Stage 2: preliminary assessment (scoping)
- Stage 3: detailed impact assessment
- Stage 4: Identification of additional mitigation
- Stage 5: Regulation 19 considerations (where necessary).

14.1.2.4 The approach adopted is intended to ensure there is no deterioration of a water body's current status or impediment to achieving future status objectives regardless of its WFD baseline classification.

Stage 1: Baseline assessment (screening)

14.1.2.5 Initial screening identifies relevant WFD water bodies located in the zone of influence. Water bodies are selected for inclusion at this early stage of the compliance assessment with reference to the relevant RBMP.

[3] The Planning Inspectorate (2017) Advice Note 18: The Water Framework Directive. June 2017
[4] Environment Agency and Department for Environment, Food and Rural Affairs (2009) WFD Expert Assessment of Flood Management Impacts. Joint EA & DEFRA Flood and Coastal Erosion Risk Management R&D Programme. R&D Technical Report FD2609/TR.

14.1.2.6 This stage has considered whether the scheme has the potential to impact on WFD water bodies. Where impact pathways have been considered possible, the proposed zone of influence has been established based on the scheme baseline.

Water body baseline

14.1.2.7 This has been established by identifying the WFD surface water and groundwater bodies potentially affected by the Project and identifying their baseline condition, using a combination of desktop assessment and, where possible, field surveys.

14.1.2.8 The desktop assessment has collated and reviewed the water body status and status objectives information for the relevant WFD water bodies based on Environment Agency data (2019 Cycle 2 Water body Status Classification data). This data is considered to provide the current best estimate of status and the formal baseline against which the Environment Agency will assess compliance with the 'no deterioration' objective in 2022.

14.1.2.9 The following datasets have also been used to further establish the nature and existing condition of those watercourses located within WFD water bodies that are affected by the Project:

- observations from hydromorphological walkovers carried out between 25th October and 5th November 2021 by JBA (National Highways, 2022)[5]
- Environment Agency Catchment Data Explorer (Environment Agency, 2022)[6]
- Environment Agency Water Quality Archive (Environment Agency, 2019)[7]
- Natural England MAGIC (Department for Environment, Food and Rural Affairs, 2019)[8]
- Ordnance Survey (OS) mapping (including topography)
- British Geological Survey (BGS) mapping (British Geological Society, 2021)[9]
- ES Appendix 14.2: Flood Risk Assessment and Outline Drainage Strategy (Application Document 3.4)
- ES Appendix 14.3: Water Quality Assessment (Application Document 3.4)
- ES Appendix 14.4: Hydromorphology Assessment (Application Document 3.4)
- ES Appendix 14.5: Spillage Risk Assessment (Application Document 3.4)
- ES Appendix 14.6: Hydrogeological Impact Assessment (Application Document 3.4)

[5] National Highways (2022) Hydromorphological Appraisal
[6] Environment Agency (2022) Catchment Data Explorer
[7] Environment Agency (2019) Water Quality Archive
[8] Department for Environment, Food and Rural Affairs (2019) MAGIC, Interactive mapping at your fingertips
[9] British Geological Society (2021) Geology of Britain viewer

- ES Appendix 14.9: Detailed Geomorphological Modelling (Application Document 3.4)
- ES Appendix 14.7: Groundwater Dependent Terrestrial Ecosystem Assessment (Application Document 3.4)
- ES Appendix 6.19: Fish (Application Document 3.4)
- ES Appendix 6.22: White Clawed Crayfish (Application Document 3.4)
- ES Appendix 6.20: Aquatic Macrophyte and River Corridor Survey (Application Document 3.4)
- ES Appendix 6.17 Fish Habitat Assessment and MoRPh[10] (Application Document 3.4).

14.1.2.10 Potential groundwater dependent terrestrial ecosystems (GWDTEs) have been identified from statutory environmental designations in the study area and spring features have been identified from issues labelled on the OS maps. Licensed and unlicensed groundwater abstraction details have been sought from the Environment Agency or the relevant local authority.

14.1.2.11 The geomorphology baseline conditions were identified during a site walkover and details are outlined in ES Appendix 14.4: Hydromorphology Assessment (Application Document 3.4). A visual inspection during a site visit is an appropriate method for undertaking a geomorphology survey to inform this level of assessment.

14.1.2.12 To establish a baseline condition, aquatic invertebrate surveys and fish habitat mapping has been conducted for watercourses that are considered to potentially be modified by the scheme (ES Appendix 6.19 Aquatic Macrophyte and River Corridor Survey and ES Appendix 6.17 Fish Habitat Assessment and MoRPh (Application Document 3.4).

14.1.2.13 Groundwater monitoring is ongoing across the Project and has informed current reporting. Details are presented in ES Appendix 14.6: Hydrogeological Impact Assessment (Application Document 3.4).

Project baseline

14.1.2.14 Scheme components and activities that have the potential to permanently affect surface water and/or groundwater bodies, and that therefore have the potential to impact on WFD status, have been identified. This includes the identification of all relevant embedded mitigation within the Project design (outlined in the EMP (Application Document 2.7) and PDP (Application Document 5.11).

14.1.2.15 Potential impacts may result from the activities required to construct the scheme (e.g., temporary dewatering), or as a result of the scheme's design (e.g., watercourse crossings / realignments) and operation (e.g., road drainage).

14.1.2.16 The components of a road scheme are typically repeatable along its length and have therefore been categorised into generic component types (e.g. culverts, outfalls, cuttings, watercourse realignments) with

[10] Modular River Physical Habitat field survey (MoRPh)

regards to their likely impacts on surface water bodies and / or groundwater bodies.

Stage 2: Preliminary assessment (scoping)

14.1.2.17 Scoping comprises a more detailed assessment to identify risks from the scheme to receptors (within the zone of influence) on the relevant WFD water bodies and their quality elements. The aim of this assessment is to identify whether there is potential for deterioration in water body status or failure to comply with WFD objectives for any of the water bodies identified in Stage 1 and establish if further detailed assessment is required.

Stage 3: Detailed impact assessment

14.1.2.18 Stage 3 is a detailed assessment of water bodies and activities carried forward from the screening stage. It includes identification of water bodies, description of the proposed development, methods used to determine impacts, risk of deterioration, and mitigation required.

14.1.2.19 The objective of the impact assessment is to establish the nature and anticipated magnitude of the effects of relevant scheme components on the WFD quality elements of the surface water and groundwater bodies affected by the scheme. These effects are to be considered in terms of the potential for deterioration of current status and/or the prevention of status objectives. A summary of the assumptions made to determine the potential magnitudes of the effects of relevant scheme components on water bodies which have been scoped into the assessment are provided in Annex A: WFD Waterbodies.

14.1.2.20 The Environment Agency provides guidance on the definition of no deterioration (UK Technical Advisory Group, 2006)[11]. Necessary measures must be taken to prevent deterioration from one water body status class to a lower one. Furthermore, according to a recent EU Court of Justice ruling[12], within-class deterioration should also be considered as an overall deterioration of the water body status.

14.1.2.21 As recommended by in *Advice Note 18: The Water Framework Directive* (Planning Inspectorate, 2017)[13] the approach to the impact assessment is outlined in following steps:

- a description of the Project and the aspects of the development considered within the scope of the WFD assessment
- identification of water bodies that are potentially affected (directly or indirectly) or could be at risk as a result of the scheme (the zone of influence)
- collation of the baseline characteristics of the water bodies concerned

[11] UK Technical Advisory Group (2006) Prevent Deterioration of Status
[12] Court of Justice of European Union (2015) The obligations laid down by the Water Framework Directive concerning enhancement and prevention of deterioration apply to individual projects such as the deepening of a navigable river, Press Release No 74/15
[13] Planning Inspectorate (2017) Advice note eighteen: The Water Framework Directive

- description of the methods used to determine and quantify the scale of WFD impacts (described in each topic specific appendix)
- an assessment of the risk of deterioration, as a Regulation 19 derogation (see Stage 5: Regulation 19 considerations) may be required where is a there is a risk the scheme will prevent the achievement of good status or result in deterioration in status
- an explanation of any mitigation required and how its delivery is secured
- an explanation of any enhancements and/or positive contributions to the RBMP objectives proposed and how their delivery would be secured

Stage 4: Identification of additional mitigation

14.1.2.22 The Project has been developed in close consultation with fluvial geomorphologists, hydrologists, hydrogeologists, ecologists and water quality scientists.

14.1.2.23 In some cases the detailed impact assessment has identified adverse (amber) effects with a risk of deterioration in the status of water body quality elements.

14.1.2.24 To address the adverse (amber) effects further site-specific additional mitigation will be implemented to reduce the potential effects of specific scheme components.

Stage 5: Regulation 19 considerations

14.1.2.25 Residual risks of deterioration in current status and/or prevention of attainment of status objectives cannot be mitigated for these water bodies, a Regulation 19 exemption assessment will be required for each affected water body and submitted for approval by the Environment Agency (as the competent regulatory authority). Regulation 19 of The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 is the provision for a failure to achieve good groundwater status, good ecological status or (where relevant) good ecological potential, or to prevent deterioration in the status of a body of surface water or groundwater.

14.1.2.26 Whilst every effort will be made to ensure a Regulation 19 exemption assessment is not required; where unavoidable, such an assessment will be prepared on a route-wide and/or specific water body basis, as appropriate, in consultation with the Environment Agency. In all circumstances, appropriate evidence will need to be collated and presented to aid in the design decision making process and ensure that any justification is appropriate.

14.1.2.27 In accordance with Regulation 19 of the WFD Regulations, new modifications resulting in a deterioration in the current status of a water body, or the prevention of the attainment of status objectives, will not be in breach of the WFD where:

- All practicable steps have been taken to mitigate the adverse impact on the status of the body of water.
- The reasons for those modifications or alterations are specifically set out and explained in the RBMP.

- The reasons for those modifications or alterations are of overriding public interest and/or the benefits to the environment and to society of achieving the objectives set out in Regulation 13 (the environmental objectives) of the WFD Regulations are outweighed by the benefits of the new modifications or alterations to (among other things) sustainable development.
- The beneficial objectives served by those modifications or alterations of the water body cannot for reasons of technical feasibility or disproportionate cost be achieved by other means, which are a significantly better environmental option.

14.1.3 Stage 1: Baseline assessment - screening

WFD water bodies

14.1.3.1 The Project has the potential to impact upon quality elements of WFD surface water and groundwater bodies. This includes all water bodies within 1 km of the Order Limits of the Project which is considered the zone of influence. The following WFD water bodies are deemed to be within the 1km potential zone of influence of the scheme.

14.1.3.2 Surface water bodies:

- Eden - Scandal Beck to Lyvennet (GB102076070880)
- Hilton Beck (GB102076070770)
- Low Gill (Crooks Beck) (GB102076070750)
- Greta from Sleightholme Beck to Eller Beck(GB103025072140)
- Deepdale Beck from Source to River Tees (GB103025072170)
- Tees from Percy Beck to River Greta (GB103025072512)
- Greta from Gill Beck to River Tees (GB103025072130)
- Lowther (Lower) (GB102076071010
- Eamont (Upper) (GB102076071020)
- Eden Lyvennet to Eamont (GB102076070980)
- Eamont (Lower) (GB102076070990)
- Skeeby/Holme/Dalton Bk from Source to River Swale (GB104027069180)
- Trout Beck (GB102076070930)
- Crowdundle Beck – Lower (GB102076070950)
- Augill Beck (GB102076070730)
- Swindale Beck (Brough) (GB102076070760)
- Hoff Beck (lower) (GB102076070820)
- Trout Beck (Kirkby Thore) (GB102076070860)
- Trout Beck (Murton) (GB102076070850)
- Leith (GB102076070900)
- Swindale Beck nr Dufton (GB102076070960)
- Swindale Beck Great Musgrave (GB102076070650)
- Tees from River Greta to River Skerne (GB103025072190)
- Scorton Beck from Source to River Swale (GB104027069160)
- Mary Wild Beck from Source to Clow Beck (GB103025072080)
- Aldbrough Beck from Source to Clow Beck (GB103025072150).

14.1.3.3 Groundwater bodies:

- Tees Carb Limestone & Millstone Grit

- SUNO Millstone Grit and Carboniferous Limestone
- Eden Valley and Carlisle Basin Permo-Triassic sandstone aquifers
- Eden and Esk Lower Palaeozoic and Carboniferous Aquifers

14.1.3.4 However, the Project is considered unlikely to affect surface water bodies where no interaction with a watercourse is proposed. Therefore, the surface water bodies have been screened to identify the water bodies which will be directly impacted by or crossed by the Project.

14.1.3.5 A total of 10 WFD surface water bodies have been identified as having potential to be affected by the Project. These are:

- Eden - Scandal Beck to Lyvennet (GB102076070880)
- Low Gill (Crooks Beck) (GB102076070750)
- Greta from Sleightholme Beck to Eller Beck(GB103025072140)
- Tees from Percy Beck to River Greta (GB103025072512)
- Greta from Gill Beck to River Tees (GB103025072130)
- Eamont (Upper) (GB102076071020)
- Eden Lyvennet to Eamont (GB102076070980)
- Eamont (Lower) (GB102076070990)
- Skeeby/Holme/Dalton Bk from Source to River Swale (GB104027069180)
- Trout Beck (GB102076070930).

14.1.3.6 These surface water bodies are shown in ES Figure 14.3: WFD Surface Water Bodies (Application Document 3.3).

14.1.3.7 A total of four WFD groundwater bodies have also been screened in. These are:

- Tees Carb Limestone & Millstone Grit
- SUNO Millstone Grit and Carboniferous Limestone
- Eden Valley and Carlisle Basin Permo-Triassic sandstone aquifers
- Eden and Esk Lower Palaeozoic and Carboniferous Aquifers.

14.1.3.8 These groundwater bodies are shown in ES Figure 14.4: WFD Groundwater Bodies (Application Document 3.3).

14.1.3.9 Across the 10 surface water bodies, a total of 47 individual surface watercourses were identified as having potential to be affected by the Project. This includes ordinary watercourses and Main Rivers that are WFD water bodies or tributaries of WFD water body main river lines. Of these watercourses, 44 have been screened into the assessment.

14.1.3.10 Watercourses were screened in for the assessment based on the criteria outlined in Screening criteria for WFD watercourses, which have been developed using professional experience and judgement. Where the screening criteria could not be applied to a watercourse due to insufficient data or lack of site survey data, the watercourse was screened in as part of a conservative assessment. This screening will therefore be reviewed and updated at the detailed design stage when more information on individual watercourses is available to establish whether or not refinements to the mitigation secured in the EMP/PDP can be made whilst ensuring no deterioration to the WFD Water Bodies occurs. These watercourses

are discussed in section 14.1.5: Water body baseline information and Annex A: WFD Waterbodies.

Table 1: Screening criteria for WFD watercourses

Watercourse category	Criteria	Screening Outcome	Receptor Value
No channel present	No evidence of presence of surface water feature (no defined channel present or evidence of historical channel but is now in filled)	Out	N/A
Channel with no baseflow* / Minor Tributary	Ordinary Watercourse Minor tributary (within WFD water body catchment). Artificially created drainage channel or small natural headwater or ephemeral channel. Channel with little or no baseflow. Absence of flowing water for majority of year / limited connection to water table (potential to dry out). Shallow, ponded water present at times. No regular fluvial geomorphological processes or features present Low potential to support freshwater fish, macroinvertebrate, and/or macrophyte species Riparian zone typically impacted by land use / regular vegetation management Low overall aquatic habitat and hydromorphological value	Out	Low
Channel with limited baseflow** / Moderate Tributary	Ordinary Watercourse or Main River that is a tributary of the WFD water body main river line Moderate tributary (within WFD water body catchment). Artificially created drainage channel or small natural channel. Channel with limited baseflow. Typically shallow low flows. Non-definable morphological flow types, except in localised and isolated reaches Limited and discrete active fluvial geomorphological processes and features Limited potential to support freshwater fish, macroinvertebrate, and/or macrophyte species Riparian zone may be impacted by land use / regular vegetation management in some cases Moderate overall aquatic habitat and hydromorphological value	In	Moderate
Channel with limited baseflow** / Moderate Tributary within a Sensitive Area	As above Located within an area Designated SSSI, SAC or SPA	In	
"Modified' channel with permanent baseflow*** / Primary Watercourse	Main River or a significant Ordinary Watercourse. WFD water body main river line. Modified natural channel with permanent baseflow. Likely designated as Heavily Modified Water Body (HMWB) under WFD. Definable flow types (but diversity impacted by modifications) Active fluvial geomorphological processes and features (but functionality and diversity impacted by modifications) Potential to support some freshwater fish, macroinvertebrate, and/or macrophyte species (but habitat value impacted by modifications)	In	High

Watercourse category	Criteria	Screening Outcome	Receptor Value
	Riparian zone typically impacted by land use / regular vegetation management Aquatic habitat and hydromorphological potential (but currently restricted by modifications)		
"Functioning' channel with permanent baseflow*** / Primary Watercourse within a sensitive area	As above Located within an area Designated SSSI, SAC or SPA	In	Very High
* Sites typically assessed has having Q95 (the 5 percentile, low flow) flow ≤0.002m3/s ** Sites typically assessed has having Q95 flow >0.002m3/s to ≤0.01m3/s *** Sites typically assessed has having Q95 flow >0.01m3/s			

Scheme baseline components

14.1.3.11 This report has considered all schemes that make up the Project that have the potential to permanently affect surface water bodies and groundwater bodies, and therefore have the potential to impact on WFD status. All schemes have been assessed individually before the combined effect of the Project on quality element status is considered.

14.1.3.12 The Project comprises eight schemes to dual the A66 between Penrith and Durham including:

- M6 Junction 40 to Kemplay Bank
- Penrith to Temple Sowerby
- Temple Sowerby to Appleby
- Appleby to Brough
- Bowes Bypass
- Cross Lanes to Rokeby
- Stephen Bank to Carkin Moor
- A1(M) Junction 53 Scotch Corner.

14.1.3.13 It should be noted that the A1(M) Junction 53 Scotch Corner scheme has been screened out of this WFD assessment as it is not considered to affect WFD water bodies as no surface watercourse crossings are proposed and the scheme will tie into existing highway drainage.

14.1.3.14 Linear infrastructure projects, such as roads, typically have generic scheme components that are repeated across the length of the scheme. A total of nine such scheme components have been identified within the Project that may directly or indirectly affect surface water bodies along the scheme alignment, these include:

- New culverts
- extensions to existing culverts
- removal of existing culverts
- clear span bridges (single span)
- viaducts (comprising a series of arches, piers or columns to support the structure)
- channel modifications/works (i.e., modifying or formalising drainage channels or minor tributaries)
- watercourse realignments
- road drainage outfalls
- flood compensations areas.

14.1.3.15 These scheme components, and any cuttings that may be required for the Project, may also directly or indirectly affect groundwater bodies through temporary dewatering activities, damming of groundwater flows or reducing groundwater contributions and through surface-groundwater interactions.

14.1.3.16 Relevant mitigation has been embedded into the design of these scheme components to avoid or minimise potential impacts, wherever possible. These embedded mitigation are outlined in Table 2: Summary of mitigation embedded in design per scheme component type, and detailed in the Environmental Mitigation Plan (EMP)

(Application Document 2.7) and secured by a requirement of the DCO
.

Table 2: Summary of mitigation embedded in design per scheme component type

Scheme Component	Embedded Mitigation
New Culverts Access road culverts Extension of existing culverts	Culvert lengths have been reduced as far as reasonably practicable. Culverts have been designed to be perpendicular to associated road crossings where possible, to minimise culvert lengths and reduce potential shading effects. Culverts have been designed to accommodate flood flows up to and including the 1 in 100 (1%) annual probability storm with an allowance for climate change based on latest guidance issued by the Environment Agency. For box culverts, the invert level of each culvert is to be buried below the existing bed level of the watercourse, in order to reduce disruption to sediment transfer and to allow build-up of natural substrate, whilst culvert dimensions have been sized to minimise impacts on flow continuity. The detailed design of all culverts is to be developed in general accordance with Construction Industry Research and Information Association and Environment Agency guidance and will ensure appropriate low-flow water depths and velocities for fish passage. The detailed design will, where reasonably practicable, aim to incorporate hydromorphological improvements on the river channel, which will be undertaken immediately upstream and downstream of the culvert to compensate for footprint loss. Where necessary, the requirement for wingwalls will be determined at the detailed design stage and will be designed to ensure as much natural light as possible can enter the culvert.
Drainage Outfalls	Surface water drainage to be appropriately treated and attenuated prior to drainage outfall to ensure no adverse impact on surface water quality or flow regimes. The specific detail of any mitigation will be developed during detailed design phase, however, the quantity or channel length required to be improved is provided in the detailed assessment stage. Embedded mitigation for these structures will include provision of scour protection only where necessary and inclusion and design of headwalls in keeping with the surroundings and maximising openings. The design will minimise the footprint of any outfall within the channel and be suitably sized compared to the size of the channel. All designs to be informed by a Fluvial Geomorphologist at the detailed design stage.
Realignment	Where permanent watercourse realignments are proposed, the aim will be to design these with equivalent hydraulic capacity to the existing channels. The detailed design will aim to ensure that field subsurface drainage systems can be adapted to discharge into the new realigned channels. The detailed design of permanent watercourse realignments will aim to incorporate appropriate features to retain, and, where reasonably practicable, enhance the watercourse's hydromorphological condition. The new realigned channels will be designed in consultation with the Environment Agency and with input from a suitably qualified Fluvial Geomorphologist and Aquatic Ecologist. The detailed design of permanent watercourse realignments will aim, where reasonably practicable, to incorporate measures to improve the watercourse's hydromorphological status (provided this is compatible with the watercourse's flood risk and land drainage functions). This may include but not be restricted to the following in-channel enhancements (as appropriate to the hydromorphological regime of the watercourse at the site location), which will be designed in consultation with the Environment Agency and with input from a suitable qualified Fluvial Geomorphologist and Aquatic Ecologist: • re-meandering of watercourses (where site extent allows)

Scheme Component	Embedded Mitigation
	• provision of in-channel fluvial geomorphological features such as berms and bars to promote flow sinuosity and width/depth variation and provide marginal habitat • improvement of morphological flow types such as pools, riffles and runs, to provide aquatic habitat diversity • provision of defined low-flow channels to sustain appropriate flow depths and velocities and improve potential for fish passage • provision of varied channel bank profiles to improve morphological diversity, included areas of shallow-graded channel banks to allow for marginal vegetation growth. Proposed realignments will incorporate a 10m wide buffer strip on both sides of the new channel in order to allow for, where practicable, the implementation of marginal and riparian habitat improvements.
Viaduct	Viaduct piers avoid the river channel and riparian zone. Viaducts have been designed to cross perpendicular to river channels wherever possible, in order to reduce potential shading effects widths have been reduced as far as reasonably practicable.
Channel works	Mitigation requirements and details to be developed during detailed design phase. The channel should be left in the same or better state than existing channel, to be determined by appropriately qualified Aquatic Ecologist and Fluvial Geomorphologist.
Flood Compensation Area	Mitigation requirements and details to be developed during detailed design phase. Flood compensation areas will typically comprise regrading of land up to 300mm and will not alter the flood mechanism or reduce the connectivity of the affected watercourse and its floodplain. Flood storage areas will be designed such that any fish located within the flood storage area can return to the channel as the floodwater recedes by appropriately grading the flood storage area, which will be undertaken at detailed design stage with input from a suitably qualified Fluvial Geomorphologist and Aquatic Ecologist. The flood storage areas will look and function as similar to the existing floodplain as possible and maintain a natural connection to the watercourse without the use of artificial engineered structures wherever possible. Where flow control structures are required, these will be carefully designed to ensure flows under normal conditions are not adversely effected and the structure does not adversely affect upstream-downstream continuity (i.e. fish passage). Design of any flow control structures will be undertaken at detailed design stage with input from a suitably qualified hydrologist, Fluvial Geomorphologist and Aquatic Ecologist. The flood storage areas will not alter river continuity or low flows.

14.1.3.17 Individual scheme components with the potential to affect the surface water bodies screened in for the WFD detailed impact assessments have been identified and catalogued route-wide. These scheme components are summarised in relation to the relevant surface water body catchment and watercourse in Annex C: Preliminary assessment (scoping).

Construction impacts

14.1.3.18 Construction activities are considered to normally have a temporary impact. Typically, temporary impacts are reviewed on a case-by-case basis and are not considered to result in a deterioration of status if the water body:

- is only impacted for a short time period (<1 year)
- is likely to recover within a short time period (<1 year)
- is likely to recover without the need for any restoration measures

14.1.3.19 Table 3: Screening of construction impacts for risks to WFD quality elements summarises the potential impacts of the Project during the construction phase, and the screening outcomes.

Table 3: Screening of construction impacts for risks to WFD quality elements

Potential impact	Screen in/out	Justification
Temporary dewatering to enable construction (e.g. for cuttings)	Out	The construction of the Project will adhere to best practice method statements, including measures to avoid and/or minimise disturbance of the water environment (detailed in the EMP (Application Document 2.7). Site investigation and monitoring will also be implemented before, during and after dewatering and excavation activities, in order to protect the integrity of nearby surface water features.
Noise and vibration during construction	Out	The construction of the Project will adhere to best practice method statements which include measures to avoid and/or minimised disturbance to the water environment (detailed in the EMP (Application Document 2.7).
Footprint (e.g. the area of channel impacted by realignment or other in-channel works)	Out	The construction of the Project will adhere to best practice method statements which include measures to avoid and/or minimised disturbance to the water environment (detailed in the EMP (Application Document 2.7).
Pollution risk and altered drainage patterns from general construction activities (e.g. establishing construction compounds and haul routes)	Out	The construction of the Project will adhere to best practice method statements which include measures to avoid and/or minimised disturbance to the water environment (detailed in the EMP (Application Document 2.7). Construction activities will be temporary in nature.
'Damming' of groundwater flow and reduction in groundwater contributions	Out	The construction of the Project will adhere to best practice method statements which include measures to avoid and/or minimised disturbance to the water environment (detailed in the EMP (Application Document 2.7). Construction activities will be temporary in nature.

Potential impact	Screen in/out	Justification
Creating or altering of pathways along which existing poor quality groundwater can migrate	Out	The construction of the Project will adhere to best practice method statements which include measures to avoid and/or minimised disturbance to the water environment (detailed in the EMP (Application Document 2.7). Construction activities will be temporary in nature.

14.1.3.20 The assessment has considered all 'scheme components' that have the potential to permanently affect surface water and groundwater bodies, and therefore have the potential to impact upon WFD status. It is assumed that construction impacts will be temporary and as such, short-term effects associated with construction have been screened out where they would not affect quality element status. Mitigation required to negate construction impacts as set out above will be secured through the Environmental Management Plan (EMP) (Application Document 2.7).

Operational impacts

14.1.3.21 The potential permanent impacts identified from the operational phase of the Project have been identified in Table 4: Screening of operational impacts for risks to WFD quality elements.

Table 4: Screening of operational impacts for risks to WFD quality elements

Potential impacts	Screen in/out	Explanation
Footprint (e.g. in-channel structures or length of realigned channel)	In	The design of the Project has sought to reduce the length of impacted river channel as far as reasonably practicable. However, scheme components will result in a localised loss of existing river channel habitat.
Changes in flow velocity and volume due to dewatering	Out	Impact assessed in ES Appendix 14.6: Hydrogeological Impact Assessment (Application Document 3.4) and considered to have a negligible impact at waterbody scale.
Shading due to the presence of a structure	In	The Project has sought to reduce shading as far as reasonably practicable by minimising the length of structures and/or seeking to cross watercourses at an angle of 90° where possible. However, the Project will result in periodic and/or permanent shading of sections of the channel.
Changes to drainage patterns discharging to surface water body	Out	The design of the Project will adhere to best practice method statements (detailed in the EMP (Application Document 2.7), including measures to appropriately manage surface water and sediment runoff prior to discharge to the watercourse. The drainage strategy has ensured the incorporation of suitable drainage systems (including balancing ponds) to intercept, attenuate and discharge runoff from the highway and other proposed infrastructure in a manner that will not significant adversely impact upon the existing flow regime or water quality of receiving watercourse.
Changes to water body hydromorphology leading to changes in river processes and habitats upstream and downstream	In	The Project has sought to reduce hydromorphological impacts as far as reasonably practicable by minimising any in-channel channels. The design of any new or altered channel will ensure the equivalent hydraulic capacity and will aim to

Potential impacts	Screen in/out	Explanation
		incorporate appropriate features equivalent to those lost along the existing channel footprint. In addition, where reasonably practicable, the design will aim to enhance hydromorphological condition over the existing condition (provided this is compatible with the watercourses' flood risk and land drainage functions). However, the Project will result in localised changes in the hydromorphological regime of affected watercourses.
Changes in water quality due to discharge of groundwater to surface water body	Out	Impact not relevant to Project as no permanent drainage of cuttings to surface waterbodies is proposed.
Creation of new habitats	In	The Project will involve the creation of new river channel and riparian habitat, and where reasonably practicable, the design will aim to enhance hydromorphological condition over the existing condition (provided this is compatible with the watercourses' flood risk and land drainage functions).
Settlement of ground leading to enhancement of fractures and increased vertical permeability where applicable	Out	Impact not relevant to Project (see ES Appendix 14.6: Hydrogeological Impact Assessment and 14.8: Desk Study Karst Risk Assessment (Application Document 3.4)

14.1.4 Stage 2: Preliminary assessment – scoping

Likely effects on current status

14.1.4.1 The scope of the detailed assessment is based upon the activities identified as potentially posing a risk to WFD quality elements in the screening assessment. The study area extends to the water bodies screened in within section 14.1.3.

14.1.4.2 A preliminary assessment of the likely effects of each of the scheme components making up the Project on the various WFD status elements of the surface water and groundwater bodies concerned, is summarised in the following sections and in Table 16: Summary of preliminary assessment (scoping) of the likely effects of the Project on the WFD status elements of surface water bodies.

14.1.4.3 All scheme components making up the Project have been assessed on a case-by-case basis, taking into account the avoidance of impact and any embedded mitigation included in the design.

Biological effects

14.1.4.4 Effects on biological status are considered in terms of likely change in composition and abundance of phytobenthos, macrophytes and macroinvertebrate communities and for fish on composition, abundance and age structure of communities.

14.1.4.5 The likely effects of the relevant scheme component types (which comprise the Project) scoped in for assessment on biological status are summarised in Table 4: Screening of operational impacts for risks to WFD quality elements.

Table 5: Likely biological effects of scheme components

Scheme Component type	Likely biological effects of scheme component	
	Impact Type	Impact Description
Viaduct	Shading	Viaducts will likely cause some minor, localised and periodic shading of the river channel. This may result in some localised reduction in photosynthetic activity. In most cases, this is anticipated to have a negligible effect on macrophytes and phytobenthos, macroinvertebrates and fish.
	Footprint	In some cases, viaducts may be required with pier footings located within the channel. This will cause a localised impact on hydromorphology and aquatic and/or bankside habitats. Some localised but permanent modifications to the river channel may also be required around the footings (e.g. local re-profiling and/or the installation of bank protection). In most cases, this is anticipated to have a minor, localised adverse effect on macrophytes and phytobenthos, macroinvertebrates and fish.
Clear span bridges	Shading	Clear span bridges will cause localised but permanent shading of a section of the river channel. This may result in a localised reduction in photosynthetic activity for macrophytes and phytobenthos. This is anticipated to have a minor, localised adverse effect on macrophytes, phytobenthos, macroinvertebrates and fish.
New Culvert / Extension of existing culvert/ Access road culvert	Footprint and shading	Culverts will cause a localised but permanent loss of a section of existing river channel and localised but permanent shading of the river channel within the footprint of the culvert. The magnitude of effect will be dependent on the length of proposed culvert and its location within the river network. In most cases, this is anticipated to have a minor, localised adverse effect on macrophytes and phytobenthos, macroinvertebrates and fish. However, where the length of proposed culvert is significant, depending on the location within the river network, this may have a more widespread, adverse effect on fish due to impacts on fish passage and spawning migration.
	Changes to hydromorphology leading to changes in process and habitat upstream and/or downstream	Culverts will also cause a localised but permanent change to the hydromorphological regime, which may lead to changes in river processes and habitat upstream and downstream. However, due to the mitigation included within the design, this is anticipated to have a negligible effect on macrophytes and phytobenthos, macroinvertebrates and fish.
Removal of existing culvert	Footprint / creation of new habitat	Daylighting/removal of existing culverts will result in a localised but permanent increase in open river channel and riparian habitat and a reduction in shading of the watercourse. The magnitude of effect will be dependent on the length of culvert that is daylighted/removed and its location within the river network. In most cases, this is anticipated to have a minor, localised beneficial effect on macrophytes, phytobenthos, macroinvertebrates and fish. However, where the length of existing culvert to be daylighted/removed is significant, and/or the existing culvert dimensions are

Scheme Component type	Likely biological effects of scheme component	
	Impact Type	Impact Description
		currently restricting continuity, daylighting/removal may provide a more widespread beneficial effect on biological elements (including improvements in fish passage and spawning migration).
	Changes to hydromorphology leading to changes in process and habitat upstream and/or downstream	Daylighting/removal of existing culverts will also cause localised but permanent changes in hydromorphological regime, which may in turn lead to changes in river processes and habitats upstream and downstream. In most cases, this is anticipated to have a negligible or minor, localised beneficial effect on macrophytes, phytobenthos, macroinvertebrates and fish. However, where the length of the culvert to be daylighted/removed is significant, or where the existing culvert is currently impacting upon river continuity and sediment transfer, this may provide a more widespread beneficial effect on macrophytes, phytobenthos, macroinvertebrates and fish.
Drainage outfall	Footprint	New drainage outfalls will have a localised impact on water bodies associated with the footprint of any associated scour protection. The requirement for scour protection will be determined at the detailed design stage, and the footprint will be minimised as far as reasonably practicable to minimise any loss of habitat. This is anticipated to have a negligible effect on macrophytes and phytobenthos, macroinvertebrates and fish.
	Changes to hydromorphology leading to changes in process and habitat upstream and/or downstream	New highway outfalls will also cause a localised but permanent change in hydromorphological regime, which may lead to changes in river processes and habitat upstream and downstream. In most cases, this is anticipated to have a negligible effect on macrophytes and phytobenthos, macroinvertebrates and fish.
	Drainage (changes in water quantity or quality due to discharge of surface water runoff to surface water body	New drainage outfalls will include measures to appropriately manage surface water and sediment runoff prior to discharge to the watercourse. The drainage strategy has ensured the incorporation of suitable drainage systems (including balancing ponds) to intercept, attenuate and discharge runoff from the highway and other proposed infrastructure in a manner that will not significantly adversely impact upon the existing flow regime or water quality of receiving watercourse or habitat. This is anticipated to have a negligible effect on macrophytes and phytobenthos, macroinvertebrates and fish.
Watercourse Realignment	Footprint	Realignments/diversions will result in the permanent loss of existing sections of river channel and riparian habitat. However, the newly created realigned/diverted channel will provide features equivalent to those lost in the existing channel and, where reasonably practicable, will aim to provide hydromorphological improvements over the existing condition. In addition, all realigned/diverted channels will incorporate an appropriately sized buffer strip to allow for marginal and riparian habitat creation/improvements. Realignments/diversions could therefore have either a negligible effect, a minor, localised adverse effect, or a minor, localised beneficial effect on macrophytes and phytobenthos, macroinvertebrates and fish; depending on the net loss or a net gain in river habitat and the existing condition of the watercourse.

Scheme Component type	Likely biological effects of scheme component	
	Impact Type	Impact Description
	Changes to hydromorphology leading to changes in process and habitat upstream and/or downstream	Realignments/diversions will result in a localised but permanent change in hydromorphological regime, with potential resultant changes to river processes and habitat upstream and downstream. In most cases, given appropriate design of the realigned/diverted channel, this is anticipated to have a negligible if not beneficial long-term effect on macrophytes, phytobenthos, macroinvertebrates and fish.
Flood Compensation Areas	Changes to hydromorphology leading to changes in process and habitat upstream and/or downstream	Flood Compensation Areas will potentially result in a localised but temporary change in hydromorphological regime during flood events, with potential resultant changes to river processes and habitat upstream and downstream of the connection with the watercourse. In most cases, given appropriate design of the realigned/diverted channel, this is anticipated to have a negligible effect on macrophytes, phytobenthos, macroinvertebrates and fish.

Physicochemical effects

14.1.4.6 Effects on physicochemical status are considered in relation to likely changes in the chemical composition of phosphate and ammonia and for physical changes which cause variations in dissolved oxygen, pH and temperature within a water body.

14.1.4.7 Disruption of contaminated land presents a potential impact to groundwater and surface water quality and will be identified and mitigated for by way of removal or remediation at the detailed design stage as detailed in the EMP (Application Document 2.7). Refer to ES Chapter 9 Geology and Soils (Application Document 3.2) for detailed information regarding contaminated land. Currently, no scheme components are considered likely to cause impacts on physicochemical quality elements associated with runoff/drainage from areas of existing contaminated land in consideration of the controls and mitigation outlined in the EMP (Application Document 2.7).

14.1.4.8 The likely effects of the relevant scheme component types scoped in for assessment on physicochemical status are summarised in Table 6: Likely physiochemical effects of scheme components.

Table 6: Likely physiochemical effects of scheme components

Scheme Component type	Likely physicochemical effects of scheme component	
	Impact Type	Impact Description
Viaduct	Shading	Viaducts will likely cause some minor, localised and periodic shading of the river channel. This is anticipated to have a negligible effect on water temperature and dissolved oxygen (due to potential localised reductions in photosynthetic activity by aquatic flora).

Scheme Component type	Likely physicochemical effects of scheme component	
	Impact Type	Impact Description
Clear span bridges	Shading	Clear span bridges will cause localised but permanent shading of a section of the river channel. In most cases, this is anticipated to have a negligible effect on water temperature and dissolved oxygen levels (due to a reduction in photosynthetic activity by aquatic flora).
Culvert / Extension of existing culvert/ Access road culvert	Shading	Culverts will cause localised but permanent shading of the watercourse. The magnitude of effect will be dependent on the length of culvert and baseline condition of the reach of watercourse affected. In most cases, this is anticipated to have a negligible effect on water temperature and dissolved oxygen levels (due to potentially reduced photosynthetic activity by aquatic flora).
	Changes to hydromorphology leading to changes in process and habitat upstream and/or downstream	Culverts will also cause a localised but permanent change in hydromorphological regime, which may in turn lead to changes in river processes and habitat upstream and downstream. Given mitigation included within the design of the culverts to minimise impacts on sediment transfer and flow continuity, in most cases this is anticipated to have a negligible effect on dissolved oxygen.
Removal of existing culvert	Shading	Daylighting/removal of existing culverts will result in a localised but permanent reduction in shading of the watercourse. The magnitude of effect will be dependent on the length of culvert that is daylighted/removed. In most cases, this is anticipated to have a negligible effect on water temperature and dissolved oxygen levels (due to a potential increase in photosynthetic activity by aquatic flora).
	Changes to hydromorphology leading to changes in process and habitat upstream and/or downstream	Daylighting/removal of existing culverts will also cause localised but permanent changes in hydromorphological regime, which may lead in turn to improvements in river processes and habitats upstream and downstream. In most cases, this is anticipated to have a negligible effect or a minor, localised beneficial effect on dissolved oxygen.
Drainage outfall	Drainage (changes in water quantity or quality due to discharge of surface water runoff to surface water body	New drainage outfalls will include measures to appropriately manage surface water and sediment runoff prior to discharge to the watercourse. The drainage strategy as defined in ES Appendix 14.2 Flood Risk Assessment and Outline Drainage Strategy, Application Document 3.4 states that the design will incorporate suitable drainage systems (including balancing ponds) to intercept, attenuate and discharge runoff from the highway and other proposed infrastructure in a manner that will not significantly adversely impact upon the existing flow regime or water quality of receiving watercourse or habitat. This is secured in the EMP (Application Document 2.7). This is anticipated to have a negligible effect on dissolved oxygen.
	Changes to hydromorphology leading to changes in process and habitat upstream and/or downstream	New highway outfalls will also cause a localised but permanent change in hydromorphological regime. In most cases, this is anticipated to have a negligible effect on dissolved oxygen.
Realignment	Footprint	Realignments/diversions will result in the permanent loss of existing river channel and riparian habitat. However, the newly created realigned/diverted channel will provide features equivalent to

Scheme Component type	Likely physicochemical effects of scheme component	
	Impact Type	Impact Description
		those lost in the existing channel and, where reasonably practicable, will aim to provide hydromorphological improvements over the existing condition. In addition, all realigned/diverted channels will incorporate an appropriately sized buffer strip to allow for marginal and riparian habitat creation/improvements where practicable. This, in turn, may reduce bank erosion (e.g. via poaching by livestock) and sediment runoff and nutrient loading from adjacent land. In most case, this is anticipated to have a negligible effect on dissolved oxygen, phosphate and ammonia concentrations.
	Changes to hydromorphology leading to changes in process and habitat upstream and/or downstream	Realignments/diversions will also result in a localised and permanent change in hydromorphological regime, which may in turn lead to changes in river processes and habitat upstream and downstream. In most cases, given appropriate design of the realigned/diverted channel, this is anticipated to have a negligible effect on dissolved oxygen.
Flood Compensation Areas	Changes to hydromorphology leading to changes in process and habitat upstream and/or downstream	Flood Compensation Areas will potentially result in a localised but temporary change in hydromorphological regime during flood events, which may in turn lead to changes in river processes and habitat upstream and downstream. In most cases, given appropriate design of the Flood Compensation Areas and temporary nature of their operation, this is anticipated to have a negligible effect on dissolved oxygen.

Specific pollutants effects

14.1.4.9 Effects on specific pollutants are considered in relation to likely changes in the concentrations of relevant substances, such as copper, triclosan, and zinc.

14.1.4.10 Disruption of contaminated land presents a potential impact to groundwater and surface water quality and will be identified and mitigated for by way of removal or remediation at the detailed design stage (see EMP (Application Document 2.7), although it is noted that no contamination has been identified through surveys to date. However, no evidence of contamination has been identified through surveys to date. Accordingly, no scheme components are considered likely to cause impacts on physicochemical quality elements associated with runoff/drainage from areas of existing contaminated land in consideration of the controls and mitigation outlined in the EMP (Application Document 2.7).

14.1.4.11 The likely effects of the relevant scheme component types scoped in for assessment on specific pollutants status are summarised in Table 7: Likely specific pollutant effects of scheme components.

Table 7: Likely specific pollutant effects of scheme components

Scheme Component type	Likely specific pollutants effects of scheme component	
	Impact Type	Impact Description
Viaduct	None	No anticipated effects.
Clear span bridges	None	No anticipated effects.
Culvert / Extension of existing culvert/ Access road culvert	None	No anticipated effects.
Removal of existing culvert	None	No anticipated effects.
Drainage outfall	Drainage (changes in water quantity or quality due to discharge of surface water runoff to surface water body	New drainage outfalls will include measures to appropriately manage surface water and sediment runoff prior to discharge to the watercourse. The drainage strategy has ensured the incorporation of suitable drainage systems (including balancing ponds) to intercept, attenuate and discharge runoff from the highway and other proposed infrastructure in a manner that will not significantly adversely impact upon the existing flow regime or water quality of receiving watercourse or habitat. This is anticipated to have a negligible effect on specific pollutants such as copper and zinc (see ES Appendix 14.3: Water Quality Assessment (Application Document 3.4).
	Changes to hydromorphology leading to changes in process and habitat upstream and/or downstream	New highway outfalls will also cause a localised but permanent change in hydromorphological regime. In most cases, this is anticipated to have a negligible effect on the concentrations of specific pollutants.
Realignment	None	No anticipated effects.
Flood Compensation Areas	None	No anticipated effects.

Hydromorphological effects

14.1.4.12 Effects on hydromorphological status are considered in relation to quantity and dynamics of flow, river continuity, river depth and width variation, structure and substrate and structure of the riparian zone.

14.1.4.13 The likely effects on hydromorphological status of the relevant scheme component types scoped in for assessment are summarised in Table 8: Likely hydromorphological effects of scheme components.

Table 8: Likely hydromorphological effects of scheme components

Scheme Component type	Likely hydromorphological effects of scheme component	
	Impact Type	Impact Description
Viaduct	None	No anticipated effects in channel (see ES Appendix 14.4: Hydromorphology Assessment (Application Document 3.4) for assessment of floodplain effects)
Clear span bridges	None	No anticipated effects.
Culvert / Extension of existing culvert/ Access road culvert	Footprint and Shading	Culverts will cause a localised but permanent loss of a section of open river channel and riparian habitat, including permanent shading of the watercourse, within the footprint of the culvert. The magnitude of effect will be dependent on the length of culvert and baseline condition of the reach of watercourse affected. In most cases, this is anticipated to have a minor, localised adverse effect on local flow dynamics, connection to groundwater, river continuity, river depth and width, the structure and substrate of the river bed, and the structure of the riparian zone. However, where the length of proposed culverts is significant, this may have a more widespread adverse effect on these hydromorphological elements.
Removal of existing culvert	Changes to hydromorphology leading to changes in process and habitat upstream and/or downstream	Culverts will also cause a localised but permanent change in hydromorphological regime, which may lead to changes in river processes and habitat upstream and downstream. However, due to the mitigation included within the design, this is anticipated to have a negligible effect on flow dynamics, river width and depth, and structure and substrate of the river bed.
Removal of existing culvert	Footprint, Shading and creation of new habitats	Daylighting/removal of existing culverts will result in a localised but permanent increase in open river channel and a reduction in shading of the watercourse within the footprint of the existing culvert. The magnitude of effect will be dependent on the length of culvert that is daylighted/removed. In most cases, this is anticipated to have a minor, localised beneficial effect on flow dynamics, connection to groundwater, river continuity, river depth and width, structure and substrate of the river bed, and structure of riparian zone. However, where the length of existing culvert to be daylighted/removed is significant, and/or the existing culvert dimensions are currently restricting continuity, daylighting/removal may provide a more widespread beneficial effect on these hydromorphological elements.
	Changes to hydromorphology leading to changes in process and habitat upstream and/or downstream	Daylighting/removal of existing culverts will also cause a localised but permanent change in hydromorphological regime, which may in turn lead to changes in river processes and habitat upstream and downstream. In most cases, this is anticipated to have a negligible effect on hydromorphology elements. However, where the length of the culvert to be daylighted/removed is significant, or where

Scheme Component type	Likely hydromorphological effects of scheme component	
	Impact Type	Impact Description
		the existing culvert is currently impacting upon river continuity and sediment transfer, this may provide a more widespread beneficial effect on hydromorphology elements.
Drainage outfall	Changes to hydromorphology leading to changes in process and habitat upstream and/or downstream	New highway outfalls will also cause a localised but permanent change in hydromorphological regime, which may lead to changes in river processes and habitat upstream and downstream. In most cases, this is anticipated to have a negligible effect on local flow dynamics and river depth and width.
Realignment	Footprint	Realignments/diversions will result in the permanent loss of a section of existing river channel. However, realigned/diverted channels will provide features equivalent to those lost in the existing channel and, where reasonably practicable, will aim to provide hydromorphological improvements over the existing condition (see EMP (Application Document 2.7)). In addition, all realignments and diversions will incorporate an appropriately sized buffer strip for marginal and riparian habitat creation/improvements. Where the existing hydromorphological value of the watercourse is limited or degraded, this is anticipated to have a negligible or minor, localised beneficial effect on hydromorphology elements. However, the realignment/diversion of reaches with well-developed riparian habitats may have a minor, localised adverse effect or adverse effect on the structure of the riparian zone (until riparian vegetation fully re-establishes).
	Changes to hydromorphology leading to changes in process and habitat upstream and/or downstream	Realignments/diversions will also result in a localised but permanent change in hydromorphological regime, which may in turn lead to changes in river processes and habitat upstream and downstream. In most cases, given appropriate design of the realigned/diverted channel, this is anticipated to have a negligible effect on hydromorphology elements.
Flood Compensation Areas	Changes to hydromorphology leading to changes in process and habitat upstream and/or downstream	Flood Compensation Areas will potentially result in a localised but short-term change in hydromorphological regime during flood events, which may in turn lead to changes in river processes and habitat upstream and downstream. In most cases, given appropriate design of the Flood Compensation Areas and temporary nature of their operation, this is anticipated to have a negligible effect on local flow dynamics and river depth and width.

Groundwater

14.1.4.14 Effects on groundwater are considered in relation to quantitative and chemical components. Details of these component aspects can be found in section 14.1.4 and Table 6: Likely physiochemical effects of scheme components

14.1.4.15 A total of four groundwater bodies have been identified as having potential to be affected by the Project. These water bodies are summarised in section 14.1.5.

14.1.4.16 Following desk study and walkover surveys, a total of 77 groundwater features (including springs, groundwater dependent habitats, and groundwater abstractions) within these groundwater bodies were screened in for detailed impact assessment. These are summarised in Annex A2: WFD Groundwater. A breakdown of the current (2019 Cycle 2 RBMP) status and status objectives data of the relevant groundwater bodies, together with descriptions of each groundwater feature and their locations relative to the proposed route, is also provided in the aforementioned Annex.

14.1.4.17 The likely effects on groundwater status of the relevant scheme component types scoped in for assessment are grading, embankments & culverts, cuttings, retaining walls, foundations, overbridge foundations, stabilisation works, borrow pits, and other works. Following scoping against these effects no groundwater bodies are taken forward for detailed impact assessment (DIA) due to the fact that the scale of these likely effects in terms of spatial extent, depth, and zone of influence is anticipated to be small and negligible compared to the four groundwater bodies affected. For further detail on this evaluation the ES Appendix 14.6: Hydrogeological Impact Assessment and ES Appendix 14.7: Groundwater Dependent Terrestrial Ecosystem Assessment (Application Document 3.4) should be consulted.

14.1.4.18 Therefore, the scheme component effects are not anticipated to pose any risk quantitatively or chemically to the status of the groundwater bodies, and thus the groundwater bodies have been scoped out of the detailed impact assessment (DIA).

Likely effects on achievement of future status objectives

14.1.4.19 WFD legislation requires consideration of whether new developments have the potential to prevent the future attainment of good status or potential objectives for water bodies (where not already achieved).

14.1.4.20 As part of the preliminary assessment, a scoping exercise has been carried out to ensure that the construction and operation of the Project will not prevent any of the relevant water bodies from achieving their status objectives in the future.

14.1.4.21 The assessment has included water bodies affected by the Project that are currently failing to meet their good ecological status/potential or good quantitative status in addition to waterbodies in moderate or good ecological and quantitative status (with regards to surface water and groundwater bodies, respectively).

14.1.4.22 This has included assessing the likely effects of the Project on key existing pressures known to be limiting water body current status/potential and a range of management and enhancement measures/actions identified by the Environment Agency to support future improvements in water body status/potential. This has utilised the latest available Environment Agency Cycle 2 RBMP investigation outputs listed below:

- 'Reasons for not achieving good' status (RNAG), which identifies the relevant category, business sector, surface water management issue (SWMI) and activity responsible for the various quality elements currently failing their status objectives
- 'Programmes of measures' (PoM), which identifies the actions proposed for relevant business sectors to address confirmed RNAG
- 'Heavily Modified Water Body (HMWB)/ Artificial Water Body (AWB) Mitigation Measure Assessments' (MMA), which identify actions required to implement measures to mitigate the impacts of existing physical modifications, assets and operations related to the 'use' of heavily modified and artificial water bodies (e.g. flood defence, water resource management, navigation, etc.).

14.1.4.23 The likely effects of the Project on each of the above are summarised in the following sections. The assessment will be reviewed and updated where necessary following the publication of the Cycle 3 RBMPs in 2022.

Reasons for not achieving good status

14.1.4.24 The Environment Agency have identified RNAG status for all water body quality elements that are not currently at good status/potential. The RNAG identify the pressures (including relevant sectors and activities) that are currently impacting upon the status classification of a water body and therefore provide an indication of the high-level causes of status objective failure.

14.1.4.25 The available 2015 RBMP RNAG for the quality elements of each of the surface water and groundwater bodies affected by the Project are provided in Table 12: Summary of Environment Agency information on WFD surface water bodies in the study area These have been considered against the relevant scheme components affecting each water body.

14.1.4.26 The assessment has considered whether the RNAG are likely to be adversely or beneficially effected by the relevant scheme components, following consideration of mitigation included in the design. A precautionary approach has been taken, whereby the identification of a potential adverse effect on a RNAG is used to highlight the potential for the Project to prevent or inhibit the attainment of the status objective of the relevant quality element.

14.1.4.27 In total, seven surface water body RNAG have been identified as having the potential to be adversely affected by the Project to an extent that may risk the future attainment of water body status objectives (see Table 12: Summary of Environment Agency

information on WFD surface water bodies in the study area. These were identified as having the potential to be adversely affected by the Project using the status elements (i.e. biological, hydromorphological, specific pollutant or chemical) of the 'Element not achieving good' and the criteria outlined in Annex C: Preliminary assessment (scoping). These RNAG have been taken forward for further detailed assessment to ensure that the Project does not worsen these existing pressures that are currently considered to be restricting the achievement of the status objectives of the relevant water bodies and it is recommended that further consultation with the Environment Agency is undertaken at the Detailed Design stage where there is potential for any residual effects (see section 14.1.16).

Table 9: Summary of preliminary assessment (scoping) of likely effects of Project on reasons for not achieving good status (RNAG) for relevant WFD surface water bodies

WFD water body	RNAG ID	Element not achieving good	Category (business sector)	SWMI	Activity	Pressure (tier)	Potential for scheme to affect RNAG	Relevant scheme component	Likely effect of scheme component (s)	Scoping Outcome
Eamont (Upper) (GB102076071020)	538129	Mercury and Its Compounds	No sector responsible	Measures delivered to address Reason, awaiting classification	No sector responsible	Not applicable	No	Not applicable	No impact	Out
Eamont (Upper) (GB102076071020)	538130	Polybrominated diphenyl ethers (PBDE)	No sector responsible	Measures delivered to address Reason, awaiting classification	No sector responsible	Not applicable	No	Not applicable	No impact	Out
Eamont (Upper) (GB102076071020)	538128	Benzo(b)fluoranthene	Sector under investigation	Unknown (pending investigation)	Sector under investigation	Not applicable	No	Not applicable	No impact	Out
Eamont (Upper) (GB102076071020)	538127	Benzo(g-h-i)perylene	Sector under investigation	Unknown (pending investigation)	Sector under investigation	Not applicable	No	Not applicable	No impact	Out
Eamont (Lower) (GB102076070990)	538121	Mercury and Its Compounds	No sector responsible	Measures delivered to address Reason, awaiting classification	No sector responsible	Not applicable	No	Not applicable	No impact	Out
Eamont (Lower) (GB102076070990)	538122	Polybrominated diphenyl ethers (PBDE)	No sector responsible	Measures delivered to address Reason, awaiting classification	No sector responsible	Not applicable	No	Not applicable	No impact	Out
Eden Lyvennet to Eamont (GB102076070980)	538119	Mercury and Its Compounds	No sector responsible	Measures delivered to address Reason, awaiting classification	No sector responsible	Not applicable	No	Not applicable	No impact	Out
Eden Lyvennet to Eamont (GB102076070980)	538120	Polybrominated diphenyl ethers (PBDE)	No sector responsible	Measures delivered to address Reason, awaiting classification	No sector responsible	Not applicable	No	Not applicable	No impact	Out
Eden Lyvennet to Eamont (GB102076070980)	530195	Macrophytes and Phytobenthos Combined	No sector responsible	Suspect data	No sector responsible	Unknown	Yes	Culvert; Drainage Outfall	Negligible	Out
Eden - Scandal Beck to Lyvennet (GB102076070880)	538101	Mercury and Its Compounds	No sector responsible	Measures delivered to address Reason, awaiting classification	No sector responsible	Not applicable	No	Not applicable	No impact	Out
Eden - Scandal Beck to Lyvennet (GB102076070880)	538102	Polybrominated diphenyl ethers (PBDE)	No sector responsible	Measures delivered to address Reason, awaiting classification	No sector responsible	Not applicable	No	Not applicable	No impact	Out
Trout Beck (GB102076070930)	509243	Fish	Agriculture and rural land management	Diffuse source	Agriculture and rural land management	Unknown	No	Not applicable	No impact	Out
Trout Beck (GB102076070930)	538109	Mercury and Its Compounds	No sector responsible	Measures delivered to address Reason, awaiting classification	No sector responsible	Not applicable	No	Not applicable	No impact	Out
Trout Beck (GB102076070930)	538110	Polybrominated diphenyl ethers (PBDE)	No sector responsible	Measures delivered to address Reason, awaiting classification	No sector responsible	Not applicable	No	Not applicable	No impact	Out
Low Gill (Crooks Beck) (GB102076070750)	508638	Phosphate	Agriculture and rural land management	Diffuse source	Agriculture and rural land management	Not applicable	No	Not applicable	No impact	Out
Low Gill (Crooks Beck) (GB102076070750)	538083	Mercury and Its Compounds	No sector responsible	Measures delivered to address Reason, awaiting classification	No sector responsible	Not applicable	No	Not applicable	No impact	Out
Low Gill (Crooks Beck) (GB102076070750)	538084	Polybrominated diphenyl ethers (PBDE)	No sector responsible	Measures delivered to address Reason, awaiting classification	No sector responsible	Not applicable	No	Not applicable	No impact	Out

WFD water body	RNAG ID	Element not achieving good	Category (business sector)	SWMI	Activity	Pressure (tier)	Potential for scheme to affect RNAG	Relevant scheme component	Likely effect of scheme component (s)	Scoping Outcome
Low Gill (Crooks Beck) (GB102076070750)	484836	Fish	Agriculture and rural land management	Other pressures	Agriculture and rural land management	Unknown	Yes	Removal of existing culvert; Viaduct; Flood Compensation Area; Clear Span Bridge; Extension of existing culvert; Drainage outfall; Access road culvert; Culvert;	Localised, minor adverse - no risk at water body scale	Out
Greta from Sleightholme Beck to Ellder Beck (GB103025072140)	539593	Mercury and Its Compounds	No sector responsible	Measures delivered to address Reason, awaiting classification	No sector responsible	Not applicable	No	Not applicable	No impact	Out
Greta from Sleightholme Beck to Ellder Beck (GB103025072140)	539594	Polybrominated diphenyl ethers (PBDE)	No sector responsible	Measures delivered to address Reason, awaiting classification	No sector responsible	Not applicable	No	Extension of existing culvert; Drainage outfall	No impact	Out
Greta from Sleightholme Beck to Ellder Beck (GB103025072140)	483152	Fish	Sector under investigation	Other pressures	Sector under investigation	Unknown	Yes	Extension of existing culvert; Drainage outfall	Localised, minor adverse - no risk at water body scale	Out
Greta from Sleightholme Beck to Ellder Beck (GB103025072140)	483156	Fish	Navigation	Physical modifications	Navigation	Unknown	Yes	Extension of existing culvert; Drainage outfall	At risk at water body scale - further assessment needed	In
Greta from Sleightholme Beck to Ellder Beck (GB103025072140)	529824	Fish	Central Government	Physical modifications	Central Government	Unknown	Yes	Extension of existing culvert; Drainage outfall	At risk at water body scale - further assessment needed	In
Greta from Sleightholme Beck to Ellder Beck (GB103025072140)	485073	Fish	No sector responsible	Natural	No sector responsible	Unknown	Yes	Extension of existing culvert; Drainage outfall	At risk at water body scale - further assessment needed	In
Tees from Percy Beck to River Greta (GB103025072512)	539679	Mercury and Its Compounds	No sector responsible	Measures delivered to address Reason, awaiting classification	No sector responsible	Not applicable	No	Not applicable	No impact	Out
Tees from Percy Beck to River Greta (GB103025072512)	539680	Polybrominated diphenyl ethers (PBDE)	No sector responsible	Measures delivered to address Reason, awaiting classification	No sector responsible	Not applicable	No	Not applicable	No impact	Out
Greta from Gill Beck to River Tees (GB103025072130)	539591	Mercury and Its Compounds	No sector responsible	Measures delivered to address Reason, awaiting classification	No sector responsible	Not applicable	No	Not applicable	No impact	Out
Greta from Gill Beck to River Tees (GB103025072130)	539592	Polybrominated diphenyl ethers (PBDE)	No sector responsible	Measures delivered to address Reason, awaiting classification	No sector responsible	Not applicable	No	Not applicable	No impact	Out
Skeeby/Holme/Dalton Bk from Source to River Swale (GB104027069180)	512561	Fish	Agriculture and rural land management	Diffuse source	Agriculture and rural land management	Unknown	Yes	Access road culvert; Drainage outfall; Culvert; Realignment	Localised, minor adverse - no risk at water body scale	Out
Skeeby/Holme/Dalton Bk from Source to River	533578	Fish	Agriculture and rural land management	Diffuse source	Agriculture and rural land management	Unknown	Yes	Access road culvert; Drainage	Localised, minor adverse - no risk	Out

WFD water body	RNAG ID	Element not achieving good	Category (business sector)	SWMI	Activity	Pressure (tier)	Potential for scheme to affect RNAG	Relevant scheme component	Likely effect of scheme component (s)	Scoping Outcome
Swale (GB104027069180)								outfall; Culvert; Realignment	at water body scale	
Skeeby/Holme/Dalton Bk from Source to River Swale (GB104027069180)	540331	Mercury and Its Compounds	No sector responsible	Measures delivered to address Reason, awaiting classification	No sector responsible	Not applicable	No	Not applicable	No impact	Out
Skeeby/Holme/Dalton Bk from Source to River Swale (GB104027069180)	540332	Polybrominated diphenyl ethers (PBDE)	No sector responsible	Measures delivered to address Reason, awaiting classification	No sector responsible	Not applicable	No	Not applicable	No impact	Out
Skeeby/Holme/Dalton Bk from Source to River Swale (GB104027069180)	533580	Fish	Industry	Physical modifications	Industry	Unknown	Yes	Access road culvert; Drainage outfall; Culvert; Realignment	At risk at water body scale - further assessment needed	In
Skeeby/Holme/Dalton Bk from Source to River Swale (GB104027069180)	533582	Fish	Agriculture and rural land management	Physical modifications	Agriculture and rural land management	Unknown	Yes	Access road culvert; Drainage outfall; Culvert; Realignment	Localised, minor adverse - no risk at water body scale	Out

Programmes of measures

14.1.4.28 The Environment Agency have identified cost-effective, catchment-wide measures required for supporting the achievement of the good status or potential objectives of a water body. These measures are linked to the RNAG identified for the quality elements of a water body that are not currently at good status/potential. The planning, implementation and evaluation of the Programme of Measures (PoM) involves an iterative process developed through the river basin management plan cycles.

14.1.4.29 The available 2015 RBMP PoM for the surface water bodies affected by the Project are provided in Table 12. These measures have been considered against the relevant scheme components affecting each water body.

14.1.4.30 The assessment has considered whether the PoM are likely to be adversely or beneficially affected by the scheme components, following consideration of mitigation included in the design. A precautionary approach has been taken, whereby the identification of a potential adverse effect on a PoM is used to highlight the potential for the Project to prevent or inhibit the attainment of the status objective of the relevant quality element.

One surface water body measure has been identified as potentially being adversely affected by the Project to an extent that may risk the future attainment of water body status objectives (see Table 10: Summary of preliminary assessment (scoping) of likely effects of Project on RBMP Programme of measures identified for WFD surface water bodies

14.1.4.31 . This PoM, relating to improving modified habitat in the Skeeby/Holme/Dalton Beck from Source to River Swale (GB104027069180) water body, has been taken forward for further detailed assessment and consultation with the Environment Agency is recommended at the Detailed Design stage.

Table 10: Summary of preliminary assessment (scoping) of likely effects of Project on RBMP Programme of measures identified for WFD surface water bodies

WFD Water body (ID)	CPS Action ID	Title	Description	Potential for scheme to affect measure	Relevant scheme compnent(s)	Likely effect of scheme component	Scoping outcome
Eamont (Lower) (GB102076070990)	40157	Eamont catchment measures to address diffuse agricultural pollution	To control or manage diffuse source inputs; Reduce diffuse pollution at source; and Manure & Fertiliser management	No	Not applicable	No impact	Out
Skeeby/Holme/Dalton Bk from Source to River Swale (GB104027069180)	39968	Mid Swale Tributaries Restoration Project	To improve modified habitat including Improvement to condition of riparian zone and/or wetland habitats and habitat creation.	Yes	Not applicable	At risk at water body scale - further assessment needed	In
Skeeby/Holme/Dalton Bk from Source to River Swale (GB104027069180)	39968	Mid Swale Tributaries Restoration Project	To control or manage diffuse source inputs including reduction of diffuse pollution pathways (i.e. control entry to water environment) and surface run-off & drainage management.	Yes	Not applicable	Localised, minor adverse - no risk at water body scale	Out

MWB/AWB Mitigation Measures

14.1.4.32 The ecological potential of HMWB and AWB is principally classified according to an assessment of a suite of 'Mitigation Measures'; with good ecological potential being assigned to water bodies where all applicable mitigation is in place, and moderate ecological potential being assigned where some or all relevant mitigation is missing. These measures are derived by the Environment Agency and are designed to address biological and hydromorphological pressures caused by physical modifications and/or operations associated with the anthropogenic 'uses' attached to the water body's heavily modified or artificial designation (e.g. flood defence, water resource management, navigation, etc.).

14.1.4.33 The latest available Cycle 2 RBMP Mitigation Measures Assessment information for the HMWB/AWBs affected by the Project are summarised in Table 11: Summary of preliminary assessment (scoping) of likely effects of Project on RBMP HMWB Mitigation Measures Assessment (MMA) identified for WFD surface water bodies. These measures have been considered against the relevant scheme components affecting each water body.

14.1.4.34 The assessment has considered whether the HMWB/AWB Mitigation Measures are likely to be adversely or beneficially effected by the scheme components, following consideration of mitigation included in the design. A precautionary approach has been taken, whereby the identification of a potential adverse effect on a HMWB/AWB Mitigation Measure is used to highlight the potential for the Project to prevent or inhibit the attainment of the status objective of the relevant quality element.

14.1.4.35 At this stage, no HMWB/AWB Mitigation Measures have been identified as being adversely affected by the Project to an extent that potentially risks the future achievement of water body status objectives.

Table 11: Summary of preliminary assessment (scoping) of likely effects of Project on RBMP HMWB Mitigation Measures Assessment (MMA) identified for WFD surface water bodies

WFD water body (ID)	HMWB Mitigation Measure Code	HMWB Mitigation Measure Title	Potential for scheme to affect measure	Relevant scheme component(s)	Likely effect of scheme component(s)	Scoping Outcome
Tees from Percy Beck to River Greta (GB103025072512)	MM. 3	Re-engineer river	Y	Access road culvert; Drainage Outfall	Localised, minor adverse - no risk at water body scale	Out
	MM. 16	Fish passes	Y	Access road culvert; Drainage Outfall	Localised, minor adverse - no risk at water body scale	Out
	MM. 17	Fish passes Fish pass flow releases	Y	Access road culvert; Drainage Outfall	Localised, minor adverse - no risk at water body scale	Out
	MM. 18	Reduce fish entrainment	N	Not applicable	No impact	Out
	MM. 29	Sediment management regime	N	Not applicable	No impact	Out
	MM. 30	Manage artificial drawdown	N	Not applicable	No impact	Out
	MM. 31	Manage seasonal water levels	N	Not applicable	No impact	Out
	MM. 42	Access to feeder-streams	N	Not applicable	No impact	Out
	MM. 43	Downstream flow regime	N	Not applicable	No impact	Out
	MM. 44	Flows to move sediment	N	Not applicable	No impact	Out
	MM. 45	Good downstream DO levels	N	Not applicable	No impact	Out
	MM. 46	Good downstream temperature	N	Not applicable	No impact	Out

14.1.5 Water body baseline information

WFD surface water bodies

14.1.5.1 The latest WFD baseline condition has been summarised below. This includes the latest WFD quality element statuses updated in 2019.

14.1.5.2 The Eamont (Upper) water body is the north-western extreme of all water bodies, covering Penrith and Sockbridge. A series of interconnected water bodies continues in a south-easterly direction towards the Eden – Scandal Beck to Lyvennet water body over Great Musgrave. A separate section of water bodies southeast begins in the Deepdale Beck from Source to River Tees and Tees from Percy Beck to River Greta water bodies over Startforth. This section similarly continues southeast until the Skeeby/Holme/Dalton Bk from Source to River Swale water body.

14.1.5.3 The Project is situated over the Solway Tweed, Northumbria, and Humber RBDs.

14.1.5.4 The following WFD water bodies have been screened into the assessment, and there status, failing elements and designations of these water bodies are summarised in Table 12: Summary of Environment Agency information on WFD surface water bodies in the study area

14.1.5.5 The watercourses located within the WFD water body catchments that are affected by the Project are summarised in Annex A: WFD Waterbodies.

Eamont (Lower)

14.1.5.6 Eamont (Lower) (GB102076070990) is classified as a river located within the Solway Tweed RBD. The modification classification is not designated as artificial or heavily modified.

14.1.5.7 In 2019 the status was designated as “Good” meeting it’s 2016 objective to achieve “Good” by 2027.

14.1.5.8 Ecological status is “Good”, with Fish, Physico-chemical quality elements, and Specific pollutants achieving “High” statuses. Chemical status was “Fail”, with the Priority hazardous substances classification failing due to the presence of Mercury and Its Compounds and Polybrominated diphenyl ethers (PBDE).

14.1.5.9 There are five watercourses within this water body affected by the M6 Junction 40 to Kemplay Bank and Penrith to Temple Sowerby schemes as summarised in Annex A1 Surface Water:

- Unnamed Tributary of Light Water 3.1
- Light Water
- Unnamed Tributary of River Eamont 3.3
- Unnamed Tributary of River Eamont 3.4
- Unnamed Tribtuary of River Eamont 3.5.

Eamont (Upper)

14.1.5.10 Eamont (Upper) (GB102076071020) is classified as a river located within the Solway Tweed RBD. The modification classification is not designated as artificial or heavily modified.

14.1.5.11 In 2019 the status was designated as “Good”, with a previous objective of achieving "Good” by 2015.

14.1.5.12 Ecological status is “Good”, with Invertebrates, all Physico-chemical quality elements except temperature, and Specific pollutants achieving “High” statuses. Chemical status was “Fail”, with the Priority hazardous substances classification failing due to the presence of Benzo(b)fluoranthene, Benzo(g-h-i)perylene, Mercury and Its Compounds, and Polybrominated diphenyl ethers (PBDE).

14.1.5.13 There are two watercourses within this water body affected by the M6 Junction 40 to Kemplay Bank scheme as summarised in Annex A1 Surface Water:

- Thacka Beck
- River Eamont.

Eden - Scandal Beck to Lyvennet

14.1.5.14 Eden - Scandal Beck to Lyvennet (GB102076070880) is classified as a river located within the Solway Tweed RBD. The modification classification is not designated as artificial or heavily modified.

14.1.5.15 Overall status was “Good” in 2019, with a previous objective of achieving “Good” by 2015.

14.1.5.16 Ecological status is “Good”. Invertebrates, Macrophytes and Phytobenthos Combined. Specific pollutants, and Physico-chemical quality elements achieved “High” statuses. Chemical status was “Fail”, with the Priority hazardous substances classification failing due to the presence of Mercury and Its Compounds and Polybrominated diphenyl ethers (PBDE).

14.1.5.17 There are five watercourses within this water body affected by the Appleby to Brough scheme summarised in Annex A1 Surface Water:

- Unnamed Tributary of Mire Sike 6.4
- Unnamed Tributary of Mire Sike 6.12
- Unnamed Tributary of Cringle Beck 6.1
- Unnamed Tributary of Cringle Beck 6.3.
- Cringle Beck

Eden Lyvennet to Eamont

14.1.5.18 Eden Lyvennet to Eamont (GB102076070980) is classified as a river located within the Solway Tweed RBD. The modification classification is not designated as artificial or heavily modified.

14.1.5.19 In 2019, the status was designated as “Moderate”, therefore not achieving it’s objective to achieve “Good” by 2015.

14.1.5.20 Ecological status is “Moderate”. Fish, Invertebrates and Physico-chemical quality elements all achieved “High” statuses. Chemical status was “Fail”, with the Priority hazardous substances classification

failing due to the presence of Mercury and Its Compounds, Macrophytes and Phytobenthos Combined and Polybrominated diphenyl ethers (PBDE).

14.1.5.21 There is one watercourse (Swine Gill) within this water body affected by the Penrith to Temple Sowerby scheme as summarised in Annex A1 Surface Water.

Greta from Gill Beck to River Tees

14.1.5.22 Greta from Gill Beck to River Tees (GB103025072130) is classified as a river located within the Northumbria RBD. The modification classification is not designated as artificial or heavily modified.

14.1.5.23 In 2019, the status was designated as “Good”, with the previous objective to achieve “Good” by 2015.

14.1.5.24 Ecological status is “Good”. Fish and Macrophytes and Phytobenthos, and Physico-chemical quality elemants all achieve “High” statuses. Chemical status was “Fail”, with the Priority hazardous substances classification failing due to the presence of Mercury and Its Compounds and Polybrominated diphenyl ethers (PBDE).

14.1.5.25 There are three watercourses within this water body affected by the Cross Lanes to Rokeby scheme as summarised in Annex A1 Surface Water:

- Punder Gill
- Unnamed Tributary of Punder Gill 8.1
- Tutta Beck.

Greta from Sleightholme Beck to Eller Beck

14.1.5.26 Greta from Sleightholme Beck to Eller Beck (GB103025072140) is classified as a river located within the Northumbria RBD. The modification classification is not designated as artificial or heavily modified.

14.1.5.27 Overall status was “Moderate” in 2019, with the objective to achieve “Good” by 2027. The 2027 deadline exists due to “Disproportionately expensive/Disproportionate burdens”.

14.1.5.28 Ecological status is “Moderate”, with a “Moderate” classification for Biological quality elements due to a “Moderate” Fish status. This is a result of natural, physical modifications and other pressures. Invertebrates, Macrophytes and Phytobenthos Combined, and Physico-chemical quality elements all achieved “High” statuses. Chemical status was “Fail”, with the Priority hazardous substances classification failing due to the presence of Mercury and Its Compounds and Polybrominated diphenyl ethers (PBDE).

14.1.5.29 There are three watercourses within this water body affected by the Bowes Bypass scheme as summarised in Annex A1 Surface Water:

- Unnamed Tirbutary of River Greta 7.3
- Unnamed Tributary of River Greta 7.5
- Unnamed Tributary of River Greta 7.6.

Low Gill (Crooks Beck)

14.1.5.30 Low Gill (Crooks Beck) (GB102076070750) is classified as a river located within the Solway Tweed RBD. The modification classification is not designated as artificial or heavily modified.

14.1.5.31 Overall status was “Poor” in 2019, with the objective to achieve “Good” by 2027. The 2027 deadline exists due to “Disproportionately expensive/Disproportionate burdens”.

14.1.5.32 Ecological status is “Poor”, with a “Poor” classification for Biological quality elements due to a “Poor” fish status. This is a result of other pressures from agricultural and rural land management. Invertebrates, Macrophytes and Phytobenthos Combined achieved “High” statuses. Chemical status was “Fail”, with the Priority hazardous substances classification failing due to the presence of Phospate, Mercury and Its Compounds and Polybrominated diphenyl ethers (PBDE).

14.1.5.33 There are nine watercourses within this water body affected by the Appleby to Brough scheme as summarised in Annex A1 Surface Water:

- Eastfield Sike
- Moor Beck (Offtake)
- Moor Beck
- Eastfield Sike
- Lowgill Beck
- Unnamed Tributary of Lowgill Beck 6.1
- Woodend Sike
- Yosgill Sike
- Unnamed Tributary of Lowgill Beck 6.7.

Skeeby/Holme/Dalton Bk from Source to River Swale

14.1.5.34 Skeeby/Holme/Dalton Bk from Source to River Swale (GB104027069180) is classified as a river located in the Humber RBD. The modification classification is not designated as artificial or heavily modified.

14.1.5.35 Overall status was “Moderate” in 2019, with the objective to achieve Good by 2021.

14.1.5.36 Ecological status is “Moderate”, with a “Moderate” classification for Fish. This is a result of physical modifications and diffuse source pressures from agriculture and rural land management and industry. Invertebrates and all Physico-chemical quality elements except Phosphate achieved “High” status. Chemical status was “Fail”, with the Priority hazardous substances classification failing due to the presence of Mercury and Its Compounds and Polybrominated diphenyl ethers (PBDE).

14.1.5.37 There are twelve watercourses within this water body affected by the Stephen Bank to Carkin Moor scheme as summarised in Annex A1 Surface Water:

- Unnamed Tributary of Cottonmill Beck 9.3

- Unnamed Tributary of Browson Beck 9.1
- Unnamed Tribtuary of Holme Beck 9.1
- Unnamed Tributary of Holme Beck 9.2
- Unnamed Tributary of Holme Beck 9.3
- Unnamed Tributary of Holme Beck 9.5
- Unnamed Tributary of Holme Beck 9.6
- Unnamed Tributary of Holme Beck 9.7
- Unnamed Tributary of Mains Gill 9.1
- Unnamed Tributary of Mains Gill 9.3
- Mains Gill
- Unnamed Tributary of Holme Beck 9.8.

Tees from Percy Beck to River Greta

14.1.5.38 Tees from Percy Beck to River Greta (GB103025072512) is classified as a river located within the Northumbria RBD. The modification classification is designated as heavily modified.

14.1.5.39 In 2019, the status was designated as “Good”, meeting its 2016 objective to achieve “Good” by 2027.

14.1.5.40 Ecological potential is “Good”, with Invertebrates and Physico-chemical quality elements achieving “High” status. Chemical status was “Fail”, with the Priority hazardous substances classification failing due to the presence of Mercury and Its Compounds and Polybrominated diphenyl ethers (PBDE).

14.1.5.41 There are two watercourses within this water body affected by the Cross Lanes to Rokeby scheme as summarised in Annex A1 Surface Water:

- Unnamed Tributary of Manyfold Beck 8.3
- Unnamed Tributary of Manyfold Beck 8.1.

Trout Beck

14.1.5.42 Trout Beck (GB102076070930) is classified as a river located within the Solway Tweed RBD. The modification classification is not designated artificial or heavily modified.

14.1.5.43 In 2019, the status was designated as “Good”, meeting it’s 2016 objective to achieve “Good” by 2027.

14.1.5.44 Ecological status is “Good”, with Invertebrates, and all Physico-chemical quality elements except Phosphate achieving “High” status. Chemical status was “Fail”, with the Priority hazardous substances classification failing due to the presence of Mercury and Its Compounds and Polybrominated diphenyl ethers (PBDE).

14.1.5.45 There are four watercourses within this water body affected by the Temple Sowerby to Appleby as summarised in Annex A1 Surface Water:

- Unnamed Tributary of Trout Beck 4.2
- Unnamed Tributary of Trout Beck 4.5
- Unnamed Tributary of Trout Beck 4.6
- Trout Beck.

Hydrogeology

14.1.5.46 The hydrogeological baseline is described in ES Appendix 14.6: Hydrogeological Impact Assessment (Application Document 3.4).

Hydromophology

14.1.5.47 The hydromorphological baseline is described in ES Appendix 14.4: Hydromorphology Assessment (Application Document 3.4).

Aquatic ecology

14.1.5.48 The aquatic invertebrate baseline is described in Appendix 6.19 Aquatic Macrophytes and River Corridor Survey Technical Appendix (Application Document 3.4).

14.1.5.49 The fish habitat baseline is Appendix 6.18 Fish Technical Appendix (Application Document 3.4).

Protected areas and designations

14.1.5.50 Under the WFD, 'Protected Areas' are defined as areas requiring special protection because of their sensitivity to pollution or due to their particular economic, social or environmental importance. These areas are water bodies or parts of them:

- Used for the abstraction of water intended for human consumption (Drinking Water Protected Area (DrWPA)
- Supporting economically significant shellfish or freshwater fish stocks (Freshwater Fish Water; Shellfish Water)
- Where a large number of people are expected to bathe (Bathing Water)
- Supporting habitats or species of international biodiversity conservation importance (such as a Special Area of Conservation (SAC) or Special Protection Area (SPA)) and/or
- Sensitive to nutrient enrichment (such as a Nitrate Vulnerable Zone (NVZ) or Urban Waste Water Treatment Directive (UWWTD) sensitive zone).

14.1.5.51 The specific environmental designations, measures and actions for these protected areas have been established under previous European Directives, which set out the requirements to ensure the protection of the area's water environment or protection of wildlife that is directly dependant on that water environment. Where a WFD water body falls within or forms all or part of one of these designated predicted areas, the water body is subject to additional environmental objectives (and associated monitoring regimes, risk assessments, and regulations) in accordance with the relevant, previous Directive(s) (see ES Chapter 14 Road drainage and the water environment (Application Document 3.2) and HRA for more information, including detailed assessment and compliance with sensitive receptors). In this assessment, the WFD water bodies which form part of a designated protected area have been designated as Very High value receptors.

14.1.5.52 The nearest DrWPA is the River Lowther (Lower) (UKGB102076071010) which is located approximately 0.4km from

the scheme. For futher details, go to ES Appendix 14.6: Hydrogeological Impact Assessment (Application Document 3.4).

14.1.5.53 The River Eamont, a tributary to the River Eden, is located within the Project area and flows parallel to the existing A66. The river is designated within the River Eden SAC (Natural England, 2019) and River Eden and Tributaries SSSI (Natural England, 1997). The River Eden also contains an UWWTD titled River Eden UKENRI2.

14.1.5.54 The Project falls within the North Pennines Area of Outstanding Natural Beauty (AONB). The AONB is designated as The North Pennine Moors SAC (Joint Nature Conservation Committee, 2021) and The North Pennine Moors Special Protection Area SPA (Natural England, 1997), but it should be noted that the Project does not encroach into them.

14.1.5.55 There are two NVZ's located within the Project; Kirby Thore G53 and Penrith G51.

14.1.6 Aquifers

Aquifer designation - bedrock

14.1.6.1 A principal bedrock aquifer exists at the eastern extent of the project, underlying the M6M6 Junction 40 to Kemplay Bank, PenrithPenrith to Temple Sowerby, TempleSowerby, Temple Sowerby to Appleby, and Appleby, and Appleby to Brough schemes. A secondary A aquifer then underliesthe Bowes Bypass, Cross Bowes Bypass, Cross Lanes to Rokeby, StephenRokeby, Stephen Bank to Carkin MoorMoor, and A1(M) Junction 53 Scotch Corner schemes.

14.1.6.2 More comprehensive details on hydrogeology are included in ES Appendix 14.6: Hydrogeological Impact Assessment (Application Document 3.4).

Aquifer designation – superficial deposits

14.1.6.3 The M6 Junction 40 to Kemplay BankBank, Penrith to Temple SowerbySowerby, Temple Sowerby to Appleby, Appleby to BroughAppleby to Brough, Cross Lanes to RokebyRokeby, Stephen Bank to Carkin Moor and A1(M) Junction 53 Scotch Corner schemes are split between a secondary A aquifer and secondary (underffierentiated) aquifer. The secondary (undifferentiated) aquifer underlies the PenrithPenrith to Temple Sowerby scheme enitrely.

14.1.6.4 More comprehensive details on hydrogeology are included in in ES Appendix 14.6: Hydrogeological Impact Assessment (Application Document 3.4).

14.1.7 Summary

14.1.7.1 The WFD water bodies that have been screened in to this assessment are shown in Table 12: Summary of Environment Agency information on WFD surface water bodies in the study area.

Table 12: Summary of Environment Agency information on WFD surface water bodies in the study area

Scheme	WFD WB	ID	WB Type	Area (km²)	HMWB / AWB	Overall Status	Objective	Chem Status	Eco Status/ Potential	Driver of failure to achieve 'good' status	Reasons for not achieving 'good' status
M6 Junction 40 to Kemplay Bank & Penrith to Temple Sowerby	Eamont (Lower)	GB102076070990	River	23.173km²	None	Good	Good by 2027	Fail	Good	Polybrominated diphenyl ethers (PBDE)	Measures delivered to address Reason, awaiting classification
										Mercury and Its Compounds	Measures delivered to address Reason, awaiting classification
M6 Junction 40 to Kemplay Bank	Eamont (Upper)	GB102076071020	River	87.824km²	None	Good	Good by 2015	Fail	Good	Benzo(g-h-i)perylene	Unknown (pending investigation)
										Benzo(b)fluoranthene	Unknown (pending investigation)
										Mercury and Its Compounds	Measures delivered to address Reason, awaiting classification
										Polybrominated diphenyl ethers (PBDE)	Measures delivered to address Reason, awaiting classification
Temple Sowerby to Appleby	Eden - Scandal Beck to Lyvennet	GB102076070880	River	65.006km²	None	Good	Good by 2015	Fail	Good	Polybrominated diphenyl ethers (PBDE)	Measures delivered to address Reason, awaiting classification
										Mercury and Its Compounds	Measures delivered to address Reason, awaiting classification
Penrith to Temple Sowerby	Eden Lyvennet to Eamont	GB102076070980	River	12.946km²	None	Moderate	Good by 2015	Fail	Moderate	Mercury and Its Compounds	Measures delivered to address Reason, awaiting classification
										Polybrominated diphenyl ethers (PBDE)	Measures delivered to address Reason, awaiting classification
										Macrophytes and Phytobenthos Combined	Suspect data
Cross Lanes to Rokeby	Greta from Gill Beck to River Tees	GB103025072130	River	11.307km²	None	Good	Good by 2015	Fail	Good	Polybrominated diphenyl ethers (PBDE)	Measures delivered to address Reason, awaiting classification
										Mercury and Its Compounds	Measures delivered to address Reason, awaiting classification
Bowes Bypass	Greta from Sleightholme Beck to Eller Beck	GB103025072140	River	17.81km²	None	Moderate	Good by 2027	Fail	Moderate	Fish	Natural
										Polybrominated diphenyl ethers (PBDE)	Measures delivered to address Reason, awaiting classification
										Fish	Physical modifications
										Fish	Physical modifications
										Mercury and Its Compounds	Measures delivered to address Reason, awaiting classification
										Fish	Other pressures
Appleby to Brough	Low Gill (Crooks Beck)	GB102076070750	River	23.991km²	None	Poor	Good by 2027	Fail	Poor	Phosphate	Diffuse source
										Polybrominated diphenyl ethers (PBDE)	Measures delivered to address Reason, awaiting classification
										Mercury and Its Compounds	Measures delivered to address Reason, awaiting classification
										Fish	Other pressures
Stephen Bank to Carkin Moor	Skeeby/ Holme/Dalton Bk from Source to River Swale	GB104027069180	River	79.453 km2	None	Moderate	Good by 2021	Fail	Moderate	Fish	Diffuse source
										Fish	Diffuse source
										Polybrominated diphenyl ethers (PBDE)	Measures delivered to address Reason, awaiting classification
										Mercury and Its Compounds	Measures delivered to address Reason, awaiting classification
										Fish	Physical modification
										Fish	Physical modification
		GB103025072512	River	15.356 km2	HMWB	Good	Good by 2027	Fail	Good	Mercury and Its Compounds	No sector responsible

Scheme	WFD WB	ID	WB Type	Area (km^2)	HMWB / AWB	Overall Status	Objective	Chem Status	Eco Status/ Potential	Driver of failure to achieve 'good' status	Reasons for not achieving 'good' status
Cross Lanes to Rokeby	Tees from Percy Beck to River Greta									Polybrominated diphenyl ethers (PBDE)	No sector responsible
Temple Sowerby to Appleby	Trout Beck	GB102076070930	River	16.499 km2	None	Good	Good by 2027	Fail	Good	Fish	Diffuse source
										Mercury and Its Compounds	Measures delivered to address Reason, awaiting classification
										Polybrominated diphenyl ethers (PBDE)	Measures delivered to address Reason, awaiting classification

14.1.8 Stage 3: Detailed impact assessment

Overview

14.1.8.1 Following baseline and preliminary assessment, a detailed impact assessment has been undertaken for all water bodies and scheme components where a potential for the Project to have an effect on current status and status objectives has been identified. The outputs of this assessment can be found in Table 13: Summary of effects of the Project on WFD surface water bodies and associated risks of deterioration in status.

14.1.8.2 The detailed impact assessment process is described in Section 14.1.2 along with the methodology for assessing the effects of the Project on the current status and status objectives of the quality elements of water bodies. This relates to the requirement under the WFD for the consideration of whether new developments have the potential to result in:

- a deterioration in current status; and/or
- prevention of the achievement of good status/potential objectives in the future.

14.1.8.3 The assessment process for determining the potential for a deterioration of current status uses the following traffic light rating system, in order to assign the magnitude of the effect anticipated on the quality elements of the affected watercourse:

- **dark blue**: beneficial effect of a scale sufficient to increase status class for the quality element at water body scale.
- **light blue**: minor beneficial effect resulting in a localised improvement, but insufficient to increase status class for the quality element at water body scale.
- **green**: no measurable change to (or effect on) status class for the quality element at water body scale.
- **yellow**: minor, localised adverse effect when balanced against embedded mitigation included in the design – insufficient to affect status class for the quality element at water body scale.
- **amber**: an adverse effect is possible when balanced against embedded mitigation included in the design – the extent of effect is uncertain and there remains a potential to affect status class for the quality element at water body scale. This effect is considered significant.
- **red**: adverse effect of sufficient scale to impact on status class for the quality element at a water body scale. This effect is considered significant.

14.1.8.4 The outcome of the assessment identifies the overall effect of all of the relevant scheme components on each quality element at a water body scale. As part of this process, the assessment also considers the ‘cumulative effects’ on quality elements associated with the impacts of scheme components located within other, adjacent water bodies.

14.1.8.5 Where adverse (amber or red) effects on quality elements are identified, with a risk of causing deterioration of status, or preventing

future attainment of the objectives, the assessment identifies additional mitigation requirements and the resultant residual effect. The magnitude of the effects has been determined using the matrix provided Table 13: Summary of effects of the Project on WFD surface water bodies and associated risks of deterioration in status

14.1.8.6 The assessments has been informed by the findings of the following detailed assessments:

- ES Appendix 14.2: Flood Risk Assessment and Outline Drainage Strategy (Application Document 3.4)
- ES Appendix 14.3: Water Quality Assessment (Application Document 3.4)
- ES Appendix 14.4: Hydromorphology Assessment (Application Document 3.4)
- ES Appendix 14.5: Spillage Risk Assessment (Application Document 3.4)
- ES Appendix 14.6: Hydrogeological Impact Assessment (Application Document 3.4)
- ES Appendix 14.7: Groundwater Dependent Terrestrial Ecosystem Assessment (Application Document 3.4)

14.1.9 Surface water - current

Summary of the effects on current status

14.1.9.1 The baseline assessment identified a total of 10 water bodies potentially affected by the Project (see Section 14.1.3). Within these water bodies, individual watercourses have been screened in for detailed assessment based on their hydromorphological and ecological characteristics. The baseline assessment has also identified all relevant scheme component affecting each of these water bodies / watercourses and the associated mitigation included in the design (see section 14.1.3).

14.1.9.2 The preliminary assessment then identified the relevant impacts of the various scheme components and the associated likely effects on the different WFD status elements of the surface water bodies affected by the Project (see section 14.1.4). This, in turn, has identified which quality elements are scoped in for detailed assessment for each water body/watercourse. All 10 surface water bodies have been scoped in for further detailed assessment (see section 14.1.3).

14.1.9.3 The detailed assessment has identified the likely magnitude of the effects of the scheme components (Table 13: Summary of effects of the Project on WFD surface water bodies and associated risks of deterioration in status) on the current status of the quality elements on the 10 water bodies, together with any associated additional mitigation requirements.

14.1.9.4 An overview of the adverse and beneficial effects anticipated within each surface water body as a result of the Project is provided in Table 13: Summary of effects of the Project on WFD surface water bodies and associated risks of deterioration in status. With further detail regarding each WFD water body in the following sections.

14.1.9.5 In summary, out of the 10 surface water bodies scoped in for detailed impact assessment:

- Nine of the10 surface water bodies are at risk of experiencing adverse (amber) overall effects on one or more quality elements, with the potential for a deterioration in quality element status (requiring additional mitigation). It should be noted that these potentially adverse effects are on tributaries of WFD waterbodies.)
- One water body considered to be at risk from minor, localised adverse (yellow) overall effects only, with no measurable change in quality element status.
- No surface water bodies are at risk of experiencing severe adverse (red) overall effects of sufficient scale to cause a deterioration in quality element status.
- No surface water bodies are anticipated to experience wider beneficial (dark blue) overall effects of a scale sufficient to cause an increase in quality element status class.
- No surface water bodies are anticipated to experience minor beneficial (light blue) or negligible (green) effects .

Table 13: Summary of effects of the Project on WFD surface water bodies and associated risks of deterioration in status

Water body (ID)	Schemes affecting water body	Overview of interaction between Project and water body	Overview of the effects of the Project	Risk of deterioration and non-compliance at this stage
Eamont (Upper) (GB102076071020)	M6 Junction 40 to Kemplay Bank	The Project crosses the far northeastern boundary of this water body catchment. It centrally crosses the Thacka Beck and passes closely to the River Eamont.	A culvert is proposed to be extended within this water body, on the Thacka Beck. It is anticipated to have widespread or prolonged adverse effects on the biological, physicochemical and hydromorphological status elements, therefore additional mitigation is required. Two drainage outfalls on the River Eamont are anticipated to have localised adverse effects on the biological, physicochemical, specific pollutants and hydromorphological status elements.	Risk of deterioration and non-compliance identified. Additional mitigation required.
Eamont (Lower) (GB102076070990)	Penrith to Temple Sowerby	The Project crosses centrally through the boundary of this water body catchment. In the southern and central reaches of the catchment, the route crosses the Unnamed Tributary of Light Water 3.1, Light Water, Unnamed Tributary of River Eamont 3.3, and Unnamed Tributary of River Eamont 3.4. There are proposed extensions on five of the culverts located within the water body.	There are six proposed culverts. One is an access road culvert and the rest are extensions of existing culverts located on the Unnamed Tributary of Light Water 3.1, Light Water, Unnamed Tributary of River Eamont 3.3, Unnamed Tributary of River Eamont 3.4, and Unnamed Tributary of River Eamont 3.5. The proposed culverts are anticipated to have widespread or prolonged adverse effects on biological, physicochemical and hydromorphological elements. There are three proposed drainage outfalls. Two are located on the Light Water watercourse and one on the Unnamed Tributary of River Eamont 3.5. These drainage outfalls are anticipated to have a localised adverse effects on biological, physiochemical, specific pollutants and hydromorphological status elements. There is a proposed realignment of the Unnamed Tributary of River Eamont 3.3. This is anticipated to have widespread or prolonged adverse effects on the biological and hydromorphological status as a result of shortening the existing channel. There is also proposed channel works within this watercourse. This is anticipated to have widespread or prolonged adverse effects on the biological and hydromorphological status elements.	Risk of deterioration and non-compliance identified. Additional mitigation required.

Water body (ID)	Schemes affecting water body	Overview of interaction between Project and water body	Overview of the effects of the Project	Risk of deterioration and non-compliance at this stage
Eden Lyvennet to Eamont (GB102076070980)	Penrith to Temple Sowerby	The Project crosses the water body on the north western most extent, towards the upstream end of the water body. It crosses the Swine Gill in one location via culvert	There is a proposed extension of the Swine Gill culvert. This is anticipated to have widespread or prolonged adverse effects on biological, physicochemical and hydromorphological elements. There is a drainage outfall also located on this watercourse. It is anticipated to have localised adverse effects on biological, physicochemical, specific pollutants and hydromorphological elements.	Risk of deterioration and non-compliance identified. Additional mitigation required.
Eden - Scandal Beck to Lyvennet (GB102076070880)	Appleby to Brough	The Project crosses the northern downstream most extent of the water body catchment. The route passes through the tributaries of the Mire Sike in the southern reaches of the catchment via either viaduct or culvert, before crossing into the Cringle Beck and its tributaries via culvert.	There are seven culverts proposed, including four access road culvert on the Unnamed Tributary of Mire Sike 6.4, the Unnamed Tributary of Mire Sike 6.12, Cringle Beck and Unnamed Tributary of Cringle Beck 6.3 and extension of an existing culvert on the Unnamed Tributary of Mire Sike 6.12. These culverts are anticipated to have widespread or prolonged adverse effects on biological, physicochemical and hydromorphological elements. The viaduct on the Unnamed Tributary of Cringle Beck 6.1 is anticipated to have localised adverse effect on biological, and physicochemical status elements. Three flood compensation areas are going to be included on the Unnamed Tributary of the Mire Sike 6.12 and the Cringle Beck. These are anticipated to have no measurable changes on the biological, physicochemical elements but widespread or prolonged adverse effects on hydromorphological status elements.	Risk of deterioration and non-compliance identified. Additional mitigation required.
Greta from Gill Beck to River Tees (GB103025072130)	Cross Lanes to Rokeby	The Project intersects the scheme in the northern central extent of the catchment.	There are two access road culverts located on the Punder Gill and the Tutta Beck. These are anticipated to have widespread adverse effects on biological, physicochemical and hydromorphological status elements. There is also a proposed extension of the existing culvert on the Unnamed Tributary of Punder Gill 8.1. This is anticipated to have widespread or prolonged adverse effects on the biological,	Risk of deterioration and non-compliance identified. Additional mitigation required.

Water body (ID)	Schemes affecting water body	Overview of interaction between Project and water body	Overview of the effects of the Project	Risk of deterioration and non-compliance at this stage
			physicochemical and hydromorphological status elements. There are four realignments within this water body. The realignments proposed on Punder Gill, Unnamed Tributary of Punder Gill 8.1 and Tutta Beck are anticipated to have widespread or prolonged adverse effects on biological and hydromorphological status as a result of shortening the existing channels. An additional realignment is also proposed on the Unnamed Tributary of Tutta Beck 8.4 (watercourse screened out of assessment). There are five drainage outfalls. They are anticipated to have localised adverse effects on biological, specific pollutants physicochemical and hydromorphological status elements.	
Greta from Sleightholme Beck to Eller Beck (GB103025072140)	Bowes Bypass	The Project is incapsulated by the northern downstream extent of the catchment.	There are two extensions of existing culverts on the Unnamed Tributary of River Greta 7.3. These are anticipated to have potentially prolonged or widespread adverse effects on biological, physicochemical and hydromorphological status elements. There are five drainage outfalls within this water body. Two are located on the Unnamed Tributary of River Greta 7.3 and two on the Unnamed Tributary of River Greta 7.5 and one on the Unnamed Tributary of River Greta 7.4 (watercourse screened out of assessment). They are anticipated to have localised adverse effects on biological, specific pollutants physicochemical and hydromorphological status elements.	Risk of deterioration and non-compliance identified. Additional mitigation required.
Low Gill (Crooks Beck) (GB102076070750)	Appleby to Brough	The Project intersects the southern downstream extent of this water body catchment and continues along a southern alignment. The route crosses the Lowgill Beck and its	There are eight proposed culverts. Three are access road culverts and three are extensions of culverts. The three extensions of existing culverts are on the Yosgill Sike, Eastfield Sike and the Unnamed Tributary of Lowgill Beck 6.7 with two access road culverts proposed on the Moor Beck and Lowgill Beck as well as the extension of existing culvert on Eastfield Sike	Risk of deterioration and non-compliance identified. Additional mitigation required.

Water body (ID)	Schemes affecting water body	Overview of interaction between Project and water body	Overview of the effects of the Project	Risk of deterioration and non-compliance at this stage
		tributaries, Yogsill Sike, Eastfield Sike, and Moor Beck primarily by culvert and one viaduct at Moor Beck.	which are anticipated to have widespread or prolonged adverse effects on biological, physicochemical and hydromorphological elements. The removal of an existing culvert on the Eastfield Sike is anticipated to have negligible effects on biological, physicochemical and hydromorphological status elements. It should be noted that there are anticipated to be localised beneficial effects on the biological footprint and hydromorphology of the river. There are four clear span bridges. Two on the Moor Beck, one on the Eastfield Sike, and one on the Unnamed Tributary of Lowgill Beck 6.7. It is anticipated that the bridges will have localised adverse effects on the biological and physicochemical status elements. There are seven drainage outfalls proposed on this water body. Two located on the Eastfield Sike, two located on the Unnamed Tributary of Lowgill Beck 6.7, and the rest are located on the the Yogsill Sike, Woodend Sike and the Lowgill Beck. They are anticipated to have localised adverse effects on biological, specific pollutants physicochemical and hydromorphological status elements. There are two realignments within this water body on the Woodend Sike and the Yogsill Sike. These are anticipated to have widespread or prolonged adverse effects on biological and hydromorphological status as a result of shortening the existing channels. There is a viaduct located at the Moor Beck within this water body. It is anticipated to have localised adverse effects on the biological and physicochemical status elements. Five flood compensation areas are proposed for this water body, located near the Woodend Sike, Yosgill Sike, two on the Eastfield Sike, and Moor Beck. They are anticipated to have widespread or prolonged	

Water body (ID)	Schemes affecting water body	Overview of interaction between Project and water body	Overview of the effects of the Project	Risk of deterioration and non-compliance at this stage
			adverse effects on the hydromorphological status elements.	
Skeeby/ Holme/Dalton Bk from Source to River Swale (GB104027069180)	Stephen Bank to Carkin Moor	The Project intersects the upstream northern extent of the water body.	There are twelve proposed culverts within this water body. Four are access road culverts located on the Unnamed Tributary of Mains Gill 9.1, Unnamed Tributary of Cottonmill Beck 9.3, Unnamed Tributary of Holme Beck 9.2, and the Unnamed Tributary of Holme Beck 9.8 as well as an extension of an existing culvert located on the Unnamed Tributary of Holme Beck 9.7. These are anticipated to have widespread or prolonged adverse effects on the biological, physicochemical and hydromorphological status elements. There are two realignments proposed on the Unnamed Tributary of Browson Beck 9.1 and Mains Gill. These realignments are anticipated to have widespread or prolonged adverse effects on the biological and hydromorphological status. There are thirteen drainage outfalls located in this water body. They are anticipated to have localised adverse effects on the biological, physicochemical, specific pollutants and hydromorphological status elements.	Risk of deterioration and non-compliance identified. Additional mitigation required.
Tees from Percy Beck to River Greta (GB103025072512)	Cross Lanes to Rokeby	The Project intersects the downstream southwestern extent of the catchment.	There are two drainage outfalls. One located on the Unnamed Tributary of Manyfold Beck 8.1 and the other on the Unnamed Tributary of Manyfold Beck 8.3. These are anticipated to have localised adverse effects on biological, physiochemical, specific pollutants and hydromorphological status elements.	Localised or Minor adverse effect. However, no deterioration in status of quality element anticipated at the water body scale.
Trout Beck (GB102076070930)	Temple Sowerby to Appleby	The Project crosses the water body at the north western downstream extent. The route then runs along the southern extent of the catchment.	There are four proposed culverts in this water body, three of which are access road culverts. The Access Road Culverts on the Unnamed Tributary of Trout Beck 4.2 and Unnamed Tributary of Trout Beck 4.6 has been assessed as amber for all quality elements as a conservative approach due to a lack of design details and will be reassessed at the detailed design	Risk of deterioration and non-compliance identified. Additional mitigation required.

Water body (ID)	Schemes affecting water body	Overview of interaction between Project and water body	Overview of the effects of the Project	Risk of deterioration and non-compliance at this stage
		The route crosses the Trout Beck at the downstream extent via culvert and viaduct.	stage. The rest of the culverts are expected to have widespread adverse effects on biological, physicochemical and hydromorphological elements. There are seven drainage outfalls within this water body, six of which are located on the Trout Beck and one on the Unnamed Tributary of Trout Beck 4.2. These are anticipated to have localised adverse effects on biological, physiochemical, specific pollutants and hydromorphological status elements. A viaduct on the Trout Beck is anticipated to have localised adverse effects on the biological and physicochemical status elements.	

Summary of the adverse effects on specific quality elements

14.1.9.6 The detailed impact assessment has identified the potential for adverse (amber) overall effects on one or more quality elements as a result of the Project within nine of the ten surface water bodies being assessed. These effects have the potential to cause a deterioration in quality element status, which therefore requires the consideration of additional mitigation to appropriately manage the risk of non-compliance.

14.1.9.7 Table 14: Summary of scheme components causing amber effects on water bodies provides a summary of the relevant scheme components causing the adverse (amber) effects and the watercourses affected within each water body.

Table 14: Summary of scheme components causing amber effects on water bodies and their tributaries / upstream catchments

Water body catchment (ID)	Watercourse(s) impacted by the scheme	Scheme components(s) causing amber effect(s)	Impact type(s) causing amber effect(s)	Quality element(s) subject to amber effect(s)
Eamont (Upper) (GB102076071020)	Thacka Beck	Extension of existing culvert	Footprint; Shading; Changes to water body Hydromorphology leading to changes in river processes and habitats upstream and downstream	Fish; Macroinvertebrates; Macrophytes and Phytobenthos; Dissolved oxygen; Phosphate; Ammonia; Temperature; Quantity and dynamics of water flow; Connection to groundwater bodies; River continuity; River depth and width variation; Structure and

Water body catchment (ID)	Watercourse(s) impacted by the scheme	Scheme components(s) causing amber effect(s)	Impact type(s) causing amber effect(s)	Quality element(s) subject to amber effect(s)
				substrate of the river bed; Structure of the riparian zone.
Eamont (Lower) (GB102076070990)	Unnamed Tributary of Light Water 3.1; Light Water; Unnamed Tributary of River Eamont 3.3; Unnamed Tributary of River Eamont 3.4; Unnamed Tributary of River Eamont 3.5	Extension to existing culverts; Access road culvert; Channel works	Footprint; Shading; Changes to water body Hydromorphology leading to changes in river processes and habitats upstream and downstream	Fish; Macroinvertebrates; Macrophytes and Phytobenthos; Dissolved oxygen; Phosphate; Ammonia; Temperature; Quantity and dynamics of water flow; Connection to groundwater bodies; River continuity; River depth and width variation; Structure and substrate of the river bed; Structure of the riparian zone.
Eden Lyvennet to Eamont (GB102076070908)	Swine Gill;	Extension to existing culvert	Footprint; Shading; Changes to water body Hydromorphology leading to changes in river processes and habitats upstream and downstream	Fish; Macroinvertebrates; Macrophytes and Phytobenthos; Dissolved oxygen; Phosphate; Ammonia; Temperature; Quantity and dynamics of water flow; Connection to groundwater bodies; River continuity; River depth and width variation; Structure and substrate of the river bed; Structure of the riparian zone.
Eden - Scandal Beck to Lyvennet (GB10207607880)	Unnamed Tributary of Mire Sike 6.4; Unnamed Tributary of Mire Sike 6.12; Unnamed Tributary of Cringle Beck 6.1; Unnamed Tributary of Cringle Beck 6.3; Cringle Beck;	Access road culverts; Extension to existing culvert; Culverts; Flood compensation areas.	Footprint; Shading; Changes to water body Hydromorphology leading to changes in river processes and habitats upstream and downstream	Fish; Macroinvertebrates; Macrophytes and Phytobenthos; Dissolved oxygen; Phosphate; Ammonia; Temperature; Quantity and dynamics of water flow; Connection to groundwater bodies; River continuity; River depth and width variation; Structure and substrate of the river bed; Structure of the riparian zone.
Greta from Gill Beck to River Tees (GB103025072130)	Punder Gill; Tutta Beck; Unnamed Tributary of Punder Gill 8.1;	Access road culverts; Channel realignment; Extension to existing culvert;	Footprint; Shading; Changes to water body Hydromorphology leading to changes in river processes and	Fish; Macroinvertebrates; Macrophytes and Phytobenthos; Dissolved oxygen; Phosphate; Ammonia; Temperature; Quantity and dynamics of water flow;

Water body catchment (ID)	Watercourse(s) impacted by the scheme	Scheme components(s) causing amber effect(s)	Impact type(s) causing amber effect(s)	Quality element(s) subject to amber effect(s)
			habitats upstream and downstream	Connection to groundwater bodies; River continuity; River depth and width variation; Structure and substrate of the river bed; Structure of the riparian zone.
Greta from Sleightholme Beck to Eller Beck (GB103025072140)	Unnamed Tributary of River Greta 7.3	Extensions to existing culverts	Footprint; Shading; Changes to water body Hydromorphology leading to changes in river processes and habitats upstream and downstream	Fish; Macroinvertebrates; Macrophytes and Phytobenthos; Dissolved oxygen; Temperature; Quantity and dynamics of water flow; Structure and substrate of the river bed; Structure of the riparian zone.
Low Gill (Crooks Beck) (GB102076070750)	Lowgill Beck; Unnamed Tributary of Lowgill Beck 6.1; Yosgill Sike; Unnamed Tributary of Lowgill Beck 6.7; Eastfield Sike; Moor Beck (Offtake); Moor Beck; Woodend Sike;	Access road culverts; Culverts; Extensions to existing culverts; Channel realignments; Flood compensation areas	Footprint; Shading; Changes to water body Hydromorphology leading to changes in river processes and habitats upstream and downstream	Fish; Macroinvertebrates; Macrophytes and Phytobenthos; Dissolved oxygen; Phosphate; Ammonia; Temperature; Quantity and dynamics of water flow; Connection to groundwater bodies; River continuity; River depth and width variation; Structure and substrate of the river bed; Structure of the riparian zone.
Skeeby/Holme/Dalton Bk from Source to River Swale	Mains Gill; Unnamed Tributary of Mains Gill 9.1; Unnamed Tributary of Browson Beck 9.1 Unnammed Tributary of Cottonmill Beck 9.3; Unnamed Tributary of Holme Beck 9.2; Unnamed Tributary of Holme Beck 9.3; Unnamed Tributary of Holme Beck 9.6; Unnamed Tributary of Holme Beck 9.7; Unnamed Tributary of Holme Beck 9.8;	Culverts; Access Road Culverts; Channel realignments	Footprint; Shading; Changes to water body Hydromorphology leading to changes in river processes and habitats upstream and downstream	Fish; Macroinvertebrates; Macrophytes and Phytobenthos; Dissolved oxygen; Phosphate; Ammonia; Temperature; Quantity and dynamics of water flow; Connection to groundwater bodies; River continuity; River depth and width variation; Structure and substrate of the river bed; Structure of the riparian zone.

Water body catchment (ID)	Watercourse(s) impacted by the scheme	Scheme components(s) causing amber effect(s)	Impact type(s) causing amber effect(s)	Quality element(s) subject to amber effect(s)
Trout Beck (GB102076070930)	Unnamed Tributary of Trout Beck 4.2; Unnamed Tributary of Trout Beck 4.6;	Access road culverts; culverts	Footprint; Shading; Changes to water body Hydromorphology leading to changes in river processes and habitats upstream and downstream	Fish; Macroinvertebrates; Macrophytes and Phytobenthos; Dissolved oxygen; Phosphate; Ammonia; Temperature; Quantity and dynamics of water flow; Connection to groundwater bodies; River continuity; River depth and width variation; Structure and substrate of the river bed; Structure of the riparian zone.

14.1.9.8 A description of each of these WFD water bodies and the associated effects of the scheme on WFD status alongside the proposed additional mitigation required to avoid non-compliance are provided in the following sections.

Eamont (Upper) (GB102076071020)

14.1.9.9 The assessment has identified the potential for adverse (amber) overall effects on the status of the Eamont (Upper) (GB102076071020) water body associated with the M6 Junction 40 to Kemplay Bank scheme which is associated with a proposed culvert extension on Thacka Beck watercourse.

14.1.9.10 The proposed culvert extension on Thacka Beck is 26.5m long which is greater than the width of the channel. This has the potential to have an adverse widespread or prolonged effect on footprint, shading and changes to hydromorphology leading to changes in river processes and habitats upstream and downstream.

14.1.9.11 Accordingly, on a precautionary basis the culvert therefore has the potential to have an adverse effect on biological, physicochemical and hydromorphological quality elements. These adverse effects have the potential to cause a deterioration in status. Consequently, additional mitigation is required at this site to reduce the potential impact on the water body and minimise the risk of non-compliance. These measures are described in section 14.1.10.

Eamont (Lower) (GB102076070990)

14.1.9.12 The assessment has identified the potential for adverse (amber) overall effects on the status of the Eamont (Lower) (GB102076070990) water body which is affected by the M6M6 Junction 40 to Kemplay Bank and Penrith to Temple Sowerby schemes comprising proposed culvert extensions on five different watercourses.

14.1.9.13 This includes an approximately 33.5m culvert extension on the Unnamed Tributary of Light Water 3.1; an approximately 12.8 m culvert extension on Light Water, a an approximately 40m culvert extension on the Unnamed Tributary of River Eamont 3.3, the replacement of a culvert on the Unnamed Tributary of River Eamont 3.4 incorporating an increase in length of 25m and an approximately 53 m extension of a culvert on the Unnamed Tributary of River Eamont 3.5. In addition, a new proposed culvert of Light Water to facilitate an access road will further impact 9m of the watercourse. These scheme components have the potential to have an adverse widespread or prologed effect on footprint, shading and changes to hydromorphology leading to changes in river processes and habitats upstream and downstream.

14.1.9.14 Further, proposed channel works are proposed on the Unnamed Tributary of the River Eamont 3.3 to formalise the channel for drainage and resulting in the channel being straightened and shortened by approximately 17m. The details of the channel works are subject to detailed design but have the potential to have an

adverse widespread or prolonged effect on footprint and changes to hydromorphology leading to changes in river processes and habitats upstream and downstream. This has the potential to have an adverse effect on biological and hydromorphological quality elements.

14.1.9.15 In total, 190.3 m of watercourse within this waterbody will be adversely affected by these scheme components. Accordingly, on a precautionary basis the Project has the potential to have an adverse effect on biological, physicochemical and hydromorphological quality elements of the Eamont (Lower). These adverse effects have the potential to cause a deterioration in status. Consequently, additional mitigation may be required at this site to reduce the potential impact on the water body and minimise the risk of non-compliance. These measures are described in section 14.1.10.

Eden Lyvennet to Eamont (GB102076070980)

14.1.9.16 The assessment has identified the potential for adverse (amber) overall effects on the status of the Eden Lyvennet to Eamont (GB102076070980) water body which is affected by the Temple Sowerby to Appleby scheme, associated with a proposed culvert extension on Swine Gill, resulting in an additional 24.6 m of culverted watercourse. This culvert extension is greater than one to five times the width of the channel. This has the potential to have an adverse widespread or prolonged effect on footprint, shading and changes to hydromorphology leading to changes in river processes and habitats upstream and downstream.

14.1.9.17 Accordingly, on a precautionary basis the culvert therefore has the potential to have an adverse effect on biological, physicochemical and hydromorphological quality elements. These adverse effects have the potential to cause a deterioration in status. Consequently, additional mitigation may be required at this site to reduce the potential impact on the water body and minimise the risk of non-compliance. These measures are described in section 14.1.10.

Eden - Scandal Beck to Lyvennet (GB102076070880)

14.1.9.18 The assessment has identified the potential for adverse (amber) overall effects on the status of the Eden - Scandal Beck to Lyvennet (GB102076070880) water body which is affected by the Appleby to Brough scheme, associated with six proposed culverts on five different watercourses, as well as one culvert extension.

14.1.9.19 The proposed culvert to faciliate an access road on Unnamed Tributary of Cringle Beck 6.1 has an indicative length of 84 m compared to a width of 4.5 m required for flood relief, the same access road also crosses Cringle Beck where a proposed culvert will be required, the details of this are subject to detailed design so, for the purposes of this assessment the length is assumed to be the same as the proposed culvert on the Unnamed Tributary of Cringle Beck 6.1. A proposed culvert on Unnamed Tributary of Mire Sike 6.4 comprises a length of 11.5 m, with another proposed culvert of ~19 m proposed on Unnamed Tributary of Cringle Beck 6.3 and another

proposed culvert on Unnamed Tributary of Mire Sike 6.12 comprises a length of 36 m and 2 m wide. In addition, there is a proposed culvert extension on this watercourse (Unnamed Tributary of Mire Sike 6.12) of 40m. This has the potential to have an adverse widespread or prologed effect on footprint, shading and changes to hydromorphology leading to changes in river processes and habitats upstream and downstream, which in turn have the potential to affect biological, physicochemical and hydromorphological quality elements.

14.1.9.20 Further, a Flood Compensation Area is also proposed on Cringle Beck. The proposed works are subject to detailed design, but Flood Storage Areas have the potential to have an adverse (amber) overall effect owing to changes in hydromorphology leading to changes in river processes and habitats upstream and downstream, affecting quantity and dynamics of water flow and the structure of the riparian zone.

14.1.9.21 In total, 160 m of watercourse within this waterbody will be adversely affected by these scheme components. Accordingly, on a precautionary basis the culvert therefore has the potential to have an adverse effect on biological, physicochemical and hydromorphological quality elements. These adverse effects have the potential to cause a deterioration in status. Consequently, additional mitigation may be required at this site to reduce the potential impact on the water body and minimise the risk of non-compliance. These measures are described in section 14.1.10.

Trout Beck (GB102076070930)

14.1.9.22 The assessment has identified the potential for adverse (amber) overall effects on the status of the Trout Beck (GB102076070930) water body which is affected by the Temple Sowerby to Appleby scheme and comprises of four proposed culverts on two different watercourse.

14.1.9.23 The proposed culvert on the Unnamed Tributary of Trout Beck 4.2 has an indicative length of 50.4 m. A proposed culvert on the Unnamed Tributary of Trout Beck 4.6 comprises a span of ~197 m with a second culvert affecting a further 316 m of the Unnamed Tributary of Trout Beck 4.6. Accordingly, on a precautionary basis these proposed culverts have the potential to have an adverse (amber) effect on biological, physicochemical and hydromorphological quality elements. These adverse effects have the potential to cause a deterioration in status.

14.1.9.24 These culverts have the potential to have an adverse widespread or prolonged effect on footprint, shading and changes to hydromorphology leading to changes in river processes and habitats upstream and downstream, which in turn have the potential to affect biological, physicochemical and hydromorphological quality elements. ES Appendix 14.9: Detailed Geomorphological Modelling (Application Document 3.4) has assessed the potential implications and impacts of the Temple Sowerby to Appleby scheme on Trout Beck. The study found that there is unlikely to be significant changes to the riverbed

substrate or sediment transport dynamics along the Trout Beck as a result of the scheme and that it is unlikely to generate significant morphological change on the Trout Beck Floodplain in the vicinity of the proposal. However, the study also noted that Trout Beck has likely been artificially straightened in the past and is undergoing natural recovery to restore a more natural, sinuous channel planform which increases the risk of channel planform migration in the future, and a moderate impact was identified on flood depths within the floodplain of Trout Beck within the Order Limits, as a result of the scheme.

14.1.9.25 In total, 563.4 m of watercourse within this waterbody will be affected by these scheme components. Accordingly, on a precautionary basis these culverts therefore have the potential to have an adverse effect on biological, physicochemical and hydromorphological quality elements. These adverse effects have the potential to cause a deterioration in status. Consequently, additional mitigation may be required at this site to reduce the potential impact on the water body and minimise the risk of non-compliance. These measures are described in section 14.1.10.

Low Gill (Crooks Beck) (GB102076070750)

14.1.9.26 The assessment has identified the potential for adverse (amber) overall effects on the status of the Low Gill (Crooks Beck) (GB102076070750) water body which is affected by the Appleby to Brough scheme associated with three proposed culverts on three different watercourses, as well as three culvert extensions on three watercourses, five Flood Compensation Areas on four different watercourses and a proposed realignment on two different watercourses.

14.1.9.27 The proposed culvert on Lowgill Beck is subject to detailed design and will affect approximately 22m of existing open channel to facilitate an access road. The proposed culvert on Unnamed Tributary of Lowgill Beck 6.1 comprises a 41.7m long structure with a 6m span and 1.6m headroom. Another culvert is proposed on Unnamed Tributary of Lowgill Beck 6.7 with a length of 26m and 1.5m wide, and a culvert on Moor Beck (Offtake) of 4.3 m in length will be required to facilitate the NMU access track. Additionally, an extension of an existing culvert on Yosgill Sike will affect an additional 16m of channel, extending the culvert to a total of 58.5m in length, with a width of 4.6m and 1.6m headroom. Extension of a culvert on Eastfield Sike will lead to an additional 31m of open channel being culverted as well as another extension to an existing culvert on the Unnamed Tributary of Lowgill Beck 6.7 taking the total culvert length from 42.5m to 65.5m. Another culvert extension on the Unnamed Tributary of Mire Sike 6.12 will extend the existing culvert from 19.1 m in length to a total of 59.1 m. These scheme components have the potential to have an adverse widespread or prolonged effect on footprint, shading and changes to hydromorphology leading to changes in river processes and habitats upstream and downstream, which in turn

have the potential to affect biological, physicochemical and hydromorphological quality elements.

14.1.9.28 Further, five Flood Compensation Areas are proposed on four watercourses, namely two Flood Compensation Areas on Eastfield Sike, and one Flood Storage Area on Moor Beck, Woodend Sike and Yosgill Sike. The proposed works are subject to detailed design, but Flood Storage Areas have the potential to have an adverse (amber) overall effect owing to changes in hydromorphology leading to changes in river processes and habitats upstream and downstream, affecting quantity and dynamics of water flow and the structure of the riparian zone.

14.1.9.29 In addition, realignments are also proposed affecting Woodend Sike and Yosgill Sike to facilitate Yosgill Sike culvert extension, affecting approximately 45 m of existing open channel on each watercourse. The realignment is subject to detailed design, but there is a risk that one or both channels may need to be shortened compared to the existing to facilitate the convergence of Woodend Sike and Yosgill Sike upstream of the proposed Yosgill Sike culvert extension. Minor realignments may also be required on the Unnamed Tributary of Mire Sike 6.4, Eastfield Sike and Lowgill Beck, however, the need for these realignments and the design will be determined at the detailed design stage. The realignments have the potential to have an adverse (amber) overall effect in the event of the realignment being shorter than the existing alignment owing to changes in footprint and changes in hydromorphology leading to changes in river processes and habitats upstream and downstream, affecting biological and hydromorphological quality elements. These effects will be quantified at the detailed design stage when the proposed realignment has been determined.

14.1.9.30 It should be noted that the ES Appendix 14.9: Detailed Geomorphological Modelling (Application Document 3.4) identified some potentially significant morphological changes to Moor Beck during the 1 in 100 year +94% climate change flood event associated with the proposed viaduct over Moor Beck, Warcop Junction structure and floodplain compensation structure. This includes significant increases in the size of material entrained in the Moor Beck channel which may increase riverbed scour and change riverbed composition and bank instability. Further, there may be significant reduction in left bank flow and increase in right bank flow on the Moor Beck as well as changes in floodplain flow velocities. The ES Appendix 14.9: Detailed Geomorphological Modelling (Application Document 3.4) therefore recommended a realignment of Moor Beck channel to improve sinuosity (and therefore flow velocities and scour) between Moor Beck viaduct and Warcop Junction, as well as green scour protection and increasing the roughness of the floodplain.

14.1.9.31 In total, 204 m of watercourse within this waterbody is currently proposed to be affected by these scheme components. Accordingly, on a precautionary basis the proposed culverts and Flood Compensation Areas therefore have the potential to have an adverse effect on biological, physicochemical and hydromorphological quality

elements. These adverse effects have the potential to cause a deterioration in status. Consequently, additional mitigation may be required at this site to reduce the potential impact on the water body and minimise the risk of non-compliance. These measures are described in section 14.1.10.

Greta from Sleightholme Beck to Ellder Beck (GB103025072140)

14.1.9.32 The assessment has identified the potential for adverse (amber) overall effects on the status of the Greta from Sleightholme Beck to Ellder Beck (GB103025072140) water body associated the Bowes Bypass scheme with three culvert extensions on two different watercourses.

14.1.9.33 The proposed extension of the culverts on the Unnamed Tributary of River Greta 7.3 comprise one with a length of 155m and an additional extension of 38m on another culvert. This has the potential to have an adverse widespread or prolonged effect on footprint, shading and changes to hydromorphology leading to changes in river processes and habitats upstream and downstream, which in turn have the potential to affect biological, physicochemical and hydromorphological quality elements.

14.1.9.34 In total, 193 m of watercourse within this waterbody will be adversely affected by these scheme components. Accordingly, on a precautionary basis the culvert therefore has the potential to have an adverse effect on biological, physicochemical and hydromorphological quality elements. These adverse effects have the potential to cause a deterioration in status. Consequently, additional mitigation may be required at this site to reduce the potential impact on the water body and minimise the risk of non-compliance. These measures are described in section 14.1.10.

Greta from Gill Beck to River Tees (GB103025072130)

14.1.9.35 The assessment has identified the potential for adverse (amber) overall effects on the status of the Greta from Gill Beck to River Tees (GB103025072130) water body which is affected by the Cross Lanes to Rokeby scheme which is associated with two proposed new culverts on two watercourses, as well as an extension of an existing culvert to a third watercourse and proposed realignments on four watercourses.

14.1.9.36 The proposed culvert on Punder Gill will affect approximately 24m of existing open channel while the proposed culvert on Tutta Beck will affect approximately 20m. Both proposed culverts will comprise a precast concrete box culvert units with precast concrete headwall to facilitate an access road. Further, an extension of an existing culvert on Unnamed Tributary of Punder Gill 8.1 is also proposed, affecting approximately 17m of existing open channel and increasing the length of the existing culvert from approximately 50m to 67m. These scheme components have the potential to have an adverse effect on footprint, shading and changes to hydromorphology leading to

changes in river processes and habitats upstream and downstream, which in turn have the potential to affect biological, physicochemical and hydromorphological quality elements.

14.1.9.37 In addition, realignments are also proposed affecting Punder Gill, Unnamed Tributary of Punder Gill 8.1 and Tutta Beck. The realignment of Punder Gill will affect approximately 166 m of existing channel by realigning it approximately 20m north, reducing the overall length to approximately 163m of which approximately 24m will be culverted resulting in a net loss of 27m of open channel. Similarly, the proposed realignment of Tutta Beck will realign approximately 104m of existing channel over approximately 131m, of which approximately 36m will be culverted resulting in a potential net loss of open channel of approximately 9m. The Unnamed Tributary of Punder Gill 8.1 will therefore need to be shortened approximately 20m to tie-in with the proposed realignments of Punder Gill and Tutta Beck. These realignments have the potential to have an adverse (amber) widespread or prolonged overall effect owing to reduction in the length of existing channel, changes in footprint and changes in hydromorphology leading to changes in river processes and habitats upstream and downstream, affecting biological and hydromorphological quality elements.

14.1.9.38 In total, 117 m of watercourse within this waterbody will be adversely affected by these scheme components. Accordingly, on a precautionary basis the proposed culverts and realignments therefore have the potential to have an adverse effect on biological, physicochemical and hydromorphological quality elements. These adverse effects have the potential to cause a deterioration in status. Consequently, additional mitigation may be required at this site to reduce the potential impact on the water body and minimise the risk of non-compliance. These measures are described in section 14.1.10.

Skeeby/Holme/Dalton Bk from Source to River Swale (GB104027069180)

14.1.9.39 The assessment has identified the potential for adverse (amber) overall effects on the status of the Skeeby/Holme/Dalton Bk from Source to River Swale (GB104027069180) water body which is affected by the Stephen Bank to Carkin Moor scheme which is associated with eleven proposed culverts and one culvert extension affecting nine different watercourses as well as one realignment and two potential realignments on one watercourse.

14.1.9.40 Two culverts are proposed on Unnamed Tributary of Cottonmill Beck 9.3, including one which will be approximately 74.5 m long with a 0.45 m diameter and a second culvert which is proposed to be 1.5m in diameter and 47.5m in length. Two culverts are also proposed on the Unnamed Tributary of Holme Beck 9.2, with one new culvert proposed to be 1.5m in height, 1.8m wide and 44.2m long, with a culvert extension proposed on an existing culvert of ~46.6 m taking the total length to ~69 m with a diameter of 1.5 m to 1.8 m subject to detailed design approximately . One proposed culvert on Unnamed Tributary of Holme Beck 9.3 will comprise a 2m by 2m culvert 99.2m

in length. The proposed culverts on Unnamed Tributary of Holme Beck 9.6 and Unnamed Tributary of Holme Beck 9.8 will comprise a 1.5m diameter culvert measuring 49.4m and 27.3m in length respectively. A second proposed culvert on Unnamed Tributary of Holme Beck 9.8 will replace an existing culvert with a 1.5m diameter culvert ~85 m in length subject to detailed design, this may require a flow control structure on upstream side of the proposed new culvert to restrict flows passing downstream. Proposed culverts on Main Gill and Unnamed Tributary of Mains Gill 9.1 will comprise 1.5m high and 2.25m wide measuring 99.3m and 8.7m in length respectively. In addition, an extension of an existing culvert is proposed on Unnamed Tributary of Holme Beck 9.7, which will comprise the same dimensions as the existing culvert (1.5m by 1.8m) with a 45.8m long extension.

14.1.9.41 These proposed culverts and culvert extension have the potential to have an adverse effect on footprint, shading and changes to hydromorphology leading to changes in river processes and habitats upstream and downstream, which in turn have the potential to affect biological, physicochemical and hydromorphological quality elements.

14.1.9.42 In addition, a proposed realignment on Mains Gill will affect approximately 22 m of existing channel to facilitate a proposed culvert, which has the potential to result in a loss of approximately 5m length of open channel. Further, the Unnamed Tributary of Browson Beck 9.1 may require minor realignment to facilitate SchemeStephen Bank to Carkin Moor, however, this is subject to detailed design. These realignments have the potentail to have an adverse (amber) widespread or prolonged overall effect owing to reduction in the length of existing channel, changes in footprint and changes in hydromorphology leading to changes in river processes and habitats upstream and downstream, affecting biological and hydromorphological quality elements.

14.1.9.43 In total, 632.5 m of watercourse within this waterbody will be adversely affected by these scheme components. Accordingly, on a precautionary basis the proposed culverts and realignments therefore have the potential to have an adverse effect on biological, physicochemical and hydromorphological quality elements. These adverse effects have the potential to cause a deterioration in status. Consequently, additional mitigation may be required at this site to reduce the potential impact on the water body and minimise the risk of non-compliance. These measures are described in section 14.1.10.

Effects on achievement of future status objectives

14.1.9.44 The preliminary assessment has scoped the likely effects of the Project on RNAG, PoM, and HMWB/AWB Mitigation Measures derived by the Environment Agency for the surface water bodies affected by the Project.

14.1.9.45 Where RNAG, PoM, and HMWB/AWB Mitigation Measures have been identified as being potentially at risk from the Project, the effects of relevant scheme components potentially affecting the watercourses

screened in within the surface water body catchment have been assessed.

Greta from Sleightholme Beck to Ellder Beck (GB103025072140)

14.1.9.46 Three RNAG for the Greta from Sleightholme Beck to Ellder Beck (GB103025072140) water body have been identified as potentially being at risk from the Project. These relate to physical modifications and other pressures which are considered to currently be limiting the Fish status of the water body.

14.1.9.47 As described in paragraphs 5.2.32 - 5.2., three extensions of existing culverts are proposed on two tributaries of the River Greta WFD waterbody. Collectively, these culverts will result in a loss of approximately 191m of existing river and riparian habitat. This is considered to have a potential adverse effect on aquatic and riparian habitat, which has the potential to worsen existing physical modification pressures on the Fish status of the water body in the future. Consequently, there is a risk that the scheme may inhibit the future achievement of the water body's Good status objective.

14.1.9.48 Additional mitigation may therefore be required to mitigate the risk caused by the Project and prevent a worsening of physical modifications causing barriers to ecological continuity and ecological recovery time within the water body. These measures are the same as those required to mitigate effects on the current status of the water body, and are described in section 14.1.10.

Skeeby/Holme/Dalton Bk from Source to River Swale (GB104027069180)

14.1.9.49 Two RNAG for the Skeeby/Holme/Dalton Bk from Source to River Swale (GB104027069180) water body have been identified as potentially being at risk from the Project. These relate to physical modifications which are considered to currently be limiting the Fish status of the water body.

14.1.9.50 One PoM for the water body has also been identified as potentially being at risk from the Project. This corresponds to the above RNAGs and relates to a package of measures needed to improve modified habitat by improvement to the condition of the riparian zone and/or wetland within the water body.

14.1.9.51 As described in paragraphs 14.114.1.9.39 - 14.114.1.9.43, 11 proposed culverts and one culvert extension affecting nine different watercourses as well as one realignment and two potential realignments on one watercourse, all of which are tributaries to the main WFD water body line. Collectively, these scheme components will result in a loss of at least 554.4m of existing river and riparian habitat, with two proposed culverts of unknown length expected to affect additional channel length. This is considered to have an adverse effect on aquatic and riparian habitat, which has the potential to worsen existing physical modification pressures on the Fish status of the water body. Consequently, there is a risk that the Project may

inhibit the future achievement of the water body's Good status objective.

14.1.9.52 Additional mitigation may therefore be required to mitigate the risk caused by the Project and prevent a worsening of physical modifications causing barriers to ecological continuity and ecological recovery time within the water body. These measures are the same as those required to mitigate effects on the current status of the water body, described in section 14.1.10, and would also support the PoM identified for the water body.

14.1.10 Additional mitigation requirements

14.1.10.1 As set out in Section 14.1.1, the results reported in this WFD compliance assessment are based on a precautionary worst case scenario. As such, the mitigation identified as being required to mitigate the likely significant effects reported are based on this worst case scenario. It may be the case that as detailed design of the Project evolves, it becomes apparent that a lesser form of mitigation is required to achieve the same outcome. As such, the EMP (Application Document 2.7) secures the 'maximum' extent of mitigation required (as identified in this assessment) but also, where appropriate, includes mechanisms (e.g. by way of further surveys or modelling) to establish, pre-construction and during detailed design, whether the identified mitigation can be refined such that a lesser extent is required to achieve the outcome reported in this assessment. The fundamental point is that the mitigation identified in this section is secured by the EMP (Application Document 2.7), where required to achieve the outcome reported in this assessment.

14.1.10.2 The preliminary designs have been developed in close consultation with fluvial geomorphologists, hydrologists, hydrogeologists, ecologists and water quality scientists to minimise impacts to the water environment where possible. However, in some cases the detailed impact assessment has identified adverse (amber) effects with a risk of deterioration in the status of water body quality elements.

14.1.10.3 As such, additional site-specific mitigation is required where the detailed impact assessment has identified adverse (amber) effects with a risk of deterioration in status of water body quality elements to offset the impact of the scheme.

14.1.10.4 A series of additional mitigation relating to the water environment have been identified in Appendix 14.11: Non-Significant Effects (ES Volume 3, Application Document Number 3.4) and Appendix 6.17 Fish Habitat Assessment and MoRPh (ES Volume 3, Application Document Number 3.4). A summary of these mitigation proposals associated with the impacted WFD water bodies are described below and detailed in the EMP (Application Dcoument 2.7). No specific mitigation has been identified for the Greta from Sleightholme Beck to Ellder Beck (GB103025072140) or Greta from Gill Beck to River Tees (GB103025072130) water bodies which have been identified in the WFD assessment as being impacted by the scheme.

Eamont (Upper) (GB102076071020)

14.1.10.5 Thacka Beck has been identified as having low connectivity with the River Eamont under low flow conditions due to the watercourse being perched at the confluence of the two channels. This disconnectivity restricts fish migration between the two rivers during low flows, therefore fish passage improvements have been identified in this location.

Eamont (Lower) (GB102076070990)

14.1.10.6 Habitat creation in the form of riparian woodland planting along Light Water, to the north and south of the existing A66 has been identified to mitigate the loss of riparian habitat associated with the proposed new culvert and culvert extension on Light Water. Improvements to an existing culvert on Light Water (approximately 200 m upstream from the confluence with the River Eamont has also been identified; the culvert is known to block up, creating a step under low flows and high velocities under high flow conditions. Improving this culvert will improve fluvial continuity and fish passage. Further, poaching from livestock has been identified on the banks of Light Water and the Unnamed Tributary of River Eamont 3.3. Through the provision of stock-proof fencing and riparian planting, the riparian and in-channel habitat will be improved as well as water quality through reduced nutrient and fine sediment input.

Eden Lyvennet to Eamont (GB102076070980)

14.1.10.7 Riparian habitat improvements have been identified adjacent to Swine Gill upstream and downstream of the existing A66 in the form of woodland planting and management. This will connect and extend areas of existing woodland and mitigate for the loss of riparian habitat associated with the extension of the existing Swine Gill culvert.

Eden - Scandal Beck to Lyvennet (GB102076070880)

14.1.10.8 A small weir on Unnamed Tributary of Mire Sike 6.12 has been identified as likely to be impassable by fish under normal flow conditions. Removal or mitigation of this weir will improve connectivity of habitats locally.

Trout Beck (GB102076070930)

14.1.10.9 It is noted that sections of bank along Trout Beck within the River Eden SAC are not rich in riparian vegetation and no buffer strip is present. There is potential to enhance the riparian zone through the addition of trees and a riparian buffer strip.

Low Gill (Crooks Beck) (GB102076070750)

14.1.10.10 The existing A66 culvert on Lowgill Beck (Appleby to Brough), immediately downstream of the Woodend Sike and Yosgill Sike confluence, is considered to be a barrier for fish passage (except for eel) under normal low flow conditions. To improve fish passage to and from Lowgill Beck to Woodend Sike and Yosgill Sike, extending

the baffles to create deeper water over the concrete bed upstream of the culvert and tying this into the natural riverbed has been recommended. Further, poaching from livestock has been identified on the banks of Eastfield Sike. Through the provision of stock-proof fencing and riparian planting, the riparian and in-channel habitat could be improved as well as water quality through reduced nutrient and fine sediment input.

Skeeby/Holme/Dalton Bk from Source to River Swale (GB104027069180)

14.1.10.11 The potential to daylight a 300 m section of culvert on Mains Gill has been identified through the removal of pipe culvert which would reconnect habitats locally. This culvert is understood to present a barrier to fish passage to the upper reaches of Mains Gill so channel improvements here could greatly improve in-channel habitat access.

WFD additional mitigation

14.1.10.12 The additional mitigation identified in Appendix 14.11: Non-Significant Effects (ES Volume 3, Application Document Number 3.4) and Appendix 6.17 Fish Habitat Assessment and MoRPh (ES Volume 3, Application Document Number 3.4) and listed above, will deliver some of the mitigation required to offset the impact of the scheme, However, the mitigation is limited to improvement of ecological receptors, and therefore, further additional mitigation is required to address wider effects on other quality and supporting element including hydromorphology, the types of activities required and the quantity/scale of interventions are outline below..

14.1.10.13 Typical interventions that are appropriate to mitigate for the impacts of the scheme are described in the following sections, with reference to the relevant scheme components in Table 14:.

14.1.10.14 A summary of the additional mitigation requirements for each water body is located within Table 16. This table will be reviewed and updated at the detailed design stage to ensure the additional mitigation proposed is suitable and sufficient to address the adverse effects identified Table 15: Summary of the additional mitigation requirements for each water body.

Low flow channel creation

14.1.10.15 Low flow channels can sustain appropriate flow depths and velocities which can improve the potential for fish passage. Creation of low flow channels is likely to include the provision of in-channel geomorphological features such as berms and bars to promote several flow types such as pools, riffles and runs. This provides habitat diversity and marginal habitat, as well as width-depth variation. The creation of low flow channels is appropriate additional mitigation for the potential adverse effects on the biological and hydromorphology status of the waterbody when extending an existing culvert or when implementing a drainage outfall.

Bank reprofiling

14.1.10.16 Bank reprofiling would provide varied channel bank profiles to improve morphological diversity. This would include areas of shallow-graded channel to allow for marginal vegetation growth. This is appropriate additional mitigation for the potential adverse effects on the biological and hydromorphology status of the waterbody when implementing an access road culvert.

Removal of existing structures

14.1.10.17 Removal of existing structures from the watercourses such as weirs or bridges can improve the natural flow of the river and increase biodiversity by restoring vegetation and habitats. It is appropriate additional mitigation for the potential adverse effects on the biological and hydromorphology status of the waterbody when implementing a culvert.

Wetland habitat creation/improving floodplain connectivity

14.1.10.18 For areas with added flood compensation areas, additional mitigation would be to create wetland habitat. They can improve water quality, erosion control, enhance habitat, and positively impact water supply. It is appropriate additional mitigation for the potential adverse effects on the biological, physicochemical and hydromorphology status of the waterbody when implementing channel works.

Buffer strips

14.1.10.19 For any proposed realignment, a 10m wide buffer strip would be incorporated on both sides of the new channel to allow for, where practical, the implementation of marginal and riparian habitat improvements as well as aiding in flood alleviation. It is appropriate additional mitigation for the potential adverse effects on the biological and hydromorphology status of the waterbody when implementing a drop inlet culvert.

Summary of additional mitigation

14.1.10.20 Table 15:. This has taken the length of affected water body and uplifted the length of mitigation required based on the following assumptions:

- If the scheme component causing a potential adverse (amber) effect is affecting a watercourse of “Poor” or “Moderate” status, the length of additional mitigation required will be double the length of affected watercourse;
- If the scheme component causing a potential adverse (amber) effect is affecting a watercourse of “Good” status and the watercourse is a tributary of a main WFD water body, the length of additional mitigation required will be triple the length of affected watercourse;
- If the scheme component causing a potential adverse (amber) effect is affecting a watercourse of “Good” status and the watercourse is the main WFD water body line, the length of

additional mitigation required will be quadruple the length of affected watercourse.

14.1.10.21 It should be noted that no adverse effects have been identified on the main WFD water body line, with the identified adverse effects only affecting tributaries of the WFD water bodies. The embedded mitigation has been designed to ensure adverse effects do not occur wherever possible, however, this has not been possible for all the tributaries impacted by the Project. These tributaries are located within waterbodies of 'Poor' or 'Moderate' status, therefore the additional mitigation proposed is twice as long as the affected watercourse. As such, the proposed additional mitigation may be applied to any watercourse within the identified WFD water body catchment of equivalent value to the affected watercourse. The length of available watercourse for additional mitigation within the red line boundary of the Project within in each WFD water body is also provided in Table 15:.

14.1.10.22 Further, the additional mitigation identified for ecological impacts summarised in Appendix 14.11: Non-Significant Effects (ES Volume 3, Application Document Number 3.4) and Appendix 6.17 Fish Habitat Assessment and MoRPh (ES Volume 3, Application Document Number 3.4) will contribute to the additional mitigation required for WFD adverse effects. At the detailed design stage, these additional mitigation will be reviewed and their contribution to the level of mitigation required for WFD quantified to enable it to contribute to the WFD additional mitigation required, as outlined in Table 15:. The additional WFD mitigation outlined in Table 15: are considered appropriate and sufficient to mitigate the identified adverse effects and are incorporated within the EMP (Application Document 2.7).

Table 15: Summary of the additional mitigation requirements for each water body catchment

WFD Surface Water Body catchment	Low flow channel creation	Bank reprofiling	Removal of structure	Wetland/ floodplain creation/ improvement	Buffer strips	Total length of adversely affected watercourse (m)	Total length of additional mitigation required (m)	Total length of watercourse within Red Line Boundary (m)
Eamont (Upper) (GB102076071020)	ü	ü				26.5	79.5	598
Eamont (Lower) (GB102076070990)	ü	ü				190.3	570.9	2,609
Eden Lyvennet to Eamont (GB102076070980)	ü	ü				24.6	49.2	573
Eden - Scandal Beck to Lyvennet (GB102076070880)	ü	ü	ü	ü		274.5	823.5	2,011
Trout Beck (GB102076070930)	ü	ü	ü			563.4	1,690.2	2,457
Low Gill (Crooks Beck) (GB102076070750)	ü	ü	ü	ü	ü	204	408	3,637
Greta from Gill Beck to River Tees (GB103025072130)	ü	ü			ü	117	351	1,838
Greta from Sleightholme Beck to Eller Beck (GB103025072140)	ü	ü	ü			193	386	786
Skeeby/Holme/Dalton Bk from Source to River Swale (GB104027069180)	ü	ü	ü		ü	632.5	1,265	4,130

14.1.11 Residual adverse effects with risk of deterioration in status

14.1.11.1 A range of additional mitigation has been identified to avoid or reduce the potential adverse effects at these sites. This includes the additional mitigation identified in ES Appendix 14.11: Non-Significant Effects (Application Document 3.4) and ES Appendix 6.18: Fish Habitat Assessment and MoRPh (Application Document 3.4) which is considered appropriate to mitigate the effects identified on ecological receptors (and therefore biological quality elements). WFD specific additional mitigation has also been identified to address any remaining adverse effects on hydromorphological quality elements. The requirement for additional mitigation has been quantified in Table 15: Summary of the additional mitigation requirements for each water body catchment, alongside the length of watercourse within the red line boundary of the Project within which the mitigation will be undertaken.

14.1.11.2 Whilst it is currently anticipated that it will be feasible to develop and implement a mitigation strategy to ensure that there is no residual risk to the future achievement of status objectives for these water bodies, further assessment and design work is required at the detailed design stage to inform the best mitigation solution at each site, which will be informed through consultation with the Environment Agency. This will be informed by ES Appendix 14.9: Detailed Geomorphological Modelling (Application Document 3.4), to ensure all potential effects are identified and the appropriate type and degree of mitigation is implemented in the necessary locations. This is required to ensure that both the type and scale of additional mitigation is appropriate and proportionate to sufficiently mitigate the potential adverse effects.

14.1.11.3 The additional mitigation identified is considered appropriate to mitigate the identified potential adverse effects and is outlined within the EMP (Application Document 2.7). As such, the potential for residual adverse overall effects associated with the risk of preventing the future achievement of status objectives of these surface water bodies is not considered to remain at this stage.

14.1.12 Residual adverse effects with risk of prevention of achievement of status objectives

14.1.12.1 A range of additional mitigation has been identified to avoid or reduce the potential adverse effects at these sites as outlined in the EMP (Application Document 2.7). Whilst it is currently anticipated that it will be feasible to develop and implement a mitigation strategy to ensure that there is no residual risk to the future achievement of status objectives for these water bodies, further assessment and design work, in consultation with the Environment Agency, is required to inform the best mitigation solution at each site.

14.1.12.2 It is anticipated that the potential for residual adverse overall effects with the risk of preventing the future achievement of status objectives of these surface water bodies is not considered to remain at this stage.

14.1.13 Cumulative effects across water bodies

14.1.13.1 No cumulative effects associated with the impacts of scheme component located within other, adjacent water bodies (upstream or downstream) have been identified for any of the surface water bodies affected by the Project.

14.1.13.2 Whilst a number of water bodies are located either upstream Oh or downstream of other water bodies that are also affected by the Project, no widespread adverse effects have been identified within any of the surface water bodies that have the potential to propagate upstream/downstream (e.g. significant impacts on flow regime, sediment transfer or biological continuity) when considered with the proposed embedded mitigation.

14.1.14 Targeted monitoring of effects on current status

14.1.14.1 The detailed impact assessment has identified the route-wide effects anticipated on surface water bodies and watercourses affected by the Project.

14.1.14.2 Targeted WFD monitoring will be implemented on each of these water bodies / watercourses prior to, during and following construction, to assess the effects of the Project and the suitability and effectiveness of mitigation included within the design and additional mitigation outlined within this assessment for the relevant scheme components.

14.1.14.3 This monitoring strategy will be developed in consultation with the Environment Agency and tailored around the relevant scheme components and quality elements affected.

14.1.14.4 Monitoring outcomes will be utilised to inform the development of any corrective measures and/or further mitigation if/where deemed necessary by the Environment Agency.

14.1.14.5 This is secured in the EMP (Application Document 2.7).

14.1.15 Groundwater

14.1.15.1 There are no groundwater bodies scoped in for detailed impact assessment (DIA), as per section 14.1.4

14.1.16 Conclusions

14.1.16.1 The Project will cross a number of surface water bodies and groundwater bodies. This report is an assessment of the Project's compliance against the statutory WFD objectives of those water bodies potentially affected.

14.1.16.2 This report assesses the effects of the Project on the current status and status objectives of the quality elements of water bodies. This relates to the requirement under the WFD for the consideration of whether new developments have the potential to result in:

- a deterioration in current status; and/or
- prevention of the achievement of good status/potential objectives in the future.

14.1.16.3 The assessment has identified a total of 10 surface water bodies and four groundwater bodies potentially affected by the Project. In total,

44 individual watercourses within these surface water bodies have been identified for assessment. These are summarised in Table 13: Summary of effects of the Project on WFD surface water bodies and associated risks of deterioration in status and Annex A: WFD Waterbodies.

14.1.16.4 The assessment identified four groundwater bodies potentially affected by the Project. However, the scoping assessment found that the scheme component effects are not anticipated to pose any risk quantitatively or chemically to the status of the groundwater bodies, and thus the groundwater bodies have not been taken forward for detailed impact assessment

14.1.16.5 A detailed impact assessment has been undertaken of all components of the Project identified as having the potential to have an effect on the status elements of the relevant WFD water bodies.

14.1.16.6 The assessment process for determining the potential for a deterioration of status uses a traffic light rating system, in order to assign the magnitude of the effect on the quality elements of the affected water body. The outcome of the assessment identifies the overall effect of all the relevant scheme components on each quality element at a water body scale.

14.1.17 Effects on current status

14.1.17.1 Of the 10 surface water bodies scoped in for detailed impact assessment:

- Nine surface water bodies are at risk of experiencing adverse (amber) overall effects on one or more quality elements, with the potential for a deterioration in quality element status (requiring additional mitigation);
- no surface water bodies are at risk of experiencing severe adverse (red) overall effects of sufficient scale to cause a deterioration in quality element status;
- no surface water bodies are anticipated to experience wider beneficial (dark blue) overall effects of a scale sufficient to cause an increase in quality element status class; and
- no surface water bodies are anticipated to experience negligible (green) or minor, with one waterbody at risk of localised adverse (yellow) overall effects only, with no measurable change in quality element status.

14.1.17.2 The potential for adverse (amber) overall effects on one or more quality elements, with the potential to cause a deterioration in quality element status, has been identified in relation to the surface water bodies, watercourses and scheme components below. However, it should be noted that the watercourses affected are tributaries of the main WFD water bodies and are considered low value fish habitat and largely disconnected, so are scoped out in the HRA:

- Eamont (Upper) (GB102076071020); Thacka Beck; Extension of existing culvert
- Eamont (Lower)(GB102076070990); Unnamed Tributary of Light Water 3.1, Light Water, Unnamed Tributary of River Eamont 3.3, Unnamed Tributary of River Eamont 3.4, Unnamed Tributary of

River Eamont 3.5; Extension to existing culverts, Access road culvert, Channel works;

- Eden Lyvennet to Eamont (GB102076070908); Swine Gill; Extension to existing culvert
- Eden - Scandal Beck to Lyvennet (GB10207607880); Unnamed Tributary of Mire Sike 6.4, Unnamed Tributary of Mire Sike 6.12, Unnamed Tributary of Cringle Beck 6.1, Unnamed Tributary of Cringle Beck 6.3, Cringle Beck; Access road culverts, Extension to existing culvert, Culverts, Flood compensation areas
- Trout Beck (GB102076070930): Unnamed Tributary of Trout Beck 4.2, Unnamed Tributary of Trout Beck 4.6; Access road culverts, culverts
- Low Gill (Crooks Beck) (GB102076070750); Lowgill Beck, Unnamed Tributary of Lowgill Beck 6.1, Yosgill Sike, Unnamed Tributary of Lowgill Beck 6.7, Eastfield Sike, Moor Beck (Offtake), Moor Beck, Lowgill Beck, Woodend Sike; Access road culverts, Culverts, Extensions to existing culverts, Channel realignments, Flood compensation areas
- Greta from Gill Beck to River Tees (GB103025072130); Punder Gill, Tutta Beck, Unnamed Tributary of Punder Gill 8.1; Access road culverts, Channel realignment, Extension to existing culvert
- Greta from Sleightholme Beck to Eller Beck (GB103025072140); Unnamed Tributary of River Greta 7.3, Extensions to existing culverts
- Skeeby/Holme/Dalton Bk from Source to River Swale (GB104027069180); Mains Gill, Unnamed Tributary of Mains Gill 9.1, Unnamed Tributary of Cottonmill Beck 9.3, Unnamed Tributary of Holme Beck 9.2, Unnamed Tributary of Holme Beck 9.3, Unnamed Tributary of Holme Beck 9.5, Unnamed Tributary of Holme Beck 9.6, Unnamed Tributary of Holme Beck 9.7, Unnamed Tributary of Holme Beck 9.8; Culverts, Access Road Culverts

14.1.17.3 A range of additional mitigation has therefore been identified with the aim to ensure no residual risk of status deterioration within these surface water bodies. This includes measures identified in ES Appendix 14.11: Non-Significant Effects (Application Document Number 3.4) and ES Appendix 6.18: Fish Habitat Assessment and MoRPh (Application Document 3.4) and WFD additional mitigation to create low flow channels, bank reprofiling, removal of existing structures, buffer strips and wetland habitat creation/floodplain connectivity improvements and will be designed to be appropriate for the quality of the affected channel. The design of the additional mitigation is subject to the detailed design stage and will be developed in consultation with the Environment Agency. It should be noted that some of the tributaries on which adverse effects have been identified may be scoped out at detailed design stage and as such, the additional mitigation identified may be reduced. The length of additional mitigation required, as outlined in the EMP (Application Document 2.7), within the catchment of each WFD water body is summarised below:

- Eamont (Upper) (GB102076071020): 79.5 m

- Eamont (Lower)(GB102076070990): 570.9 m
- Eden Lyvennet to Eamont (GB102076070908): 49.2 m
- Eden - Scandal Beck to Lyvennet (GB10207607880): 823.5 m
- Trout Beck (GB102076070930): 1,690.2 m
- Low Gill (Crooks Beck) (GB102076070750): 408 m
- Greta from Gill Beck to River Tees (GB103025072130): 351 m
- Greta from Sleightholme Beck to Eller Beck (GB103025072140): 386m
- Skeeby/Holme/Dalton Bk from Source to River Swale (GB104027069180): 1,265 m.

14.1.17.4 The additional mitigation outlined above and in the EMP (Application Document 2.7) is considered appropriate to mitigate any adverse effects on WFD within the Order limits of the Project and within the relevant WFD water body catchment on a watercourse of equivalent value to the affected watercourse. As such, the potential for residual adverse overall effects with the risk of causing a deterioration in status of one or more quality elements is not considered to remain at this stage. However, further detailed mitigation design work is required to inform the best mitigation solution for the relevant scheme components at the next stage of design.

14.1.18 Effects on achievement of future status objectives

14.1.18.1 The scheme has been scoped against the available 2015 RBMP RNAG, PoM, and HMWB/AWB MMA data for the relevant surface water bodies.

14.1.18.2 Where RNAG, PoM, and HMWB/AWB mitigation measures have been identified as being potentially at risk from the scheme, the effects of relevant scheme components potentially affecting the surface water bodies have been assessed.

14.1.18.3 Three RNAG for the Greta from Sleightholme Beck to Ellder Beck (GB103025072140) water body have been identified as potentially being at risk from the Project. These relate to physical modifications and other pressures which are considered to currently be limiting the Fish status of the water body.

14.1.18.4 Two RNAG for the Skeeby/Holme/Dalton Bk from Source to River Swale (GB104027069180) water body have been identified as potentially being at risk from the Project. These relate to physical modifications which are considered to currently be limiting the Fish status of the water body. Further, one PoM for the water body was also identified as potentially being at risk from the Project. Corresponding to the above RNAGs and relates to a package of measures needed to improve modified habitat by improvement to the condition of the riparian zone and/or wetland within the water body.

14.1.18.5 The additional mitigation identified to mitigate the risks to the current status of the water bodies are the same as those required to mitigate the risk to the achievement of status objectives. The additional mitigation is outlined in the EMP (Application Document 2.7) and is within the Order limits of the Project and within the relevant WFD water body catchment on a watercourse of equivalent value to the

affected watercourse. However, further detailed mitigation design work is required to inform the best mitigation solution for the relevant scheme components at the next stage of design to inform the best mitigation solution at each site.

14.1.18.6 It is anticipated that the potential for residual adverse overall effects with the risk of preventing the future achievement of status objectives of these surface water bodies is not considered to remain at this stage.

14.1.18.7 This assessment has been based on currently available WFD baseline data and design information for the scheme. The assessment is considered a 'live' document and will be reviewed and updated at detailed design and construction, particularly if:

- the EA update or provide additional WFD baseline data for the relevant water bodies; and/or
- significant changes to the nature, alignment, scale or construction methods of the scheme are made.

14.1.18.8 Any future updates to the assessment will be shared and agreed with the EA as the regulatory authority in England.

14.1.19 Project compliance

14.1.19.1 The Project has the potential to have an adverse affect on 9 surface waterbodies which has the potential to cause a deterioration in the current status of the waterbodies.

14.1.19.2 Therefore, additional mitigation has been identified comprising ecological mitigation identified in Appendix 14.11: Non-Significant Effects (ES Volume 3, Application Document Number 3.4) and Appendix 6.17 Fish Habitat Assessment and MoRPh (ES Volume 3, Application Document Number 3.4) and WFD additional mitigation comprising low flow channel creation, bank reprofiling, removal of existing structures, wetland habitat creation/improving floodplain connectivity and buffer strips.

14.1.19.3 The additional mitigation measures identified are considered appropriate to mitigate the identified potential adverse affects. As such, the potential for residual adverse overall effects associated with the risk of preventing the future achievement of status objectives of these surface water bodies is not considered to remain at this stage.

14.1.20 References

Environment Agency (2022) Catchment Data Explorer

The Planning Inspectorate (2017) Advice Note 18: The Water Framework Directive

Environment Agency and Department for Environment, Food and Rural Affairs (2009) WFD Expert Assessment of Flood Management Impacts. Joint EA & DEFRA Flood and Coastal Erosion Risk Management R&D Programme. R&D Technical Report FD2609/TR.

National Highways (2022) Hydromorphological Appraisal

Environment Agency (2022) Catchment Data Explorer

Environment Agency (2019) Water Quality Archive

Department for Environment, Food and Rural Affairs (2019) MAGIC, Interactive mapping at your fingertips

British Geological Society (2021) Geology of Britain viewer

UK Technical Advisory Group (2006) Prevent Deterioration of Status

Court of Justice of European Union (2015) The obligations laid down by the Water Framework Directive concerning enhancement and prevention of deterioration apply to individual projects such as the deepening of a navigable river, Press Release No 74/15

Planning Inspectorate (2017) Advice note eighteen: The Water Framework Directive

Environment Agency (2021) The River Basin Management Plan for the Solway Tweed River Basin District.

Environment Agency (2015a) Northumbria River Basin Management Plan

Environment Agency (2015b) Humber River Basin Management Plan

Annex A: WFD Waterbodies

Annex A1 Surface Water

WFD Water body	Water body ID	River Basin District / Management Plan	Environment Agency management catchment	Water body type (designation)	Overall status	Watercourse name	Approximate length (m)	Scheme
Eamont (Upper)	GB102076071020	Solway Tweed	Eden and Esk	River (not designated artificial or heavily modified)	Good	Thacka Beck	5.68	0102
Eamont (Upper)	GB102076071020	Solway Tweed	Eden and Esk	River (not designated artificial or heavily modified)	Good	River Eamont	33.1	0102
Eamont (Lower)	GB102076070990	Solway Tweed	Eden and Esk	River (not designated artificial or heavily modified)	Good	Unnamed Tributary of Light Water 3.1	1.97	0102
Eamont (Lower)	GB102076070990	Solway Tweed	Eden and Esk	River (not designated artificial or heavily modified)	Good	Light Water	4.66	03
Eamont (Lower)	GB102076070990	Solway Tweed	Eden and Esk	River (not designated artificial or heavily modified)	Good	Unnamed Tributary of River Eamont 3.3	3.15	03
Eamont (Lower)	GB102076070990	Solway Tweed	Eden and Esk	River (not designated artificial or heavily modified)	Good	Unnamed Tributary of River Eamont 3.4	0.53	03
Eamont (Lower)	GB102076070990	Solway Tweed	Eden and Esk	River (not designated artificial or heavily modified)	Good	Unnamed Tributary of River Eamont 3.5	0.34	03

WFD Water body	Water body ID	River Basin District / Management Plan	Environment Agency management catchment	Water body type (designation)	Overall status	Watercourse name	Approximate length (m)	Scheme
Eden Lyvennet to Eamont	GB102076070980	Solway Tweed	Eden and Esk	River (not designated artificial or heavily modified)	Moderate	Swine Gill	4.45	03
Trout Beck	GB102076070930	Solway Tweed	Eden and Esk	River (not designated artificial or heavily modified)	Good	Trout Beck	5.99	0405
Trout Beck	GB102076070930	Solway Tweed	Eden and Esk	River (not designated artificial or heavily modified)	Good	Unnamed Tributary of Trout Beck 4.2	2.13	0405
Trout Beck	GB102076070930	Solway Tweed	Eden and Esk	River (not designated artificial or heavily modified)	Good	Unnamed Tributary of Trout Beck 4.5	0.97	0405
Trout Beck	GB102076070930	Solway Tweed	Eden and Esk	River (not designated artificial or heavily modified)	Good	Unnamed Tributary of Trout Beck 4.6	2.92	0405
Eden - Scandal Beck to Lyvennet	GB102076070880	Solway Tweed	Eden and Esk	River (not designated artificial or heavily modified)	Good	Unnamed Tributary of Mire Sike 6.4	0.59	0405
Eden - Scandal Beck to Lyvennet	GB102076070880	Solway Tweed	Eden and Esk	River (not designated artificial or heavily modified)	Good	Unnamed Tributary of Mire Sike 6.12	1.39	0405
Eden - Scandal Beck to Lyvennet	GB102076070880	Solway Tweed	Eden and Esk	River (not designated artificial or heavily modified)	Good	Unnamed Tributary of Cringle Beck 6.1	0.62	0405

WFD Water body	Water body ID	River Basin District / Management Plan	Environment Agency management catchment	Water body type (designation)	Overall status	Watercourse name	Approximate length (m)	Scheme
Eden - Scandal Beck to Lyvennet	GB102076070880	Solway Tweed	Eden and Esk	River (not designated artificial or heavily modified)	Good	Unnamed Tributary of Cringle Beck 6.3	0.62	0405
Eden - Scandal Beck to Lyvennet	GB102076070880	Solway Tweed	Eden and Esk	River (not designated artificial or heavily modified)	Good	Cringle Beck	5.71	0405
Low Gill (Crooks Beck)	GB102076070750	Solway Tweed	Eden and Esk	River (not designated artificial or heavily modified)	Poor	Eastfield Sike	1.73	06
Low Gill (Crooks Beck)	GB102076070750	Solway Tweed	Eden and Esk	River (not designated artificial or heavily modified)	Poor	Moor Beck (Offtake)	0.84	06
Low Gill (Crooks Beck)	GB102076070750	Solway Tweed	Eden and Esk	River (not designated artificial or heavily modified)	Poor	Moor Beck	0.69	06
Low Gill (Crooks Beck)	GB102076070750	Solway Tweed	Eden and Esk	River (not designated artificial or heavily modified)	Poor	Eastfield Sike	3.91	06
Low Gill (Crooks Beck)	GB102076070750	Solway Tweed	Eden and Esk	River (not designated artificial or heavily modified)	Poor	Lowgill Beck	3.85	06
Low Gill (Crooks Beck)	GB102076070750	Solway Tweed	Eden and Esk	River (not designated artificial or heavily modified)	Poor	Unnamed Tributary of Lowgill Beck 6.1	1.25	06

WFD Water body	Water body ID	River Basin District / Management Plan	Environment Agency management catchment	Water body type (designation)	Overall status	Watercourse name	Approximate length (m)	Scheme
Low Gill (Crooks Beck)	GB102076070750	Solway Tweed	Eden and Esk	River (not designated artificial or heavily modified)	Poor	Woodend Sike	1.54	06
Low Gill (Crooks Beck)	GB102076070750	Solway Tweed	Eden and Esk	River (not designated artificial or heavily modified)	Poor	Yosgill Sike	1.15	06
Low Gill (Crooks Beck)	GB102076070750	Solway Tweed	Eden and Esk	River (not designated artificial or heavily modified)	Poor	Unnamed Tributary of Lowgill Beck 6.7	2.12	06
Greta from Sleightholme Beck to Ellder Beck	GB103025072140	Northumbria	Tees	River (not designated artificial or heavily modified)	Moderate	Unnamed Tributary of River Greta 7.3	1.89	07
Greta from Sleightholme Beck to Ellder Beck	GB103025072140	Northumbria	Tees	River (not designated artificial or heavily modified)	Moderate	Unnamed Tributary of River Greta 7.5	0.6	07
Greta from Sleightholme Beck to Ellder Beck	GB103025072140	Northumbria	Tees	River (not designated artificial or heavily modified)	Moderate	Unnamed Tributary of River Greta 7.6	0.6	07
Tees from Percy Beck to River Greta	GB103025072512	Northumbria	Tees	River (heavily modified)	Good	Unnamed Tributary of Manyfold Beck 8.3	0.57	08
Greta from Gill Beck to River Tees	GB103025072130	Northumbria	Tees	River (not designated artificial or heavily modified)	Good	Punder Gill	1.52	08

WFD Water body	Water body ID	River Basin District / Management Plan	Environment Agency management catchment	Water body type (designation)	Overall status	Watercourse name	Approximate length (m)	Scheme
Greta from Gill Beck to River Tees	GB103025072130	Northumbria	Tees	River (not designated artificial or heavily modified)	Good	Unnamed Tributary of Punder Gill 8.1	0.77	08
Greta from Gill Beck to River Tees	GB103025072130	Northumbria	Tees	River (not designated artificial or heavily modified)	Good	Tutta Beck	4.77	08
Skeeby/Holme/ Dalton Bk from Source to River Swale	GB104027069180	Humber	Swale Ure Nidd and Ouse Upper	River (not designated artificial or heavily modified)	Moderate	Unnamed Tributary of Cottonmill Beck 9.3	0.4	09
Skeeby/Holme/ Dalton Bk from Source to River Swale	GB104027069180	Humber	Swale Ure Nidd and Ouse Upper	River (not designated artificial or heavily modified)	Moderate	Unnamed Tributary of Browson Beck 9.1	0.28	09
Skeeby/Holme/ Dalton Bk from Source to River Swale	GB104027069180	Humber	Swale Ure Nidd and Ouse Upper	River (not designated artificial or heavily modified)	Moderate	Unnamed Tributary of Holme Beck 9.1	0.59	09
Skeeby/Holme/ Dalton Bk from Source to River Swale	GB104027069180	Humber	Swale Ure Nidd and Ouse Upper	River (not designated artificial or heavily modified)	Moderate	Unnamed Tributary of Holme Beck 9.2	1.38	09
Skeeby/Holme/ Dalton Bk from Source to River Swale	GB104027069180	Humber	Swale Ure Nidd and Ouse Upper	River (not designated artificial or heavily modified)	Moderate	Unnamed Tributary of Holme Beck 9.3	1.37	09
Skeeby/Holme/ Dalton Bk from Source to River Swale	GB104027069180	Humber	Swale Ure Nidd and Ouse Upper	River (not designated artificial or heavily modified)	Moderate	Unnamed Tributary of Holme Beck 9.5	0.11	09

WFD Water body	Water body ID	River Basin District / Management Plan	Environment Agency management catchment	Water body type (designation)	Overall status	Watercourse name	Approximate length (m)	Scheme
Skeeby/Holme/ Dalton Bk from Source to River Swale	GB104027069180	Humber	Swale Ure Nidd and Ouse Upper	River (not designated artificial or heavily modified)	Moderate	Unnamed Tributary of Holme Beck 9.6	0.94	09
Skeeby/Holme/ Dalton Bk from Source to River Swale	GB104027069180	Humber	Swale Ure Nidd and Ouse Upper	River (not designated artificial or heavily modified)	Moderate	Unnamed Tributary of Holme Beck 9.7	0.01	09
Skeeby/Holme/ Dalton Bk from Source to River Swale	GB104027069180	Humber	Swale Ure Nidd and Ouse Upper	River (not designated artificial or heavily modified)	Moderate	Unnamed Tributary of Mains Gill 9.1	1.22	09
Skeeby/Holme/ Dalton Bk from Source to River Swale	GB104027069180	Humber	Swale Ure Nidd and Ouse Upper	River (not designated artificial or heavily modified)	Moderate	Unnamed Tributary of Mains Gill 9.3	1.21	09
Skeeby/Holme/ Dalton Bk from Source to River Swale	GB104027069180	Humber	Swale Ure Nidd and Ouse Upper	River (not designated artificial or heavily modified)	Moderate	Mains Gill	1.36	09
Skeeby/Holme/ Dalton Bk from Source to River Swale	GB104027069180	Humber	Swale Ure Nidd and Ouse Upper	River (not designated artificial or heavily modified)	Moderate	Unnamed Tributary of Holme Beck 9.8	1.06	09

Annex A2: WFD Groundwater

WFD Water Body Name (ID)	RBDMP	Environment Agency management catchment	Overall Status	Scheme
Eden Valley and Carlisle Basin Permo-Triassic sandstone aquifers (GB40201G100400)	Solway Tweed	Solway Tweed Groundwater	Poor	M6 Junction 40 to Kemplay Bank, Penrith to Temple Sowerby, Temple Sowerby to Appleby, Appleby to Brough
Eden and Esk Lower Palaeozoic and Carboniferous Aquifers (GB40202G102300)	Solent Tweed	Solway Tweed Groundwater	Poor	Appleby to Brough
Tees Carb Limestone & Millstone Grit (GB40302G700300)	Northumbria	Northumbria Groundwater	Poor	Bowes Bypass, Cross Lanes to Rokeby, Stephen Bank to Carkin Moor
SUNO Millstone Grit and Carboniferous Limestone (GB40402G701900)	Humber	Humber Groundwater	Poor	A1(M) Junction 53 Scotch Corner

Annex B: RBMP objectives

14.1.20.1 The study area is located across three river basin districts: Solway Tweed, Northumbria and Humber.

Solway Tweed

14.1.20.2 The Solway Tweed River Basin District (RBD) is a cross border river basin that includes Scottish and English water bodies that flow into the Solway and Tweed estuaries. The RBD is around 17,500km^2 and it jointly managed by the Environment Agency and the Scottish Envrionment Protection Agency. The Solway Tweed incorporates the Scottish Borders, Dumfries and Galloway, and parts of Cumbria and Northumberland. The river basin is largely rural and supports a wide range of internationally important habitates and wildlife. It encompasses parts of the Southern Uplands and the Lake District (a Northumberland National Park). It has multiple water bodies that are designated as Special Areas of Conservation and Special Protection Areas.

14.1.20.3 The Solway Tweed River Basin Management Plan (RBMP) (Environment Agency, 2021)[14] indicates that the 45% of the current surface water bodies within the Solway Tweed are at good or better ecological condition.

14.1.20.4 The Solway Tweed RBMP indicates that the key issues affecting the district is pollution from agriculture and rural land management, changes to water levels and flows, modifications to physical condition (including man-made barriers to fish migrations) and invasive non-native species.

Northumbria

14.1.20.5 The Northumbria RBD extents from the Scottish border in the north through Northumbria to Stockton-upon-Tees in the south. The RBD is around 9,000km^2 and includes Holy Island and the Farne Islands. The major urban centres are in Newcastle, Gateshead, Sunderland and Middlesbrough. It contains a rich diversity of wildlife and habitats, supporting many species of global and national importance. Around 67% of the district is farmed or used for forestry.

14.1.20.6 The Northumbria River Basin Mangament Plan (RBMP) (Environment Agency, 2015a)[15] indicates that the key issues affecting the district is from physical modifications, pollution from waste water, towns, cities, transport, rural areas, and mines, and changes to the natural flow and level of water.

Humber

14.1.20.7 The Humber RBD extends from the West Midlands in the south, northwards North Yorkshire and from Staffordshire into the west part of Lincolnshire and the Humber Eastuary in the east. The RBD is

[14] Environment Agency (2021) The River Basin Management Plan for the Solway Tweed River Basin District.
[15] Environment Agency (2015a) Northumbria River Basin Management Plan

around 26,100km^2 and has a rich diversity of wildlife and habitats, supporting species of global and national importance. It encompasses the Uplands of the Peak, river valleys of the Trent, and the aquifers of Yorkshire and Lincolnshire Wolds.

14.1.20.8 The Humber River Basin Management Plan (RBMP) (Environment Agency, 2015b)[16] indicates that the key issue within the catchment is physical modifications for flood defences and pollution from waste waters, sewage and from towns, cities, and transport.

[16] Environment Agency (2015b) Humber River Basin Management Plan

Annex C: Preliminary assessment (scoping)

C.1 Likely effects on current status

Surface Water

14.1.20.9 The results of the preliminary assessment (scoping) of the likely effects of the relevant scheme components on the WFD status elements of surface water bodies are summarised in .

14.1.20.10 The assessment has identified the relevant impact types of each scheme component (following consideration of mitigation included within the design) and which WFD status elements have been scoped in, these have been carried forward for detailed impact assessment (see Annex A: WFD Waterbodies).

Table 16: Summary of preliminary assessment (scoping) of the likely effects of the Project on the WFD status elements of surface water bodies

WFD water body (ID)	Watercourse	Scheme component type	Biological effects	Physio-chemical effects	Specific pollutants effects	Hydromor-phological effects
Eamont (Upper) (GB102076071020)	Thacka Beck	Extension of existing culvert	✔	✔	✗	✔
Eamont (Upper) (GB102076071020)	River Eamont	Drainage outfall	✔	✗	✗	✔
Eamont (Upper) (GB102076071020)	River Eamont	Drainage outfall	✔	✗	✗	✔
Eamont (Lower) (GB102076070990)	Unnamed Tributary of Light Water 3.1	Culvert	✔	✔	✗	✔
Eamont (Lower) (GB102076070990)	Light Water	Culvert	✔	✔	✗	✔
Eamont (Lower) (GB102076070990)	Light Water	Drainage outfall	✔	✗	✗	✔
Eamont (Lower) (GB102076070990)	Light Water	Drainage outfall	✔	✗	✗	✔
Eamont (Lower) (GB102076070990)	Unnamed Tributary of River Eamont 3.3	Culvert	✔	✔	✗	✔
Eamont (Lower) (GB102076070990)	Unnamed Tributary of River Eamont 3.3	Channel works	✔	✔	✗	✔
Eamont (Lower) (GB102076070990)	Unnamed Tributary of River Eamont 3.4	Access road culvert	✔	✔	✗	✔
Eamont (Lower) (GB102076070990)	Unnamed Tributary of River Eamont 3.5	Extension of existing culvert	✔	✔	✗	✔
Eamont (Lower) (GB102076070990)	Unnamed Tributary of River Eamont 3.5	Drainage outfall	✔	✗	✗	✔
Eden Lyvennet to Eamont (GB102076070980)	Swine Gill	Culvert	✔	✔	✗	✔
Eden Lyvennet to Eamont (GB102076070980)	Swine Gill	Drainage outfall	✔	✗	✗	✔
Eden - Scandal Beck to Lyvennet (GB102076070880)	Unnamed Tributary of Mire Sike 6.4	Access road culvert	✔	✔	✗	✔
Eden - Scandal Beck to Lyvennet (GB102076070880)	Unnamed Tributary of Mire Sike 6.12	Culvert	✔	✔	✗	✔
Eden - Scandal Beck to Lyvennet (GB102076070880)	Unnamed Tributary of Mire Sike 6.12	Culvert	✔	✔	✗	✔
Eden - Scandal Beck to Lyvennet (GB102076070880)	Unnamed Tributary of Mire Sike 6.12	Flood Compensation Area	✗	✗	✗	✔

WFD water body (ID)	Watercourse	Scheme component type	Biological effects	Physio-chemical effects	Specific pollutants effects	Hydromor-phological effects
Eden - Scandal Beck to Lyvennet (GB102076070880)	Unnamed Tributary of Mire Sike 6.12	Flood Compensation Area	✗	✗	✗	✓
Eden - Scandal Beck to Lyvennet (GB102076070880)	Unnamed Tributary of Mire Sike 6.12	Access road culvert	✓	✓	✗	✓
Eden - Scandal Beck to Lyvennet (GB102076070880)	Unnamed Tributary of Cringle Beck 6.1	Culvert	✓	✓	✗	✓
Eden - Scandal Beck to Lyvennet (GB102076070880)	Unnamed Tributary of Cringle Beck 6.1	Viaduct	✓	✓	✗	✗
Eden - Scandal Beck to Lyvennet (GB102076070880)	Unnamed Tributary of Cringle Beck 6.3	Culvert	✓	✓	✗	✓
Eden - Scandal Beck to Lyvennet (GB102076070880)	Cringle Beck	Flood Compensation Area	✗	✗	✗	✓
Eden - Scandal Beck to Lyvennet (GB102076070880)	Cringle Beck	Culvert	✓	✓	✗	✓
Trout Beck (GB102076070930)	Trout Beck	Viaduct	✓	✓	✗	✗
Trout Beck (GB102076070930)	Trout Beck	Clear Span Bridge	✓	✓	✗	✗
Trout Beck (GB102076070930)	Trout Beck	Drainage Outfall	✓	✗	✗	✓
Trout Beck (GB102076070930)	Trout Beck	Drainage Outfall	✓	✗	✗	✓
Trout Beck (GB102076070930)	Trout Beck	Drainage Outfall	✓	✗	✗	✓
Trout Beck (GB102076070930)	Trout Beck	Drainage outfall	✓	✗	✗	✓
Trout Beck (GB102076070930)	Trout Beck	Drainage outfall	✓	✗	✗	✓
Trout Beck (GB102076070930)	Trout Beck	Drainage outfall	✓	✗	✗	✓
Trout Beck (GB102076070930)	Unnamed Tributary of Trout Beck 4.2	Drainage outfall	✓	✗	✗	✓
Trout Beck (GB102076070930)	Unnamed Tributary of Trout Beck 4.2	Access road culvert	✓	✓	✗	✓
Trout Beck (GB102076070930)	Unnamed Tributary of Trout Beck 4.2	Access road culvert	✓	✓	✗	✓
Trout Beck (GB102076070930)	Unnamed Tributary of Trout Beck 4.6	Culvert	✓	✓	✗	✓

WFD water body (ID)	Watercourse	Scheme component type	Biological effects	Physio-chemical effects	Specific pollutants effects	Hydromor-phological effects
Trout Beck (GB102076070930)	Unnamed Tributary of Trout Beck 4.6	Access road culvert	✔	✔	✗	✔
Low Gill (Crooks Beck) (GB102076070750)	Eastfield Sike	Removal of existing culvert	✔	✔	✗	✔
Low Gill (Crooks Beck) (GB102076070750)	Moor Beck (Offtake)	Viaduct	✔	✔	✗	✗
Low Gill (Crooks Beck) (GB102076070750)	Moor Beck	Flood Compensation Area	✗	✗	✗	✔
Low Gill (Crooks Beck) (GB102076070750)	Moor Beck	Viaduct	✔	✔	✗	✗
Low Gill (Crooks Beck) (GB102076070750)	Moor Beck	Clear Span Bridge	✔	✔	✗	✗
Low Gill (Crooks Beck) (GB102076070750)	Moor Beck	Clear Span Bridge	✔	✔	✗	✗
Low Gill (Crooks Beck) (GB102076070750)	Eastfield Sike	Clear Span Bridge	✔	✔	✗	✗
Low Gill (Crooks Beck) (GB102076070750)	Eastfield Sike	Flood Compensation Area	✗	✗	✗	✔
Low Gill (Crooks Beck) (GB102076070750)	Eastfield Sike	Flood Compensation Area	✗	✗	✗	✔
Low Gill (Crooks Beck) (GB102076070750)	Eastfield Sike	Extension of existing culvert	✔	✔	✗	✔
Low Gill (Crooks Beck) (GB102076070750)	Eastfield Sike	Drainage outfall	✔	✗	✗	✔
Low Gill (Crooks Beck) (GB102076070750)	Eastfield Sike	Drainage outfall	✔	✗	✗	✔
Low Gill (Crooks Beck) (GB102076070750)	Lowgill Beck	Access road culvert	✔	✔	✗	✔
Low Gill (Crooks Beck) (GB102076070750)	Lowgill Beck	Drainage outfall	✔	✗	✗	✔
Low Gill (Crooks Beck) (GB102076070750)	Unnamed Tributary of Lowgill Beck 6.1	Culvert	✔	✔	✗	✔

WFD water body (ID)	Watercourse	Scheme component type	Biological effects	Physio-chemical effects	Specific pollutants effects	Hydromor-phological effects
Low Gill (Crooks Beck) (GB102076070750)	Woodend Sike	Realignment	✔	✔	✗	✔
Low Gill (Crooks Beck) (GB102076070750)	Woodend Sike	Drainage outfall	✔	✗	✗	✔
Low Gill (Crooks Beck) (GB102076070750)	Woodend Sike	Flood Compensation Area	✗	✗	✗	✔
Low Gill (Crooks Beck) (GB102076070750)	Yosgill Sike	Flood Compensation Area	✗	✗	✗	✔
Low Gill (Crooks Beck) (GB102076070750)	Yosgill Sike	Culvert	✔	✔	✗	✔
Low Gill (Crooks Beck) (GB102076070750)	Yosgill Sike	Realignment	✔	✔	✗	✔
Low Gill (Crooks Beck) (GB102076070750)	Yosgill Sike	Drainage outfall	✔	✗	✗	✔
Low Gill (Crooks Beck) (GB102076070750)	Unnamed Tributary of Lowgill Beck 6.7	Extension of existing culvert	✔	✔	✗	✔
Low Gill (Crooks Beck) (GB102076070750)	Unnamed Tributary of Lowgill Beck 6.7	Culvert	✔	✔	✗	✔
Low Gill (Crooks Beck) (GB102076070750)	Unnamed Tributary of Lowgill Beck 6.7	Clear Span Bridge	✔	✔	✗	✗
Low Gill (Crooks Beck) (GB102076070750)	Unnamed Tributary of Lowgill Beck 6.7	Drainage outfall	✔	✗	✗	✔
Low Gill (Crooks Beck) (GB102076070750)	Unnamed Tributary of Lowgill Beck 6.7	Drainage outfall	✔	✗	✗	✔
Greta from Sleightholme Beck to Ellder Beck (GB103025072140)	Unnamed Tributary of River Greta 7.3	Extension of existing culvert	✔	✔	✗	✔
Greta from Sleightholme Beck to Ellder Beck (GB103025072140)	Unnamed Tributary of River Greta 7.3	Drainage outfall	✔	✗	✗	✔
Greta from Sleightholme Beck to Ellder Beck (GB103025072140)	Unnamed Tributary of River Greta 7.3	Drainage outfall	✔	✗	✗	✔
Greta from Sleightholme Beck to Ellder Beck (GB103025072140)	Unnamed Tributary of River Greta 7.3	Extension of existing culvert	✔	✔	✗	✔

WFD water body (ID)	Watercourse	Scheme component type	Biological effects	Physio-chemical effects	Specific pollutants effects	Hydromor-phological effects
Greta from Sleightholme Beck to Ellder Beck (GB103025072140)	Unnamed Tributary of River Greta 7.5	Drainage outfall	✔	✗	✗	✔
Greta from Sleightholme Beck to Ellder Beck (GB103025072140)	Unnamed Tributary of River Greta 7.6	Drainage outfall	✔	✗	✗	✔
Tees from Percy Beck to River Greta (GB103025072512)	Unnamed Tributary of Manyfold Beck 8.3	Access road culvert	✔	✔	✗	✔
Tees from Percy Beck to River Greta (GB103025072512)	Unnamed Tributary of Manyfold Beck 8.3	Drainage outfall	✔	✗	✗	✔
Tees from Percy Beck to River Greta (GB103025072512)	Unnamed Tributary of Manyfold Beck 8.1	Drainage outfall	✔	✗	✗	✔
Greta from Gill Beck to River Tees (GB103025072130)	Punder Gill	Drainage outfall	✔	✗	✗	✔
Greta from Gill Beck to River Tees (GB103025072130)	Punder Gill	Realignment	✔	✔	✗	✔
Greta from Gill Beck to River Tees (GB103025072130)	Punder Gill	Access road culvert	✔	✔	✗	✔
Greta from Gill Beck to River Tees (GB103025072130)	Unnamed Tributary of Punder Gill 8.1	Realignment	✔	✔	✗	✔
Greta from Gill Beck to River Tees (GB103025072130)	Unnamed Tributary of Punder Gill 8.1	Drainage outfall	✔	✗	✗	✔
Greta from Gill Beck to River Tees (GB103025072130)	Unnamed Tributary of Punder Gill 8.1	Extension of existing culvert	✔	✔	✗	✔
Greta from Gill Beck to River Tees (GB103025072130)	Tutta Beck	Realignment	✔	✔	✗	✔
Greta from Gill Beck to River Tees (GB103025072130)	Tutta Beck	Access road culvert	✔	✔	✗	✔
Greta from Gill Beck to River Tees (GB103025072130)	Tutta Beck	Drainage outfall	✔	✗	✗	✔
Greta from Gill Beck to River Tees (GB103025072130)	Tutta Beck	Drainage outfall	✔	✗	✗	✔
Greta from Gill Beck to River Tees (GB103025072130)	Tutta Beck	Drainage outfall	✔	✗	✗	✔

WFD water body (ID)	Watercourse	Scheme component type	Biological effects	Physio-chemical effects	Specific pollutants effects	Hydromor-phological effects
Skeeby/Holme/Dalton Bk from Source to River Swale (GB104027069180)	Unnamed Tributary of Cottonmill Beck 9.3	Access road culvert	✔	✔	✗	✔
Skeeby/Holme/Dalton Bk from Source to River Swale (GB104027069180)	Unnamed Tributary of Cottonmill Beck 9.3	Drainage outfall	✔	✗	✗	✔
Skeeby/Holme/Dalton Bk from Source to River Swale (GB104027069180)	Unnamed Tributary of Cottonmill Beck 9.3	Culvert	✔	✔	✗	✔
Skeeby/Holme/Dalton Bk from Source to River Swale (GB104027069180)	Unnamed Tributary of Holme Beck 9.1	Drainage outfall	✔	✗	✗	✔
Skeeby/Holme/Dalton Bk from Source to River Swale (GB104027069180)	Unnamed Tributary of Holme Beck 9.2	Access road culvert	✔	✔	✗	✔
Skeeby/Holme/Dalton Bk from Source to River Swale (GB104027069180)	Unnamed Tributary of Holme Beck 9.2	Culvert	✔	✔	✗	✔
Skeeby/Holme/Dalton Bk from Source to River Swale (GB104027069180)	Unnamed Tributary of Holme Beck 9.2	Drainage outfall	✔	✗	✗	✔
Skeeby/Holme/Dalton Bk from Source to River Swale (GB104027069180)	Unnamed Tributary of Holme Beck 9.2	Drainage outfall	✔	✗	✗	✔
Skeeby/Holme/Dalton Bk from Source to River Swale (GB104027069180)	Unnamed Tributary of Holme Beck 9.3	Culvert	✔	✔	✗	✔
Skeeby/Holme/Dalton Bk from Source to River Swale (GB104027069180)	Unnamed Tributary of Holme Beck 9.5	Culvert	✔	✔	✗	✔
Skeeby/Holme/Dalton Bk from Source to River Swale (GB104027069180)	Unnamed Tributary of Holme Beck 9.6	Drainage outfall	✔	✗	✗	✔
Skeeby/Holme/Dalton Bk from Source to River Swale (GB104027069180)	Unnamed Tributary of Holme Beck 9.6	Drainage outfall	✔	✗	✗	✔
Skeeby/Holme/Dalton Bk from Source to River Swale (GB104027069180)	Unnamed Tributary of Holme Beck 9.6	Culvert	✔	✔	✗	✔
Skeeby/Holme/Dalton Bk from Source to River Swale (GB104027069180)	Unnamed Tributary of Holme Beck 9.6	Drainage outfall	✔	✗	✗	✔
Skeeby/Holme/Dalton Bk from Source to River Swale (GB104027069180)	Unnamed Tributary of Holme Beck 9.7	Culvert	✔	✔	✗	✔

WFD water body (ID)	Watercourse	Scheme component type	Biological effects	Physio-chemical effects	Specific pollutants effects	Hydromor-phological effects
Skeeby/Holme/Dalton Bk from Source to River Swale (GB104027069180)	Unnamed Tributary of Mains Gill 9.1	Drainage outfall	✔	✗	✗	✔
Skeeby/Holme/Dalton Bk from Source to River Swale (GB104027069180)	Unnamed Tributary of Mains Gill 9.1	Access road culvert	✔	✔	✗	✔
Skeeby/Holme/Dalton Bk from Source to River Swale (GB104027069180)	Unnamed Tributary of Mains Gill 9.3	Drainage outfall	✔	✗	✗	✔
Skeeby/Holme/Dalton Bk from Source to River Swale (GB104027069180)	Mains Gill	Drainage outfall	✔	✗	✗	✔
Skeeby/Holme/Dalton Bk from Source to River Swale (GB104027069180)	Mains Gill	Drainage outfall	✔	✗	✗	✔
Skeeby/Holme/Dalton Bk from Source to River Swale (GB104027069180)	Mains Gill	Realignment	✔	✔	✗	✔
Skeeby/Holme/Dalton Bk from Source to River Swale (GB104027069180)	Mains Gill	Culvert	✔	✔	✗	✔
Skeeby/Holme/Dalton Bk from Source to River Swale (GB104027069180)	Unnamed Tributary of Holme Beck 9.8	Drainage outfall	✔	✗	✗	✔
Skeeby/Holme/Dalton Bk from Source to River Swale (GB104027069180)	Unnamed Tributary of Holme Beck 9.8	Culvert	✔	✔	✗	✔
Skeeby/Holme/Dalton Bk from Source to River Swale (GB104027069180)	Unnamed Tributary of Holme Beck 9.8	Access road culvert	✔	✔	✗	✔
Skeeby/Holme/Dalton Bk from Source to River Swale (GB104027069180)	Unnamed Tributary of Holme Beck 9.8	Drainage outfall	✔	✗	✗	✔

Groundwater

14.1.20.11 The results of the preliminary assessment (scoping) of likely effects of relevant scheme components on the WFD status elements of groundwater bodies are summarised in Table 17: Summary of preliminary assessment (scoping) of the likely effects of the Project on the WFD status elements of groundwater bodies

14.1.20.12 The assessment has identified the relevant impact types of each scheme component (following consideration of mitigation included within the design) and which WFD status elements are likely to be affected. Where impacts types and effects on WFD status elements have been scoped in, these have been carried forward for detailed impact assessment (see Annex A2: WFD Groundwater).

Table 17: Summary of preliminary assessment (scoping) of the likely effects of the Project on the WFD status elements of groundwater bodies

WFD groundwater body (ID)	Unique ID	Quantitative effects		Chemical effects	
		Lowering of groundwater levels and reduction in groundwater contributions to surface water bodies GWDTE or groundwater abstractions by temporary dewatering/permanent groundwater control	'Damming' of groundwater flow and reduction in groundwater contributions	Disturbing or mobilising existing poor quality groundwater by temporary dewatering or depressurisation and permanent groundwater control	Creating or altering of pathways along which existing poor quality groundwater can migrate
Eden Valley and Carlisle Basin Permo-Triassic sandstone aquifers	GB40201G100400	✗	✗	✗	✗
Eden and Esk Lower Palaeozoic and Carboniferous Aquifers	GB40202G102300	✗	✗	✗	✗
Tees Carb Limestone & Millstone Grit	GB40302G700300	✗	✗	✗	✗
SUNO Millstone Grit and Carboniferous Limestone	GB40402G701900	✗	✗	✗	✗

Annex D: Magnitude of Effect Assumptions

Table 18: Assumptions of effect magnitudes by scheme

Scheme component	Type of effect					
	Major Beneficial	Minor/ localised beneficial	Green (no effect)	Yellow – adverse localised / temporary effect	Amber – significant adverse widespread or prolonged effect	Red – significant adverse effect on an individual quality element and/or overall status of water bodies
Culvert/ Access road culvert	Unlikely – review on a case by case basis.	Unlikely – review on a case by case basis.	Unlikely – review on a case by case basis .	Culvert length is less than the width of the channel.	Culvert length is greater than the width of the channel if the channel is designated: -Good overall status and the receptor value is **Moderate** or **Low**; or -**Less than Good** overall status on all value receptors.	Culvert length is greater than the width of the channel if the channel is designated: -**Good** overall status and the receptor value is **High** or **Very High**.
Drainage outfall	Unlikely – review on a case by case basis.	Potential beneficial effects due to increased quantity of flow in channel (refer to RNAGs), or treatment of runoff on a section of road that is currently untreated.	Unlikely – review on a case by case basis.	HEWRAT undertaken to assess and mitigate water quality and discharge rates and mitigation embedded where necessary. Headwall or scour protection may be present, but footprint size is suitable for the size of channel (based on professional judgement).	No HEWRAT or failure of HEWRAT and water quality or quantity or flow may be adversely affected. Headwall or scour protection is present, but the footprint size is significant compared to the size of the channel (based on professional judgement).	Unlikely given nature of scheme component – potential for cumulative impacts.

Scheme component	Type of effect					
	Major Beneficial	Minor/ localised beneficial	Green (no effect)	Yellow – adverse localised / temporary effect	Amber – significant adverse widespread or prolonged effect	Red – significant adverse effect on an individual quality element and/or overall status of water bodies
Channel works	Unlikely – review on a case by case basis.	Unlikely – review on a case by case basis.	Unlikely – review on a case by case basis.	If the channel works result in a realignment or physical works to the river channel or riparian area or floodplain but there is no net loss in length or area. Consider Groundwater – Surface water interactions.	If the channel works result in a realignment or physical works to the river channel or riparian area or floodplain and there is some net loss in length or area of a **Moderate** or **Low** value receptors. Consider Groundwater – Surface Water interactions.	If the channel works result in a realignment or physical works to the river channel or riparian area or floodplain and there is some net loss in length or area of a **High** or **Very High** value receptor. Consider Groundwater – Surface Water interactions.
Extension of an existing culvert	Unlikely – review on a case by case basis.	Unlikely – review on a case by case basis.	Unlikely – review on a case by case basis.	Existing and new culvert length is less than the width of the channel.	Existing and new culvert length is greater than the width of the channel if the channel is designated: -Good overall status and the receptor value is **Moderate** or **Low**; or -**Less than Good** overall status on all value receptors.	Existing and new culvert length is greater than the width of the channel if the channel is designated: -Good overall status and the receptor value if **High** or **Very High.**
Realignment	New channel is longer (more than 10% of water body	New channel is longer (more than 5 times of channel width)	New channel is equivalent in length to the old channel.	Old channel is shorter than the new channel – dependent on channel width.	Old channel is shorter than the new channel width.	Old channel is shorter (more than 10% of waterbody length) than the new channel- dependent on

Scheme component	Type of effect					
	Major Beneficial	Minor/ localised beneficial	Green (no effect)	Yellow – adverse localised / temporary effect	Amber – significant adverse widespread or prolonged effect	Red – significant adverse effect on an individual quality element and/or overall status of water bodies
	length) than the old channel. Reduction in the length of bank protection and/or structures.	than the old channel. Reduction in the length of bank protection and/or structures.	No change in the length of bank protection and/or structures.	Increasing the length of bank protection and/or structures.	Increasing the length of bank protection and/or structures.	channel width. Increasing the length of bank protection and/or structures. Reduction in flow quantity resulting in an improvement in quality element.
Flood compensation area	Unlikely – review on a case by case basis.	Unlikely – review on a case by case basis.	Unlikely – review on a case by case basis.	No flow control structure required, and scheme component will not alter flows up to the 1 in 2 year event.	Flow control structure required and potential for scheme component to materially change channel and floodplain structure.	Flow control structure required that will form barrier to river continuity and fish passage and potential for scheme component to materially change channel and floodplain structure and flooding mechanism.
Viaduct/ Clear span bridge	Unlikely- review on a case by case basis.	Unlikely – review on a case by case basis.	Unlikely – review on a case by case basis.	No structures within the channel of floodplain. Shading impact.	No structures in the channel, but structures present within the floodplain, and/or shading impacts.	Structures in the channel or within close proximity (2 channel widths of existing river) to channel.