A57 Link Roads

TR010034

9.45 Environmental Statement Chapter 13 Road Drainage and the Water Environment (Tracked)

Rule 8(1)(k)

Planning Act 2008

Infrastructure Planning (Examination Procedure) Rules 2010

January 2022

Infrastructure Planning

Planning Act 2008

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Development Consent Order 202[x]

9.45 ENVIRONMENTAL STATEMENT CHAPTER 13 ROAD DRAINAGE AND THE WATER ENVIRONMENT (TRACKED)

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Table of contents

Chapter

Pages

Tables

Inserts

13. Road Drainage and the Water Environment

13.1 Introduction

13.1.1 This chapter presents the road drainage and water environment assessment associated with the Scheme. It has been prepared in accordance with best practice guidance for impact assessment of highway schemes including the Design Manual for Roads and Bridges (DMRB) LA 113 Road drainage and the water environment[1] and DMRB LA 109 Geology and soils[2].

13.1.2 This chapter provides the baseline, an evaluation of the road drainage and water environment receptors relevant to the Scheme, the assessment methodology to be used when identifying and assessing any significant effects and an assessment of the significant effects on those receptors after mitigation, as a result of the Scheme.

13.1.3 The scope of the chapter will comprise impacts to surface water features and flood risk predominantly associated with the creation of surface-borne pollutants, works within surface water features, surface water runoff and works within areas identified to be at risk of flooding. With regards to surface water features the impact assessment will consider surface water quality, hydromorphology, flood risk and groundwater separately.

13.1.4 This chapter is set out as follows:

- Legislative and policy context – relevant international, national and local policy requirements, legal requirements and guidance which have been used to define the assessment approach are outlined
- Assessment methodology – the methodology the assessment follows is defined including the justification for the study area and the approach for determining significance of effects
- Baseline – a summary of the water environment baseline within the scheme is provided
- Potential effects – the potential impacts and effects (both beneficial and adverse) during construction and operation are characterised
- Mitigation measures – agreed avoidance, mitigation, compensation and enhancement measures are described
- Residual effects – the significance of residual effects (both beneficial and adverse) following the implementation of mitigation measures are assessed
- Assessment of cumulative effects with committed developments relevant to the scheme.

13.1.5 To accompany this chapter the following technical appendices and stand alone reports have been prepared to support the assessment of the likely significant effects on the road drainage and water environment, as a result of the Scheme.

[1] DMRB LA 113 Road drainage and water environment (formerly (formerly HD 45/09) Revision 1
[2] DMRB LA 109 Geology and soils (formerly (formerly DMRB Volume 11, Section 3, Part 11 & Part 6) Revision 0

- The Highways England Water Risk Assessment Tool (HEWRAT), has been used to assess the effects of road drainage discharges, and the risks from spillages, on the quality of receiving water bodies. The HEWRAT assessment is found within Appendix 13.1 (TR010034/APP/6.5)
- A Flood Risk Assessment (FRA) (TR010034/APP/5.5) has been undertaken in accordance with the National Planning Policy Framework (NPPF) and local planning policy and will inform the ES chapter. More information on the FRA is outlined in Section 13.3 of this chapter
- A Water Framework Directive (WFD) (TR010034/APP/5.4) compliance assessment has been undertaken to support the ES, the methodology for which is outlined in Section 13.4 of this chapter. The WFD compliance assessment evaluates the impact of likely significant effects of the Scheme on surface water and groundwater bodies, and also considers opportunities for betterment to help meet the objectives of the WFD (to protect the water environment) where appropriate
- A Hydrogeological Risk Assessment to assess long-term impacts on the groundwater environment as result of the Scheme, presented in Appendix 13.2 (TR010034/EXAM/9.43).

13.1.6 Impacts to groundwater resources and groundwater quality associated with the Scheme have been addressed in both this chapter and the Geology and Soils chapter (Chapter 9)). Impacts to aquatic ecology have been addressed in the Biodiversity chapter (Chapter 8).

13.2 Legislative and policy framework

13.2.1 This assessment in this chapter has been prepared taking account of legislation and guidance at European, national and local levels. A summary of these requirements, specific to the water environment, is set out in the following section. The Scheme lies within the boundaries of Tameside Metropolitan Borough Council, Derbyshire County Council and High Peak Borough Council.

UK and European[3]

13.2.2 The Department for Environment, Food and Rural Affairs (Defra) manages the coordination of policies for the water environment. Many flood risk and water quality requirements are set at European level, and then transposed into UK law. The Environment Agency (EA) manages the enforcement of flood risk and water quality requirements in England. The assessments have due regard to the European legislation and guidance, summarised in

Table 13-1 Summary of European legislation

Legislation	Descriptions
Water Framework Directive (WFD) (2000/60/EC)	The WFD legislation requires that all inland waters within defined river basin districts must reach at least Good status by 2015 and defines how this should be achieved through the establishment of environmental objectives and ecological targets for surface waters.

[3] It is noted that the impact of European legislation may need to be revised following the UK's exit from the European Union but much of this has been transposed into UK law in any event.

Legislation	Descriptions
	Any new project must not cause deterioration of the water environment or prevent the future attainment of Good status. The WFD requires that surface water discharges are managed so that their impact on the receiving environment is mitigated. The objective is to protect the aquatic environment and control pollution from diffuse sources such as urban drainage – a key aspect that effectively precludes use of the traditional approach to drainage.
Environmental Quality Standards Directive (2008/105/EC)	Lists environmental quality standards (EQS) for priority substances and certain other pollutants as provided for in Article 16 of the Water Framework Directive 2000/60/EC (WFD), with the aim of achieving Good surface water chemical status. It includes certain metals that are associated with runoff from highways.
Groundwater Directive (2006/118/EC)	Complements the WFD. It requires measures to prevent or limit inputs of pollutants into groundwater to be operational so that WFD environmental objectives can be achieved.
Habitats Directive (92/43/EEC)	To promote the maintenance of biodiversity by taking measures to maintain or restore natural habitats and wild species at a favourable conservation status, introducing robust protection for those habitats and species of European importance. Sites or species that come under this Directive will heighten the importance of water features that sustain them.
Floods Directive (2007/60/EC)	The aim of this Directive is to reduce and manage the risks that floods pose to human health, the environment, cultural heritage and economic activity. It sets the strategic level for flood risk that any development will need to comply with.

National

13.2.3 The aim of water policy in England is to protect both public health and the environment by maintaining and improving the quality of natural waters. These include surface water bodies (e.g. rivers, streams, lakes, and ponds) and groundwater. European legislation is implemented in the UK through specific sets of Regulations (e.g. Flood Risk Regulations 2009, Groundwater (England and Wales) Regulations 2009, Private Water Supplies Regulations 2009). Defra is responsible for all aspects of water policy in England. Management and enforcement of water policy is the responsibility of Regulators, principally the EA, but also Lead Local Flood Authorities (LLFA). There is extensive domestic legislation which regulates the water environment, as summarised in Table 13.2.

Table 13-2 National legislation summary

Legislation	Descriptions
Act	
Environment Act 1995	The Act provides for the establishment of a Corporate body to be known as the EA, the key regulator for the water environment.
Environmental Protection Act 1990	This Act brings in a system of integrated pollution control for the disposal of wastes to land, water and air.

Legislation	Descriptions
Act	
Flood and Water Management Act 2010	The key areas covered by this Act are: Roles and responsibilities for flood and coastal erosion risk management; and, improving reservoir safety.
Highways Act 1980	The Act deals with the management and operation of the road network in England and Wales including the drainage of highways into environmental waters and sewers.
The Land Drainage Act 1991	This requires that a watercourse be maintained in such a condition that the free flow of water is not impeded. The 1994 Land Drainage Act amends it in relation to the functions of internal drainage boards (IDB) and local authorities
Water Act 2003 and Water Act 2014	These Acts aim to improve water conservation, protect public health and the environment, and improve the service offered to consumers. The Acts relate to water resources, regulation of the water industry and other provisions.
Water Framework Directive (Standards and Classification) Directives (England and Wales) 2015 (SI 17/407)	This sets out the environmental standards to be used for the second cycle of river basin plans. They transpose Directive 2013/39/EC on environmental quality standards for priority substances
Water Industry Act 1991	This sets out the responsibilities of the EA in relation to water pollution, resource management, flood defence, fisheries, and in some areas, navigation. The Act regulates discharges to controlled waters, namely rivers, estuaries, coastal waters, lakes and groundwaters
Water Resources Act 1991 (as amended by the Water Resources Act 1991 (Amendment) (England and Wales) Regulations (2009))	The Act to regulate water resources, water quality and pollution, and flood defence. Sets out standards for Controlled Waters
Regulations	
Anti-Pollution Works Regulations 1999	Where pollution occurs, or is likely to occur, the EA can serve a works notice under Section 161A of the Water Resources Act 1991 on any person who has caused or knowingly permitted the pollution (or risk of pollution) to controlled waters, requiring them to carry out anti-pollution/preventative works and operations. The EA can also recover the costs of any investigation and anti-pollution works carried out. The Anti-Pollution Works Regulations prescribe the content of anti-pollution works notices. They also prescribe the information to be placed on the pollution control registers maintained by the EA.
Control of Pollution (Oil Storage) (England) Regulations 2001	Regulations for the storage of more than 200 litres of oil above ground at an industrial, commercial or institutional site not used in refining or distribution oil. The Regulations apply in England only.
Environmental Damage (Prevention and Remediation) Regulations (England) 2015	The emphasis of these Regulations is proactively putting in place appropriate pollution prevention measures to reduce risks to the environment.

Legislation	Descriptions
Act	
Environmental Permitting (England and Wales) Regulations 2016	These provide a consolidated system of environmental permitting in England and Wales and transpose the provisions of 15 European Union (EU) Directives, which impose obligations requiring delivery through permits or which are capable of being delivered through permits. These cover EA permits for flood risk (on Main Rivers) and certain discharges to watercourses.
Flood Risk Regulations 2009 Amended SI2011/2880 transpose directive 2007/60/EC	These aim to provide a consistent approach to managing flood risk. The EA are responsible for managing flood risk from main rivers, the sea and reservoirs. LLFAs are responsible for local sources of flood risk from surface water, groundwater and ordinary watercourses.
Environmental Permitting (England and Wales) Regulations 2016	These transpose the Groundwater Directive (2006/118/EC) into law in England and Wales.
Water Environment (Water Framework Directive) (England and Wales) Regulations 2017	These outline the duties of regulators (EA in England) in relation to environmental permitting, abstraction and impoundment of water.
The Water Resources (Environmental Impact Assessment) (England and Wales) Regulations 2003	These impose procedural requirements in relation to the consideration of applications or proposals for an abstraction or impounding licence under Chapter II of Part II of the Water Resources Act 1991 and require consent in other cases.

National planning policy National Planning Policy Framework and National Policy Statement National Networks

13.2.4 The National Planning Policy Framework (NPPF) (Department for Communities and Local Government (DCLG), 2019) needs to be taken into account. The NPPF sets strict tests to protect people and property from flooding which all local planning authorities are expected to follow. This has formed the basis of assessment of flood risk for this Scheme.

13.2.5 Guidance and policy are set out in detail for water quality and resources and flood risk within the National Policy Statement National Networks guidance.

13.2.6 The objectives include reference to the WFD and that new and existing development should be prevented from contributing to, or being put at unacceptable risk from, or being adversely affected by, water pollution. Existing status of water quality, water resources and physical characteristics in the water environment must be ascertained and that the impacts of the proposed project, including those associated with any cumulative effects, are assessed as part of the Environmental Statement. Careful design to facilitate adherence to good pollution control practice can reduce the risk of impacts on the water environment.

Technical guidance and standards

13.2.7 The assessment has also taken into account the following technical guidance and standards as summarised in Table 13-3.

Table 13-3 Guidance and standard summary

Guidance	Descriptions
A Green Future: Our 25 Year Plan to Improve the Environment (HM Government, 2018)	This 25 Year Environment Plan sets out government action to help the natural world regain and retain good health. It aims to deliver cleaner air and water in our cities and rural landscapes, protect threatened species and provide richer wildlife habitats. It calls for an approach to agriculture, forestry, land use and fishing that puts the environment first. The aim is to work with nature to protect communities from flooding, slowing rivers and creating and sustaining more wetlands to reduce flood risk and offer valuable habitats. Policies relevant to flood risk include expanding the use of natural flood management solutions, putting in place more sustainable drainage systems, aiming to protect and grow our natural capital, making 'at-risk' properties more resilient to flooding, and tackling climate change.
EA Groundwater Protection (previously known as GP3)	Guidance on the protection of groundwater for those proposing an activity which may cause groundwater impacts. The guidance aims to protect groundwater and prevent pollution. It covers requirements, permissions, risk assessments and controls.
National Planning Practice Guidance (NPPG) DCLG 2019	Guidance to accompany the NPPF. This advises on how local planning authorities can ensure water quality and the delivery of adequate water infrastructure and take account of the risks associated with flooding in the plan-making and the planning application process: Meeting the challenge of climate change, flooding and coastal change; and Conserving and enhancing the natural environment
Catchment Flood Management Plans (CFMPs) (EA)	CFMPs provide a large scale, strategic planning framework for the integrated management of flood risks to people, property and the environment in a sustainable manner over the next 50 to 100 years.
River Basin Management Plans (RBMPs) (EA)	RBMPs set out how organisations, stakeholders and communities will work together to improve the water environment. The plans set out environmental objectives for protecting and improving the waters and a programme of measures, actions needed to achieve the objectives.
Design Manual for Roads and Bridges (DMRB) LA113 Road drainage and the water environment	Standard providing the requirements for assessment and management of the impacts that road projects can have on the water environment.
Transport Analysis Guidance (TAG), Department for Transport) Unit A3 Environmental Impact Assessment (May 2019)	Guidance on tailoring level of detail for assessment to the stage of development of the Scheme; the relationship between environmental impact appraisal (as set out in this manual) and Environmental Impact Assessment (EIA); the differing types of environmental impact and reporting requirements
Guidance for Pollution Prevention (GPPs)	GPPs provide environmental good practice guidance for the whole of the UK, relevant guidance to this scheme cover: Pollution Prevention Guidance[4] (PPG) 1: Understanding your environmental responsibilities – good environmental practices;

[4] PPGs are no longer considered as formal guidance, but it is good practice to meet requirements set out within these documents.

Guidance	Descriptions
	PPG 3: Use and design of oil separators in surface water drainage systems; GPP 4: Treatment and disposal of wastewater where there is no connection to the public foul sewer; and GPP 5: Works and maintenance in or near water.
GPP for businesses (GOV.UK)	Guidance for businesses and organisations on prevention of pollution from oil and chemical storage, car washing, construction and other activities. These guidelines are specific to England.

Local planning policies

13.2.8 Local plan policies and Supplementary Planning Guidance state what is acceptable in terms of drainage, landscape, water quality and amenity within new development. Policy guidance is available from the various local authority websites. The Scheme study area lies within the boundaries of Tameside Metropolitan Borough Council (Tameside MBC) and High Peak Borough Council. The scheme does not fall within any IDB districts.

Tameside Metropolitan Borough Council (MBC)

13.2.9 Tameside MBC adopted the Sustainable Design and Construction Guide as a Supplementary Planning Document (SPD) under the provisions of the Planning and Compulsory Purchase Act 2004 in October 2005. Tameside MBC is working with the development and construction industry to deliver the following objectives:

- Development processes that work with local communities to deliver economic, environmental and social benefits now and for the future
- Design approaches that provide healthy living and working environments, where businesses can be competitive and where all can enjoy a rich and rewarding quality of life
- Construction practices that maximise the use of services from local businesses and the use of locally sourced materials while at the same time minimising adverse impacts on existing communities and the environment.

13.2.10 With regard the water environment the following checks are included within the SPD:

- Section 4.2: why does climate change matter
  - *New developments in Tameside should be resilient to climate change impacts such as intense rainfall, flooding etc.*
- Section 4.4: Why does water pollution matter
  - *Impacts from diffuse pollution can be reduced through the use of good design of buildings, drains and hard surfacing (including roads). This should include the use of Sustainable Urban Drainage (SuDS).*
  - *Potential impacts from construction processes can be avoided by instituting good management of materials and practices on site and being prepared for an accidental spill of polluting substances.*

- Section 8.3 Feasibility, checks should include:
  - *Is the site in an area at risk from current or future climate change impacts and extreme weather events (including flash flooding, slow onset flooding, fluvial flooding and groundwater rise flooding)?*
  - *Does the development potentially increase climate change related risks in the locality? This could be in terms of increased surface water run-off, changes to flood or groundwater regimes elsewhere, increased pressure for new or enhanced flood defence measures.*
- Section 8.4 Outline proposal, checks should include:
  - *Have features that increase resilience/ adaptability to flood risk or specifying SuDS been included in the design?*
  - *In larger developments has consideration been given to the potential for treating wastewater on site (including the consideration of long term maintenance).*
  - *Has the possibility of integrating reed-bed treatment of wastewater in the landscaping of the site been considered?*
- Section 8.6 Detailed Design, check should include:
  - *Has the creation of new culverts been avoided and old culverts opened up where possible to reduce flood risk?*
  - *Have sustainable urban drainage features such as permeable surfacing been specified to slow water run-off and reduce flood risk?*
  - *Have features to reduce water pollution and prevent contamination of 689/rainwater runoff been specified?*

13.2.11 The Tameside Unitary Development Plan notes the following:

MW12 Control of Pollution:

- *"Planning permission will not be granted for a development if its operation is likely to be a source of pollution (including noise pollution) or a generator of waste which would pose a threat to the amenity of the surrounding area, lead to contamination of land, or adversely affect the quality of rivers, other watercourses, lakes, ponds or groundwater and their role for fishing, nature conservation and informal recreation."*
- *"Where appropriate, conditions will be attached to planning permissions to safeguard against the loss of amenity which may be caused by pollution or waste resulting from the operation of a development, or to establish acceptable levels which should not be breached. Where developments are permitted, any emissions may be monitored to ensure compliance with conditions which are imposed."*

U3 Water Services for Developments

"Incorporation of sustainable drainage systems into developments will be encouraged and promoted wherever appropriate, as a means of controlling run-off, managing water resources, minimising diffuse pollution, reducing environmental damage, and providing an opportunity for imaginative

landscaping. The Council will expect satisfactory arrangements to be made for the ongoing maintenance of the structures involved."
U4 Flood Prevention

- *"When considering proposals for development the Council will apply a risk based approach to the assessment of possible flooding, taking into account the Environment Agency's most recent Indicative Flood Plain Maps and any other relevant sources of information."*

13.2.12 Local plans are also included within the Greater Manchester Spatial Framework Publication Plan 2020 (Draft for Approval).

High Peak Borough Council

13.2.13 High Peak Borough Council adopted the Local Plan in April 2016, this sets out the council's vision and strategy for the borough until 2031. The following local plan polices apply to the water environment:

- Policy EQ10 – Pollution control and unstable land
  - *The Council will not permit any proposal that has an adverse effect on a European site – Pollution of watercourses (rivers, canals, reservoirs, streams, ditches ponds and wetland areas) or groundwater.*
  - *Ensuring all new developments have regard to the actions and objectives of the Humber and North West River Basin Management Plans in striving to protect and improve the quality of water bodies in and adjacent to the Borough, including the Rivers Etherow, Sett, Goyt and Wye, Glossop, Black and Randal Carr Brooks and their tributaries*
- EQ11 – Flood risk management
  - *The council will support development proposals that avoid areas of current or future flood risk, and which do not increase the risk of flooding elsewhere, where this is viable and compatible with other polices aimed at achieving a sustainable pattern of development. When considering planning applications, the Council will also have regard to all relevant Catchment Flood Management Plans and the Local Flood Risk Management Strategy.*
  - *Developments within areas at risk from flooding, as defined by the Environment Agency would need to undertake testing as per the NPPF prior to permitting.*
  - *Development proposals should consider opportunities to contribute towards the objectives of the relevant Catchment Flood Management Plan.*
  - *Where a watercourse is present on a development site, it should be retained or restored into a natural state and enhanced where possible. The culverting of any watercourse will not normally be permitted, and development should wherever possible remove any existing culverts and increase on-site flood storage. Development should be laid out to enable maintenance of the watercourse.*
  - *Wherever possible SuDS will be expected to contribute towards wider sustainability considerations, including amenity, recreation, conservation of biodiversity and landscape character, making use of the role that trees,*

woodland and other green infrastructure can play in flood alleviation and water quality control.

13.3 Assessment methodology

Consultation

13.3.1 Details of consultation undertaken to inform this assessment are presented in the Introduction chapter (Chapter 1) and the Consultation Report (TR010034/APP/5.1).

13.3.2 Technical leads for water quality, flood risk, hydromorphology, WFD compliance, groundwater and aquatic ecology undertook formal consultation with the Environment Agency on the 3rd December 2020. Additional consultation with the Environment Agency and the LLFA in relation to groundwater is ongoing.

13.3.3 Table 13-4 summarises the topics discussed with the EA.

Table 13-4 Summary of consultation topics discussed with the EA

Topic	Technical Area	Discussion point raised	Environment Agency response
Groundwater	Scheme impacts (Groundwater flow and groundwater quality)	Hydrogeological risk assessment will be undertaken following completion of additional ground investigation, to assess groundwater contribution to base flow of any relevant surface water receptors, and groundwater abstraction receptors. Due to the programme, the additional ground investigation and hydrogeological risk assessment will be undertaken after the environmental impact assessment.	We are pleased that the necessary hydro-geological assessments, which you are planning to undertake can be done at a point when you have the necessary information to allow you to complete them fully. Following the submission of the Ground Investigation reports, depending on what you find, we will be happy to arrange additional meetings when and where appropriate
		Email sent to the EA 21/04/21 confirming the approach to assessing groundwater in the environmental statement.	The EA responded to confirm this was in line with what was discussed in the meeting 03/12/20 and it was agreed the WFD and FRA would be issued to EA for comment.
Water diversions and crossings	Realignment proposals	River alignments will follow best practice as outlined from previous EA comments.	Further consultation may be required.
Water Framework Directive	Scope for Water Framework Directive	Zone of Influence is proposed to be a 500 m buffer from Scheme Boundary for surface water and a 1 km buffer from Scheme Boundary for groundwater. WFD water bodies which fall (or partly fall) within the ZoI will be subject to a screening assessment to determine the potential impact of the Scheme on the water body. If the Scheme is considered to have no impact, the water body will be screened out from further assessment. Those watercourses which are not assigned a WFD ID within the North West RBMP but are located within	Satisfied with this process.

Topic	Technical Area	Discussion point raised	Environment Agency response
		the ZoI (i.e. unnamed land drains and ditches, as well as Tara Brook, Hurstclough Brook and Hollingworth Brook) will not be specifically assessed. However, where such watercourses are impacted by the Scheme and are hydrologically connected, the potential for indirect effects on the relevant WFD surface water body/ies will be considered.	
Water quality	Water quality monitoring	Water quality monitoring would only be undertaken where there are in-channel works.	Any potential mitigation measures captured within an Environment Management Plan, and any method statements regarding pollution prevention measures (during both construction and operation) would need to be reviewed.
Water quality	Discharge consents	Discharge consents would be sought for any new discharges.	Further consultation would be required.
Flood Risk	Flood Risk Assessment Mitigation options	Seek formal approval during planning process from EA on flood risk mitigation options proposed i.e. compensatory flood storage areas.	Climate change allowances will change in 2021 and these will be shared to add on peak river flow when running the hydraulic model ensuring that the soffit level is set correctly and the compensatory flood storage volume is adequate over the lifetime of the new highway structure.
Aquatic Ecology		Watercourse ecology is being considered within the both the WFD at a waterbody scale and the nature conservation chapter of the Environmental Statement.	Any flood compensatory storage area (FCSA) be encompassed as part of HE permanent land take area, as this provided more security, this area will be more positively managed in the long term, and potentially provides opportunity to create new priority habitat
Aquatic Ecology		ECO4 is noted and further surveys including MoRPh, aquatic invertebrates, PSYM pond surveys have been undertaken which will inform the baseline and mitigation.	

Topic	Technical Area	Discussion point raised	Environment Agency response
Aquatic Ecology		Best practice will be followed as per previous EA comments.	and be included as part of BNG for scheme.
Aquatic Ecology		PSYM5 survey undertaken to inform mitigation for pond loss.	

[redacted]

Scoping responses

13.3.4 An overview of the Planning Inspectorate's Scoping Opinion on the proposed scope of the Road drainage and water environment assessment is provided in Appendix 4.1 (document reference TR010034/APP/6.5). Any additional consultation responses or changes to assessment methodology due to the latest DMRB standards or design changes are also detailed in Appendix 4.4 (document reference TR010034/APP/6.5).

Data Sources

13.3.5 The following sources of information have been used to inform the assessment. As these are all live websites it has been assumed that data presented here is current at the time of writing/when accessed:

- Ordnance Survey (OS) OpenData[6]
- The EA website[7]
- The EA Flood Map for Planning website[8]
- The Flood Mapping Service (rivers/sea, surface water, reservoirs) website[9]
- The EA Catchment Data Explorer website[10]
- Multi-Agency Geographic Information for the Countryside (MAGIC) Map[11]
- British Geological Survey (BGS) Geology of Britain viewer map[12]
- The EA Water Quality Data archive website[13]
- Online historic mapping resources, e.g. National Library of Scotland (NLS)[14]
- High-resolution aerial photography, e.g. Google Earth.

13.3.6 The following flood risk models have been provided by the EA and used to inform the FRA:

- 2019 River Etherow Model (Flood Modeller Tuflow linked model)

Identification of Receptors

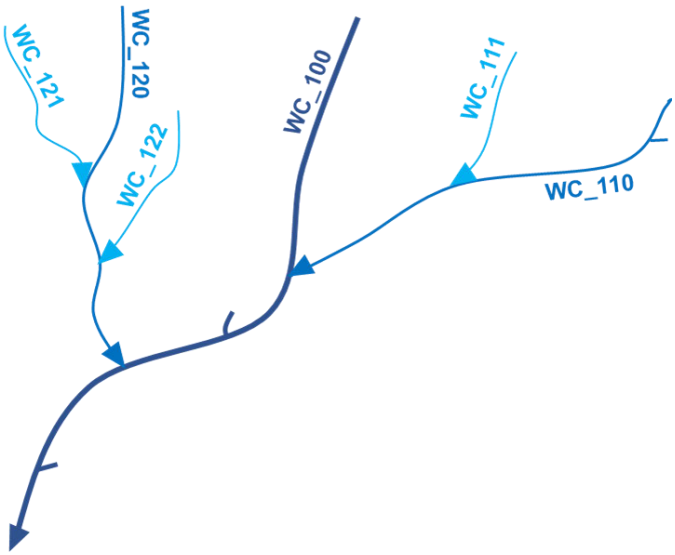
13.3.7 The data sources listed above have been used to identify water environment receptors assessed, including surface watercourses and groundwater bodies.

13.3.8 Many of the identified surface watercourses are unnamed on OS mapping, such that all identified watercourses within the Study Area have been assigned a unique identifier code for ease of reference and consistency across chapters and assessments. Watercourses which are named have also been assigned an identifier code. The numbering system uses the format "WC_xxx", where "WC"

[redacted]

stands for “watercourse” and “xxx” is a unique three-digit number which is also used to indicate stream order.

13.3.9 Using the example shown in Insert 13-1 below, WC_100 is a major named watercourse (i.e. first order), WC_110 and WC_120 are tributaries of that river (i.e. second order), and WC_111, WC_121 and WC_122 are tributaries of the second order streams (i.e. third order). The numbering system also accommodates ordering of incoming tributaries from upstream to downstream (e.g. WC_110 joins WC_100 upstream of WC_120). To avoid longer codes, where there are very short (< 100 m in length) tributaries of a watercourse, these are incorporated into the assessment for the watercourse they are joining. Watercourses which are located within the Zone of Influence (ZoI), but flow into a major named watercourse outside of the ZoI, are given the first digit 0 (i.e. “WC_0xx”).



Insert 13-1 Example watercourse numbering system

Site Walkovers

13.3.10 Hydromorphological walkovers were undertaken on 10th and 16th September 2020 to assess bed and bank characteristics (materials, forms and features), flow conditions and fluvial processes. Where it was not possible to undertake field surveys due to access restrictions, watercourses were characterised using readily available information.

13.3.11 A flood risk walkover was undertaken on 22nd September 2020 to assess bed and bank characteristics, identify flood mechanisms and vulnerable receptors.

Approach

Water Environment

13.3.12 The method of assessment and reporting of significant effects has been predominantly qualitative, based on the methodology set out in the Environmental Impact Assessment Methodology chapter (Chapter 4) of this ES. The assessment has been undertaken for both construction and operational phases.

13.3.13 The methodology has involved the steps set out below:

- Categorisation of importance (sensitivity) of receptor
- Categorisation of magnitude of the impact
- Assessment of the significance of the effect based on the importance of the receptor and magnitude of the impact.

13.3.14 Estimation of importance of the receptor has been based on the data collected as part of the baseline study, taking into consideration designations, publicly available data, site walkovers and consultations with stakeholders. Estimation of magnitude of impacts has been a primarily semi-qualitative description, relying on professional judgement, knowledge and experience of other similar schemes.

13.3.15 This assessment has considered the following water environment technical areas:

- water quality (i.e. changes to watercourse chemistry and condition)
- flood risk (i.e. changes to risk from flooding),
- hydromorphology (i.e. changes to physical characteristics and functioning of watercourses),
- groundwater (i.e. changes to groundwater quality and quantity)

13.3.16 The likely significant effects associated with the scheme on identified receptors are assessed for each technical area. An overall assessment has been based on the water environment technical area with the most adverse significant effect resulting from construction and operational activity. This approach aims to highlight the impact on the water receptor as a whole rather than from one technical area.

13.3.17 This chapter has a further three associated standalone assessments, which are provided as appendices to this chapter or standalone documents:

- HEWRAT Assessment (Appendix 13.1 Water Environment data) (TR010034/APP/6.5)
- FRA (Level 3) (TR010034/APP/5.5)
- WFD Compliance Assessment (TR010034/APP/5.4).

13.3.18 Methodologies for these standalone assessments are also provided within this chapter and the results have fed into the overall impact assessment.

13.3.19 The Geology and soils chapter (Chapter 9) and the Biodiversity chapter (Chapter 8) have also been used to inform the assessment within this chapter.

Highways England Water Risk Assessment Tool (HEWRAT)

13.3.20 To assess the potential for likely significant effect on surface water quality from routine runoff, a simple assessment has been undertaken using the Highways England Water Risk Assessment Tool (HEWRAT) to determine whether the risk to surface and ground water quality from soluble pollutants and chronic impacts from sediment released pollutants is acceptable.

13.3.21 Where the initial assessment has shown a potential for the risk to be not acceptable for annual average concentrations of soluble pollutants, and proportionate mitigation cannot be readily incorporated, a detailed assessment

has been carried out using the UKTAG Rivers and Lakes Metal Bioavailability Assessment Tool (M-BAT).

13.3.22 The HEWRAT has also been used to perform the surface water spillage assessment and determine whether the risk of a serious pollution incident occurring is acceptable.

13.3.23 Groundwater quality and routine runoff, and groundwater spillage assessments have also been undertaken under certain flow conditions as detailed in Appendix 13.1 (TR010034/APP/6.5).

Water Framework Directive Assessment

13.3.24 The overall aim of the WFD compliance assessment is to identify and assess potential impacts of the Scheme upon the water environment, and to determine if the Scheme is compliant with WFD legislation. Where appropriate, this WFD assessment has also identified mitigation measures (both included into the design as embedded mitigation and site-specific) to ensure no deterioration to any WFD surface water body or groundwater body.

13.3.25 A detailed WFD compliance assessment and its associated assessment methodology has been provided as a separate document with this DCO application (TR010034/APP/5.4).

13.3.26 The WFD assessment follows guidance produced by The Planning Inspectorate (PINS) in Advice Note 18 on the Water Framework Directive[15]. This includes three phases of work:

- Stage 1 (WFD Screening)
- Stage 2 (WFD Scoping)
- Stage 3 (WFD Impact Assessment).

13.3.27 Stage 1 (WFD Screening) included a desk-based study to consider activities associated with the Scheme and the identification of water receptors which have the potential to be affected by the Scheme. A more detailed desk-study was undertaken at Stage 2 (WFD Scoping) to review the baseline characteristics of the identified WFD surface and groundwater bodies (e.g. examination of aerial photography and old maps, review of EA WFD, fisheries, and water quality data), and also to consider the potential risks from the Scheme to water receptors.

13.3.28 Stage 3 (WFD Impact Assessment) comprised:

- Field surveys by experienced geomorphologists and aquatic ecologists to further assess the character of watercourses potentially impacted by the Scheme
- Identification of specific works associated with the Scheme and which receptor(s) may be impacted
- A thorough matrix-based approach WFD impact assessment for each quality element within each individual WFD water body with the potential to be impacted by the Scheme
- Identification of site-specific mitigation measures required as a result of the Scheme

[15]Advice note 18 The Water Framework Directive The Planning Inspectorate, June 2017

- Synthesis of all assessments to assess the cumulative impact of the Scheme on potentially affected WFD water bodies in order to determine compliance of the scheme with WFD legislation.

Flood Risk Assessment

13.3.29 The overall aim of the FRA is to understand flood risk to and from the proposed development and the management of flood risk through mitigation if required.

13.3.30 The assessment has considered receptors for flood risk and includes the Scheme and committed developments (i.e. cumulative assessment) within the study area. Receptor vulnerability is classified in accordance with NPPF and flood risk and coastal change planning practice guidance.

13.3.31 Receptors considered in this assessment include the Scheme and areas at risk of flooding. In this regard, the receptors are each watercourse and their floodplains; and each surface water flood route, both of which may hold developments and assets of various type. For clarity, receptors are described by their source watercourse or groundwater body.

13.3.32 The assessment makes consideration of the vulnerability of the receptor with reference to the flood risk category, which is categorised by assessing the design elements of the Scheme. This assessment aims to identify whether the Scheme has any potential to influence or alter the risk of flooding to each receptor.

13.3.33 The appraisal of flood risk impacts associated with the Scheme has considered:

- Increases in upstream water level caused by any restriction in flow
- Loss of floodplain storage due to infrastructure occupying areas which were previously available for flood storage or flows
- Loss of floodplain conveyance due to infrastructure crossing existing floodplain and forming a barrier to flow or modifying existing hydraulic links between channel and floodplain
- Impediment of water flow caused by infrastructure crossing existing drainage channels, causing potential blockage and altering local catchment area boundaries
- The diversion of watercourses and drains causing changes in catchment boundaries, channel flow capacities and floodplain storage
- Surface water drainage strategy.
- Remain operational and safe for users during times of flood
- Effect of below ground structures on groundwater flow and groundwater flood risk.

13.3.34 A high-level review of the risk of flooding and potential impacts has been undertaken across all flood sources. Where this review indicated potential significant impacts on the risk of flooding, or a risk of flooding to the scheme, further investigation in the form of hydraulic modelling has been undertaken during the development of the Flood Risk Assessment (FRA).

13.3.35 The detailed FRA and its associated assessment methodology has been provided in as a separate document with this DCO application

(TR010034/APP/5.5). They are based upon the requirements of the NPPF and Flood Risk and Coastal Change Planning Practice Guidance.

13.3.36 The FRA also considers impacts of climate change, as set out in the NPPF and a sensitivity analysis has been undertaken in agreement with the Environment Agency on the UKCP2018 climate change projections.

Assessment Criteria

Assessment of sensitivity

13.3.37 The sensitivity of receptors is detailed in Table 13-5 and has referred to the DMRB LA 113 Table 3.70, with criteria relating to the water environment used where appropriate. Each water environment technical area will identify sensitivity (for surface waters) on the criteria shown in Table 13-5 the highest level of sensitivity will be selected for the watercourse assessment. Sensitivity criteria for the FRA will consider receptors vulnerable to flooding i.e. the properties at risk, A-roads or agricultural land rather than the waterbody itself.

Table 13-5 Sensitivity descriptors

Importance	Typical criteria	Typical examples	
Very High	Nationally significant attribute of high importance	Surface water	• Watercourse having a WFD classification shown in a RBMP and Q_{95}≥ 1.0 m^3/s. • Site protected/ designated under EC or UK legislation (SAC, SPA, SSSI, Ramsar site, salmonid water)/Species protected by EC legislation LA108
		Groundwater	• Principal aquifer providing a regionally important resource and/ or supporting a site protected under EC and UK legislation LA 108 • Groundwater locally supports Groundwater Dependent Terrestrial Ecosystem (GWDTE) • Source Protection Zone[16] (SPZ)1
		Flood risk	• Essential infrastructure or highly vulnerable development
High	Locally significant attribute of high importance	Surface water	• Watercourse having a WFD classification shown in a RBMP and Q_{95}<1.0 m3/s • Species protected under EC or UK legislation LA 108
		Groundwater	• Principal aquifer providing locally important resource or supporting a river ecosystem.

[16] For groundwater sources such as wells, boreholes and springs used for public drinking water supply. These zones show the risk of contamination from any activities that might cause pollution in the area. The closer the activity, the greater the risk.

Importance	Typical criteria	Typical examples	
			• Groundwater supports a GWDTE • SPZ2
		Flood risk	• More vulnerable development
Medium	Of moderate quality and rarity	Surface water	• Watercourses not having a WFD classification shown in a RBMP and Q_{95}>0.001 m^3/s.
		Groundwater	• Aquifer providing water for agricultural or industrial use with limited connection to surface water. • SPZ3
		Flood risk	• Less vulnerable development
Low	Lower Quality	Surface water	• Watercourses not having a WFD classification shown in a RBMP and Q_{95}≤0.001 m^3/s.
		Groundwater	• Unproductive strata
		Flood risk	• Water compatible development

Table Source: Extracted from DMRB LA113 Table 3.70 Estimating the importance of water environment attributes

13.3.38 The magnitude of impacts is detailed in Table 13-6, with specific examples relating to the water environment.

Table 13-6 Criteria for assessing potential magnitude of impact

Magnitude of Impact	Typical criteria	Typical examples	
Major adverse	Results in loss of attribute and/or quality and integrity of the attribute	Surface water	• Failure of both acute-soluble and chronic-sediment related pollutants in HEWRAT and compliance failure with EQS values. • Calculated risk of pollution from a spillage ≥2% annually (spillage assessment). • Loss or extensive change to a fishery. • Loss of regionally important public water supply. • Loss or extensive change to a designated nature conservation site. • Reduction in water body WFD classification.
		Groundwater	• Loss of, or extensive change to, an aquifer. • Loss of regionally important water supply. • Potential high risk of pollution to groundwater from routine runoff - risk score >250 (Groundwater quality and runoff assessment). • Calculated risk of pollution from spillages ≥2% annually (Spillage assessment). • Loss of, or extensive change to GWDTE or baseflow contribution to protected surface water bodies. • Reduction in water body WFD classification • Loss or significant damage to major structures through subsidence or similar effects.
		Flood risk	• Increase in peak flood level (> 100mm).
Moderate Adverse	Results in effect on integrity of attribute, or loss of part of attribute	Surface water	• Failure of both acute-soluble and chronic-sediment related pollutants in HEWRAT but compliance with EQS values. • Calculated risk of pollution from spillages ≥1% annually and <2% annually. • Partial loss in productivity of a fishery. • Degradation of regionally important public water supply or loss of major commercial/industrial/agricultural supplies. • Contribution to reduction in water body WFD classification.
		Groundwater	• Partial loss or change to an aquifer.

Magnitude of Impact	Typical criteria	Typical examples	
			• Degradation of regionally important public water supply or loss of significant commercial/ industrial/agricultural supplies. • Potential medium risk of pollution to groundwater from routine runoff - risk score 150-250. • Calculated risk of pollution from spillages ≥1% annually and <2% annually. • Partial loss of the integrity of GWDTE. • Contribution to reduction in water body WFD classification. • Damage to major structures through subsidence or similar effects or loss of minor structures.
		Flood risk	• Increase in peak flood level (> 50mm).
Minor Adverse	Results in some measurable change in attributes, quality or vulnerability	Surface water	• Failure of either acute soluble or chronic sediment related pollutants in HEWRAT. • Calculated risk of pollution from spillages ≥0.5% annually and <1% annually. • Minor effects on water supplies.
		Groundwater	• Potential low risk of pollution to groundwater from routine runoff - risk score <150 • Calculated risk of pollution from spillages ≥0.5% annually and<1%annuallyMinor effects on an aquifer, • GWDTEs, abstractions and structures
		Flood risk	• Increase in peak flood level (> 10mm)
Negligible	Results in effect on attribute, but of in sufficient magnitude to affect the use or integrity	The proposed project is unlikely to affect the integrity of the water environment	
		Surface water	• No risk identified by HEWRAT (pass both acute-soluble and chronic-sediment related pollutants). • Risk of pollution from spillages <0.5%.
		Groundwater	• No measurable impact upon an aquifer and/or ground water receptors and risk of pollution from spillages <0.5%.
		Flood risk	• Negligible change to peak flood level (≤ +/- 10mm).
Minor Beneficial		Surface water	• HEWRAT assessment of either acute soluble or chronic-sediment related pollutants becomes pass from an existing site where the baseline was a fail condition.

Magnitude of Impact	Typical criteria	Typical examples	
	Results in some beneficial effect on attribute or a reduced risk of negative effect occurring		• Calculated reduction in existing spillage risk by 50% or more (when existing spillage risk is <1% annually).
		Groundwater	• Calculated reduction in existing spillage risk by 50% or more to an aquifer (when existing spillage risk <1% annually). • Reduction of groundwater hazards to existing structures. • Reductions in waterlogging and groundwater flooding.
		Flood risk	• Creation of flood storage and decrease in peak flood level (> 10mm).
Moderate Beneficial	Results in moderate improvement of attribute quality	Surface water	• HEWRAT assessment of both acute-soluble and chronic-sediment related pollutants becomes pass from an existing site where the baseline was a fail condition. • Calculated reduction in existing spillage by 50% or more (when existing spillage risk >1% annually). • Contribution to improvement in water body WFD classification.
		Groundwater	• Calculated reduction in existing spillage risk by 50% or more (when existing spillage risk is >1% annually). • Contribution to improvement in water body WFD classification. • Improvement in water body catchment abstraction management Strategy (CAMS) (or equivalent) classification. • Support to significant improvements in damaged GWDTE.
		Flood risk	• Creation of flood storage and decrease in peak flood level1 (>50mm).
Major Beneficial	Results in major improvement of attribute quality	Surface water	• Removal of existing polluting discharge or removing the likelihood of polluting discharges occurring to a watercourse. • Improvement in water body WFD classification.
		Groundwater	• Removal of existing polluting discharge to an aquifer or removing the likelihood of polluting discharges occurring. • Recharge of an aquifer. • Improvement in water body WFD classification.
		Flood risk	• Creation of flood storage and decrease in peak flood level (> 100mm).

Magnitude of Impact	Typical criteria	Typical examples
No Change		No loss or alteration of characteristics, features or elements; no observable impact in either direction.

Table Source: Extracted from DMRB LA 113 Table 3.71 Estimating the magnitude of an impact on an attribute

13.3.39 Identification of the impacts of the Scheme will consider whether the impacts are:

- Direct or indirect
- Secondary or cumulative
- Short, medium or long term
- Permanent or temporary
- Reversible or irreversible
- Beneficial or adverse.

Assessment of significance of effect

13.3.40 Once the sensitivity of receptors and magnitude of impacts have been established, the overall significance of effects will be assessed using the matrix in Table 13-7.

Table 13-7 Significance of effect

Environmental Value (sensitivity)	Magnitude of impact				
	Major	Moderate	Minor	Negligible	No Change
Very High	Very Large	Large or Very Large	Moderate or Large	Slight	Neutral
High	Large or Very Large	Moderate or Large	Slight or Moderate	Slight	Neutral
Medium	Moderate or Large	Moderate	Slight	Neutral or Slight	Neutral
Low	Slight or Moderate	Slight	Neutral or Slight	Neutral or Slight	Neutral
Negligible	Slight	Neutral or Slight	Neutral or Slight	Neutral	Neutral

Table Source: Extracted from DMRB LA 104 Table 3.8.1 Significance Matrix

13.3.41 Where significance of impact has an option (e.g. moderate or large) then professional judgement shall be applied to determine the most suitable significance. This will draw on baseline information and the nature of the impacts as described above such as length of likely impact, etc.

13.3.42 For the purpose of this assessment, all effects assessed as being of moderate significance or above are considered to be significant in EIA terms. Effects of minor or negligible significance are not considered to be significant and will therefore not be reported as significant residual effects.

13.3.43 Appropriate additional mitigation measures to reduce and, wherever possible, avoid identified adverse effects have been identified and are discussed within this ES chapter.

13.3.44 During construction, many of these measures are likely to be associated with good site practice and preparation of robust work packages. Such measures have been incorporated into the First iteration Environmental Management Plan (EMP) Iteration (TR010034/APP/7.2).

13.3.45 During operation, these measures would be part of the design of the Scheme as embedded mitigation and have looked to avoid likely significant effects and provide betterment where possible. For example, measures have included maintaining channel capacity and enhancing watercourse habitats which have been derived as part of the WFD assessment and through discussions with the specialists carrying out the biodiversity assessment.

13.3.46 Any residual effects of the Scheme on the water environment and flood risk following the inclusion of mitigation measures have been identified.

13.4 Assessment Assumptions and Limitations

Water Quality

13.4.1 The water quality assessments undertaken have relied upon the accuracy and level of detail of the documented data sources.

13.4.2 Several sample locations did not have current data available for assessment. Data is not available for all watercourses.

Hydromorphology

13.4.3 Many of the watercourses within the study area are small, likely ephemeral agricultural ditches which do not appear on background mapping layers.

13.4.4 The watercourse features and processes observed may vary with time, seasonality, and high flow events. Site surveys were undertaken under relatively dry conditions, and the overall watercourse function and stability were inferred through professional judgement and the interpretation of features on site.

13.4.5 Some watercourses (or lengths of watercourses) were not visited due to access restrictions. Where a site visit was not possible, these watercourses have been characterised through desk study using openly available data and professional judgement.

Groundwater

13.4.6 This assessment is based on the currently available site-specific groundwater level data obtained during ground investigations. ~~, the most recent of which was in 2018.~~ Due to changes to the Scheme design since the 2018~~se~~ surveys were undertaken (see Table 3-3 in the Alternative of Assessments chapter (Chapter 3)), there were~~are~~ some gaps in site-specific data and additional ground investigation~~s~~ was conducted in 2021 ~~is planned~~ to address these areas. Subsequently, a Hydrogeological Risk Assessment has been undertaken and is contained in Appendix 13.2 (TR010034/EXAM/9.43). ~~Where available, the site-specific groundwater data has been used to inform the assessment, and elsewhere, a precautionary approach has been used of assuming below ground scheme elements intersect with groundwater. Further hydrogeological assessment will be required following the completion of the additional ground investigation.~~

13.4.7 The ~~additional data gathered as part of the 2021 ground investigation described above will be provided in~~ 2021~~a~~ Ground Investigation Report is not yet available but will be submitted into the examination as a supporting document at a future DCO deadline and utilised to support the later stages of design.

Flood Risk

13.4.8 This assessment has relied upon the accuracy and level of detail of the documented data sources.

13.4.9 The watercourse features and processes observed may vary over time/seasons and high flow events. Site surveys were undertaken under relatively dry conditions, and the overall watercourse function and stability were inferred through professional judgement and the interpretation of features on site.

13.4.10 The accuracy of hydraulic modelling is primarily dependent on the quality of hydrological and topographical data, such as LiDAR data. Key factors include the resolution of the topographic data, the accuracy of surveys of hydraulic structures, the availability of data on past flooding and the limitations of the modelling software.

13.4.11 There is no detailed programme of construction activity and the sequencing of works specifically relating to the construction of the proposed compensatory flood storage area, reprofiling of the cross sectional area of the river, lowering of right bank and development of the left bank flood defence embankment. The assumptions made on the Preliminary Design stage construction programme and associated activities has driven the assessment of likely significant effects during construction.

13.4.12 It is not considered that these limitations and/or assumptions have affected the ability to undertake the assessment nor the conclusions reported in this chapter.

13.5 Study Area

13.5.1 The Zone of Influence was used to inform the extent of study area. It includes the Development Consent Order (DCO) boundary[17]. It also takes into consideration all water features and associated floodplain physically impacted by the Scheme and those watercourses in direct hydraulic connectivity within 1 km of the DCO boundary. These, together with the WFD water bodies, are shown in Figure 13.3 (TR010034/APP/6.4). A 1 km buffer around the DCO boundary was selected as professional judgement and understanding of the local watercourse connectivity considers this to be an appropriate distance for any significant effects unlikely to be identified beyond this point (for example, dilution of pollutants).

13.5.2 Information for the baseline conditions was collected from a detailed desk-based study, a site visit and consultation with relevant stakeholders.

13.6 Baseline conditions

Surface waters and WFD status

13.6.1 Six WFD water bodies are within the study area, comprising five river water bodies and one groundwater body. This covers 36 surface watercourses of which four are WFD reportable watercourses.as shown Table 13-8 and presented in Figure 13.3.

13.6.2 Reportable WFD watercourses are assessed under the WFD and assigned a WFD status. Non-reportable watercourses drain into reportable WFD

[17] This boundary shows the limits within which works associated with the Scheme may be carried out. This includes the land required permanently and temporary for the operation and construction of the Scheme.

watercourses and although not assessed and assigned a WFD status are part of the WFD water body catchment. It is therefore necessary that consideration should be given to their impact upon the status of the wider WFD water body.

13.6.3 Watercourses are classified as either Main River or Ordinary Watercourse. Ordinary Watercourses are all other watercourses which are not classified as a Main River. Main Rivers fall under the legal powers and responsibility of the EA, whereas Ordinary Watercourses are the responsibility of the LLFA.

Table 13-8 Surface watercourses within the study area

Surface watercourse[1]	WFD reportable watercourse?	Main River/Ordinary Watercourse?
Etherow (Woodhead Res. To Glossop Bk.) GB112069060780		
• River Etherow (WC_100)	Yes	Main River
• WC_110	No	Ordinary watercourse
• WC_120	No	Ordinary watercourse
• WC_200	No	Ordinary watercourse
• WC_210	No	Ordinary watercourse
• WC_211	No	Ordinary watercourse
• WC_212	No	Ordinary watercourse
• WC_213	No	Ordinary watercourse
• WC_214	No	Ordinary watercourse
• WC_215	No	Ordinary watercourse
• WC_220	No	Ordinary watercourse
• Hollingsworth Brook (WC_500)	No	Ordinary watercourse
Etherow (Glossop Brook to Goyt) GB112069061050		
• River Etherow (WC_100)	Yes	Main River
• WC_130	No	Ordinary watercourse
• WC_140	No	Ordinary watercourse
• WC_150	No	Ordinary watercourse
• WC_160	No	Ordinary watercourse
• WC_170	No	Ordinary watercourse
• Hurstclough Brook (WC_300)[2]	Yes	Main River
• Hurstclough Brook (WC_300)[2]	No	Ordinary watercourse
• WC_310	No	Ordinary watercourse
• WC_320	No	Ordinary watercourse
• WC_330	No	Ordinary watercourse

Surface watercourse[1]	WFD reportable watercourse?	Main River/Ordinary Watercourse?
• WC_340	No	Ordinary watercourse
• WC_350	No	Ordinary watercourse
• WC_360	No	Ordinary watercourse
• WC_370	No	Ordinary watercourse
Glossop Brook (Long Clough to Etherow) GB112069060720		
• Glossop Brook (WC_400)	Yes	Main River
• WC_410	No	Ordinary watercourse
• WC_420	No	Ordinary watercourse
• WC_430	No	Ordinary watercourse
Tame (Chew Brook to Swineshaw Brook) GB112069061111		
• WC_010	No	Ordinary watercourse
Wilson Brook GB112069061280		
• WC_020	No	Ordinary watercourse
• WC_030	No	Ordinary watercourse
• WC_040	No	Ordinary watercourse
• WC_050	No	Ordinary watercourse

Table Notes:

1 Many watercourses within the study area are unnamed, identifiers have been using the naming system described in Section 13.3.

2 Upstream of the existing A57 (Hyde Road), Hurstclough Brook is defined as an Ordinary Watercourse. Downstream of the road, Hurstclough Brook is designated as a Statutory Main River.

Table Source: Environment Agency Catchment Explorer

WFD status

13.6.4 The WFD is implemented through River Basin Management Plans (RBMPs) which set out statutory objectives for river, canal, lake, groundwater, estuarine and coastal water bodies and summarises the measures needed to achieve them. This study area is covered by the North West RBMP (Environment Agency, 2016[18]).

13.6.5 As noted, there are five river water bodies within the study area, Table 13-9 details the status of these water bodies.

13.6.6 All of the river water bodies, apart from Etherow (Glossop Brook to Goyt) are designated as Heavily Modified Water Bodies (HMWBs), which means that they are substantially altered. Consequently, rather than achieving a 'status' they

18

aspire to achieving a ‘potential’. Currently all four water bodies, except Etherow (Glossop Brook to Goyt) have Moderate overall potential and Moderate ecological status. Etherow (Glossop Brook to Goyt) has Poor overall potential and Poor ecological status. All of the river water bodies Fail chemical status.

Table 13-9 River WFD water bodies within the study area (2019 status)

River water body	Etherow (Woodhead Res. To Glossop Bk.)	Etherow (Glossop Brook to Goyt)	Glossop Brook (Long Clough to Etherow)	Tame (Chew Brook to Swineshaw Brook)	Wilson Brook
Water body ID	**GB112069060780**	**GB112069061050**	**GB112069060720**	**GB112069061111**	**GB112069061280**
Artificial/Heavily Modified Water Body (A/HMWB)?	HMWB	Not designated A/HMWB	HMWB	HMWB	HMWB
Overall water body status/potential	Moderate	Poor	Moderate	Moderate	Moderate
Ecological status	Moderate	Poor	Moderate	Moderate	Moderate
• Supporting elements (surface water)	Moderate	-	Moderate	Moderate	Moderate
• Biological quality elements	Poor	Poor	Good	Moderate	Moderate
• Hydromorphological supporting elements	-	Supports Good	Supports Good	-	Supports Good
• Physico-chemical quality elements	Good	Moderate	Good	Moderate	Moderate
• Specific pollutants	High	High	-	High	-
Chemical status	Fail	Fail	Fail	Fail	Fail
• Priority substances	Good	Fail	Good	Fail	Good
• Other pollutants	Does not require assessment	Does not require assessment	Does not require assessment	Does not require assessment	Does not require assessment
• Priority hazardous substances	Fail	Fail	Fail	Fail	Fail
Linked protected areas	None	None	None	River Tame Urban Waste Water Treatment Directive (UKENRI144)	None

Table Source: [redacted]

13.6.7 The RBMP details the pressures that exist for each WFD water body which are causing the water body to not achieve Good status. These are summarised as follows:

- **Etherow (Woodhead Res. To Glossop Bk.)**: North American signal crayfish invasive non-native species; and physical modifications from barriers, drinking water supply, water regulation and flood protection
- **Etherow (Glossop Brook to Goyt):** point source pollution from continuous sewage discharge; diffuse source pollution from poor livestock, nutrient and soil management and riparian/in-river activities; physical modification from barriers; and North American signal crayfish invasive non-native species
- **Glossop Brook (Long Cough to Etherow):** physical modifications from flood protection and urbanisation
- **Tame (Chew Brook to Swineshaw Brook):** point source pollution from continuous and intermittent sewage discharges
- **Wilson Brook:** diffuse source pollution from transport drainage, urban developments, poor livestock, nutrient and soil management and riparian/in-river activities; and physical modifications from urban development and urbanisation.

13.6.8 Water quality has been assessed through both the physico-chemical quality elements of the WFD and the Environment Agency water quality monitoring.

13.6.9 Table 13-10 shows a breakdown of the physico-chemical quality elements for the five river water bodies within the study area. Two of the water bodies have Good physico-chemical status. The remaining all have Moderate physico-chemical status, which is being driven by ammonia and phosphate in all water bodies.

Table 13-10 Water quality under the WFD for river water bodies

River water body	Etherow (Woodhead Res. To Glossop Bk.)	Etherow (Glossop Brook to Goyt)	Glossop Brook (Long Clough to Etherow)	Tame (Chew Brook to Swineshaw Brook)	Wilson Brook
Water body ID	**GB112069060780**	**GB112069061050**	**GB112069060720**	**GB112069061111**	**GB112069061280**
Physico-chemical quality elements	Good	Moderate	Good	Moderate	Moderate
• Acid Neutralising Capacity	High	High	-	High	-
• Ammonia (phys-chem)	High	Moderate	High	Moderate	Moderate
• Biochemical oxygen demand (BOD)	-	-	-	High	-
• Dissolved oxygen	High	High	High	High	High
• pH	High	High	High	High	High
• Phosphate	High	Poor	Good	Poor	Poor
• Temperature	Good	High	High	High	High

Table Source: [redacted]

EA Surface water quality monitoring

13.6.10 In order to characterise the 'baseline' water quality conditions, EA water quality data was downloaded from the Water Quality Data Archive for sampling locations within the study area (see Figure 13.3) Two additional sampling points out with the study area on the River Etherow were included within the data analysis as they had good data coverage, and the downstream sampling point provides a location downstream of the sewage treatment works (STW).

13.6.11 Monitoring data which was available for physico-chemical determinands, specific pollutants and priority substances (as specified in The Water Framework Directive (Standards and Classifications) Directions (England and Wales) 2015) were selected for analysis. The dataset was pre-processed before analysis to remove older sample records collected prior to 20/01/2010 (i.e. those greater than 10 years old). Records collected for the purpose of 'unplanned reactive monitoring' were also removed to prevent biasing the data toward uncharacteristic baseline values.

13.6.12 A summary of the data used for further analysis is shown in Table 13-11. For four of the six sites (NW-88001818, NW-88001834, NW-88001826 and NW-88001841) the majority of the data is collected for statutory monitoring purposes, with samples taken throughout the last 10 years. However, for the remaining two sites (NW-88001836 and NW-88023190) far fewer samples exist because no statutory monitoring was undertaken in the last 10 years. The samples for these sites were taken for the purpose of 'planned investigation' and 'statutory failure follow ups' respectively, with sampling confined to short periods of less than two years.

Table 13-11 EA Sample site relevant to study area

Watercourse	EA sampling ID	EA sample point description	Location description	Sample counts
WC_100 (River Etherow)	NW-88001818	River Etherow below Bottoms Reservoir	Upstream of study area	1983
WC_500 (Hollingworth Brook)	NW-88023190	Hollingworth Bk @ Millsbrook Bridge	Within study area	335
WC_100 (River Etherow)	NW-88001826	Etherow Above Confl With Glossop Brk	Within study area	1834
WC_400 (Glossop Brook)	NW-88001834	Glossop Brook Above Conf With Etherow	Within study area	1159
WC_100 (River Etherow)	NW-88001836	Etherow Below Confl With Glossop Brk	Upstream of Glossop STW	77
WC_100 (River Etherow)	NW-88001841	Etherow @ Railway Viaduct @ Broadbottom	Downstream of study area and downstream of Glossop STW	1456

13.6.13 Summarised EA water quality data is presented in Table 13-12 and Table 13-13. These data are put into context using WFD standards; the WFD standards used in this assessment do not aim to assess the overall status of the watercourse,

but instead provide an indication of the water quality of the watercourses. Physico-chemical standards are presented in Table 13-12 and those for specific pollutants priority substances are shown in Table 13-13.

13.6.14 The WFD status for the physico-chemical elements at the sample sites are High and Good for all elements in four of the six sites: NW-88001818, NW-88023190, NW-88001826 & NW-88001834 (Table 13-12). The remaining two sample sites are further downstream, after the confluence of Glossop Brook. At site NW-88001836 determinants are similar to the other sampling locations, though reactive phosphorus concentrations are just high enough to be classified as Moderate rather than Good. In addition, at this site the monitoring purpose of the 77 samples was 'planned investigation (local monitoring)' which suggests the potential for systematic bias in the data which does not reflect typical 'baseline' conditions. At site NW-88001841 the reactive phosphorus concentration is classified as Poor, and the concentration is an order or magnitude higher than other sites. At this site the ammoniacal nitrogen concentration is also higher than other sites. This site is downstream of the study area but was included in order to characterise water quality downstream of Glossop Sewage Treatment Works, which is just within the study area.

13.6.15 Where data is available for priority substances and specific pollutants, all sample sites, which are along the River Etherow, achieve the WFD Pass threshold for all determinants (Table13-13). At two sites, NW-88023190 and NW-88001834, no data is available, and these columns have been omitted from the table.

Table 13-12 EA water quality data (physico-chemical)

		Ortho-phosphate, reactive as P (µg/l)	Oxygen, Dissolved Saturation (%)	BOD: 5 Day ATU (mg/l)	pH	pH	Temperature of Water (°C)	Ammoniacal Nitrogen as N (mg/l)
Watercourse	**EA sampling point**	**Mean**	**10th percentile**	**90th percentile**	**5th percentile**	**95th percentile**	**98th percentile**	**90th percentile**
WC_100 (River Etherow)	NW-88001818	12.0	94.3	1.35	6.79	8.00	15.5	0.06
WC_500 (Hollingsworth Brook)	NW-88023190	33.6	91.2	1.76	7.21	8.00		0.12
WC_100 (River Etherow)	NW-88001826	25.4	93.9	1.89	6.89	8.08	18.3	0.05
WC_400 (Glossop Brook)	NW-88001834	29.7	95.8	2.19	7.19	8.30	14.7	0.07
WC_100 (River Etherow)	NW-88001836	33.4	92.0	1.84	7.23	7.91		0.10
WC_100 (River Etherow)	NW-88001841	302	94.0	3.94	7.18	8.02	17.3	0.53

Table key (WFD status)

High	Good	Moderate	Poor	Bad

Table 13-13 EA water quality data – Average Values of Priority Substances and Specific Pollutants in relevant watercourses

	Parameter	Standard	Units	NW-88001818	NW-88001826	NW-88001836	NW-88001841
				Watercourse: WC_100 (River Etherow)			
Specific pollutants	Chromium VI[1]	3.4	µg/l		0.25	0.37	0.79
	Copper	1	µg/l	0.07	0.13		0.09
	Manganese	123	µg/l	23.5	17.9		
	Iron	1000	µg/l	380	330		213
	Permethrin[2]	0.001	µg/l				$9.1x10^{-4}$
	Zinc[3]	12.3	µg/l		4.49		
Priority Substances	Cadmium and its Compounds[4]	ug/l			0.06	0.05	
	Hardness[4]	For Cd Class	mg/l	18.4	28.6		
	Class 1 (<40mg/l $CaCO_3$/l)[3]	<0.08	µg/l		0.06		
	Fluoranthene	0.0063	µg/l		0.006		
	Lead and its compounds	1.2	µg/l		0.11		
	Nickel and its compounds	4	µg/l		0.37		
	Benzo(a)pyrene	$1.7x10^{-4}$	µg/l		0.01		
	Benzo(b)fluoranthene[5]		µg/l		0.005		
	Benzo(k)fluoranthene		µg/l		0.005		
	Benzo(g,h,i)-perylene		µg/l		0.002		

	Parameter	Standard	Units	NW-88001818	NW-88001826	NW-88001836	NW-88001841
				Watercourse: WC_100 (River Etherow)			
	Indeno(1,2,3-cd)-pyrene		µg/l		0.006		
	Cypermethrin	$8x10^{-5}$	µg/l				$3.5x10^{-5}$

Table Notes

1 – Only monitoring data for Chromium dissolved was available, so this was compared to the most conservative chromium EQS available.

2 – Monitored data for cis-permethrin is presented as this is responsible for the insecticidal properties of permethrin.

3 – The Ambient Background Concentration for freshwaters of 1.4 ug/l has been added to the standard

4 - For cadmium and its compounds the environmental quality standards (EQS) values vary depending on the hardness of the water as specified in five class categories

5 - For the group of priority substances of polyaromatic hydrocarbons (PAH), the biota EQS and corresponding annual average EQS (AA-EQS) in water refer to the concentration of benzo(a)pyrene. Benzo(a)pyrene can be considered as a marker for the other PAHs, hence only benzo(a)pyrene must be monitored for comparison with the biota EQS or the corresponding AA-EQS in water. Concentrations of the other PAHs are provided for information only.

Groundwater

Geology

13.6.16 Glacial Till (glacial boulder clay) is the predominant mapped superficial geology within the study area. An area of Glaciofluvial Deposits overlies the bedrock to the south west of the Scheme. An area of Alluvium occurs to the south and east of the Scheme associated with the River Etherow[19].

13.6.17 The mapped solid geology of the study area is dominated by the Millstone Grit Group, as shown on BGS 1:50,000 series mapping[19]. The series comprises a sequence of thick sandstone (or grit) units interbedded with mudstone and/or siltstone units (see Table 13-14).

13.6.18 The bedrock units at outcrop within the ZoI are: Fletcher Bank Grit, Marsden Formation, Huddersfield White Rock and the Rossendale Formation. The Hebden Formation is at outcrop to the north west of the ZoI and the Pennine Lower Coal Measures outcrop to the south. The bedrock generally dips towards the south at 5 to 15 degrees, following the general fall in topography[20].

13.6.19 There is a high degree of faulting throughout the area, often offsetting sandstone and mudstone units against one another and creating a block-like sub-crop pattern. In the Mottram area, intersecting the proposed Mottram underpass there is a NW-SE trending geological fault (see Figure 13.2) which has a significant effect on the groundwater regime. This fault appears to act as a barrier to flow in the Millstone Grit due to probable softening and smearing of the mudstone producing a low permeability fault zone, which would be a barrier to groundwater flow[21].

[19] BGS (2020a), GeoIndex. [redacted] [Accessed 26 October 2020]
[20] Arcadis (2017), Detailed groundwater flow modelling for Mottram tunnel. Cdf lot 1 pc 1004 – As14 Phase2 – Options Selection – North West.
[21] Hyder Consulting (2007) A57/A628 Mottram Tintwistle Bypass and A628/A616 Route Restraint Measures. A Geotechnical Report on the Assessment of Potential Settlement due to Tunnel Construction.

Table 13-14 Generalised geological sequence within the study area

Period	Group	Formation	Sub-Unit	Lithology[22]	Aquifer designation[23]
Quaternary	-	Glacial Till	-	A heterogenous mixture of clay, sand, gravel, and boulders varying widely in size and shape, deposited directly by a glacier without subsequent reworking.	Secondary undifferentiated
		Glaciofluvial Deposits	-	Mostly coarse-grained sediments (i.e. sand and gravel) with some finer-grained layers.	Secondary A
		Alluvium	-	Clay, silt sand and gravel deposited by a river or stream	Secondary A
Carboniferous (Westphalian)	Pennine Coal Measures Group	Pennine Lower Coal Measures Formation	-	Interbedded grey mudstone, siltstone and pale grey sandstone and more numerous and thicker coal seams in the upper part.	Secondary A
Carboniferous (Namurian)	Millstone Grit Group	Rossendale Formation	-	A fine- to very coarse-grained feldspathic sandstone, interbedded with grey siltstone and mudstone.	Secondary A
		Marsden Formation	Huddersfield White Rock	Medium- to coarse-grained, massive to flaggy, cross-bedded, micaceous sandstone	
			Fletcher Bank Grit	Sandstone and pebbly sandstone, coarse-grained with angular grains, with quartz and quartzite pebbles and subordinate beds of mudstone and coal.	
		Hebden Formation	Upper Kinderscout Grit	Fine- to very coarse-grained and pebbly, feldspathic sandstone interbedded with grey siltstone and mudstone, with subordinate marine black shales, thin coals and seatearths.	
			Lower Kinderscout Grit		
			Shale Grit		

[22] BGS Lexicon (2020b) [redacted] [Accessed 01/12/20]
[23] Environment Agency (2020) Aquifer designations. Available at [redacted] [27 October 2020]

Hydrogeology

13.6.20 The aquifer designations are presented in Table 13-14. The bedrock underlying the Scheme is all classed as Secondary A aquifer, which is defined as *"permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of baseflow to rivers."*[23]. The presence of wells on historical OS maps indicates that groundwater has been extracted from the Millstone Grit strata in the past[24].

13.6.21 The Till, which covers much of the ZoI, is classified as a Secondary Undifferentiated aquifer. A Secondary Undifferentiated aquifer "*has been assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.*"[23]. The areas of Glaciofluvial Deposits and Alluvium are classified as Secondary A aquifers.

13.6.22 The underlying groundwater forms part of the Manchester and East Cheshire Carboniferous Aquifers groundwater body under the WFD.as shown in Table 13-15. The current overall status of this water body is Poor, with Quantitative status being Good and Chemical status being Poor.

Table 13 15 Groundwater WFD water body within the study area (2019 status)

Groundwater body	Manchester and East Cheshire Carboniferous Aquifers
Water body ID	**GB41202G102900**
Overall status	Poor
Quantitative	Good
Quantitative status element	Good
Chemical (GW)	Poor
Chemical status element	Poor
Linked protected areas	• Nitrates Directive (North Staffordshire G149 and East Shropshire G27) • Drinking Water Protected Area (Manchester ad East Cheshire Carboniferous Aquifers, UKGB41202G102900)

Source: [redacted]

13.6.23 Groundwater quality under the WFD is assessed through the Chemical status element. Table 13-16 shows a breakdown of the Chemical status element, which is Poor overall being driven by the chemical drinking water protected area status.

[24] Mott MacDonald (2005), A57/A628 Mottram Tintwistle Bypass and A628/A616 Route Restraint Measures. Volume 4: Annex A - Assessment of potential settlement due to dewatering during tunnel construction

Table 13-16 Water quality under the WFD for the groundwater body within the study area (2019 status)

Groundwater body	Manchester and East Cheshire Carboniferous Aquifers
Water body ID	**GB41202G102900**
Chemical status element	Poor
• Chemical drinking water protected area	Poor
• General chemical test	Good
• Chemical Ground Water Dependent Terrestrial Ecosystems (GWDTEs) test	Good
• Chemical Dependent Surface Water Body Status	Good
• Chemical Saline Intrusion	Good

Table Source: https://environment.data.gov.uk/catchment-planning

13.6.24 The RBMP details the pressures that exist for each WFD water body which are causing the water body to not achieve Good status. These are summarised as follows:

- **Manchester and East Cheshire Carboniferous Aquifers:** point source pollution from private sewage treatments; and diffuse source pollution from septic tanks, poor nutrient and livestock management.

13.6.25 Site specific groundwater level information is available from a number of previous investigations including the Ground Investigation Report (GIR) (TR010034/APP/7.6). Detailed information can be found in the Geology and soils chapter (Chapter 9), ~~and~~ the WFD assessment (TR010034/APP/5.4) and the Hydrogeological Risk Assessment (Appendix 13.2). A summary is provided below.

13.6.26 Groundwater level data have been collected between January 1994 and August 2007, obtained from monitoring boreholes associated with previous ground investigations. This data is summarised in Appendix 13-1. These previous investigations have been associated with earlier alternative scheme designs, including the A57/A628 Mottram – Tintwhistle Bypass. Therefore, the data do not provide full spatial coverage of the study area. ~~In the study area, the water table is positively correlated with the topography. The groundwater generally flows within the Millstone Grit Group in a south easterly direction towards the River Etherow. Groundwater west of Mottram in Longdendale is likely to discharge towards the south-west towards Hurstclough Brook, due to high ground to the south associated with an outcrop of Rossendale Formation. The ground investigation identified a number of areas with artesian groundwater. The average hydraulic gradient is ~0.1 m/m. A shallower hydraulic gradient is present around the River Etherow at the eastern end of the study area. This is likely to be associated with the higher permeability Glaciofluvial deposits present beneath the Glacial Till in this area.~~

~~13.6.26~~13.6.27 As part of the GIR (TR010034/APP/7.6), groundwater levels were monitored manually at 10 boreholes and automatically by loggers at 28 boreholes between 14 March and 25 July 2018. Pockets of pressurised artesian conditions were reported demonstrating the heterogeneity of the Millstone Grit Group aquifer[25]. Groundwater level monitoring from the 2018 Ground Investigation has shown that the Millstone Grit Group is generally confined by the Glacial Till and is also self-confining, due to its layered structure. The Glacial Till is generally composed of cohesive clay, has very low hydraulic conductivity and is often found to be dry when drilled. As shown by the results of the GI, the Glacial Till is extensive across the Scheme and the interaction between groundwater in the Millstone Grit and surface water is very limited due to its presence[26].

~~13.6.27~~13.6.28 Supplementary ground investigation was undertaken in 2021 to fill data gaps in the site specific information. The 2021 Ground Investigation Report will be submitted during the examination as a supporting document once it is available. A Hydrogeological Risk Assessment has been carried out informed by this additional information. The Hydrogeological Risk Assessment presents a detailed groundwater conceptual model based on a review of historical ground investigation and recent data gathered in 2021. It is presented in ES Appendix 13.2.

13.6.29 The following conclusions are based on a review of historical and recent ground investigations and the groundwater conceptual model presented in the Hydrogeological Risk Assessment. In the study area, the water table is positively correlated with the topography. The groundwater generally flows within the Millstone Grit Group in a south easterly direction towards the River Etherow. Groundwater west of Mottram in Longdendale is likely to discharge towards the south-west towards the lower reaches of Hurstclough Brook. The ground investigation identified a number of areas with artesian groundwater, all of them to the east of the Mottram fault, which acts as a flow divide. The average hydraulic gradient is ~0.1 m/m. A shallower hydraulic gradient is present around the River Etherow at the eastern end of the study area. This is likely to be associated with the higher permeability Glaciofluvial deposits present beneath the Glacial Till in this area.

~~13.6.28~~13.6.30 Large changes in groundwater elevation occur around the zone of tectonic deformation around Mottram in Longdendale. Here, the groundwater level is over 10 m lower to the west of it than it is to the east, where it is artesian. It is interpreted that there is a significant barrier to groundwater flow across the zone of tectonic deformation. Bedrock within the zone of tectonic deformation has low transmissivity due to weathering and disorganisation of strata as a result of deformation. Pumping tests showed that drawdown propagates preferentially in a direction parallel to the fault zone in a NW-SE direction and did not propagate in a SW-NE direction across the fault zone.

~~13.6.29~~13.6.31 The presence of the geological fault across the scheme has caused groundwater piezometric levels to build up in the Millstone Grit, on the north easterly side or upgradient side of the fault. Here artesian and subartesian groundwater conditions exist.

[25] Highways England (2018), Ground Investigation Report. TR010034/APP/7.6
[26] Highways England (2019), Road Drainage and the Water Environment. TR010034/APP/6.12

Hydrogeological conceptual model:

~~13.6.30~~13.6.32 In the study area, the bedrock consists of the Millstone Grit Group (part of the Manchester and East Cheshire Carboniferous Aquifers). This is largely overlain by lower permeability Glacial Till. In the Mottram in Longdendale area, the Glacial Till behaves as an aquitard, confining the Millstone Grit aquifer and inhibiting upward groundwater flow. Groundwater is present within the Glacial Till as discontinuous perched lenses. In the eastern section of the scheme, Glacio-fluvial deposits exist between the Millstone Grit and Glacial Till, forming a confined water bearing unit.

13.6.33 There is a fault zone within the bedrock in the vicinity of the Mottram Underpass. In addition to displacing the bedrock and superficial geology, the fault causes artesian groundwater conditions to the east of the fault zone, relative to lower or absent groundwater to the west of the fault zone.

~~13.6.31~~13.6.34 A detailed summary of groundwater conditions can be found in the Hydrogeological Risk Assessment included in ES Appendix 13.2 (TR010034/EXAM/9.43).

Groundwater abstractions and discharges

~~13.6.32~~13.6.35 There are no groundwater abstraction licences within the Study Area. Tameside MBC provided details of current private abstractions. There are five private abstractions from spring, surface and groundwater (borehole) located within the study area and some additional private spring, well and borehole abstractions within a 1 km radius identified through the surface water features survey. Full details are presented in the Geology and soils chapter (Chapter 9) of this ES (TR010034/APP/6.3).

~~13.6.33~~13.6.36 The EA data provided indicates there are no discharges to ground in the study area.

Flood risk

~~13.6.34~~13.6.37 A detailed assessment of flood risk is provided in the FRA (TR010034/APP/5.5). This covers hydraulic modelling results for the River Etherow as well as qualitative assessments made for all the other watercourse crossings and other forms of flood risk.

Main Rivers

~~13.6.35~~13.6.38 The Scheme crosses the River Etherow, which is designated as Main River. The River Etherow is part of the Upper Mersey catchment, with its source being Salter's Brook, a watercourse on the border of Derbyshire and Barnsley in the Pennines. The River Etherow is a tributary of the River Goyt. With a steep to moderate channel gradient, it flows along the south eastern boundary of the borough into Stockport where it joins the Goyt south of Compstall.

~~13.6.36~~13.6.39 The EA flood map for planning, displayed in Figure 13.4 shows that the Scheme crosses both flood zones 2 and 3 that are associated with flood risk from the River Etherow.

~~13.6.37~~13.6.40 Glossop Brook is a tributary of the River Etherow, it flows north westerly from Long Clough Brook to join the River Etherow in Brookfield. The EA flood map indicates the area surrounding the confluence and upstream reach to

be at risk of flooding, impacting commercial and residential properties along Glossop Brook. The flooding from both the River Etherow and Glossop Brook appears to be hydraulically linked by potential propagation of flood waters.

~~13.6.38~~13.6.41 The EA's recorded and historic flood outlined in Figure 13.4 indicate several documented major incidents of flooding from the River Etherow and Glossop brook.

Ordinary Watercourses

~~13.6.39~~13.6.42 Hurstclough Brook originates near Mottram in Longdendale within Tameside MBC, it flows southerly and crosses the A57 before joining the River Etherow at Broadbottom. Hurstclough Brook is only designated as Main River downstream of the Scheme extent and therefore will be assessed as an ordinary watercourse within this assessment. The reach of Hurstclough Brook that is proposed to be realigned by the Scheme is therefore the jurisdiction of the LLFA.

~~13.6.40~~13.6.43 The EA's Risk of Flooding from Surface Water (RoFSW) mapping indicates that north of Hyde Road the area is shown to be at risk from the 1% and 3.3% annual chance event, with the river alignment indicating a high risk (of greater than 3.3% annual chance event). However, this may be as a result of LiDAR indicating bankfull flow as high risk. There are no receptors shown to be at risk with the exception of the A57 itself, although this is unlikely due to the A57 being embanked and the watercourse passing underneath is unlikely to overtop.

~~13.6.41~~13.6.44 Tara Brook (WC_200) is a tributary of the River Etherow. It flows in an easterly direction, crossing Carrhouse Lane and then flows south easterly parallel to Woolley Lane to join the River Etherow at Home Farm. The EA's RoFSW mapping indicates that near Carrhouse Lane the area is shown to be at risk from the 0.1% and 1% annual chance event. Flood extents at this location are not shown to impact any receptors. An area approximately 300 m downstream from this point, is shown to be at risk from a greater than 3.3% annual chance event although this flood risk does not seem to impact any receptors. Tara Brook is shown in the 1% and 0.1% annual chance events to be hydraulically linked to surface water flow. A flood flow route is evident along Mottram Moor and Wooley Lane where surface water and Tara Brook combine. The watercourse then joins the River Etherow where the area is shown to be at risk from the 0.1% and 1% annual chance event.

~~13.6.42~~13.6.45 Additionally, there are a number of watercourses that originate to the north of Mottram Moor that conflux before crossing the A57 and joining Tara Brook. These include:

- WC_210
- WC_211
- WC_212
- WC_213
- WC_214
- WC_215

~~13.6.43~~13.6.46 The source of these watercourses is unknown beyond Old Hall Lane. WC_211 flows southerly towards Mottram Moor Road with the ROFSW map indicating little risk from flooding from this watercourse. Site investigations found

this watercourse to be deeply incised until the confluence with WC_212. Watercourses WC_212, WC_213 and WC_214 are not well defined on joining the WC_211, which becomes WC_210 entering into culvert running parallel to Mottram Moor Road. Risk of flooding along the aforementioned watercourses is limited to that of the 1% and 0.1% annual chance event much owing to the topology of the riparian zone. At these higher chance events significant areas of surface water flood risk are evident in the vicinity of Lodge Court and north of Coach Road, with the latter appearing to be hydraulically linked with WC_215. WC_210 then flows beneath the road toward its confluence with Tara Brook. The brook is well defined and steep. The EA's RoFSW mapping indicates that the area around the brook is at very low risk, with this area shown to be at a risk of less than 0.1% annual chance event.

~~13.6.44~~13.6.47 WC_130, north of the reservoir keepers house is a tributary of the River Etherow. The EA's RoFSW mapping indicates that the area around the source of this small watercourse is shown to be at risk from a greater than 3.3% annual chance event. Further downstream, the area is shown to be at risk from the 0.1% and 1% annual chance event.

~~13.6.45~~13.6.48 WC_140 is a surface water flow path that flows south easterly toward the River Etherow. There are suspected subsurface field drains along this path and the EA's RoFSW mapping indicates that the majority of flooding is confined with the exception of limited areas that are shown to be at risk of the 0.1% annual chance event, however no receptors are shown to be affected by this potential flooding.

Surface water flood risk

~~13.6.46~~13.6.49 The EA's RoFSW mapping indicates the presence of surface water flood risk in the following areas of the Scheme:

~~13.6.47~~13.6.50 North of Hyde Road A57 and the road itself is shown to be at risk from 1% annual chance event upwards. Flood depths at the 0.1% annual chance event are predicted to be below 300mm.

~~13.6.48~~13.6.51 Overland flow routes are shown to flood within the Scheme boundary at the 0.1% annual chance event in the vicinity of Old Hall Lane. The risk of flooding originates in the residential area and traverses overland spreading on an area of steep agricultural land flowing toward WC_211. Flood depths associated with this event are expected to be below 300mm. An additional overland flow path originating in the vicinity of Stalybridge Road and along the A57 appears to also flow towards WC_211. Risk here is presented from the 1% annual chance event upwards with depths expected to be below 300mm.

~~13.6.49~~13.6.52 West of Carrhouse Lane (Easting: 399872, Northing: 395557), there is a field drain flowing into an attenuation pond. The EA's RoFSW mapping indicates that the area around the field drain is shown to be at risk of the 0.1% and 1% annual chance event.

~~13.6.50~~13.6.53 North of Mottram Moor Road and the road itself is shown the be at risk from 3.3% annual chance event upwards. This is shown to be predominantly associated with WC_220. The overland flow paths are shown to impact a number roads and associated properties including Coach Road, Hollinhey Terrace, Wedneshough and Mottram Moor A57 before flowing down Wooley Lane and entering Tara Brook. Predicted depths are predominantly below

300mm given the steep nature of the topology however the ROFSW map indicates limited areas of ponding with flood depths over 900 mm.

Groundwater flood risk

~~13.6.51~~13.6.54 A groundwater conceptual model has been developed based on both desk-based and site-specific groundwater information. Detailed information can be found in the Geology and soils chapter (Chapter 9) of the ES (TR010034/APP/6.3), ~~and~~ the WFD assessment (TR010034/APP/5.4) and also in the Hydrogeological Risk Assessment (HRA) included in ES Appendix 13.2 (TR010034/EXAM/9.43).

~~13.6.52~~13.6.55 Information from the relevant Strategic Flood Risk Assessments (SFRA) for the study area shows that generally, the risk of groundwater flooding varies considerably across the scheme. The Derbyshire County Council SFRA[27] presents the Areas Susceptible to Groundwater Flooding (AStGWF) map which identifies areas susceptible to groundwater flooding based on geological and hydrogeological conditions. The mapping shows that in the locality of the Scheme between <25% and <50% of each of the 1 km grid squares are susceptible to groundwater emergence.

~~13.6.53~~13.6.56 Site specific groundwater information has identified a key area around Mottram in Longdendale where artesian groundwater conditions were recorded during the 2018 and 2021 ground investigations. This is consistent with the conceptual understanding and is associated with the bedrock faulting across this area. Where artesian groundwater conditions exist, the likelihood of groundwater flooding is higher, as any connection between the surface and the confined aquifer would result in groundwater emerging above ground.

~~13.6.54~~ A review of the ~~currently available site specific~~ groundwater levels and desk-based information suggests that while much of the Scheme is at low risk of groundwater flooding, some small, localised areas, in the vicinity of Mottram, are at medium risk. ~~As discussed earlier, due to the changes to the Scheme since the previous ground investigations were undertaken, additional ground investigation is planned, following which a Hydrogeological Risk Assessment will be completed.~~

Flooding from sewers

~~13.6.55~~13.6.57 The Tameside MBC SFRA does not report a detailed analysis of the scale and consequences of sewer flooding. This is due to a lack of model data available to indicate which parts of the sewer network may have insufficient capacity and areas at risk of flooding from sewers.

Other flood risks

~~13.6.56~~13.6.58 Five reservoirs are located in the headwaters of the River Etherow (Bottoms, Valehouse, Rhodeswood, Toreside and Woodhead). These reservoirs could pose a flood risk to the study area in the event of a breach. The EA's Risk of Flooding from Reservoirs map indicates that extensive flooding, (over 2 m

[27] Derbyshire County Council (2012), Strategic Flood Risk Assessment (SFRA) Level 1. Accessed online March 2021: [redacted]

deep and over 2 m/s) will cover the majority of the Mottram in Longdendale area, including the study site and most of the A57 Woolley Lane.

~~13.6.57~~13.6.59 The Tameside MBC SFRA reports that the risk of flooding from canals and reservoirs in Tameside MBC is generally low.

~~13.6.58~~13.6.60 EA's Risk of Flooding map indicates that there are some flood defences on the River Etherow at the study site, however the flood defences do not provide sufficient standard of protection to protect from the 1% annual exceedance probability event.

Hydromorphology

~~13.6.59~~13.6.61 The hydromorphology of a channel dictates, in part, the available habitat and associated ecological diversity found within a watercourse. As a component assessed under the WFD, it is a legal requirement to consider the impact of new schemes on the hydromorphology of affected watercourses.

~~13.6.60~~13.6.62 As previously noted, with the exception of Etherow (Glossop Brook to Goyt), all WFD surface water bodies within the study area are designated as HMWBs, which means that they are substantially altered. Hydromorphological descriptions of all watercourses with the study area are provided in Table 13-17.

Table 13 17 Hydromorphological Descriptions

Watercourse name/ identifier	Hydromorphological description
WC_010	Small agricultural land drain.
WC_020	Small agricultural land drain.
WC_030	Small agricultural land drain.
WC_040	Small agricultural land drain.
WC_050	Small agricultural land drain.
River Etherow (WC_100)	Large channel (6 - 8 m wide) which has been modified through a residential area (i.e. straightened planform, bank protection, overwidened) and through agricultural land. The bed substrate is gravel and cobble, and the banks (where natural) are earthy and vegetated with mature trees and scrub. Some active processes are observed, including gravel bar deposition and bank erosion.
WC_110	Small watercourse originating from Hollingworthall Moor. Flows through woodland with some natural sinuosity and is then culverted underneath residential area in Hollingworth prior to joining the River Etherow.
WC_120	Small watercourse originating from hillside above Hadfield. Constrained within parkland in residential area. Exhibits some natural sinuosity.
WC_130	Small agricultural land drain which joins River Etherow.
WC_140	Small agricultural land drain which joins River Etherow.
WC_150	Small agricultural land drain which joins River Etherow.
WC_160	Small agricultural land drain which joins River Etherow.
WC_170	Small agricultural land drain which joins River Etherow.

Watercourse name/ identifier	Hydromorphological description
Tara Brook (WC_200)	Small (~ 1 m wide), shallow (~ 0.2 m flow depth) active watercourse with gravel bed substrate and earthy banks.
WC_210	Agricultural land drain. Slow-flowing, heavily vegetated and ponded in various locations. Limited active fluvial processes observed.
WC_211	Small watercourse through woodland behind residential area in Spout Green. Little flow observed at time of survey.
WC_212	Small agricultural land drain. Little flow observed at time of survey.
WC_213	Small agricultural land drain. Little flow observed at time of survey.
WC_214	Small agricultural land drain. Little flow observed at time of survey.
WC_215	Small agricultural land drain. Little flow observed at time of survey.
WC_220	Small (~1 m wide) watercourse originating from hillside above Mottram. Exhibits some natural sinuosity as it flows through wooded corridor to mill pond north of Mottram Moor Road. Culverted from mill pond to join Tara Brook.
Hurstclough Brook (WC_300)	Small (~ 1 m wide) watercourse through agricultural fields. Directly downstream of Roe Cross Road, the channel exhibits a gravel bed substrate and earthy banks vegetated with grass, scrub and mature trees. Some active fluvial processes are observed, including small gravel bars and some bank erosion. Cattle poaching observed along the channel banks. Closer to the Hyde Road, the channel narrows (~ 0.5 m wide) and perceptible flow reduces significantly. Channel forms part of a larger wetland-type environment. Downstream of Hyde Road, the watercourse occupies a defined channel (1 - 1.5 m wide) through woodland between A560 and residential area. Planform exhibits some irregular sinuosity and few natural fluvial processes observed. Culverted for significant lengths.
WC_310	Small agricultural land drain. Dry at time of survey, likely ephemeral.
WC_320	Small agricultural land drain. Dry at time of survey, likely ephemeral.
WC_330	Small agricultural land drain. Dry at time of survey, likely ephemeral.
WC_340	Small agricultural land drain. Dry at time of survey, likely ephemeral.
WC_350	Small watercourse through woodland which joins Hurstclough Brook. Likely land drainage from residential area.
WC_360	Small watercourse through woodland which joins Hurstclough Brook. Likely land drainage from residential area.
WC_370	Small watercourse through woodland which joins Hurstclough Brook. Likely land drainage from residential area.
Glossop Brook (WC_400)	Large channel (~ 10 m wide) through urbanised area which has been significantly modified (i.e. planform straightening, over-widened, artificial stone banks). Fast-flowing watercourse with a coarse gravel/cobble substrate
WC_410	Small watercourse which originates from hillside near Shaw to join Glossop Brook.
WC_420	Small watercourse which flows through woodland near Gamesley to join Glossop Brook. Likely land drainage from residential area.

Watercourse name/ identifier	Hydromorphological description
WC_430	Small watercourse which flows through woodland near Gamesley to join Glossop Brook. Likely land drainage from residential area.
Hollingworth Brook (WC_500)	Small (~1 m wide) watercourse originating from moorland above Arnfield Reservoirs. Exhibits some natural sinuosity through woodland before joining River Etherow.

Designated sites

~~13.6.61~~13.6.63 Water dependant designated sites are summarised in Table 13-18 and shown in Figure 8.1Statutory Designated Sites for Nature Conservation.

~~13.6.62~~13.6.64 No European or Nationally designated sites including Special Areas of Conservation (SAC), Special Protected Areas (SPA), RAMSAR, Sites of Special Scientific Interest (SSSI), National Nature Reserves (NNR) or Areas of Outstanding Natural Beauty (AONB) have been identified within the study area. The Peak District National Park (PDNP) is 0.6 km east of the boundary of the study area, at its closest point; and it is noted that the headwaters of the River Etherow flow from the PDNP.

~~13.6.63~~13.6.65 One Local Nature Reserve (LNR) has been identified within the study area and another is in close proximity to the boundary of the study area. Hurst Clough LNR comprises ancient woodland in the steep valley and a mixture of grassland, scrub and recent woodland on the broader slopes elsewhere. Great Wood LNR is recognised for nature conservation and dominated by oak but contains a variety of tree species. No specific water dependant water features have been identified within these LNRs.

Table 13-18 Water dependent designations relevant to study area

Site	Designation	Notes
Hurst Clough	LNR	Within study area
Great Wood	LNR	0.3km from study area boundary
Peak District	National Park	0.6km from study area boundary

Table Source: www.magic.gov.uk

Value of environmental receptors

~~13.6.64~~13.6.66 The water receptors which have been assessed, the reason for their inclusion and their importance are shown in Table 13-19. Those water receptors not included for assessment and reasons for exclusion are provided in Table 13-20.

~~13.6.65~~13.6.67 As noted in 13.4.32, sensitivity of receptors (i.e. importance) has made reference to DMRB LA 113 Table 3.70, with each water environment technical area identifying sensitivity based on the criteria shown in Table 13-4. In order to provide a holistic approach to environmental assessment of the water receptor the highest level of sensitivity will be selected for the watercourse assessment as shown in the “Overall” column of Table 13.19. Sensitivity criteria for the FRA will

consider receptors vulnerable to flooding i.e. the properties at risk, A-roads or agricultural land rather than the waterbody itself.

~~13.6.66~~13.6.68 In the majority of cases, surface water and flood risk importance align, the following exceptions are noted:

- WC_140
- WC_330
- WC_340

Table 13-19 Water receptors and their importance

Water receptor	Descriptors to determine technical area importance (Surface Water[1], Flood Risk and Groundwater)	Importance			Reason for inclusion in assessment
		Surface Water	Flood Risk	Overall	
River Etherow (WC_100)	• Surface Water: Reportable WFD watercourse, Main River, Q95< 1.0m^3/s • Flood risk: The River Etherow is of regional scale and is designated as Main River. Out of bank flooding occurs along the River Etherow which baseline modelling indicates to impact residential properties.	High	High	**High**	New river crossing over Etherow, new discharges into Etherow proposed. Main River flows north to south beneath Road alignment in in open channel
WC_120	• Surface water: Ordinary Watercourse. Not assigned a WFD classification Q95<0.001m^3/s • Flood risk: Watercourse is tributary to the River Etherow upstream of the proposed scheme.	Low	Low	**Low**	Hydraulic connectivity to River Etherow flood extent. Ordinary Watercourse, hydraulically linked to the maximum flood extent at the Etherow Crossing
WC_130	• Surface Water: Ordinary Watercourse. Not assigned a WFD classification Q95>0.001m^3/s • Flood risk: Watercourse is hydraulically linked to the River Etherow. The Environment Agency's flood map shows flood zone 2 and 3 adjacent to the watercourse.	Medium	Medium	**Medium**	Within DCO Boundary. New discharge location. Ordinary Watercourse flows through the DCO boundary, hydraulically linked to the maximum flood extent at the Etherow in vicinity of crossing
WC_140	• Surface Water: Ordinary Watercourse. Not assigned a WFD classification Q95>0.001 m^3/s • Flood risk: The watercourse appears not to overtop its banks between the 1% and 3.3% events. Agricultural land is adjacent to the watercourse with no buildings nearby	Medium	Low	**Medium**	Ordinary Watercourse flows through the DCO boundary
Tara Brook (WC_200)	• Surface Water: Ordinary Watercourse. Not assigned a WFD classification Q95>0.001 m^3/s • Flood risk: Tara Brook appears to overtop between the 0.1% and 1% events. There are residential and agricultural buildings adjacent to the watercourse.	Medium	Medium	**Medium**	Within DCO Boundary. New discharge location. Realignment works proposed. Ordinary Watercourse flows through the DCO boundary, hydraulically linked to the maximum flood extent at the Etherow in vicinity of crossing

Water receptor	Descriptors to determine technical area importance (Surface Water[1], Flood Risk and Groundwater)	Importance			Reason for inclusion in assessment
		Surface Water	Flood Risk	Overall	
WC_210	• Surface Water: Ordinary Watercourse. Not assigned a WFD classification Q95>0.001 m^3/s • Flood risk: The watercourse is hydraulically connected to WC_211-214. Out of bank flow occurs at the crossing of the existing A57 potentially impacting residential properties	Medium	Medium	**Medium**	Within DCO Boundary. Ordinary Watercourse flows through the DCO boundary under road via culvert, runs through predominantly rural area upstream
WC_211	• Surface Water: Ordinary Watercourse. Not assigned a WFD classification Q95>0.001 m^3/s • Flood risk: The watercourse is hydraulically connected to WC_210-214. Out of bank flow occurs at the crossing of the existing A57 potentially impacting residential properties	Medium	Medium	**Medium**	Within DCO Boundary. Ordinary Watercourse flows through the DCO boundary into WC_210
WC_212	• Surface Water: Ordinary Watercourse. Not assigned a WFD classification Q95>0.001 m^3/s • Flood risk: The watercourse is hydraulically connected to WC_210-214. Out of bank flow occurs at the crossing of the existing A57 potentially impacting residential properties	Medium	Medium	**Medium**	Within DCO Boundary. Ordinary Watercourse flows through the DCO boundary into WC_210
WC_213	• Surface Water: Ordinary Watercourse. Not assigned a WFD classification Q95>0.001 m^3/s • Flood risk: The watercourse is hydraulically connected to WC_210-214. Out of bank flow occurs at the crossing of the existing A57 potentially impacting residential properties	Medium	Medium	**Medium**	Within DCO Boundary. Ordinary Watercourse flows through the DCO boundary into WC_210
WC_214	• Surface Water: Ordinary Watercourse. Not assigned a WFD classification Q95>0.001 m^3/s • Flood risk: The watercourse is hydraulically connected to WC_210-214. Out of bank flow occurs at the crossing	Medium	Medium	**Medium**	Within DCO Boundary. Ordinary Watercourse flows through the DCO boundary into WC_210

Water receptor	Descriptors to determine technical area importance (Surface Water[1], Flood Risk and Groundwater)	Importance			Reason for inclusion in assessment
		Surface Water	Flood Risk	Overall	
	of the existing A57 potentially impacting residential properties				
WC_215	• Surface Water: Ordinary Watercourse. Not assigned a WFD classification Q95<0.001m^3/s • Flood risk: The watercourse appears not to overtop its banks between the 1% and 3.3% events. Agricultural land is adjacent to the watercourse with no buildings nearby	Low	Low	**Low**	Hydraulic connectivity to Scheme. Tributary of watercourse WC_210 which is within Scheme. Ordinary Watercourse flows into DCO_210 and under the scheme via a culvert.
WC_220	• Ordinary Watercourse. Not assigned a WFD classification Q95<0.001 m^3/s • Flood risk: The watercourse appears not to overtop its banks between the 1% and 3.3% events. Agricultural land is adjacent to the watercourse with no buildings nearby	Low	Low	**Low**	Hydraulic connectivity to River Etherow flood extent. Ordinary Watercourse, maximum flood extent envelops scheme boundary
Hurstclough Brook (WC_300)	• Surface Water: Reportable WFD watercourse, Main River, Q95<1.0m3/s • Flood risk: Hurstclough Brook is of local scale and classified as Main River downstream of the existing A57. The Environment Agency flood map indicates that out of bank flow has the potential to impact the existing A57. This is the main road through route.	High	High	**High**	Within DCO Boundary. Potential new discharge location. Realignment works proposed. Ordinary Watercourse flows through the DCO boundary predominantly through rural land before crossing A57 and becoming Main River
WC_320	• Surface Water: Ordinary Watercourse. Not assigned a WFD classification Q95<0.001 m^3/s (Low) • Flood risk: The watercourse appears not to overtop its banks between the 1% and 3.3% events. Agricultural land is adjacent to the watercourse with no buildings nearby	Low	Low	**Low**	Within DCO Boundary. Ordinary Watercourse flows through the DCO boundary

Water receptor	Descriptors to determine technical area importance (Surface Water[1], Flood Risk and Groundwater)	Importance			Reason for inclusion in assessment
		Surface Water	Flood Risk	Overall	
WC_330	• Surface Water: Ordinary Watercourse. Not assigned a WFD classification Q95<0.001 m^3/s (Low) • Flood risk; The Environment Agency flood map indicates that out of bank flow has the potential to impact the existing A57 which is hydraulically linked to flooding from Hurstclough Brook. This is the main road through route	Low	Medium	**Medium**	Within DCO Boundary. Ordinary Watercourse flows into WC_300 and through the DCO boundary
WC_340	• Surface Water: Surface Water: Ordinary Watercourse. Not assigned a WFD classification Q95<0.001 m^3/s (Low) • Flood risk: The Environment Agency flood map indicates that out of bank flow has the potential to impact the existing A57 which is hydraulically linked to flooding from Hurstclough Brook. This is the main road through route	Low	Medium	**Medium**	Within DCO Boundary. New discharge location. Ordinary Watercourse flows through the DCO boundary
Glossop Brook WC_400	• Reportable WFD watercourse, Main River, Q95<1.0m3/s (High) • Flood risk: Glossop Brook is designated as Main River. Out of bank flooding occurs along Glossop Brook and flooding is concurrent with that of the River Etherow, baseline modelling indicates flooding impacts residential properties.	High	High	**High**	Main River flows east to west toward River Etherow. Maximum flood extent is hydraulically linked to that of the Etherow in the vicinity of the proposed crossing.
Manchester and East Cheshire Carboniferous Aquifers	• Groundwater: Secondary aquifer used for local supplies (5 private abstractions), supplying base flow to surface water features.	Groundwater Importance: Medium	N/A	**Medium**	Underlies DCO boundary

Table Source: Summary of baseline study

Table Notes:1 – Q95 values have been estimated based on baseline study

Table 13-20 Water receptors not included in assessment

Water receptor	Reason for not being included in assessment
WC_010	No hydraulic connectivity
WC_020	No hydraulic connectivity
WC_030	No hydraulic connectivity
WC_040	No hydraulic connectivity
WC_050	No hydraulic connectivity
WC_110	No hydraulic connectivity
WC_150	No hydraulic connectivity
WC_160	No hydraulic connectivity
WC_170	No hydraulic connectivity
WC_310	No hydraulic connectivity
WC_350	No hydraulic connectivity
WC_360	No hydraulic connectivity
WC_370	No hydraulic connectivity
WC_410	No hydraulic connectivity
WC_420	No hydraulic connectivity
WC_430	No hydraulic connectivity
Hollingworth Brook (WC_500)	No hydraulic connectivity
WC_010	No hydraulic connectivity
WC_020	No hydraulic connectivity
WC_030	No hydraulic connectivity
WC_040	No hydraulic connectivity

13.7 Potential impacts

Scheme works

13.7.1 The impact assessment is undertaken based on the following proposed Scheme works. Activities and their associated potential impacts during the construction and operation phases are summarised below.

Construction Compounds

13.7.2 One construction compound is located on agricultural land to the east of the M67 Junction 4, adjacent to Hurstclough Brook.

Bridges

13.7.3 Construction of a single-span structure over the River Etherow, including abutments within the riparian zone. No in-channel works currently proposed.

Underpasses

13.7.4 Construction of underpasses may impact local groundwater resources; the following underpasses are included within the Scheme:

- Old Mill Farm Underpass to be located beneath the main carriageway and Roe Cross Road.
- Mottram Underpass at 60 m east of Roe Cross Road, the top of the underpass would be 2m below ground level. Associated cutting to the east of the Mottram underpass.
- Carr House Lane Underpass beneath the carriageway between Mottram Moor Junction and the A57.

Culverts

13.7.5 New culverts are proposed at the following watercourses:

- Tara Brook (WC_200) (with river realignment)
- WC_210
- Hurstclough Brook (WC_300) (with river realignment)
- WC_330
- WC_340

River realignments/ channel loss

13.7.6 Realignment and/or channel loss is proposed at the following watercourses:

- Tara Brook (WC_200) (includes construction of new culvert below scheme)
- WC_211 (channel loss)
- WC_212 (channel loss)
- WC_213 (channel loss)
- WC_214 (channel loss) Construction of new realigned watercourse to capture water in the catchment draining to WC_212, WC_213 and WC_214 to connect to existing WC_214.
- Hurstclough Brook (WC_300) (includes construction of new culvert below scheme)

Flood storage and defence

13.7.7 Under operation the following flood prevention measures have been included:

- Compensatory Flood Storage at River Etherow - provision of compensatory flood storage area located downstream of the proposed River Etherow crossing along the right bank floodplain. This mitigation is due to the displacement of floodplain storage associated with the embanked portions of the scheme.
- Changes to flood defence arrangements along left bank of the River Etherow upstream of proposed scheme crossing.

Discharge outfalls

13.7.8 New discharge outfalls are proposed at:

- River Etherow (WC_100) (at two locations) (SK 00914 95553 and SK 01035 95481)
- WC_130 (SK 00818 95465)
- WC_140 (SK 00193 95563)
- Tara Brook (WC_200) (SJ 99900 95693)
- Hurstclough Brook (WC_300) (SJ 98622 95422)

Cuttings and embankments

13.7.9 A number of cuttings and embankments are proposed within the DCO boundary as per Table 13-25 (see The Scheme General Arrangement (Figure 2.2 TR010034/APP/6.4), these may impact local groundwater resources.

Table 13-21 Location of proposed Cuttings and Embankments within DCO boundary

Cutting/Embankment	Chainage
Eastbound Section 1 (Chainage 0-715)	
False Cutting (1:2 inner face, 1:3 outer face)	0-120
At Grade	120-200
Cutting	200-290
Embankment	290-550
False Cutting (1:2 inner face, 1:3 outer face)	550-715
Eastbound Section 2 (Chainage 715-1690)	
Embankment	715-760
Cutting	760-870
Cutting	1100-1450
Cutting	1450-1510
Embankment	1510-1690
Eastbound Section 3 (Chainage 1690-3070)	
Embankment	1810-1860
False Cutting (1:2 inner face, 1:3 outer face)	1860-2250
Embankment	2250-2360
Embankment	2360-2920
Embankment	2985-3070
Westbound Section 1 (Chainage 0-715)	
Embankment	0-60
Embankment	60-550
False Cutting (1:2 inner face, 1:3 outer face)	550-640

Cutting/Embankment	Chainage
Westbound Section 2 (Chainage 715-1690)	
False Cutting (1:2 inner face, 1:3 outer face)	640-720
Cutting	720-890
Cutting (Benched)	1100-1450
Cutting	1450-1530
Embankment	1530-1690
Westbound Section 3 (Chainage 1690-3070)	
False Cutting (1:2 inner face, 1:3 outer face)	1800-2060
Embankment	2060-2400
False Cutting (1:2 inner face, 1:3 outer face)	2400 - 2430
False Cutting (1:2 inner face, 1:3 outer face)	2430-2700
Embankment	2700-2920
Embankment	2985-3070

Construction

13.7.10 Construction activities associated with the listed scheme works have the potential to impact water receptors as summarised in Table 13-22. These cover activities that have the potential to impact the water environment in terms of water quality, hydromorphology, flood risk and groundwater.

13.7.11 Potential impacts to water quality cover works to watercourses, construction vehicle movements and associated oil/fuel and runoff, which have the potential to impact water quality (via increased sediment loading and chemicals), affect watercourse ecology and alter watercourse hydromorphology. Contaminated runoff may also infiltrate to groundwaters and affect groundwater quality.

13.7.12 Potential impacts to hydromorphology cover construction compound activities, direct and indirect works to watercourses and temporary structures in watercourses, which have the potential to affect watercourse conveyance and fluvial processes.

13.7.13 Potential impacts to flood risk cover temporary structures in watercourses, works in the floodplain, excavation/earthworks, drainage and increased areas of impermeable surfaces, which have the potential to affect watercourse conveyance, flood risk and flow pathways.

13.7.14 Works at the proposed River Etherow crossing lies within flood zone 3 and will be at risk during construction. Construction works at this location have the potential to interrupt existing flood pathways and conveyance. Throughout the duration of the works there is expected to be a localised risk to the construction site and activity within this receptor, however this risk does not impact properties outside of the construction boundary.

13.7.15 Potential impacts to groundwater include the same potential impacts as for surface water as well as effects relating to temporary dewatering, construction of deep foundations and road runoff. These have the potential to effect groundwater levels, flow pathways and groundwater quality. ~~It should be noted~~

~~that the assessment of potential effects on groundwater is based on the currently available site-specific groundwater level data. Additional ground investigation gathered as part of the 2021 supplementary ground investigation to address these gaps would be utilised to support the detailed design stage. Additional hydrogeological assessment may be required following completion of the supplementary ground investigation.~~

Table 13- 22 Activities and related impacts during the construction phase within the water environment

Activity	Impact
Direct works to/ within watercourses and indirect/ associated works such as earthworks, cuttings, embankments, upgrades, extensions replacement or new culverts or bridge structures, realignments, temporary structures in-channel to facilitate structural works and works in the floodplain.	Increased risk of pollution to watercourses due to runoff containing elevated levels of suspended solids and resuspension of potentially contaminated sediments.
	In-channel structures can act as a barrier to flow which may cause local changes in velocities and cause increased erosional and depositional processes. This can limit available habitat for aquatic flora and fauna and may also impede the movement of any fish present within the watercourse. Construction activities in the floodplain may alter natural functioning (floodplain connectivity and storage), runoff rates and velocities which contribute to the adjacent watercourse and may also contain elevated levels of suspended solids which can cause increased turbidity and may smother vegetation and bed substrates.
	Watercourse diversions/ pumping may increase flood risk through flows being more effectively conveyed downstream or water backing up due to insufficient capacity. Blockages may occur if materials/equipment are washed into the channel, these may block existing drainage, modify flow pathways and increase runoff. The order in which construction activities are undertaken within the River Etherow floodplain (flood zone 3) may alter natural functioning (floodplain connectivity and storage),
	Risk of untreated runoff from construction sites discharging through permeable surface geology direct to the aquifer.
Activities associated with construction compounds/ sites, including vehicle access/ refuelling, oil/ fuel storage tanks, accidental spillage, storage and use of construction materials/ chemicals (e.g. solvents, degreasers) on site, runoff from construction compounds – stockpiles, drainage, wheel washings and material movements.	Risk of release of hydrocarbons and oils, leading to polluted runoff migrating to surface water and groundwater. Hydrocarbons within surface water can chemically impair biological functions of freshwater fish.
	Construction compound runoff typically contains elevated suspended solids levels. Runoff with high sediment load can have direct adverse effects on adjacent watercourses through increasing turbidity (thus reducing light penetration and reducing plant growth) and by smothering vegetation and bed substrates.
	Displacement of flood waters and changes to surface water runoff pathways increasing flood risk to surrounding area. Construction compounds could block

Activity	Impact
Excavation, earthworks, temporary dewatering and installation of deep foundations associated with new structures and installing cuttings.	existing drainage, modify flow pathways and increase runoff.
	Risk of accidental releases of contaminants to surface water and infiltration to groundwaters.
	Risk of untreated runoff from construction sites discharging through permeable surface geology direct to the aquifer.
	Where subsurface structures/foundations and dewatering are proposed these might intercept or alter groundwater flows/levels which may contribute to watercourse baseflow and local groundwater abstractions.
	Culvert blockage, displacement of flood water, and/or severance of surface and sub surface flow paths that could lead to localised flooding. Increased sediment load from earthworks reducing capacity of culverts.
	Local changes to groundwater levels and groundwater flow pathways. Leading to potential effects on baseflow contribution to surface water features and local groundwater abstractions. Impact associated with pumping out of subterranean works areas (e.g. deep foundations) and disposal of pumped water to surface water bodies.
	Installing deep foundations and cuttings may introduce a rapid vertical flow pathway into the aquifer for potentially contaminated runoff.
Works in the floodplain including localised ground-raising for temporary works, movement of materials, creation of stockpiles or development of construction compound, temporary drainage and increases in areas of impermeable surfaces.	Displacement of flood waters, changes to surface water runoff pathways, such as severing or interception of existing drainage, and increased surface water volume and rate of runoff increasing flood risk to surrounding area.

Operation

13.7.16 Activities during operation that have the potential to impact water receptors are summarised in Table 13-23. These cover activities that have the potential to impact the water environment in terms of water quality, hydromorphology, flood risk and groundwater.

13.7.17 The potential impacts that may occur during operation to water quality cover accidental spillages and drainage which have the potential to affect water quality and ecological quality.

13.7.18 The potential impacts to hydromorphology during operation cover permanent works to watercourses and drainage discharge to watercourses which may cause alteration of natural fluvial processes.

13.7.19 The potential impacts during operation to flood risk cover permanent works to culverts/ bridges, drainage and increases in impermeable surface areas which have the potential to affect watercourse hydraulics and flood risk.

13.7.20 The potential impacts during operation to groundwater cover the permanent effect of subsurface structures on groundwater flow and accidental spillages and drainage to groundwater. Detailed assessment of impacts on the groundwater environment from the Scheme in the operational phase is presented in the Hydrogeological Risk Assessment (ES Appendix 13.2). ~~This assessment of potential effects on groundwater is based on the currently available site-specific groundwater level data. Additional ground investigation gathered as part of the 2021 supplementary ground investigation to address these gaps would be utilised to support the detailed design stage. Additional hydrogeological assessment may be required following completion of the additional ground investigation.~~

Table 13-23 Activities and related impacts during the operation phase within the water environment

Activity	Potential impact
Accidental spillage	Risk of release of hydrocarbons/oils/other chemicals from accidental spillages, leading to potentially polluted runoff migrating to local surface water and groundwater is the spillage reaches the aquifers. Releases of hydrocarbons and other chemicals within surface water can chemically impair biological functions of freshwater fish.
Highways drainage into watercourses	Runoff from the roads may have increased levels of suspended sediments, oils, metals, de-icing fluids and herbicides which can have adverse impacts upon water quality and ecology. Increased levels of suspended sediments which may cause increased turbidity and may smother vegetation and bed sediments, causing a detrimental effect for aquatic fauna.
	Alteration to existing drainage and additional drainage into a watercourse can alter water levels and velocities which in turn may cause increased erosional/depositional processes. This may alter the habitat available for aquatic flora and fauna.
	Additional drainage increasing surface water flooding. Alteration to existing drainage, increasing discharge to a watercourse and flood risk.
Permanent watercourse diversion/realignment or works to culverts/bridges	In-channel structures may act as a barrier to flow and cause local changes to velocities and cause increased erosional or depositional processes. Such structures may also impede the movement of any sediment and fish present in the watercourse.
	Permanent changes in the hydraulics of existing watercourses could impact flood risk by increasing flood levels upstream of works, or conversely improve conveyance in watercourses. Reduction in culvert capacity could increase flood risk.
	Realignment of watercourses may alter the natural hydrological and geomorphological regime, potentially causing instability and pose a threat to adjacent assets. This may also result in some loss of habitat availability for aquatic flora and fauna.
	Watercourse realignment and culverting may act to alter the hydrology and hydraulics of the given catchment, resulting in potential for altered flow regimes.

Activity	Potential impact
Permanent works in the floodplain	Permanent loss of floodplain storage or change in flood flow conveyance, which increases flood risk.
Permanent increase in impermeable surface areas	Increased surface water volume and rate of runoff, increasing flood risk.
Permanent disturbance of groundwater flow paths due to deep foundations, cuttings and underpass structures	Where subsurface structures or deep foundations are included as part of the design these shall remain after construction and may form a barrier to groundwater flow. This may result in groundwater emergence above ground and thus flooding on the surface.
	Barriers to groundwater flow may lead to potential effects on baseflow contribution to surface water features and local groundwater abstractions.
	The deep foundations may also introduce a permanent rapid vertical flow pathway into the groundwater body for potentially contaminated runoff.

13.8 Design, mitigation and enhancement measures

Embedded mitigation

13.8.1 The assessment has been undertaken with consideration of embedded mitigation and best practice which would be used during construction and operation. These are summarised for each discipline below. Further details of these measures can be found in the Scheme chapter (Chapter 2). Strict adherence to the Environmental Management Plan (EMP) (TR010034/APP/7.2) and the Register of Environmental Actions and Commitments (REAC) (TR010034/APP/7.3).

Overall Water Environment

13.8.2 The following mitigation measures would be implemented during construction:

- Timing of any temporary in-channel works should consider seasonality for watercourse biota (see Chapter 9 (Biodiversity).
- Prepare site-specific responses for potential pollution incidents (e.g. spillages) or extreme weather events (e.g. storms) which may cause an increase in sediment run-off.

13.8.3 The following mitigation measures would be implemented during operation:

- Adherence to the Drainage Strategy (TR010034/APP/7.7) in order to manage any increase in runoff.

Water quality

13.8.4 Construction mitigations measures – water quality:

- Visual inspections of watercourses impacted during construction activities
- Water quality monitoring where in-channel works have been identified

13.8.5 Operation mitigations measures – water quality:

- Design mitigation measures at discharge outfalls

Hydromorphology

13.8.6 Construction mitigations measures – hydromorphology

- Where the erection of temporary in-channel structures is required for construction, use appropriate isolation techniques. These measures would be in place for the minimum possible period of time in order to minimise disruption of flow, sediments and biota.
- Any vegetation clearance required for construction should be minimised.
- Use appropriate erosion control and silt management measures to minimise the volume of sediment produced and to reduce the volume of sediment entering watercourses (e.g. silt curtains, silt matting).

13.8.7 Operation mitigations measures – hydromorphology

- Hydraulic modelling should be used to further inform the design – including comparison of velocities (and potential for scour) between the baseline and the proposed works both upstream and downstream.
- Watercourse realignments should be designed to be ecologically sensitive and to promote the natural hydromorphological regime (for example, allowance for a two-stage channel profile). Designs should be considered by an appropriately qualified fluvial geomorphologist in order to ensure long-term channel stability.
- Minimise the lengths required for physical modifications (i.e. culvert length to be as short as possible).
- Use grey/green measures to “soften” the aesthetic of the hard measures (e.g. culverts), where practicable.
- Plant shrubs and trees along riparian corridors to enhance riparian connectivity and complexity.

Flood risk

13.8.8 Construction mitigations measures – flood risk:

- Temporary drainage systems would be implemented to alleviate localised surface water flood risk and prevent obstruction of existing surface runoff pathways. This may include localised realignments, over-pumping, storage and coffer dams, etc.
- Where construction activity is at risk of flooding from fluvial sources it is required that the site signs up to EA’s Floodline[28].

13.8.9 Construction activity in the vicinity of the River Etherow, including compensatory flood storage provision, flood embankment and right bank groundworks will require careful programming. Works here would require sequencing so as not to increase risk to others. However, during construction there will be a localised risk of flooding to the construction site whilst works the aforementioned works take place within the River Etherow floodplain. The localised risk to the construction site is considered to be a short-term/ temporary impact.

13.8.10 Operation mitigations measures – flood risk:

[redacted]

- Culverted reaches of all watercourse crossings are to be sized appropriately
- Where watercourse alignments are proposed, appropriate design should seek to replicate existing flow conveyance characteristics
- Where flood plain is lost, compensatory flood storage shall be provided on a volume for volume and level for level basis
- Localised change in flood defence arrangement along the left bank of the River Etherow immediately upstream of the proposed scheme crossing.
- ~~Mitigation measures for groundwater flood risk in the Mottram underpass and cutting area will be designed in detail following completion of the supplemental ground investigation and a Hydrogeological Risk Assessment. However, the mitigation principles to managing this risk during both construction and operation will include d~~Designing the drainage strategy to allow for management of groundwater contributions to surface water flow and design of longitudinal piling taking into account local groundwater conditions. ~~King pin piling can be used to ensure groundwater flood risk upgradient is not increased.~~

Groundwater

13.8.11 Mitigation measures for groundwater effects are broadly the same during construction and operation phases.

- ~~The supplementary ground investigation report would be used to further inform the assessment in terms of groundwater level and quality information in the areas of the Scheme not covered by existing data.~~
- Deep foundations extending beneath the groundwater table would be designed in accordance with industry standards – taking into account the site-specific water level and flow monitoring data obtained from intrusive ground investigation for the scheme
- Where piling is planned, a piling risk assessment would be carried out to ensure the selected piling method does not introduce contamination pathways into the aquifer; and
- The Hydrogeological R~~r~~isk A~~a~~ssessment, included in Appendix 13.2 (TR010034/EXAM/9.43) of the Environmental Statement, would be ~~undertaken where appropriate~~used to inform the design. This would involve the development of a monitoring strategy for the Scheme to specify groundwater monitoring required prior to, during and post-construction in order to monitor any identified potential impacts from the Scheme. ~~For example, works associated with Mottram Underpass would require this. This must includes a dewatering risk assessment and considers any potential pollution pathways which may contribute to groundwater contamination.~~

Essential mitigation and enhancement

13.8.12 No essential mitigation measures or enhancement opportunities relating to the various elements of the water environment have been identified at this stage.

Permitting and consenting requirements

13.8.13 The following section provides a summary of permitting and consenting requirements included within the EMP (TR010034/APP/7.2) and the REAC (TR010034/APP/7.3).

13.8.14 Flood Risk Activity Permits are required for the River Etherow to cover the following:

- Programme works to minimise impacts on compensatory flood storage areas during construction
- Erecting any temporary or permanent structure in, over or under a Main River.
- Any activity within 8m of the bank of a main river, or 16m if it is a tidal main river.
- Any activity within 8m of any flood defence structure or culvert on a Main River, or 16m on a tidal river.

13.8.15 For the FRAP to be issued, the EA would need to have reviewed the WFD Compliance Assessment and provide informal agreement with the report and it findings, lending a degree of confidence to the WFD conditions within the FRAP.

13.8.16 Where works have the potential to impede flow in ordinary watercourses, Ordinary Watercourse Consents will be sought from both Tameside MBC and High Peak Borough Councils.

13.8.17 Licences and permits will be required for temporary dewatering activities and discharges from excavations. Where the discharge is to foul sewer, a permit is not required, but discharge conditions must be agreed with the water company.

13.8.18 New outfall structures as part of the highway drainage or permanent groundwater drainage may require Environmental Permits or a Land Drainage Consents if connecting into a Main River or Ordinary Watercourse respectively. Consent would be required for both the temporary works and the permanent outfall structure. The requirements for the permit or consent would be agreed in full consultation with the Environment Agency and/or LLFA at the Detailed Design stage of the scheme.

13.9 Assessment of Likely Significant Effects

Significance of effects

13.9.1 Significance of effect is presented in Table 13-30 to Table 13-31, for water quality, hydromorphology, flood risk and groundwater, for both construction and operation. As no additional mitigation measures have been identified, this impact assessment presents residual impacts only. The assessment takes into account that even where mitigation is in place in many cases risk cannot be fully eliminated and therefore there is still likely to be a residual risk of an impact occurring (albeit reduced).

13.9.2 The overall significance of effect table summarises the most adverse impact on for each water receptor, presented in Table 13- 32 and Table 13-33 for construction and operation respectively.

Construction – water quality

13.9.3 Effects on receptor water quality, where embedded mitigation and best practice have been considered, are assessed for construction in Table 13-24. Impacts during construction phase, in terms of water quality are generally considered to be:

- *Direct* – whereby pollutants may directly enter watercourses.
- *Short/ medium term* – whereby impacts are during the specified construction activity time period only.
- *Temporary* – whereby impacts are during the specified construction activity time period only.
- *Negative* – in consideration of potential pollution events.

13.9.4 Any differences to these notes are provided within the comments section of the impact tables.

13.9.5 The results show that there is no significant effect for all receptors. Works associated with construction are not expected to have a direct impact on watercourses WC_120, WC_215, WC_220, WC_320, WC_330 and Glossop Brook (WC_400) and significance of effect is considered to be neutral. All other water courses are considered to have a slight adverse effect relating to construction activity.

13.9.6 Therefore, there are no residual significant effects for construction on any receptor for water quality during construction.

Table 13-24 Potential significance of effects during construction - water quality

Water Receptor	Importance	Residual Magnitude of impact	Residual significance of effect	Comments
River Etherow (WC_100)	High	Minor adverse	Slight adverse	Construction of clear-span structure over River Etherow (WC_100) – no in-channel works proposed. Assessment takes account of works undertaken directly adjacent to watercourse
WC_120	Low	No change	Neutral	No direct or indirect impact to watercourse.
WC_130	Medium	Minor adverse	Slight adverse	Construction activity related to discharge outfall location.
WC_140	Medium	Minor adverse	Slight adverse	Construction activity related to discharge outfall location.
Tara Brook (WC_200)	Medium	Minor adverse	Slight adverse	Construction activity during realignment/ culverting works. In-channel works. Disturbance of potentially contaminated sediments.

Water Receptor	Importance	Residual Magnitude of impact	Residual significance of effect	Comments
WC_210	Medium	Minor adverse	Slight adverse	Construction activity during realignment/ culverting works. In-channel works. Disturbance of potentially contaminated sediments.
WC_211	Medium	Minor adverse	Slight adverse	Construction activity relating to scheme (loss of proportion of watercourse). In-channel works. Disturbance of potentially contaminated sediments.
WC_212	Medium	Minor adverse	Slight adverse	Construction activity relating to scheme (loss of proportion of watercourse). In-channel works. Disturbance of potentially contaminated sediments.
WC_213	Medium	Minor adverse	Slight adverse	Construction activity relating to scheme (loss of proportion of watercourse). In-channel works. Disturbance of potentially contaminated sediments.
WC_214	Medium	Minor adverse	Slight adverse	Construction of new realigned watercourse to capture water in the catchment draining to WC_212, WC_213 and WC_214 to discharge to existing WC_214. Assessment takes account of works undertaken directly adjacent to watercourse
WC_215	Low	No change	Neutral	No direct impact or indirect to watercourse.
WC_220	Low	No change	Neutral	No direct or indirect impact to watercourse.
Hurstclough Brook (WC_300)	High	Minor adverse	Slight adverse	Construction activity during realignment/ culverting works and discharge outfall. In-channel works. Disturbance of potentially contaminated sediments.
WC_320	Low	No change	Neutral	No direct or indirect impact to watercourse.

Water Receptor	Importance	Residual Magnitude of impact	Residual significance of effect	Comments
WC_330	Medium	Minor adverse	Slight adverse	Construction activity during realignment/ culverting works. In-channel works. Disturbance of potentially contaminated sediments.
WC_340	Medium	Minor adverse	Slight adverse	Construction activity during realignment/ culverting works. In-channel works. Disturbance of potentially contaminated sediments.
Glossop Brook (WC_400)	High	No change	Neutral	No direct or indirect impact to watercourse.
Manchester and East Cheshire Carboniferous Aquifers	Medium	Minor adverse	Slight adverse	Construction activity may lead to an increase in potentially contaminated unattenuated surface water runoff permeating to groundwater.

Operation – water quality

13.9.7 Effects on receptor water quality, where embedded mitigation and best practice have been considered, are assessed for operation in Table 13 25. The assessment takes into account the results of the HEWRAT assessment undertaken at all proposed outfalls and includes any additional treatment train designs required following the initial assessment. Impacts during the operation phase, in terms of water quality are generally considered to be:

- *Direct* – whereby pollutants may directly enter watercourses.
- *Long term* – whereby impacts are expected during the duration of the Scheme operation.
- *Permanent* – whereby impacts are expected for the duration of the Scheme operation.
- *Negative* – in consideration of potential pollution events.

13.9.8 Any differences to these notes are provided within the comments section of the impact tables.

13.9.9 Discharge outfalls are proposed at the River Etherow, watercourses WC_130, WC_140, Tara Brook (WC_200) and Hurstclough Brook (WC_300), effects from operation to these receptors are considered to be slight adverse.

13.9.10 There is potential for flow reduction in Hurstclough Brook (WC_300) to the south of the new realignment as a result of the interception of both surface and subsurface flow derived from the rising topography to the north. The drainage network captures flow within the impacted catchment area and discharges at Outfall 1, joining with the realignment reach. Therefore, flow downstream of

Outfall 1 is expected to be similar to the baseline catchment and expected dilution capacity remains similar, as such there is no impact on water quality expected here.

13.9.11 The operation of the Scheme is not expected to have a direct impact on the remaining watercourses and significance of effect is considered to be neutral.

13.9.12 The results show that there is no significant effect for all receptors for water quality during operation.

Table 13-25 Potential significance of effects during operation - water quality

Water Receptor	Importance	Residual Magnitude of impact	Residual significance of effect	Comments
River Etherow (WC_100)	High	Minor adverse	Slight adverse	New discharge
WC_120	Low	No change	Neutral	No operational impacts to water quality
WC_130	Medium	Minor adverse	Slight adverse	New discharge - fails soluble copper EQS but does pass M-BAT analysis, low risk from spillages.
WC_140	Medium	Minor adverse	Slight adverse	New discharge - fails soluble copper EQS but does pass M-BAT analysis, low risk from spillages.
Tara Brook (WC_200)	Medium	Minor adverse	Slight adverse	New discharge - fails soluble copper EQS but does pass M-BAT analysis, low risk from spillages. Realigned watercourse, no water quality impact expected.
WC_210	Medium	No change	Neutral	No operational impacts to water quality
WC_211	Medium	No change	Neutral	No operational impacts to water quality
WC_212	Medium	No change	Neutral	No operational impacts to water quality
WC_213	Medium	No change	Neutral	No operational impacts to water quality
WC_214	Medium	No change	Neutral	New realigned watercourse to capture water in the catchment draining to WC_212, WC_213 and WC_214. New watercourse to tie into existing WC_214.
WC_215	Low	No change	Neutral	No operational impacts to water quality

Water Receptor	Importance	Residual Magnitude of impact	Residual significance of effect	Comments
WC_220	Low	No change	Neutral	No operational impacts to water quality
Hurstclough Brook (WC_300)	High	Minor adverse	Slight adverse	New discharge - fails soluble copper EQS but does pass M-BAT analysis, low risk from spillages. No impact to water quality expected from road realignment.
WC_320	Low	No change	Neutral	No operational impacts to water quality
WC_330	Medium	No change	Neutral	No operational impacts to water quality
WC_340	Medium	No change	Neutral	No operational impacts to water quality
Glossop Brook (WC_400)	High	No change	Neutral	No operational impacts to water quality
Manchester and East Cheshire Carboniferous Aquifers	Medium	Negligible	Neutral	Discharges to WC_130 and WC_140 may result in surface water drainage permeating to groundwater.

Construction – hydromorphology

13.9.13 The assessment of potential effects during construction for the hydromorphology of the surface water receptors is presented in Table 13-26.

13.9.14 Impacts during the construction phase, in terms of hydromorphology are generally considered to be:

- *Direct* – whereby the receptor's hydromorphological functioning would be directly altered.
- *Short/medium term* – whereby alterations would be made to the hydromorphological functioning of a receptor during the construction activity time period only.
- *Temporary* – whereby alterations to the hydromorphological functioning of a receptor during construction would be temporary.
- *Negative* – in consideration of changes to the hydromorphological functioning of a receptor.

13.9.15 Any differences to these notes are provided within the comments section of the impact tables.

13.9.16 The works associated with the construction of the Scheme are considered to have no direct impact on Glossop Brook (WC_400) and unnamed watercourses WC_120, WC_130, WC_140, WC_215, WC_220 and WC_320, such that the residual significance of effect is considered to be Neutral.

13.9.17 The construction of the clear-span structure over the River Etherow (WC_100) is considered to have a Slight Adverse residual significance of effect.

13.9.18 Numerous watercourses (WC_200, WC_210, WC_211, WC_212, WC_213 and WC_214, Hurstclough Brook (WC_300), WC_330 and WC_340) would require construction works to infill existing open channel sections and to construct new watercourse realignments and associated structures (i.e. culverts). The residual significance of effect of these works on the receptors is considered to be slight adverse.

13.9.19 Therefore, there are no residual significant effects for construction on any receptor for hydromorphology during construction.

Table 13-26 Potential significance of effects during construction – hydromorphology

Water Receptor	Importance	Residual Magnitude of impact	Residual significance of effect	Comments
River Etherow (WC_100)	High	Minor adverse	Slight adverse	Construction of new clear-span bridge with abutments in riparian zone. Earthworks to improve existing channel capacity and provide additional storage capacity on the floodplain.
WC_120	Low	No change	Neutral	No direct or indirect impact to watercourse.
WC_130	Medium	No change	Neutral	No direct or indirect impact to watercourse.
WC_140	Medium	No change	Neutral	No direct or indirect impact to watercourse.
Tara Brook (WC_200)	Medium	Minor adverse	Slight adverse	Construction of realignment of Tara Brook (WC_200), and new culverts (and tie-ins). Infilling of portion of existing Tara Brook (WC_200) open channel.
WC_210	Medium	Minor adverse	Slight adverse	Construction of new culvert for WC_210 (and tie-ins). Infilling of portion of existing WC_210 open channel within Scheme footprint.
WC_211	Medium	Minor adverse	Slight adverse	Infilling of existing WC_211 open channel within Scheme footprint.
WC_212	Medium	Minor adverse	Slight adverse	Infilling of existing WC_212 open channel within Scheme footprint..
WC_213	Medium	Minor adverse	Slight adverse	Infilling of existing WC_213 open channel within Scheme footprint.
WC_214	Medium	Minor adverse	Slight adverse	Construction of realigned WC_214 (and tie-ins). Infilling of portion of existing open channel.
WC_215	Low	No change	Neutral	No direct impact to watercourse.
WC_220	Low	No change	Neutral	No direct impact to watercourse.

Water Receptor	Importance	Residual Magnitude of impact	Residual significance of effect	Comments
Hurstclough Brook (WC_300)	High	Minor adverse	Slight adverse	Construction of realignment of Hurstclough Brook (WC_300), and new culverts (and tie-ins). Infilling of portion of existing Hurstclough Brook (WC_300) open channel. Construction compound adjacent to Hurstclough Brook (WC_300).
WC_320	Low	No change	Neutral	No direct impact to watercourse.
WC_330	Medium	Minor adverse	Slight adverse	Construction of new culvert (and tie-ins) for WC_330 within Scheme footprint.
WC_340	Medium	Minor adverse	Slight adverse	Construction of new culvert (and tie-ins) for WC_340 within Scheme footprint.
Glossop Brook (WC_400)	High	No	Neutral	No direct impact to watercourse.

Operation – hydromorphology

13.9.20 The assessment of potential effects during operation for the hydromorphology of the surface water receptors is presented in Table 13-27. Impacts during the operation phase, in terms of hydromorphology are generally considered to be:

- *Direct* – whereby the receptor's hydromorphological functioning would be directly altered.
- *Long term* – whereby alterations made to the hydromorphological functioning of a receptor would remain during the duration of the Scheme operation.
- *Permanent* – whereby impacts to the hydromorphological functioning of a receptor made during construction would result in a permanent change and would remain during the duration of the Scheme operation.
- *Negative* – in consideration of changes to the hydromorphological functioning of a watercourse.

13.9.21 Any differences to these notes are provided within the comments section of the impact tables.

13.9.22 The works associated with the operation of the Scheme are considered to have no direct impact on Glossop Brook (WC_400) and unnamed watercourses WC_120, WC_130, WC_140, WC_215, WC_220 and WC_320, such that the residual significance of effect is considered to be neutral.

13.9.23 The permanent presence of the clear-span structure over the River Etherow (WC_100) and associated works is considered to have a Slight Adverse residual significance of effect.

13.9.24 Numerous watercourses (WC_200, WC_210, WC_211, WC_212, WC_213 and WC_214, Hurstclough Brook (WC_300), WC_330 and WC_340) would be permanently altered with new watercourse realignments and associated

structures (i.e. culverts). The residual significance of effect of these works on the receptors is considered to be slight adverse.

13.9.25 There is potential for minor flow reduction in a length (approximately 600 m) of Hurstclough Brook (WC_300) to the south of the new realignment as described in 13.9.10 above. In the absence of any detailed hydrological modelling and understanding of recharge pathways it is not possible to quantify the volumetric effect. However, field observations have identified that a significant proportion of the flow in the potentially affected reach was derived from the upstream channel extent. This upstream catchment is not affected by the proposed Scheme since the flow path is retained by the culvert. Therefore, any potential changes in flow are likely to result in a minor localised adverse change in the watercourse hydromorphological regime. The drainage network and realigned watercourse captures flow within the impacted catchment area and discharges at Outfall 1. Therefore, flow downstream of Outfall 1 is expected to be similar to the baseline catchment and the potential impact on flow in Hurstclough Brook (WC_300) downstream of the Scheme is considered to be negligible.

13.9.26 Therefore, there are no residual significant effects for operation on any receptor for hydromorphology.

Table 13-27 Potential significance of effects during operation - hydromorphology

Water Receptor	Importance	Residual Magnitude of impact	Residual significance of effect	Comments
River Etherow (WC_100)	High	Minor adverse	Slight adverse	Permanent new clear-span bridge with abutments in riparian zone, and improved flood storage capacity on floodplain.
WC_120	Low	No change	Neutral	No direct or indirect impact to watercourse.
WC_130	Medium	No change	Neutral	No direct or indirect impact to watercourse.
WC_140	Medium	No change	Neutral	No direct or indirect impact to watercourse.
Tara Brook (WC_200)	Medium	Minor adverse	Slight adverse	Permanent presence of realigned Tara Brook (WC_200) and associated culverts.
WC_210	Medium	Minor adverse	Slight adverse	Permanent culverting of WC_210 within Scheme footprint to tie-in to existing culverted reach downstream, and permanent loss of length of existing WC_210.
WC_211	Medium	Minor adverse	Slight adverse	Permanent loss of length of existing WC_211 open channel within Scheme footprint.
WC_212	Medium	Minor adverse	Slight adverse	Permanent loss of existing WC_212 open channel within Scheme footprint.

Water Receptor	Importance	Residual Magnitude of impact	Residual significance of effect	Comments
WC_213	Medium	Minor adverse	Slight adverse	Permanent loss of existing WC_213 open channel within Scheme footprint.
WC_214	Medium	Minor adverse	Slight adverse	Permanent loss of length of existing WC_214 open channel within Scheme footprint. Permanent watercourse realignment to capture water in catchment draining to WC_212, WC_213 and WC_214.
WC_215	Low	No change	Neutral	No direct or indirect impact to watercourse.
WC_220	Low	No change	Neutral	No direct or indirect impact to watercourse.
Hurstclough Brook (WC_300)	High	Minor adverse	Slight adverse	Permanent realignment of Hurstclough Brook (WC_300) within Scheme footprint, and associated culverts. Potential reduction in flow in Hurstclough Brook (WC_300) as a result of road alignment.
WC_320	Low	No change	Neutral	No direct or indirect impact to watercourse.
WC_330	Medium	Minor adverse	Slight adverse	Permanent culverting of WC_330 within Scheme footprint.
WC_340	Medium	Minor adverse	Slight adverse	Permanent culverting of WC_340 within Scheme footprint.
Glossop Brook (WC_400)	High	No change	Neutral	No direct or indirect impact to watercourse.

Construction – flood risk

13.9.27 The assessment of the potential effects during construction for the flood risk of the surface water receptors is presented in Table 13-28. Impacts during the construction phase, in terms of flood risk are generally considered to be:

- *Direct* – whereby the receptor's hydrological functioning would be directly altered.
- *Short/medium term* – whereby alterations would be made to the hydrological functioning of a receptor during the construction activity time period only.
- *Temporary* - whereby impacts from altering the hydrological functioning of a receptor during construction would be temporary.
- *Negative* – in consideration of changes to the hydrological functioning of a receptor.

13.9.28 As highlighted in the Assumptions and limitations section (13.4), a sufficiently detailed construction programme has not been available at the time of

assessment to allow for a quantified assessment of the effects of the programming of proposed works, particularly those taking place within the floodplain. A worst-case scenario is therefore assumed and utilised to inform the assessment where modelling is unable to distinguish.

13.9.29 Any differences to these notes are provided within the comments section of the impact tables.

13.9.30 The works associated with the construction of the Scheme are considered to have no direct impact on the unnamed watercourses WC_140, WC_215 and WC_320 such that the residual significance of effect is considered to be Neutral.

13.9.31 The construction of the clear-span structure over the River Etherow (WC_100) is considered to have a moderate adverse residual significance of effect following changes to floodplain functionality and in channel capacity as a result of embankment and earthworks associated with new road alignment. There is a localised risk to the construction site which would be within the floodplain of the River Etherow. Works here should be programmed in order to minimise the cumulative impact of the proposed works including that of the compensatory flood storage area and wider flood alleviation measures. The potential affects to this receptor are considered to be short term and temporary. This moderate adverse effect is considered to be short- term during the construction activity programme.

13.9.32 Numerous watercourses (WC_120, WC_130, WC_200, WC_210, WC_211, WC_212, WC_213 and WC_214, Hurstclough Brook (WC_300), WC_330, WC_340 and Glossop Brook WC_400) would be impacted by changes resulting in flood plain functionality. The residual significance of effect of these works on the receptors is considered to be Slight Adverse.

Table 13-28 Potential significance of effects during construction – flood risk

Water Receptor	Importance	Residual Magnitude of impact	Residual significance of effect	Comments
River Etherow (WC_100)	High	Minor adverse	Slight adverse	New crossing of River Etherow. Change in floodplain functionality and in channel capacity as a result of embankment and earthworks associated with new road alignment. This would be mitigated though careful programming of works here, so as not to increase risk to others, however there would still be a localised risk of flooding to the construction site whilst works take place in the immediate vicinity of the water receptor . Impact is considered to be a short-term/ temporary impact during construction only.

Water Receptor	Importance	Residual Magnitude of impact	Residual significance of effect	Comments
WC_120	Low	Negligible	Slight adverse	Change in floodplain functionality as a result of works at proposed River Etherow crossing. This would be mitigated though careful programming of works here so as not to increase risk to others, however during construction there would still be a localised risk of flooding to the construction site whilst works take place in the immediate vicinity of the water receptor. Impact is considered to be a short-term/ temporary impact during construction only.
WC_130	Medium	Negligible	Slight adverse	Change in floodplain functionality as a result of works at proposed River Etherow crossing. This would be mitigated though careful programming of works here so as not to increase risk to others, however during construction there would still be a localised risk of flooding to the construction site whilst works take place in the immediate vicinity of the water receptor. Impact is considered to be a short-term/ temporary impact during construction only.
WC_140	Medium	No change	Neutral	No direct or indirect impact to watercourse.
Tara Brook (WC_200)	Medium	Low adverse	Slight adverse	Displacement of waterbody and change in functionality resulting from construction of embankment associated with new road alignment. New culverts passing under the scheme associated with watercourse realignment. Risk of increased runoff from earthworks
WC_210	Medium	Minor adverse	Slight adverse	Displacement of waterbody and change in functionality resulting from construction of embankment associated with new road alignment. New culvert passing under the scheme.

Water Receptor	Importance	Residual Magnitude of impact	Residual significance of effect	Comments
WC_211	Medium	Minor adverse	Slight adverse	Loss of existing open watercourse.
WC_212	Medium	Minor adverse	Slight adverse	New watercourse alignment. Loss of existing open watercourse.
WC_213	Medium	Minor adverse	Slight adverse	New watercourse alignment. Loss of existing open watercourse.
WC_214	Medium	Minor adverse	Slight adverse	New watercourse alignment. Loss of existing open watercourse. Displacement of waterbody and change in functionality resulting from construction of cutting associated with new road alignment. Risk of increased runoff from earthworks.
WC_215	Low	No change	Neutral	No direct or indirect impact to watercourse.
WC_220	Low	Negligible	Neutral	Assumed to pass under the Scheme in culvert. No direct impact to watercourse from works.
Hurstclough Brook (WC_300)	High	Minor adverse	Slight adverse	Displacement of waterbody and change in functionality resulting from construction of embankment associated with new road alignment. New culvert passing under the scheme associated with watercourse realignment. Risk of increased runoff from earthworks. Locality of proposed construction compound may be at risk from surface water flood flow routes.
WC_320	Low	No change	Neutral	No direct or indirect impact to watercourse.
WC_330	Medium	Minor adverse	Slight adverse	Displacement of waterbody and change in functionality resulting from construction of embankment associated with new road alignment. New culvert passing under the scheme associated with drainage feature.

Water Receptor	Importance	Residual Magnitude of impact	Residual significance of effect	Comments
WC_340	Medium	Minor adverse	Slight adverse	Displacement of waterbody and change in functionality resulting from construction of embankment associated with new road alignment. New culvert passing under the scheme associated with drainage feature.
Glossop Brook (WC_400)	High	Minor adverse	Slight adverse	Change in floodplain functionality and in as a result of works at proposed River Etherow crossing. This would be mitigated though careful programming of works here so as not to increase risk to others, however during construction there would be a localised risk of flooding to the construction site whilst works take place in the immediate vicinity of the water receptor Impact is considered to be a short-term/ temporary impact during construction only.
Manchester and East Cheshire Carboniferous Aquifers	Medium	Negligible ~~Minor adverse~~	Neutral ~~Slight adverse~~	Potential changes to groundwater levels associated with underground structures in the have been assessed in the Hydrogeological Risk Assessment. Modelled changes were small (maximum 2 m) and no impacts were modelled outside of the DCO boundary and therefore the magnitude of this impact has been reduced to negligible following this assessment. ~~Potential for increased groundwater flood risk up gradient of longitudinal below ground structures. This would be mitigated through additional ground investigation, hydrogeological risk assessment and design of the structures to allow groundwater flow across them if required.~~

Operation – flood risk

13.9.33 The assessment of the potential effects during operation for the flood risk of the surface water receptors is presented in Table 13-29. Impacts during the operation phase, in terms of flood risk are generally considered to be:

- *Direct* – whereby the receptor's hydrological functioning would be directly altered.
- *Long term* – whereby alterations would be made to the hydrological functioning of a receptor would remain during the duration of the Scheme operation.
- *Permanent* – whereby impacts to the hydrological functioning of a receptor during operation would result in a permanent change.
- *Negative* – in consideration of changes to the hydrological functioning of a receptor.

13.9.34 Any differences to these notes are provided within the comments section of the impact tables.

13.9.35 The works associated with the operation of the Scheme are considered to have no direct impact on the unnamed watercourses WC_120, WC_130, WC_140, WC_215, WC_220, WC_320, WC_340 and WC_400 such that the residual significance of effect is Neutral.

13.9.36 The permanent presence of the clear-span structure over the River Etherow (WC_100) is considered to have a slight adverse residual significance of effect. The modelling results in reduction in peak level of 300mm when compared to baseline against the 35% cc flood level, with a peak downstream reduction of approximately 150mm thus not increasing flood risk. The flood alleviation measures provide a betterment at the Wooley Bridge Junction with the 1600m^3 lost to the scheme replaced with a compensatory flood storage increase of approximately 4600m^3. This increase in flood storage results in an increased maximum flood extent. The changes in floodplain functionality and in-channel conveyance result from construction of embankment associated with new road alignment.

13.9.37 The severance of the hydrological catchment associated with Hurstclough Brook (WC_300) may reduce the contribution of overland flow pathways to the north of the proposed alignment. However, field observations indicate that a significant proportion of the flow in the potentially affected reach was derived from the upstream channel extent which is unaffected by the Scheme. The watercourse realignment to the south of the scheme will be designed such that flood flows are conveyed within the channel, therefore a negligible impact on flood risk is anticipated. The drainage network and realigned watercourse captures flow within the impacted catchment area and discharges at Outfall 1. Therefore, flow downstream of Outfall 1 is expected to be similar to the baseline catchment and the expected impact on flood risk is negligible.

13.9.38 All other watercourses would be impacted by changes resulting in flood plain functionality. The residual significance of effect of these works on the receptors is Slight Adverse.

13.9.39 The Hydrogeological Risk Assessment (Appendix 13.2) has been carried out to assess the potential impacts of the Scheme on groundwater levels and flows. To do this, a three dimensional groundwater model of the area of catchment

surrounding the Scheme was constructed and calibrated to observed data to represent the baseline case. Key features of the Scheme were then applied in the model to allow the potential impacts from the Scheme to be simulated.

13.9.40 This assessment showed that increases in groundwater level would occur associated with the secant piles around Mottram Underpass. However, these increases would be limited to the immediate vicinity of the pile walls and would not extend beyond the DCO boundary of the Scheme. This is because the dominant effect is one of drawdown of groundwater, associated with drainage in the adjacent cutting. Maximum increases in groundwater level were modelled to be <2 m which is within the seasonal variability of the groundwater level. Initially a precautionary assessment was made based on the available information. Following the additional assessment in the Hydrogeological Risk assessment the significance of this impact has been updated to neutral as the magnitude has been reduced from minor adverse to negligible. The full results of the modelling and impact assessment are presented in Appendix 13.2.

13.9.41 Therefore, there are no residual significant effects for operation on any receptor for flood risk.

Table 13 29 Potential significance of effects during operation – flood risk

Water Receptor	Importance	Residual Magnitude of impact	Residual significance of effect	Comments
River Etherow (WC_100)	High	Negligible	Slight adverse	Change in floodplain functionality and in-channel conveyance resulting from construction of embankment associated with new road alignment. Reduction in in-channel peak flood level and betterment with reduced flooding at the proposed Wooley Bridge Junction, however there is an increase in the footprint of flooding through the compensatory flood storage area
WC_120	Low	Negligible	Neutral	Change in floodplain functionality as a result of works at proposed River Etherow crossing. Reduction in in-channel peak flood level and betterment with reduced flooding at the proposed Wooley Bridge Junction, however there is an increase in the footprint of flooding through the compensatory flood storage area
WC_130	Medium	Negligible	Neutral	Change in floodplain functionality as a result of works at proposed

Water Receptor	Importance	Residual Magnitude of impact	Residual significance of effect	Comments
				River Etherow crossing. Reduction in in-channel peak flood level and betterment with reduced flooding at the proposed Wooley Bridge Junction, however there is an increase in the footprint of flooding through the compensatory flood storage area
WC_140	Medium	Negligible	Neutral	New outfall location associated with surface water drainage strategy
Tara Brook (WC_200)	Medium	Negligible	Slight adverse	New outfall location associated with surface water drainage strategy. Realignment of existing watercourse. New culvert passing under the scheme.
WC_210	Medium	Negligible	Slight adverse	New culvert passing under the scheme.
WC_211	Medium	Negligible	Slight adverse	Realignment of existing watercourse
WC_212	Medium	Negligible	Slight adverse	Realignment of existing watercourse
WC_213	Medium	Negligible	Slight adverse	Realignment of existing watercourse
WC_214	Medium	Negligible	Slight adverse	Realignment of existing watercourse Change in functionality due to realignment
WC_215	Low	No change	Neutral	No direct or indirect impact to watercourse.
WC_220	Low	No change	Neutral	Assumed to pass under the Scheme in culvert. No direct impact to watercourse from works.
Hurstclough Brook (WC_300)	High	Negligible	Slight adverse	New outfall location associated with surface water drainage strategy. Realignment of existing watercourse, resulting in severance of hydrological catchment. New culvert passing under the scheme to convey significant proportion of upstream flow.
WC_320	Low	No change	Neutral	No direct or indirect impact to watercourse.

Water Receptor	Importance	Residual Magnitude of impact	Residual significance of effect	Comments
WC_330	Medium	Negligible	Slight adverse	New outfall location associated with road embankment drainage. New culvert passing under the scheme
WC_340	Medium	Negligible	Neutral	New outfall location associated with road embankment drainage. New culvert passing under the scheme
Glossop Brook (WC_400)	High	Negligible	Neutral	Change in floodplain functionality and in as a result of works at proposed River Etherow crossing. Reduction in in-channel peak flood level and betterment with reduced flooding at the proposed Wooley Bridge Junction, however there is an increase in the footprint of flooding through the compensatory flood storage area
Manchester and East Cheshire Carboniferous Aquifers	Medium	Negligible ~~Minor adverse~~	Neutral ~~Slight adverse~~	Potential changes to groundwater levels associated with underground structures in the have been assessed in the Hydrogeological Risk Assessment. Modelled changes were small (maximum 2 m) and no impacts were modelled outside of the DCO boundary and therefore the magnitude of this impact has been reduced to negligible following this assessment.~~Potential for increased groundwater flood risk up-gradient of longitudinal below ground structures. This would be mitigated through additional ground investigation, hydrogeological risk assessment and design of the structures to allow groundwater flow across them if required.~~

Construction – groundwater

~~13.9.39~~13.9.42 The assessment of the potential effects during construction for groundwater receptors is presented in Table 13-30.

~~13.9.40~~13.9.43 There are no residual significant effects for construction on any receptor for groundwater.

Table 13-30 Potential significance of effects during construction – groundwater

Water Receptor	Importance	Residual Magnitude of impact	Residual significance of effect	Comments
Manchester and East Cheshire Carboniferous Aquifers	Medium	Minor adverse	Slight Adverse	Temporary dewatering, installation of deep foundations and cuttings associated with subsurface structures may cause temporary local changes to groundwater levels and groundwater flow pathways. ~~This is a conservative assessment as site specific ground investigation works to determine groundwater levels in the area of the scheme have not been completed. On completion of the ground investigation works, the scale of the local residual significance can be clarified.~~

Operation – groundwater

~~13.9.41~~13.9.44 The assessment of the potential effects during operation for groundwater receptors is presented in Table 13-31.

~~13.9.42~~13.9.45 There are no residual significant effects for operation on any receptor for groundwater.

Table 13-31 Potential significance of effects during operation – groundwater

Water Receptor	Importance	Residual Magnitude of impact	Residual significance of effect	Comments
Manchester and East Cheshire Carboniferous Aquifers	Medium	Minor adverse	Slight Adverse	Subsurface structures (e.g. Mottram Underpass) and deep foundations which are part of the permanent design may cause a barrier to groundwater flow. This impact has been assessed in the Hydrogeological Risk Assessment (ES Appendix 13.2) ~~Mitigation measures for proposed structures would take into account site-specific groundwater levels.~~

Overall significance of effect

Construction

~~13.9.43~~13.9.46 Taking all areas of the water environment into consideration the overall assessment for significance of construction impacts is summarised in Table 13-32. The overall assessment is based on the water environment technical area (i.e. water quality, hydromorphology, flood risk or groundwater) with the most adverse significant effect resulting from construction activity, which is shown in the 'Significance of effect driven by:' column.

Table 13-32 Potential significance of effects during construction – overall

Water Receptor	Significance of effect	Significance of effect driven by:	Impact[1]			
River Etherow (WC_100)	Slight adverse	Water quality Hydromorphology Flood risk	D	S/M T	T	N
WC_120	Neutral	Water quality Hydromorphology Flood risk	N/A			
WC_130	Slight adverse	Water quality Flood risk	D	S/M T	T	N
WC_140	Slight adverse	Water quality	D	S/M T	T	N
Tara Brook (WC_200)	Slight adverse	Water quality Hydromorphology Flood risk	D	S/M T	T	N
WC_210	Slight adverse	Water quality Hydromorphology Flood risk	D	S/M T	T	N
WC_211	Slight adverse	Water quality Hydromorphology Flood risk	D	S/M T	T	N
WC_212	Slight adverse	Water quality Hydromorphology Flood risk	D	S/M T	T	N
WC_213	Slight adverse	Water quality Hydromorphology Flood risk	D	S/M T	T	N
WC_214	Slight adverse	Water quality Hydromorphology Flood risk	D	S/M T	T	N
WC_215	Neutral	Water quality Hydromorphology Flood risk	N/A			
WC_220	Neutral	Water quality	N/A			

Water Receptor	Significance of effect	Significance of effect driven by:	Impact[1]			
		Hydromorphology Flood risk				
Hurstclough Brook (WC_300)	Slight adverse	Water quality Hydromorphology Flood risk	D	S/M T	T	N
WC_320	Neutral	Water quality Hydromorphology Flood risk	N/A			
WC_330	Slight adverse	Water quality Hydromorphology Flood risk	D	S/M T	T	N
WC_340	Slight adverse	Water quality Hydromorphology Flood risk	D	S/M T	T	N
Glossop Brook (WC_400)	Slight adverse	Flood risk	D	S/M T	T	N
Manchester and East Cheshire Carboniferous Aquifers	Slight adverse	Groundwater Flood risk	D	S/M T	T	N

[1]Table Notes- Impact considered to be:
- Direct (D)/ Indirect (I)
- Short/ medium/ long term (S/M/L T)
- Permanent (P)/ Temporary (P/T)
- Negative (N)/ Positive (Po)

Operation

~~13.9.44~~13.9.47 Taking all areas of the water environment into consideration the overall assessment for significance of operation impacts is summarised in Table 13-33. The overall assessment is based on the water environment technical area (i.e. water quality, hydromorphology, flood risk or groundwater) with the most adverse significant effect resulting from construction activity, which is shown in the 'Significance of effect driven by:' column.

Table 13-33 Potential significance of effects during operation – overall

Water Receptor	Significance of effect	Significance of effect driven by:	Impact[1]			
River Etherow (WC_100)	Slight adverse	Water quality Hydromorphology Flood risk	D	LT	P	N
WC_120	Neutral	Water quality Hydromorphology Flood risk	N/A			
WC_130	Slight adverse	Water quality	D	LT	P	N

Water Receptor	Significance of effect	Significance of effect driven by:	Impact[1]			
WC_140	Slight adverse	Water quality	D	LT	P	N
Tara Brook (WC_200)	Slight adverse	Water quality Hydromorphology Flood Risk	D	LT	P	N
WC_210	Slight adverse	Hydromorphology Flood risk	D	LT	P	N
WC_211	Slight adverse	Hydromorphology Flood risk	D	LT	P	N
WC_212	Slight adverse	Hydromorphology Flood risk	D	LT	P	N
WC_213	Slight adverse	Hydromorphology Flood risk	D	LT	P	N
WC_214	Slight adverse	Hydromorphology Flood risk	D	LT	P	N
WC_215	Neutral	Water quality Hydromorphology Flood risk	N/A			
WC_220	Neutral	Water quality Hydromorphology Flood risk	N/A			
Hurstclough Brook (WC_300)	Slight adverse	Water quality Hydromorphology Flood risk	D	LT	P	N
WC_320	Neutral	Water quality Hydromorphology Flood risk	N/A			
WC_330	Slight adverse	Hydromorphology Flood Risk	D	LT	P	N
WC_340	Slight adverse	Hydromorphology	D	LT	P	N
Glossop Brook (WC_400)	Neutral	Water quality Hydromorphology Flood risk	N/A			
Manchester and East Cheshire Carboniferous Aquifers	Slight adverse	Groundwater Flood risk	D	LT	P	N

[1]Table Notes- Impact considered to be:
- Direct (D)/ Indirect (I)
- Short/ medium/ long term (S/M/L T)
- Permanent (P)/ Temporary (P/T)
- Negative (N)/ Positive (Po)

13.10 National Policy Statement for National Networks (NPS NN) compliance

13.10.1 The NPS NN objectives include reference to the WFD and that new and existing development should be prevented from contributing to, or being put at unacceptable risk from, or being adversely affected by, water pollution. Embedded mitigation within the Scheme enables compliance with NSP NN and has been demonstrated in Section 13.10.

13.11 Monitoring

13.11.1 The EMP (First iteration) (TR010034/APP/7.2) and the Register of Environmental Actions and Commitments (REAC) (TR010034/APP/7.3) sets out the monitoring requirements and procedures to be implemented to reduce or eliminate impacts on the environment during the construction phase of works. The EMP (Second iteration) must be substantially in accordance with the EMP (First iteration). An Environmental Clerk of Works or Site Environmental Manager would be appointed to ensure that objectives of the EMP (Second iteration) are achieved. This would include the requirement to undertake visual inspections during construction for all watercourses where realignment is proposed as be secured by Requirement 4 of the Draft Development Consent Order (TR010034/APP/3.1).

13.11.2 Water quality monitoring has not been requested from the Environment Agency.

13.12 Summary

13.12.1 The water environment assessment considers surface waters (water quality and hydromorphology), flood risk and ground water (quality and quantity). The Zone of Influence was used to inform the study area and takes into consideration all water features and associated floodplain physically impacted by the Scheme and those watercourses in direct hydraulic connectivity within 1 km of the DCO boundary. A total of 21 receptors are taken forward for assessment, of which three are WFD reportable watercourses and one WFD groundwater receptor.

13.12.2 The impact assessment follows guidance provided within the DMRB LA 113 standard identifying receptor importance and magnitude of impact to determine significance of effect. Surface water receptor importance is initially identified per disciple (i.e. water quality, hydromorphology and flood risk). To undertake the assessment using a holistic approach to the water environment, the highest level of sensitivity (from each discipline) is selected for each watercourse.

13.12.3 The magnitude of impact incorporates embedded mitigation both during construction and operation phases. The assessment considers that even where mitigation is in place in many cases risk cannot be fully eliminated and therefore there is still likely to be a residual risk of an impact occurring (albeit reduced). Impacts have been considered in terms of direct/ indirect, short/ medium/ long term, temporary/ permanent and negative/ positive.

13.12.4 Following assessment of surface watercourses and groundwater within the study area, no significant impacts, i.e. less than Moderate, are identified to all remaining receptors either during construction or operation. No further additional mitigation is therefore proposed.

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