M5 Junction 10 Improvements Scheme

Statement of Common Ground

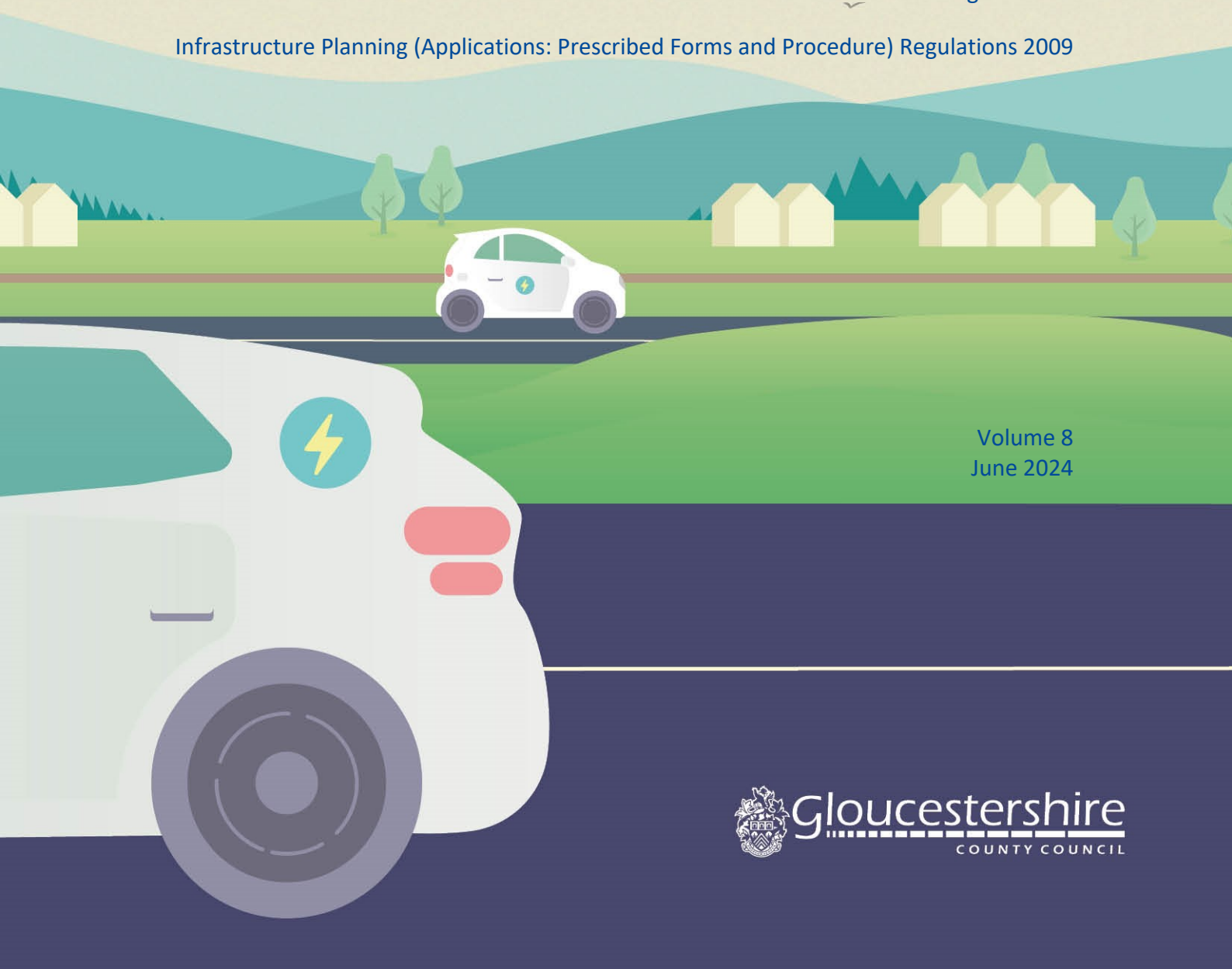
Environment Agency

TR010063 – APP 8.4

Regulation 5(2)(q)

Planning Act 2008

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



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Infrastructure Planning

Planning Act 2008

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

M5 Junction 10 Improvements Scheme

Development Consent Order 202[x]

8.3 Statement of Common Ground Environment Agency

Regulation Number:	Regulation 5(2)(q)
Planning Inspectorate Scheme Reference	TR010063
Application Document Reference	TR010063/APP/8.4
Author:	M5 Junction 10 Improvements Scheme Project Team

Version	Date	Status of Version
Rev 0	October 2023	DCO Application
Rev 1	June 2024	Deadline 1

STATEMENT OF COMMON GROUND

This Statement of Common Ground has been prepared and agreed by (1) Gloucestershire County Council and (2) the Environment Agency.

Signed

On behalf of Gloucestershire County Council

Date:

Signed

On behalf of the Environment Agency

Date:

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Glossary

Table 1-1 - Glossary

Term	Meaning / Definition
(The) Act	The Planning Act 2008 (as amended)
(The) Applicant	Gloucestershire County Council (Strategic Development Team) applying for the DCO.
Biodiversity Net Gain (BNG)	Biodiversity Net Gain delivers measurable improvements for Biodiversity by creating or enhancing habitats in association with development.
Carter Jonas (CJ)	Land referencing consultant working on behalf of the Applicant
Cheltenham Borough Council (CBC)	CBC is the local planning authority for Cheltenham Borough, and is a statutory consultee for the Scheme, as defined under section 42 (1)(b) of the Act.
Development Consent Order (DCO)	The consent for the construction, operation and maintenance of Nationally Significant Infrastructure Projects (NSIP) given by the relevant Secretary of State on the recommendation of the Planning Inspectorate under the Planning Act 2008 (as amended).
Environment Agency (EA)	A non-departmental public body with responsibilities relating to the protection and enhancement of the environment in England.
Environmental Impact Assessment (EIA)	A process of evaluating the likely environmental impacts of a proposed development, including inter-related socioeconomic, cultural and human health impacts, both beneficial and adverse.
Environmental Statement (ES)	Reports the findings of the EIA, including at least the information reasonably required to assess the likely significant environmental effects of the development.
Examining Authority (ExA)	The person(s) appointed by the Secretary of State (SoS) to assess the DCO application and make recommendation to the SoS.
Flood Risk Assessment (FRA)	An assessment on the likelihood of flooding in a particular area so that development needs, and mitigation measures can be considered.
Gloucestershire County Council (GCC)	Gloucestershire County Council. It is therefore a statutory consultee for the Scheme, as defined under section 42(1)(b) and section 43(c) of the Planning Act 2008 (“the Act”). GCC is the local highway authority in Gloucestershire and is the Minerals and Waste Planning Authority (MWPA) for Gloucestershire. GCC also has statutory duties in relation to drainage, flood risk, and heritage assets and archaeology
Historic England	Publicly funded body that champions and protects England’s historic places, also known as the Historic Buildings and Monuments Commission for England.
Host Authority	The local authority, within which the Scheme would be situated, In this case, Cheltenham Borough Council, Gloucestershire County Council and Tewkesbury Borough Council.

Term	Meaning / Definition
Local Planning Authority (LPA)	The county council, metropolitan, or district council, which has statutory responsibilities within its administrative areas.
Nationally Significant Infrastructure Project (NSIP)	A project of a type and scale defined under the Planning Act 2008 and by Order of the Secretary of State (SoS) relating to energy, transport, water, wastewater and waste generally. These projects require a single development consent, which includes consents under different regimes, such as planning permission, listed building consent and scheduled monument consent.
Natural England (NE)	Executive non-departmental public body responsible for the natural environment.
Planning Inspectorate (PINS)	The Government Agency responsible for operating the planning process for NSIPs. The Planning Inspectorate is responsible for examining DCO applications and making recommendations to the relevant SoS, who will make the decision on whether to grant or to refuse development consent. The SoS for Transport takes the decision on applications for highway NSIPs.
Preferred Route Announcement	Designation of a proposed option as a ‘preferred route’ by the Department for Transport and provides a form of planning protection from development of land in the vicinity of the M5 Junction 10 improvement scheme
Statement of Community Consultation (SoCC)	Prepared in accordance with Section 47 of the Planning Act 2008, to inform, explain and communicate how the consultation will be undertaken.
Statutory Consultation	In accordance with the Planning Act 2008, applicants of major infrastructure projects have a statutory duty to carry out a consultation on their proposals before submitting an application to the Planning Inspector.
(the) Scheme	The proposed M5 Junction 10 improvements development which is the subject of a DCO application.
Tewkesbury Borough Council (TBC)	Tewkesbury Borough Council.is the local planning authority for Tewkesbury Borough and a statutory consultee for the Scheme, as defined under section 42(1)(b) and section 43(b) of the Act.
Water Framework directive	The Water Framework Directive (2000/60/EC) which established a framework for European Community action in the field of water policy.

1. Introduction

1.1.1. This Statement of Common Ground (SoCG) has been prepared in respect of the application for the M5 Junction 10 Improvements Scheme ("the Scheme") made by Gloucestershire County Council (GCC) (the Applicant) to the Secretary of State for a Development Consent Order (DCO) under section 37 of the Planning Act 2008.

1.1.2. If made, the DCO would grant consent for the construction of improvement works to M5 Junction 10, consisting of a new all-movements motorway junction, a new West Cheltenham Link Road (the Link Road from the A4019 to B4634 (Old Gloucester Road)), and the widening of the A4019 (Tewkesbury Road) east of the junction to the Gallagher Retail Park Junction. A small section of the A4019 will be realigned to the west of the junction.

1.2. Purpose of this Document

1.2.1. This document is a Statement of Common Ground (SoCG) between GCC (the Applicant) and the Environment Agency (EA) in relation to the M5 Junction 10 Improvements Scheme.

1.2.2. The document identifies the following between the parties:

- A record of key consultation / correspondence.
- Matters which have been agreed; and
- Matters currently outstanding (subject to negotiation or not agreed).

1.2.3. The matters which are referenced in this document are that which are considered to be of material difference. The SoCG will continue to evolve through the examination process.

1.3. Structure of Statements of Common Ground

1.3.1. The SoCG has been structured in a generally consistent form across all consultees and sets out the matters which are agreed, the matters subject to further discussion and those matters which are not agreed. Each SoCG has been tailored according to the approach agreed with the interested party concerned.

1.3.2. This SoCG has the following structure:

- Section 1: Introduces the SoCG and provides a description of its purpose;
- Section 2: Outlines the engagement that has taken place with the interested party; and
- Section 3: sets out the topics discussed - topics struck through have had no matters raised through out engagement with the EA as not relevant to their statutory functions.
- Sections 4 and 5 sets out the issues that have arisen, reporting on the status of each issue, i.e., whether it is agreed (Table 4.1), still under discussion or not agreed, and any remaining actions (Table 5.1).

1.3.3. Where relevant, documents that are referenced in the SoCG but do not form part of the application are available to the Examining Authority (ExA) upon request.

1.3.4. This SoCG is a correct reflection of the position of both parties at the DCO Deadline 1 submission 18 June 2024.

1.3.5. It is acknowledged that the views and opinions of both parties may change over time and as such this SoCG will continue to evolve as the application for development consent progresses through the Examination Stage.

2. Consultation

2.1. The Role of GCC

2.1.1. In this SoCG, GCC is the Applicant for the M5 Junction 10 Improvements Scheme, and this is separate and independent from the other functions and statutory duties carried out by the Council. As Applicant, GCC is promoting and delivering the Scheme with support of the rest of the Council, other Local Planning Authorities, National Highways and Homes England. This is to be recorded in separate SoCGs with the other parties.

2.2. The Role of the Environment Agency (EA)

2.2.1. The EA is a non-departmental public body sponsored by DEFRA with responsibilities relating to the protection and enhancement of the environment in England. The EA decides if relevant environmental permits and other consents and licences should be issued and, if so, what conditions should be applied. The EA also monitors compliance with the permit / licence conditions and takes enforcement action if appropriate.

2.2.2. The EA is a prescribed consultee as defined under section 42(1)(a) of the Planning Act 2008 (the Act).

2.3. Summary of Consultation

2.3.1. GCC has been in consultation with the EA during the development of the Scheme's design, including the optioneering process. The parties have continued communicating throughout the progression of the Scheme.

2.3.2. The engagement outlines in Table 2-1 covers formal consultation with the EA and engagement which pertains to matters raised in this SoCG. Other exchanges, such as requests for information or clarification points are not detailed below but are available on request.

2.3.3. The consultation with the EA since the Preferred Route announcement on 16th June and 2021 and to date is set out in Table 2-1 below.

Table 2-1 - Consultation with EA

Date	Method	Matters Discussed
27.06.2021	Meeting (via Teams)	The preferred route option was discussed along with the potential impacts and appropriate mitigation in relation to the WFD assessment.
12.07.2021	Email	Atkins Engineer inquired advice from the EA on the level for level storage and shared a memo outlining the level for level storage through the system.
06.12.2021	Email	Consultation documents were sent to the EA for comment.
15.02.2022	Email	Representation from the EA was received.
05.04.2022	Email	EA provided comments on the baseline model.

Date	Method	Matters Discussed
12.05.2022	Email	Atkins sent a letter responding to comments raised by the EA at the statutory consultation.
13.01.2023	Meeting (via Teams)	Meeting with the EA to communicate progress since the statutory consultation and progress with the SoCG.
02.02.2023	Email	Atkins sent an updated copy of document (GCCM5J10-ATK-LDC-ZZ-RP-LP-000005) SoCG for comment. No response has been received from the EA.
16.05.2023	Email	As part of the Further Targeted Consultation, consultation materials were sent to EA comment. The consultation materials were sent again on 26.06.2023 by request for comment.
15.02.2024	Meeting (via Teams)	Meeting to provide an update on the progress of the Scheme, the DCO programme, and agree an engagement plan to develop the SoCG.
22.04.2024	Meeting (via Teams)	Meeting with the EA to discuss flood risk matters (SoCG matter references 1.1, 8.1 – 8.8 & 8.17.
15.04.2024	Meeting (via Teams)	Meeting with the EA water quality and ecology specialists to discuss matters relating to WFD and ecological mitigation.
17.05.2024	Email	Email sent to the EA with the draft SoCG for EA review.
29.05.2024	Email	The EA returned the SoCG updated with tracked changes confirming matters which are now agreed.
05.06.2024	Meeting (via Teams)	Meeting to discuss the remaining outstanding items on the SoCG.

3. Topics covered in this SoCG

3.1.1. The following table is a summary of the topics which are considered within this SoCG. Topics struck through have had no matters raised throughout engagement with the EA as not relevant to their statutory functions.

Table 3-1 - Summary of topics considered within this SoCG.

Overarching topic	Topic Number	Topic
Background	1.	Principle of Development
	~~2.~~	~~Statutory Consultation~~
Relevant ES Chapter	~~3.~~	~~Assessment of Alternatives~~
	4.	Environmental Impact Assessment Methodology
	~~5.~~	~~Air Quality~~
	~~6.~~	~~Noise and Vibration~~
	7.	Biodiversity
	8.	Road Drainage and the Water Environment
	~~9.~~	~~Landscape and Visual~~
	~~10.~~	~~Geology and Soils~~
	~~11.~~	~~Cultural Heritage~~
	~~12.~~	~~Materials and Waste~~
	~~13.~~	~~Population and Human Health~~
	~~14.~~	~~Climate~~
	~~15.~~	~~Assessment of Cumulative Effects~~
Other Topics	~~16.~~	~~Engineering Design~~
	~~17.~~	~~Draft Development Consent Order~~
	~~18.~~	~~Land~~
	19.	Environmental Management Plan
	20.	~~Construction Traffic Management Plan~~

4. Matters Agreed

4.1.1. Table 4-1 shows those matters which have been agreed, including the matter reference number, and the date and method by which it was agreed. Topics struck through have had no matters raised throughout engagement with the EA as not relevant to their statutory functions.

Table 4-1 - Matters agreed between the Applicant and EA

Matter Reference number	Position	Date and method of agreement
~~1. Principle of Development~~		
~~2. Statutory Consultation~~		
~~3. Assessment of Alternatives~~		
4. Environmental Impact Assessment Methodology		
4.1	Water Framework Directive (WFD) At PEIR stage, the EA had concerns regarding the cited guidance (PIER section 8.5.9 and elsewhere) presented in the DMRB LA 113. Whilst Q95flow is an indicator of the likely importance of a watercourse and being Main River can be a surrogate for size and importance it is not necessarily the case that being an ordinary watercourse means it is of less importance. In this instance there is a correlation but in many parts of the area and County, and the country as a whole, ordinary watercourses can be of as high or high importance hydromorphologically and ecologically as main river. Main River being a function of flood risk and serving only to clarify where the EA has permissive powers to maintain watercourses for flood risk management purposes. Similarly, the WFD designation of a stretch of watercourse does not mean that that is the only reach or part of the catchment that is relevant for consideration in a WFD assessment but is a proxy, largely for monitoring and reporting purposes for the other controlled waters in the waterbody or catchment. The Applicant acknowledges the potential limitations of the guidance in this context, however LA 113 is part of the overall DMRB guidance and therefore has been applied appropriately. Further clarification and assessment will be undertaken as part the ES/WFD assessment and discussed further as part of the Statement of Common Ground.(12.05.2022). Additional explanation has been added to the ES to outline that, although there are limitations to the DMRB LA113 method, in this instance, the method is appropriate and accurately identified importance (13.01.2023).	Agreed via EA review 24.05.2024

Matter Reference number	Position	Date and method of agreement
	Following a meeting on 24.05.2024, the EA are satisfied with the approach used to determine watercourse importance and sensitivity provided professional judgement was also utilised, in addition to the DMRB LA113 guidance, following the 2019 and 2022 site visits described in Section 8.6.1 of the Road Drainage and Water Environment chapter within the ES. (Matter Agreed) 24/05/24.	
~~5. Air Quality~~		
~~6. Noise and Vibration~~		
7. Biodiversity		
7.1.	The Biodiversity chapter of the PEIR provided a thorough and detailed initial account of the main environmental issues. However, whilst some effects have been avoided, reduced or mitigated the range of mitigation measures considered to offset the identified environmental effects on the aquatic environment have been underestimated. Ref WE4 in the Register of Environmental Actions and Commitments (REAC) [APP-137] details mitigation measures with regards to the river Chelt Bridge, along with other measures such as in-channel enhancements (e.g. woody debris and morphological features). The following Refs WE5, WE6 and WE7 also mention bank reprofiling, and that culvert lengths will be kept to a minimum. The Applicant therefore considers that the Environment Agency's involvement in the process of detailed design is sufficiently controlled for this element of the Scheme. The EA are satisfied that the Applicant has included enough mitigation measures to offset the environmental effects on the aquatic environment. However as per the REAC, the EA should be consulted following confirmation of bank protection measures.	Matter agreed via EA review 07.06.2024.
7.2.	West Cheltenham Link Road River Chelt Bridge A single span structure is the preferred type of crossing to minimise impact on the water environment if designed appropriately. The EA welcome the clear span structure with no mid channel features with reduced interactions during the operational phase with the river bed and banks. However within the PEIR, there were conflicting descriptions of the geometry of the bridge in relation to the river. Whilst there will not be the direct permanent habitat loss and significant habitat severance associated with the culverting of the other watercourses there is potential for changes to riparian and associated flood plain quality and as well as water body hydromorphology leading to changes in river processes and habitats upstream and downstream. The Applicant has confirmed the structural dimensions of the proposed bridge (12.05.2022). The Applicant also acknowledged that based on indicative cross sections, the EA have requested greater variety in bank top to bank	Matter agreed via EA review 07.06.2024.

Matter Reference number	Position	Date and method of agreement
	top width to create a more geomorphologically interesting channel. At this time the drawings shared are concept plans and further work will be incorporated at that point to support detailed design (13.01.2023). At a meeting held on 05.06.2024, the Applicant confirmed that ref WE4 in the REAC details the geometry of the River Chelt bridge, therefore the EA are satisfied that there are no conflicting descriptions with regards to the bridge geometry. Refs WE3 to WE9 mentions measures to avoid deterioration to hydromorphology and ref WE15 states that works in the floodplain will be minimised as far as possible. Therefore, the EA are also satisfied that changes to riparian and flood plain quality and hydromorphology have been adequately addressed.	
7.3.	Section 5.4.39 of the PEIR referred to advice from the EA indicating that a 4m easement on the south bank and a 2m easement on the north bank would be acceptable for their regulatory requirements. However, this would represent a significant compromise ecologically and geomorphological and may necessitate bank protection. Whilst a reduction of easement width to below 8m to help reduce the span, supported by a small layby to allow operatives to pull off the road to safely access may be necessary, the operating principal is the wider it can be the better for the environment. The Applicant confirmed that the proposed bridge will have a clear span of 24.8m to allow for a clear crossing of River Chelt with a minimum abutment offset from top of bank of 4m. The offset of the structure will provide a wildlife corridor and general through access in the permanent condition. The total bridge deck width is 20.8m to accommodate the single carriageway road and separated active travel route. The minimum deck soffit clearance to high ground level is 2.8m at 31.04m AOD, with the highest solid feature (top of parapet upstand) proposed at 32.82m AOD (12.05.2022) . The design has since developed and there is a requirement to look into inclusion of bank protection under the single span structure due to potential for erosion and risk to the crossing. In the draft ES, the worst case scenario has been assessed which includes rip-rap bank protection. Further investigation is required at the detailed design stage to determine the need for bank protection and the requirements of that bank protection. Endeavours will be made to soften this bank protection to green infrastructure. (13.01.2023). Following the EAs review of the DCO application, the matter has been agreed (24.05.2024).	Matter agreed via EA review 24.05.2024.
7.4.	Within the Biodiversity chapter of the PEIR, Section 7.6.16, wildlife crossings made reference to otter ledges to be installed on both sides of the River Chelt bridge, along the Link Road. The EA queried whether these are to be attached to the structure above the height of the flood levels in addition to the natural bank. As maintaining a bankside strip will additionally act as a mammal easement below the Link Road in most river level conditions. As part of any additional design measures higher level mammal passage may be required below the roadway..	Matter agreed via EA review 24.05.2024.

Matter Reference number	Position	Date and method of agreement
	The Applicant confirmed that the requirement for otter ledges under the River Chelt bridge has been reviewed since the production of the PEIR. As the land either side of the River Chelt underneath the bridge are not expected to flood (these areas are modelled to remain dry in the 100yr flood event (with allowance for climate change)), then otter ledges in this location are considered as no longer required and have been removed from the current design.(12.05.2022). An underpass has been included in the design to the south of the River Chelt, within 50m of the watercourse, designed specifically for otters but with the capacity to be used by other species. This is located above possible flood levels. (13.01.2023). Following the EA review of the DCO application, the matter has been agreed (24.05.2024).	
7.5.	The EA strongly supported landscape plans provided within the PEIR and other embedded measures designed to encourage use of these features and prevent otters from accessing the carriageway. The EA advocated an acknowledgement that otters also travel overland particularly along ditches and hedgerows and the increase in complexity and hazards as a result of the scheme and associated developments leads to some residual risk. The Applicant confirmed that numerous underpasses/features suitable for use by otters have been incorporated into the design along the Link Road, and otter proof fencing will prevent access to the carriageway. The underpass beneath the A4019 will provide a safe route for otters and other species to cross this road and the otter ledge that will be retrofitted to the existing M5 culvert over the River Chelt will provide safe passage to otters at times of flood. Combined, these measures will ensure that otters can safely move through the landscape. (13.01.2023). Following the EAs review of the DCO application, the matter has been agreed (24.05.2024).	Matter agreed via EA review 24.05.2024.
7.6.	Enhancements to aquatic habitats Section 7.7.58. of the Biodiversity chapter within the PEIR acknowledged there are potential opportunities for enhancements to aquatic features across the Scheme, which will contribute to any biodiversity net gain targets and may contribute to the SNAs. The EA would welcome more detail on this aspect. The Applicant confirmed that additional detail would be added to the mitigation strategy as part of the landscape plans, WFD assessment and ES. This detail would also be shared with the EA as the design develops. (12.05.2022). There are plans in place to develop a wetland area which has now been included as part of the dDCO submission. Aquatic and terrestrial ecologists, hydro geologists and flood risk experts have collaborated to determine the conceptualisation of this wetland area (13.01.2023). Following the EAs review of the DCO application, the matter has been agreed (24.05.2024).	Matter agreed via EA review 24.05.2024.

Matter Reference number	Position	Date and method of agreement
7.7.	Section 7.7.59. of the Biodiversity Chapter of the PEIR stated that opportunities to enhance and restore sections of the River Chelt may have been available within the redline boundary. The EAs assessment was that an element of river restoration was required to mitigate the impacts of the scheme and on top of that improvements to watercourses and riparian condition to align with WFD status objectives are essential. Additional detail would be added to the mitigation strategy as part of the landscape plans, WFD assessment and ES. It is the applicants understanding that the area assigned for mitigation measures (100m upstream and downstream of crossings on the River Chelt) would be sufficient to align with WFD legislation. This area would include bank rehabilitation, riparian improvements, and enhancements to the in-channel morphology. These measures have been incorporated into the BNG assessment which has determined >10% BNG for the Rivers and Streams assessment. If the Biodiversity Net Gain (BNG) target of 10% cannot be met within this reach, opportunities will be investigated off site. However, it is not anticipated that a net gain would drop below 10%(13.01.2023). Following the EAs review of the DCO application, the matter has been agreed (24.05.2024).	Matter agreed via EA review 24.05.2024.
7.8.	Elsewhere within the PEIR there was reference to improving in-channel and riparian habitat diversity, bank re-profiling, riparian planting and removal of invasive species (namely Himalayan balsam). the EA noted that the redline boundary had been extended 100m upstream and downstream of the two River Chelt crossings to allow for enhancements along these sections of channel. The EA recommended an extension to this boundary particularly with respect to net gain. Following early consultation with the EA the redline boundary was extended beyond normal best practice. This provided sufficient space for meaningful mitigation measures to be applied, including bank rehabilitation, riparian improvements and enhancements to the in-channel morphology. Further extensions to the redline boundary would require further justification and clarifications from the regulator. Further extension of the redline boundary is not expected to be required to achieve our biodiversity net gain(12.05.2022). With the preliminary Scheme design and mitigation measures, the Scheme can achieve a net gain of >10% for Rivers and Streams. This is subject to change at detailed design (i.e., confirmation of the bank protection design on the River Chelt); however, it is not anticipated that a net gain would drop below 10%. (13.01.2023) The biodiversity chapter of the ES discusses preventing the spread of Himalayan balsam to ensure compliance with legislation. All recommendations are contained within the REAC. (13.01.2023) Following the EAs review of the DCO application, the matter has been agreed (24.05.2024).	Matter agreed via EA review 24.05.2024.

Matter Reference number	Position	Date and method of agreement
7.9.	Severn Estuary SAC/SPA/Ramsar Although the Severn Estuary SPA, SAC and Ramsar site boundary is 23km south-west of the Scheme it is important to capture the distance downstream to confluence with the tidal Severn River Chelt, Leigh Brook, and River Swilgate) running from east to west, before draining into the River Severn (at least 7.5km downstream of the Scheme). This has been captured in the Biodiversity chapter paragraph 7.5.4 as well as in the HRA (PEIR Appendix 7.13) The HRA was submitted with the ES (application document: TR010063 - APP 6.15) to the biodiversity chapter. Following the EAs review of the DCO application, it has been agreed that Natural England will lead on this decision, and the matter has been agreed (24.05.2024).	Matter agreed via EA review 24.05.2024.
7.10.	Fish The importance valuation of the River Chelt in section 7.5.145 of the PEIR did not refer to the native brown trout that reside in the river. The WFD assessment submitted with the PEIR makes reference to EA fish monitoring sites which have been surveyed within the last 10 years where bullhead, three-spined stickleback, brown trout and European eel were found and acknowledges that the species present are considered to be important. The European eel being a Critically Endangered species on the International Union for Conservation of Nature (IUCN) Red List of Threatened Species (2010), species of Principal Importance under section 41 of the Natural Environment and Rural Communities (NERC) Act 2006, and a UK Biodiversity Action Plan (BAP; 2007) priority fish species. Brown trout is a species of principal importance under section 41 of the NERC Act 2006 and a UK BAP (2007) priority fish species. Bullhead is a European Commission Habitats Directive Annex II non-priority species 4 (in section 4.1.35). Additionally, in 2014 during a previous survey, in section 4.1.35. Atlantic salmon are mentioned as being recorded at Site ID 52484. Atlantic salmon is a European Commission Habitats Directive Annex II and V species, a species of Principal Importance under section 41 of the NERC Act 2006 and a UK BAP (2007) priority fish species. Salmon Par have also been caught during fish rescues downstream at Norton prior to a weir removal and subsequent to the removal are expected to be able to migrate upstream. Following the EAs review of the DCO application the matter has been agreed (24.05.2024).	Matter agreed via EA review 24.05.2024.
7.11.	Existing Chelt Culvert under the M5 The EA strongly welcomed inclusion of our suggestion to retrofit an otter ledge within the existing River Chelt culvert beneath the M5, on the opposite side of the footbridge which we consider essential mitigation. The EA note	Matter agreed via EA review 24.05.2024.

Matter Reference number	Position	Date and method of agreement
	that otters currently use the footbridge, but camera footage and observations have identified that it floods. Retro-fitting an otter ledge will provide safe passage during times of flood. An otter ledge is being included in the design in this location and will be reported in the ES. (13.01.2023) Following the EAs review of the DCO application the matter has been agreed (24.05.2024).	
7.12.	Other watercourses Within the PEIR, there were several references to the drainage ditches to be relocated due to encroachment from road widening and embankment and the current plan to replace with like for like habitats. Even though some of these watercourses will not be in water all year it is best practice to replace with an improved physical habitat e.g. with variation in bank slope and improved sinuosity. The details of these replacements in the PEIR refer to them being sown with a wet grassland seed mix of appropriate provenance and to represent geographical context however this will be much more meaningful and significant if the physical habitat is enhanced. Where possible within the Scheme boundary, the physical form of the drainage ditches will be enhanced, including forming some sinuosity and variation in profile. However, these will be largely dry/ephemeral and vegetation will likely dominate, therefore appropriate seeding will be applied. (12.05.2022) Sinuosity has been applied to a small number of ditches within the drainage strategy where space allows. (13.01.2023). Following the EAs review of the DCO application the matter has been agreed (24.05.2024).	Matter agreed via EA review 24.05.2024.

Matter Reference number	Position	Date and method of agreement
7.13.	The description of Morphological enhancements in the PEIR WFD chapter (Scheme wide) 6.3.7. refers Watercourse channels and ditches adjacent to roads have often been modified by previous road building or drainage schemes. Hence, in some instances, the realignment of a channel can present an opportunity to restore channels to a more natural state of ecological function in line with WFD objectives. 6.3.8. As there will be extensive lengths of ditches created as part of the Drainage and Environment Plans, there is potential for enhancement of these features to create a biologically diverse habitat. This will help the attainment of Good through the preservation and restoration of habitats and enhancements to ecology as part of the mitigation measures set out by the EA. This potential does not yet appear to have been realised in the current design iterations. Additional detail will be added to the mitigation strategy as part of the landscape plans, WFD assessment and ES within the dDCO submission. The extent and nature of the plans will be discussed further as part of the Statement of Common Ground.(12.05.2022) Following the EAs review of the DCO application the matter has been agreed, evidence is provided in the plans of new replacement ditches which are presented in Appendix 2.2 (24.05.2024).	Matter agreed via EA review 24.05.2024.
8. Road Drainage and the Water Environment		
8.1.	Incidentally, there are some minor errors in the FRA submitted with the PEIR with respect to description of the current flood alleviation measures in the Chelt for example Dowdeswell reservoir, which is managed by the EA as one of three flood storage areas on the Chelt. The ownership and operation of the Dowdeswell Reservoir have now been updated in the FRA (See paragraph 1.5.5 in application document: TR010063 - APP 6.15). Following the meeting with the EA on 22.04.2024 this matter has been agreed (22.04.2024)	Matter agreed via EA review 22.04.2024.
8.2.	At the PEIR stage, the EA registered concern that, based on the stage of the project at present, they did not consider it includes sufficient river and floodplain restoration in order to mitigate the impacts of the proposed development. As the Environmental Impact Assessment (EIA) of the Scheme progresses and detailed design ensues we are hopeful this will be rectified and realised, however the assessment as it stands does not appear to facilitate the necessary river and floodplain restoration we would expect to see. The Applicant confirmed additional detail will be added to the mitigation strategy as part of the landscape plans, WFD assessment and ES. Following early consultation with the EA the redline boundary was extended beyond	Matter agreed via meeting with the EA on 05.05.2024.

Matter Reference number	Position	Date and method of agreement
	normal best practice to include 100m upstream and downstream of crossings on the River Chelt. This provided sufficient space for meaningful enhancement measures to be applied, including bank rehabilitation, riparian improvements, and enhancements to the in-channel morphology. (12.05.2022). 28.05.2024 the EA indicated the matter was outstanding in relation to Table 4-4 in Appendix 7.18 Biodiversity Net Gain details the proposed enhancements to watercourses impacted by the scheme. However, EA would want to see further enhancements with regards to floodplain restoration, e.g. creation of floodplain meadows as they are "a key part of the relevant National Character Area Profile". Discussions at meeting held 05.06.2024 confirmed that this matter is now agreed on the basis that floodplain meadows require connection to the floodplain, as seasonal flooding is necessary to maintain this habitat type. There are no areas within the Order limits that are connected to the floodplain and would flood regularly enough to be suitable for creation of this type of habitat.	
8.3.	The WFD assessment (APP-108) assumes a clear span structure with a 25m deck width with abutments set back 5m from the river bank tops. The PEIR refers a 24 m wide span with the deck soffit set at least 600 mm above the predicted design flood level of 27.75 m AOD. The abutments will be set back from the river banks by 4m on the north and 8m on the south, permitting access under the bridge on both banks if required. The Applicant confirmed the proposed bridge will have a span of 24.8m to allow for a clear crossing of River Chelt with a minimum abutment offset from top of bank of 4m. The offset will ensure minimum disturbance during construction and provide a wildlife corridor and general through access in the permanent condition. The total bridge deck width is 20.8m to accommodate the single carriageway road and separated active travel route. The minimum deck soffit clearance to high ground level is 2.8m at 31.04m Above Ordnance Datum (AOD), with the highest solid feature (top of parapet upstand) proposed at 32.82m AOD. (12.05.2022) Following the EAs review of the DCO application the matter has been agreed (28.05.2024)	Matter agreed via EA review 28.05.2024.
8.4.	The EA stated that additional mitigation will need to be included in the next stage of design (Following the PEIR) to mitigate impacts on the water environment and reach compliance with WFD and other relevant planning policy. The Applicant confirmed that additional detail will be added to the mitigation strategy as part of the landscape plans, WFD assessment and ES. It is the Applicants understanding that the mitigation proposed as part of the Scheme is sufficient to be compliant with the WFD and other planning policy. (13.01.2023) Following the EAs review of the DCO application the matter has been agreed (28.05.2024)	Matter agreed via EA review 28.05.2024.
8.5.	Table 4-2 - Mitigation measures for the River Chelt - source to M5 water body within the WFD of the PEIR makes reference to potential WFD mitigation measures which are all possible and necessary within and without the	Matter agreed via EA review 28.05.2024.

Matter Reference number	Position	Date and method of agreement
	redline boundary. These include working with physical form and function (e.g. remove obsolete structures, re-engineer river, remove or soften hard banks, improve in-channel morph diversity, bank rehabilitation, re-opening culverts alter culvert channel bed and set-back embankments to restore floodplain connectivity and fish passes). The Applicant confirmed that additional detail would be added to the mitigation strategy as part of the landscape plans, WFD assessment and ES. It is our understanding that the mitigation proposed as part of the PEIR will be sufficient to be compliant with the WFD and other planning policy. The approach to implementation of mitigation measures will be proportionate to the impacts of the Scheme. (12.05.2022). Following the EAs review of the DCO application the matter has been agreed (28.05.2024)	
8.6.	The PEIR FRA chapter 5.1.7 makes reference to many of the River Chelt banks in this area being slightly raised above the local floodplain. In the context of flood risk during construction of the Scheme, that may impact on the works or third party receptors. Lowering of slightly raised levels in the river restoration zone should be factored into the model as a potential means of improving connectivity with the flood plain and bank enhancements. The Applicant confirmed that enhancement measures along the River Chelt will include reprofiling of banks. However, the flood risk implications have been considered and bank levels will not be lowered where there is any potential for increased flood risk.(12.05.2022). Following the EAs review of the DCO application the matter has been agreed on the basis that the banks cannot be lowered as there is flood risk to consider (28.05.2024).	Matter agreed via EA review 28.05.2024.
8.7.	The EA highlighted that the emergency procedure for pollutions, and spills need to be considered in the EMP. The Applicant can confirm that the procedures for containing spillage has been outlined in the EMP 1st iteration and will be developed further by the principle contractor in the 2nd iteration. The Register of Environmental Actions and Commitments (REAC) will also draw down all mitigations and securing mechanisms within the DCO. (13.01.2023). Following the EAs review of the DCO application the matter has been agreed (28.05.2024)	Matter agreed via EA review 28.05.2024.
8.8.	The EA have requested information on the legislation which the project is looking to disapply. The Applicant confirmed that they have not included any disapplication in relation to the Environmental Permitting Regulations or Water Resources Act for which the EA are the consenting body. The EA confirmed the matter is agreed as the Scheme is not disapplying any permits (28.05.2024)	Matter agreed via EA review 28.05.2024.
9. ~~Landscape and Visual~~		

Matter Reference number	Position	Date and method of agreement
10. ~~Geology and Soils~~		
11. ~~Cultural Heritage~~		
12. ~~Materials and Waste~~		
13. ~~Population and Human Health~~		
14. ~~Climate~~		
15. ~~Assessment of Cumulative Effects~~		
16. ~~Engineering Design~~		
17. ~~Draft Development Consent Order~~		
18. ~~Land~~		
19. Environmental Management Plan		
20. ~~Construction Traffic Management Plan~~		

5. Matters Outstanding

5.1. Principal matters outstanding

5.1.1. The principal matters outstanding between Applicant and the EA are presented in Table 5-1 Topics struck through have had no matters raised throughout engagement with the EA as not relevant to their statutory functions.

5.2. Matters outstanding

Table 5-1 - Matters Outstanding

Matters Reference Number	Position of Interested Party	Response	Date of the last position
1. Principle of Development			
1.1.	Within the PEIR section 4.3.2 the scheme, has been defined as “essential infrastructure”. Whilst we consider that this is appropriate to the improvement works to the motorway junction and A4019 link, it could be considered that the West Cheltenham Link Road (the Link Road) is proposed to support future development only, which would fall outside of this definition. We would welcome the relevant Planning Authorities views on this matter in respect to future planning requirements.	The various elements of the Scheme make up a single project, either as part of the main alignment or as associated development. Any works identified as associated development, linked to a DCO, will be treated in the same way as the main DCO during the examination process. In the case of the M5 Junction 10 scheme, the three elements of the road improvements (Junction 10, A4019 and the link road) are all linked and dependent on each other and are considered together as part of the main DCO. The draft DCO comprises each element of the work, including: – Formation of new or improved vehicular or pedestrian access (work sites etc), whether temporary or permanent – Alteration or construction of roads, footpaths and bridleways – Diversion or realignment of watercourses – Construction of new road or foot bridges, and works to reconstruct, alter or replace existing ones	Matter Outstanding: for the Examining Authority to confirm if the Scheme is essential infrastructure. 28/05/24

Matters Reference Number	Position of Interested Party	Response	Date of the last position
		– Highway route/junction improvements (which may provide some benefit to third-party network users as well as users of the principal development) – Relocation of apparatus of statutory undertakers' equipment (mains, sewers, drains, pipes, cables, pylons etc) – Working sites, site offices and laydown areas – Settlement lagoons and surface water balancing facilities As such the Applicant is treating the entire Scheme as essential infrastructure (making up a single DCO) which is required to enable the identified growth in the area. The EA requests that the Examining Authority confirm the Scheme as essential infrastructure, in particular, the classification of the Link Road element of the Scheme which is not part of the SRN (22.04.2024).	
~~2. Consultation~~			
~~3. Assessment of Alternatives~~			
4. Environmental Impact Assessment Methodology			
~~5. Air Quality~~			
~~6. Noise and Vibration~~			
7. Biodiversity			

Matters Reference Number	Position of Interested Party	Response	Date of the last position
7.1.	The Biodiversity chapter of the PEIR provides a thorough and detailed initial account of the main environmental issues. However whilst some effects have been avoided, reduced or mitigated the range of mitigation measures considered to offset the identified environmental effects on the aquatic environment have been underestimated.	The design has since developed and there is a requirement to look into inclusion of bank protection under the single span structure due to potential for erosion and risk to the crossing. In the draft ES, the worst case scenario has been assessed which includes rip-rap bank protection. Further investigation is required at the detailed design stage to determine the need for bank protection and the requirements of that bank protection. Endeavours will be made to soften this bank protection to green infrastructure. (13.01.2023)	Matter outstanding regarding flood risk, a clear span structure over the River Chelt.. 07/06/24
7.2.	Flood storage basin We note within the PEIR FRA Section: 5.4.37, that the storage design was proven in the hydraulic model and it includes for nominal 1 in 3 side slopes around the wetland, It is important that this don't translate into final design and there is stronger commitment to optimise the biodiversity value of this feature with organic planform shape that includes bays, inlets and islands, so promoting a future wetland area with significant excavation below existing ground level proximity of floodplain compensation area to the road junction will impact on its attractiveness to some wildlife.	This will be considered through the development of the design and reported in the ES. An area of farmland to the south east of the motorway junction (referred to as the flood storage area) will be transformed into an area supporting wetland habitats, scrub and species-rich grassland surrounded by woodland planting, whilst also fulfilling its role as a flood storage area. The area will incorporate a permanently wet area, plus ephemeral pools. A channel will link the outfall of the attenuation basin to the Piffs Elm culvert which will regularly refresh the permanent waterbody to avoid stagnation. Although the wetland is incorporated as a 'mitigation measure' under the DMRB methodology, tests have been undertaken that show water quality is sufficiently mitigated prior to entering the wetland due to swales, ditches and basins	Matter Outstanding re: flood risk assessment of the final design will be required. 28.05.2024

Matters Reference Number	Position of Interested Party	Response	Date of the last position
		prior to out falling. Depressions have been designed to include variations in bed topography, with shallow bank slopes to create drawdown zones and marginal shelves. The approach will be to lightly seed the central area with wetland grass species, and plant small amounts of scattered scrub and suitable marginal plants, allowing a degree of natural regeneration. The area will be monitored before a management plan is produced to suit the developing conditions and habitats. (13.01.2023). Requirement 13 of dDCO Flood compensatory storage. Flood compensation will be required during the construction phase to offset the losses. This is described in the Register of Environmental Commitments [AS-027] under item WE17, which states: *"To mitigate the impact of permanent earthworks within the wider floodplain, construction work will be phased so that floodplain storage and compensation areas are constructed prior to loss of floodplain volume to ensure no overall adverse impact".* Compensatory floodplain to offset the volume of water displaced by the Scheme during the design flood, will be implemented prior to the removal of any existing floodplain. This includes a flood storage basin between the M5 motorway and Withybridge Lane (Work No. 7), and two areas of compensatory floodplain	

Matters Reference Number	Position of Interested Party	Response	Date of the last position
		immediately east of the West Cheltenham Link Road (Work No. 5n) and north of the B3634 (Work No. 6d)". (04.06.2024).	
7.3.	Timing with respect to fish. The summary document highlights that construction of the River Chelt bridge will avoid ecologically sensitive periods for fish species e.g. migratory/spawning periods, in particular for European eel. This also needs to take into account the salmonid spawning season "	Key ecologically sensitive periods will be added to the Register of Environmental Actions and Commitments (REAC) which will be secured through the DCO. This includes where possible, works most likely to cause disturbance to migratory species in the River Chelt (i.e., the construction of the new bridge crossing and installation of bank protection associated with the crossing) will be timed to occur outside of the key ecologically sensitive periods for migratory fish species. Due to the range of species potentially present, it may not be practical to avoid all sensitive periods. However, based on the fisheries habitat provision at the crossing and confirmed species presence it is recommended that the migratory and/or spawning periods for European eel, river lamprey and sea/brown trout should be the focus of the timing consideration. It is therefore recommended that February to July and October to November are avoided as they are the key migratory periods for European eel, which also avoids the spawning period for lamprey (March to April), sea trout and Atlantic salmon (peaks in October to November). These periods will be confirmed through ongoing consultation	Matter Outstanding:– The EA require additional information regarding confirmation of construction timing restrictions from Leigh Brook 24.05.24

Matters Reference Number	Position of Interested Party	Response	Date of the last position
		with Natural England and the Environment Agency. Where works during migratory periods are unavoidable, no night-time (taken to be between 30 minutes prior to sunset until 30 minutes following sunrise) vibration work will be undertaken. If night working is essential, minimal and directional lighting will be used. The proposed fish mitigation has been forwarded to the EA on 13.01.2023 for information. (13.01.2023). 05.06.2024 Following consultation with the Environment Agency, additional mitigation has been included within the updated Biodiversity chapter submitted at Deadline 1 (application document: TR010063 – APP 6.5), the WFD assessment (application document: TR010063 - APP 6.15) and the Register of Environmental Actions and Commitments (REAC) (APP-137): B28 as part of Deadline 1 to offset any potential risk to fish as a result of construction of the Barn Farm Culvert extension on the Leigh Brook.	
8. Road Drainage and the Water Environment			
8.1.	As highlighted both embedded mitigations, as highlighted in PEIR paragraph 8.6.29, and any essential (additional) mitigation will need to be based on a sound evidence base. This would take the form of a detailed hydraulic model to support the design works. Matter Outstanding 24.05.24 – require updated modelling to	The Scheme modelling report and hydraulic model has been issued to the EA (March 2022). These items support the Flood Risk Assessment (FRA) and Preliminary Environmental Impact Report (PEIR) The model has been reviewed by the EA,	14.06.2024 Environment Agency have stated that as the scheme is essential infrastructure, it would wish to review the Ordinary Watercourse model.

Matters Reference Number	Position of Interested Party	Response	Date of the last position
	be reviewed by the EA post 2022. Whilst we are happy with the baseline and with scheme models and the statement in red, a second model has been developed, the results of which are described in the Flood Risk Impacts Technical Note TR010063. This describes modelling which was undertaken to understand flood risk from the ordinary watercourse at the southern end of the West Cheltenham link road. The Environment Agency have not seen or commented on this modelling. The Environment Agency have only reviewed the baseline and with scheme models for the River Chelt and Leigh Brook. Whilst the detail presented in the Flood Risk Impacts Technical Note (TR010063) is reasonable there is not enough information available to verify if the findings and the results presented in the Flood Risk Impacts Technical Note are accurate. In principle the EA should review this modelling, It appears that there is an outstanding matter regarding the review of this modelling.	which has approved its use. However, the EA has requested the detail of the storage before it can formally agree to the proposed mitigation for flood risk. It was also requested that any future updates to the model should be noted in the appendices of the modelling report (13.01.2023) 22.04.2024 A sound evidence base has been provided through the flood modelling which has been reviewed and accepted by the Environment Agency. This is documented in the Baseline and Scheme modelling reports which are appended to the Flood Risk Assessment (FRA). The FRA covers the preliminary design. As described in the FRA, the detailed design will be proven against the metrics described in the FRA post DCO and is a task for the Construction stage. 05.06.2024 The Lead Local Flood Authority (LLFA) has reviewed and approved the development and output of the ordinary watercourse model produced in 2022 for the stream to the south of the West Cheltenham Link Road. It is the Applicants understanding that the EA would not be required to review the model as they are not the regulatory authority for ordinary watercourses including this one. Hence the EA was not engaged in this matter. Conversely on the Leigh Brook, the LLFA previously deferred to the EA, given its proximity and relevance to the	

Matters Reference Number	Position of Interested Party	Response	Date of the last position
		River Chelt. 14.06.2024 The Environment Agency have reviewed their internal guidance regarding reviewing models for flood risk assessments (LIT 14594), which indicates that the Environment Agency should undertake a detailed review of the model given that the development is classed as essential infrastructure.	
8.2.	If the sequential test is deemed to have been passed then, as the link road will cross all flood zone designations, it is felt that both parts of the exception test would also need to be passed as set out in paragraphs.	Agreed that both parts of the exception test need to be met, being wider sustainability benefits to the community; and the scheme being safe over its lifetime. The FRA covers the latter point. The first point (wider benefits to the community) is described within the Scheme objectives and the details on the purpose of the Scheme (Chapter 1 of the PEIR). (12.05.2022). 22.04.2024 See item 8.3 for Sequential Test. The Applicant agrees that the exception test needs to be passed and the FRA has sought to address this. . 05.06.2024 The development and output of the ordinary watercourse model (8.1) has been reviewed and approved by the LLFA and considered fit for purpose. 14.06.2024 The Environment Agency have reviewed	14.06.2024 Environment Agency have stated that as the scheme is essential infrastructure, it would wish to review the Ordinary Watercourse model.

Matters Reference Number	Position of Interested Party	Response	Date of the last position
		their internal guidance regarding reviewing models for flood risk assessments (LIT 14594), which indicates that the Environment Agency should undertake a detailed review of the model given that the development is classed as essential infrastructure.	
8.3.	If part one of the test is felt to outweigh the presence of a vulnerability use not defined as essential infrastructure which is partially located in Flood Zone 3b, as this would be unavoidable as a result of the sequential test decision, then the exception test must be passed."	If the Scheme is reclassified as being Highly Vulnerable, then its presence in Flood Zone 3 is not compatible. However, by virtue of its location and the sequential test, this comment indicates that the Exception Test would still need to be passed, which is in line with our expectations too. (12.05.2022). 22.04.2024 FZ3b is now 1 in 30yr event which reflects the overland flow from the River Chelt to the M5. At the time of modelling this was the 1 in 20yr flood, and there was no functional floodplain FZ3b. The Flood Risk Assessment (FRA) describes the Scheme as Essential Infrastructure, based on it being transport infrastructure with junctions to the existing SRN road network, as well as a Nationally Significant Infrastructure Project (NSIP). The Applicant agrees that the exception test needs to be passed and the FRA has sought to address this. Matter to be resolved. Examining Authority to confirm the Scheme Vulnerability under the NPPF.	14.06.2024 Environment Agency have stated that as the scheme is essential infrastructure, it would wish to review the Ordinary Watercourse model.

Matters Reference Number	Position of Interested Party	Response	Date of the last position
		05.06.2024 The development and output of the ordinary watercourse model (8.1) has been reviewed and approved by the LLFA (pers comms Siret-Vaughan 5 August 2022). 14.06.2024 The Environment Agency have reviewed their internal guidance regarding reviewing models for flood risk assessments (LIT 14594), which indicates that the Environment Agency should undertake a detailed review of the model given that the development is classed as essential infrastructure.	
8.4.	As set out in Chapter 5 of the PEIR FRA - managing flood risk, should be based on the hierarchy set out within table 5.1, with the emphasis being on Avoidance/Prevention through appropriate design and location rather than relying on significant mitigation or other interventional measures to provide a truly sustainable scheme. The failure to follow this way of delivering new development is highlighted within paragraph 5.19 of the report.	The approach taken has been to avoid areas of predicted flooding where technically possible. Through the embedded mitigation, built by default into the Scheme, detrimental impacts to flood risk are avoided. As the inclusion of flood culverts and flood storage/attenuation was part of the initial design, these control measures in effect prevent adverse effects on flood risk. Refers to Para 5.19 as being a factual admission of worst case impacts. The Scheme modelling report (issued in March 2022) includes a test on the impacts of the Scheme without some of the embedded mitigation to further evidence the need for mitigation. (12.05.2022) 22.04.2024 Discussions at meeting confirmed that the	Matter Outstanding 24.05.2024

Matters Reference Number	Position of Interested Party	Response	Date of the last position
		embedded mitigations for flood risk is based on the flood risk hierarchy and is described in the Flood Risk Assessment (FRA) in its Chapter 5.	
8.5.	Additionally, the principles set out in section 5.4.3 of the PEIR FRA are also crucial in minimising impacts during the construction phase and need to be considered fully prior to final development boundaries being set.	The Buildability Report provides some further information on how this Scheme might be constructed. Requirements to the Contractor will be set out in the REAC and the Environmental Management Plan (EMP) 1st iteration, that will be produced as part of the Environmental Statement (ES) and secured through the DCO. (12.05.2022). Discussions at meeting held on 22.04.2024 clarified that the dDCO Requirement 3 is the securing mechanism which requires the contractor to adhere to the EMP 1st iteration. An EMP 2nd iteration will be prepared by the contractor. 05.06.2024 - Identified that REAC commitment WE15 has identified the mechanisms in which flood risk during construction will be mitigated.	Discussion on 05.06.2024: requirement for construction phase flood risk, as per REAC, to be agreed with flood risk specialist at Environment Agency
8.6.	However, we would highlight the need to fully understand the groundwater regime in the area of the wetland compensation scheme, to avoid this area being full prior to out of bank fluvial flows reaching the feature meaning the proposals would not meet the design concepts outlined in the PIER or FRA, this is deemed a potentially significant issue to providing appropriate mitigation.	Ground investigations (GI) in the area of the flood storage have been undertaken. The factual and interpretative information demonstrate that the ground is highly impermeable and will not be subject to significant groundwater ingress. However, the GI did find isolated and localised lenses of gravels near the southern boundary of the proposed storage area. There may be some intrusion, or infiltration, through these	05.06.2024 EA to review Groundwater Technical note following Deadline 1.

Matters Reference Number	Position of Interested Party	Response	Date of the last position
		lenses through the excavated edge of the flood storage area. This has been calculated to be of negligible flow which would pass straight through the storage area and out through the Piffs Elm culvert. We do not perceive any loss of the available storage volume through accumulation of groundwater. (13.01.2023) As such, the flood storage will remain available for overland flow and fluvial storage. 22.04.2024 The groundwater impact on the flood storage solution is described in the Flood Risk Assessment (FRA): see its Chapter 5 paragraphs 5.4.41 to 5.4.43. Matter to be resolved. 05.06.2024 The groundwater technical note has been issued as part of Deadline 1 for EA review, see Appendix B.	
8.7.	Any solution for the crossing of the Link Road through the Chelt flood plain as highlighted in sections 5.4.42 to 5.4.48 of the PEIR FRA, should take account of the extents of Flood Zone 3b, where an open viaduct structure should be considered to meet the avoidance principles set out in table 5.1 (PEIR FRA).	The Link Road structures are described in the Scheme modelling report (issued March 2022). Testing has been undertaken to evaluate the size of conveyance structures and optimise the balance between a zero afflux structure and something smaller and its adverse impacts upstream. This follows the hierarchy of flood risk management taking into account the wider social, environmental and economic factors in the design. Further testing was undertaken to establish the location of the floodplain	24.06.2024 EA to review FZ3b figure following Deadline 1.

Matters Reference Number	Position of Interested Party	Response	Date of the last position
		crossing in relation to the overland flow paths.(12.05.2023) 24.06.2024 The Applicant has appended the Flood Zone 3b figure within Appendix A of this document.	
8.8.	We agree with 6.2.6. of the WFD submitted with the PEIR where it states it will be designed and constructed in such a way as to minimise disruption to the river and riparian zone with abutments being set well back from the bank edge to allow the river to function naturally and to maintain a wildlife corridor along the banks. Where practically possible the bridge deck should run perpendicular to the watercourse (to reduce shading). Bed and bank protection should only be used where a real risk to life or critical infrastructure is apparent.	The layout of the new River Chelt Bridge is predominantly dictated by the proposed alignment of the Link Road, which crosses the river on a skew. A square (perpendicular) crossing was considered in the early stages but was found to only reduce the bridge span by around 1m, with greater negative impacts to the surrounding land due to reprofiling of the highway in order to achieve a square approach. There is a possibility that bank protection will be necessary to reduce the risk of erosion due to vegetation loss under the structure. This is being considered to determine requirements and outline if there are any alternate solutions. It is likely that the details of the bank protection will be determined at detailed design stage. (12.05.2022) The design has since developed and there is a requirement to look into inclusion of bank protection under the single span structure. In the draft ES, the worst-case scenario has been assessed which includes rip-rap bank protection. Further investigation is required at the detailed design stage to	The EA would want to see final design details for the proposed bank protection under the River Chelt Bridge, as the Applicants comment on the SoCG on 13.01.23 suggests that the Applicant is still deciding whether to use hard or soft engineering 28.05.24.

Matters Reference Number	Position of Interested Party	Response	Date of the last position
		determine the need for bank protection and the requirements of that bank protection. Endeavours will be made to soften this bank protection following further assessment. (13.01.2023). 05.06.2024 - REAC commitment WE4 outlines that the EA will be consulted on the designs for the bank protection.	
8.9.	The EA maintains the view that it is not yet possible to scope out/prevent the future attainment of Good status. (Test B). The WFD submitted with the PEIR 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.	The Highways Agency Water Risk Assessment Tool (HAWRAT) (DMRB LA 113) has been used to determine whether the risk to the receiving surface water receptors water quality is acceptable and whether any surface water receptors require mitigation through three assessments: • Assessment of acute impacts from soluble pollutants. • Assessment of chronic impacts due to sediment related pollutants. • Compliance with Environmental Quality Standards (EQS) for dissolved copper and dissolved zinc. A pass for these three assessments demonstrates that the Scheme adequately mitigates against potential impacts on water quality and will therefore pass Test B. The Applicant acknowledges the EA's concerns regarding emergency cut-offs in the event of an incident on the highway. The Applicant can confirm that shutoff penstocks	EA to review updated Chapter 8 following Deadline 1 submission.

Matters Reference Number	Position of Interested Party	Response	Date of the last position
		have been incorporated for each basin with the specific details of these being developed at detailed design stage. (13.01.2023) 05.06.2024 The wording has been updated in section 8.7.48 to state that the drainage catchments would provide containment for a potential spillage. This update is submitted as part of Deadline 1.	
8.10.	The existing M5 crossing on the River Chelt is assumed to be embedded due to the presence of gravel and silt substrates through the culvert). Elsewhere there is reference to the potential need to clear this material. We request that model runs including blockage runs include this sediment and high channel roughness to ascertain if the natural substrate can be retained in the long term to maintain habitat continuity and quality and reduce or remove unsustainable ongoing management and disposal of material to a minimum.	The flood modelling undertaken for this Scheme is not based on the assumption that sediment has been removed; we agree that sediment and natural substrate should be kept in place.(12.05.2022) 22.04.2024 Blockage runs of the Scheme flood model (and Baseline) have been undertaken to examine the impact of blockage. These are documented in the modelling reports. The natural substrate is being retained in the River Chelt culvert under the M5. 05.06.2024 Outlined that the LLFA have reviewed and approved the ordinary watercourse model. The LLFA also raised a query regarding blockage runs and the applicant has provided the following response: as the single culvert will be replaced with three larger culverts, the risk as a result of blockage will be reduced compared with the baseline.	Discussion on 05.06.24: requirement for blockage runs on ordinary watercourse model to be agreed with flood risk specialist at EA having had LLFA acceptance.

Matters Reference Number	Position of Interested Party	Response	Date of the last position
~~9. Landscape and Visual~~			
~~10. Geology and Soils~~			
~~11. Cultural Heritage~~			
~~12. Materials and Waste~~			
~~13. Population and Human Health~~			
~~14. Climate~~			
~~15. Assessment of Cumulative Effects~~			
~~16. Engineering Design~~			
~~17. Draft Development Consent Order~~			
~~18. Land~~			
19. Environmental Management Plan			
19.1.	The EA would also require details such as the location of work compounds, location of temporary spoil storage areas, details of the phasing works and a flood warning/evacuation procedure to all be included with the supporting details for any planning application. This may avoid the need for both parties to duplicate the same work to obtain separate permissions under the Environmental Permitting Regulations 2016.	Further details will be provided as part of the Environmental Statement. The item on flood warning/evacuation procedure will be covered at a high level within the EMP 1st iteration which will be produced as part of the ES. However, it is expected that the Contractor will address this specifically as part of their activities and provide more detail as part of the DCO requirements discharge process. (12.05.2022) 22.04.2024 An assessment and advice on construction phase methodology and approaches are outlined in the Flood Risk Assessment	05.06.2024 – discussed at meeting. REAC commitment WE15 states requirements for specific temporary floodplain compensation will be determined by detailed flood risk modelling.

Matters Reference Number	Position of Interested Party	Response	Date of the last position
		(FRA) and the 1st iteration EMP, and requirements of the Contractor are set out in the REAC. The DCO does not disapply the Environment Agency permitting requirements. Further detail will be prepared post DCO. Temporary Flood Risk Activity Permit (under the Environmental Permitting Regulations 2016) will be required. The detailed modelling will be a requirement of the temporary construction phase FRAP (under the Environmental Permitting Regulations 2016). Matter to be resolved on acceptance of update to the REAC submitted at Deadline 1.	
~~20. Construction Traffic Management Plan~~			

Appendices

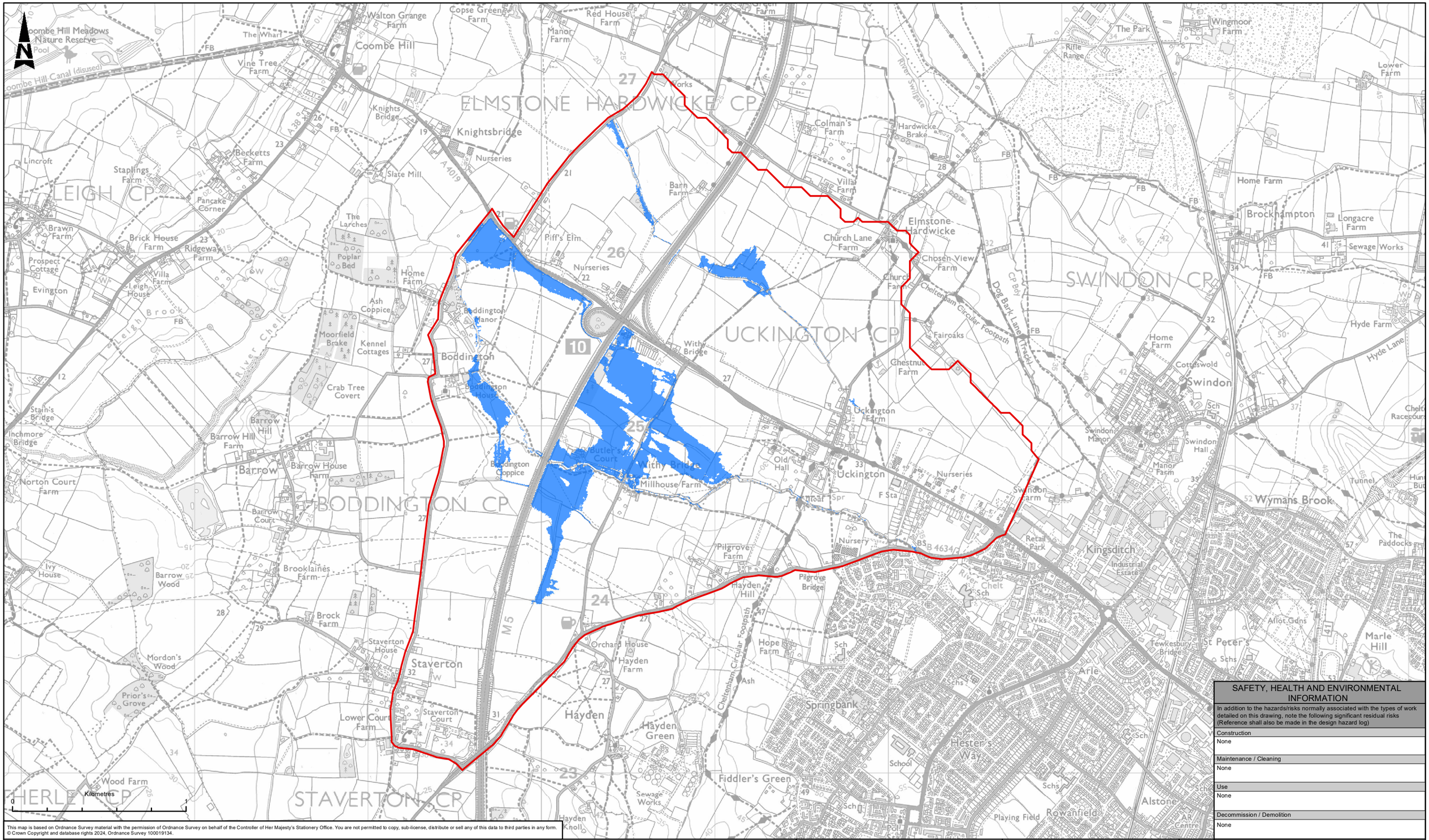
Appendix A. Extents of Flood Zone 3B

A.1.1. Flood zone 3b (FZ3b) is defined by the Environment Agency as the functional floodplain. Once the 5% annual exceedance probability event (1 in 20-year return period), the definition was updated by the Environment Agency in August 2022 to reflect the 3.3% annual exceedance probability event (1 in 30-year return period). The zone describes land where water has to flow or be stored in times of flooding.

A.1.2. Local planning authorities identify areas of functional floodplain in their Strategic Flood Risk Assessments (SFRA), in agreement with the Environment Agency, which are then used to support their Local Plans. However, the SFRA covering this area (Gloucester, Cheltenham & Tewkesbury Joint Core Strategy – Strategic Flood Risk Assessment for Local Development Framework Level 2, FINAL REPORT. October 2011) does not indicate the presence of FZ3b in the area of the Scheme. This does not mean that FZ3 was not present at the time, just likely that it was not mapped.

A.1.3. The hydraulic modelling prepared for the baseline conditions on this Scheme did identify the 5% annual exceedance probability event (1 in 20-year return period) event, and this is provided in the baseline modelling report (AS-047), being reflective of FZ3b at the time of the work.

A.1.4. We have now applied the 3.3% annual exceedance probability event (1 in 30-year return period) event to the model to specifically identify the floodplain equivalent to the updated FZ3b. This is indicated in the figure below – see Figure 1: Flood Zone 3b (3.3% annual exceedance probability event (1 in 30-year return period)).



LEGEND

MODEL DOMAIN

1 IN 30 YEAR RETURN PERIOD

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	KS	NJ	CC	TT	12/06/24

Drawing Suitability: **PUBLISHED**

Status: **A1**

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SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Project Title: M5 Junction 10 Improvements Scheme

Drawing Title: FIGURE 1
FLOOD ZONE 3B (3.3% ANNUAL EXCEEDANCE PROBABILITY EVENT (1 IN 30-YEAR RETURN PERIOD))

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EWE
ZZ - GS - GI - XXXXXX
Location | Type | Role | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
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Appendix B. Groundwater Technical Note

AtkinsRéalis

Gloucestershire COUNTY COUNCIL

Technical Note

Project:	M5 Junction 10 Improvements Scheme		
Subject:	Groundwater Technical Note		
Author:	Lucinda Hardisty	Reviewed by:	Jo Nicholls
Approved Date:	11/06/2024	Approved by:	Mike Vaughan

1. Aims

1.1.1. A compensatory flood storage area (CFSA) is being planned as part of the M5 J10 planned upgrade works. The current proposal is to design the CFSA so as to provide additional beneficial wetland habitat. The Environment Agency (EA) have provided comments on the proposal: "we would highlight the need to fully understand the groundwater regime in the area of the wetland compensation scheme, to avoid this area being full prior to out of bank fluvial flows reaching the feature meaning the proposals would not meet the design concepts outlined in the PIER or FRA, this is deemed a potentially significant issue to providing appropriate mitigation".

1.1.2. This means that the hydrogeological regime in the area of the proposed CFSA needs to be understood. If the CFSA receives groundwater inflow then it may potentially reduce the capacity to accept the required overland flow of flood water. At present, the wetland is proposed to be a maximum depth of 3 m and minimum of 1.5 m[1].

1.1.3. This memo summarises the shallow hydrogeological conditions of the M5 J10 in the vicinity of the proposed CFSA. This has been investigated by reviewing results of intrusive ground investigation (boreholes, trial pits and in-situ testing) and subsequent groundwater monitoring in the area of interest. The questions that are addressed are:

- What is the underlying geology in the area of the proposed CFSA – both mapped and encountered?
- Is there groundwater observed? If so, where (i.e. shallow superficial, bedrock)?
- If groundwater is observed, what is the groundwater flow direction, what is an estimate of the flow rate and what is the likely volume of groundwater in the base of the excavated CFSA.

2. Data

2.1.1. BGS 1:50k mapped bedrock and superficial geology is shown in Figure 1.

2.1.2. Ground investigation has been undertaken across the M5 J10 proposed works area, including the area in and around the proposed CFSA. Figure 2 shows the locations of all ground investigation within the M5 J10 study area and Table 1 summarises the intrusive ground investigation undertaken within the area of the proposed CFSA (application document TR010063 – APP 6.15).

[1] Pers Comms. M Vaughan (email corres.) 31/03/2022

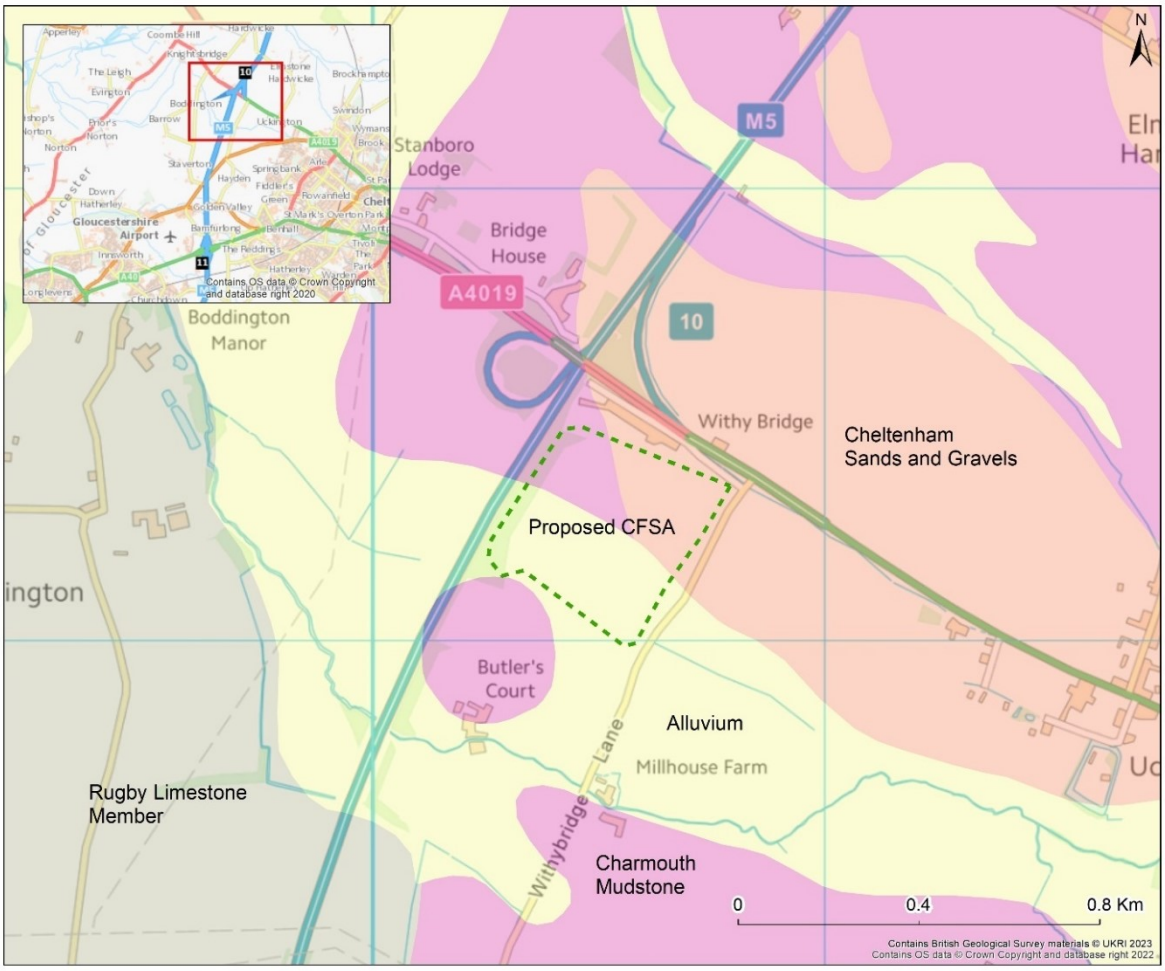

Figure 1– Mapped bedrock and superficial geology (1:50k) with proposed CFSA (green dash box)

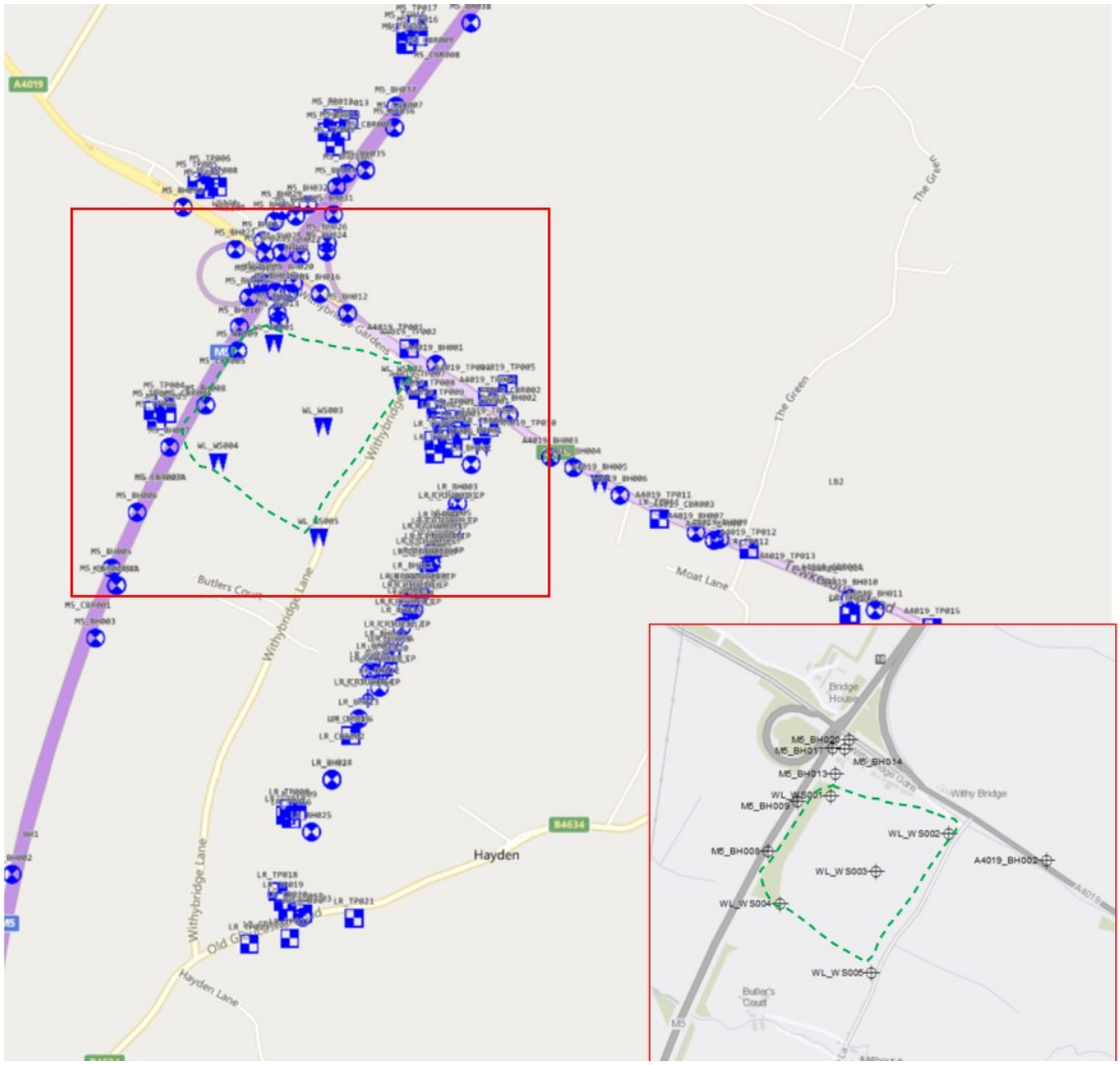

Figure 2– Intrusive ground investigation locations at M5 J10

Table 1 - Summary of available ground investigation data within proposed CFSA

Borehole ID	Easting	Northing	Is there a borehole log available?	Is groundwater level monitored?	What is the formation being monitored?
A4019_BH002	391060	225237	Yes	Yes	Cheltenham Sands and Gravels & Charmouth Mudstone
M5_BH008	390262	225263	Yes	No	N/A
M5_BH009	390347	225406	Yes	No	N/A
M5_BH011	390451	225504	Yes	No	N/A
M5_BH013	390456	225485	Yes	No	N/A
M5_BH014	390482	225557	Yes	Yes	Weathered Charmouth Mudstone
M5_BH017	390447	22559	Yes	No	N/A
M5_BH020	390494	225582	Yes	No	N/A
WL_WS001	390443	225423	Yes	No	N/A
WL_WS002	390780	225314	Yes	Yes	Alluvium & Weathered Charmouth Mudstone
WL_WS003	390571	225205	Yes	No	N/A
WL_WS004	390295	225113	Yes	Yes	Alluvium & Cheltenham Sands and Gravels
WL_WS005	390559	224914	Yes	No	N/A

3. Geology and hydrogeology

3.1. Mapped vs encountered geology

3.1.1. Based on 1:50k mapping, M5 J10 is located on the Charmouth Mudstone Formation. Designated as a Secondary Aquifer[2], it only provides groundwater for local water supply[3]. Mapped superficial deposits are comprised of Alluvium and Cheltenham Sands and Gravels and are mapped (Figure 1) at 1:50k scale as two units trending NW-SE.

[2] DEFRA (2023) https://magic.defra.gov.uk/magicmap.aspx
[3] Environment Agency (2023) https://www.gov.uk/government/publications/protect-groundwater-and-prevent-groundwater-pollution/protect-groundwater-and-prevent-groundwater-pollution#geological-characteristics

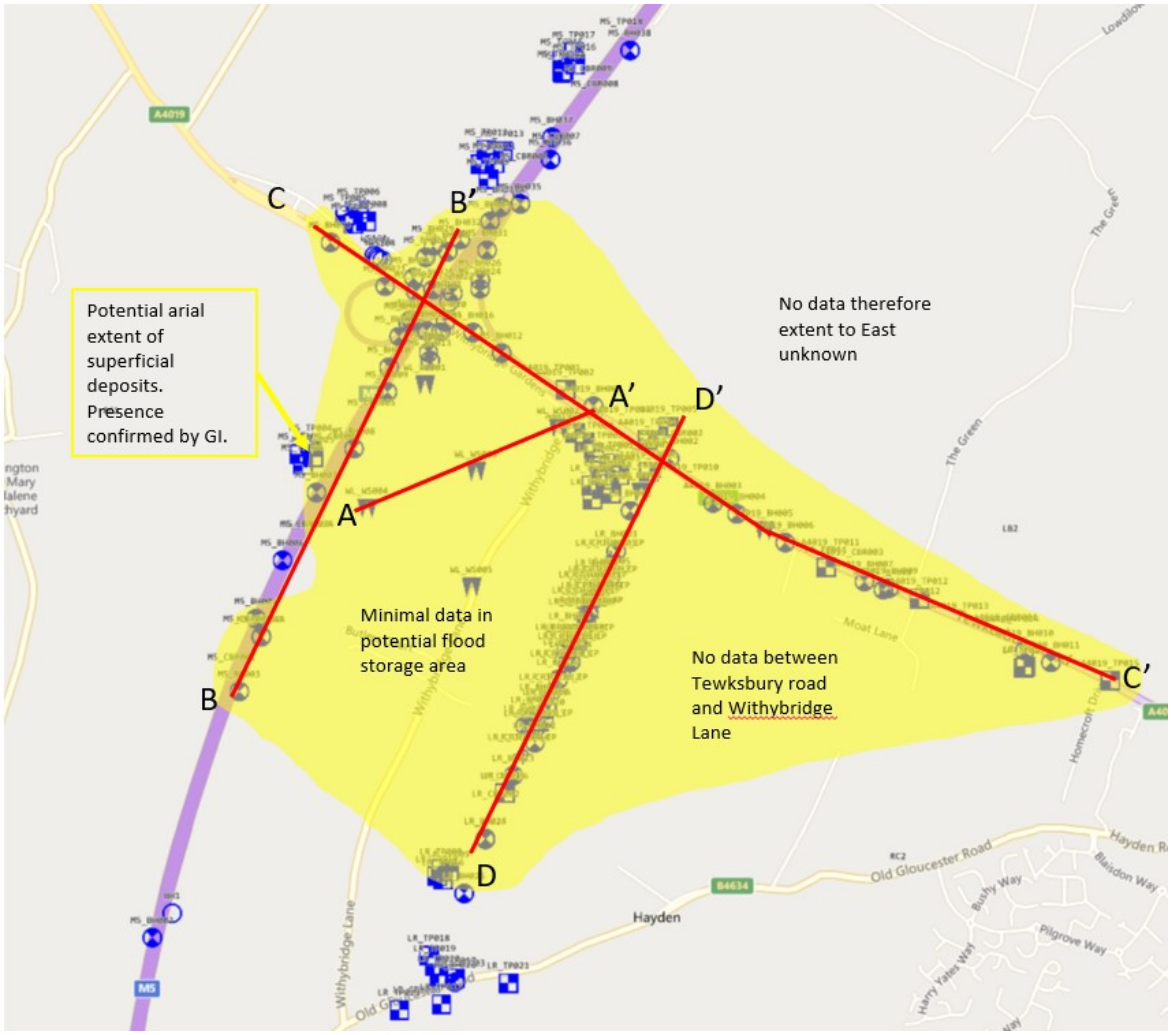

Figure 3– Spatial extent of permeable superficial deposits based on ground investigation

3.1.2. The results of the ground investigation provide the encountered geology which can be different to the mapped geology. Of particular note for M5 J10, the spatial extent of the formations of the superficial deposits on the ground differs to that expected from the mapping. Table 2 summarises the expected (mapped) geology vs the confirmed (ground investigation) geology at borehole locations. Figure 3 presents the interpreted areal extent of superficial deposits (both Alluvium and Sand and Gravels) and cross section lines, with the corresponding section interpretations in Figure 4 to Figure 7.

Table 2 - Summary of mapped geology vs ground investigation confirmed geology

Borehole ID	Mapped geology (BGS 1:50k)		Encountered geology (from ground investigation)			
	Alluvium	Cheltenham Sands and Gravels	Confirmed Alluvium	Thick-ness (m)	Confirmed Cheltenham Sands & Gravels	Thick-ness (m)
M5_BH008	Yes	No	Yes	1.25	Yes	0.75
M5_BH009	No	Yes	Yes	0.5	Yes	0.4
M5_BH011	No	No	Yes	0.35	No	N/A
M5_BH013	No	No	Yes	0.7	No	N/A
M5_BH014	No	Yes	Yes	0.3	Yes	0.20
M5_BH017	No	No	Yes	0.65	Yes	0.30
M5_BH020	No	Yes	No	N/A	No	N/A
WL_WS001	No	No	Yes	2.15	No	N/A
WL_WS002	No	Yes	Yes	1.65	No	N/A
WL_WS003	Yes	No	Yes	1.90	No	N/A
WL_WS004	No	No	Yes	2.15	Yes	0.90
WL_WS005	Yes	No	Yes	1.45	Yes	1.00

3.1.3. In summary:

- The encountered geology differs from the mapped geology.
- The ground investigation shows the superficial deposits to be more widespread and laterally persistent than initially suspected based on mapping. Multiple deposits overlie each other in some locations: Alluvium consistently overlies the Cheltenham Sands and Gravels, meaning both are present and the spatial extent is greater than mapped.
- Both superficial deposits (Alluvium and Cheltenham Sands and Gravels) are water bearing.
- Alluvium ranges from 0 to 2.15 m thick and the Cheltenham Sands and Gravels is between 0 and 1.95 m thick across the area of the proposed CFSA.
- Whilst the ground investigation suggests there is less superficial deposit cover in the north of the Scheme area, along the M5 it is proven by borehole logs across the majority of the Scheme area.

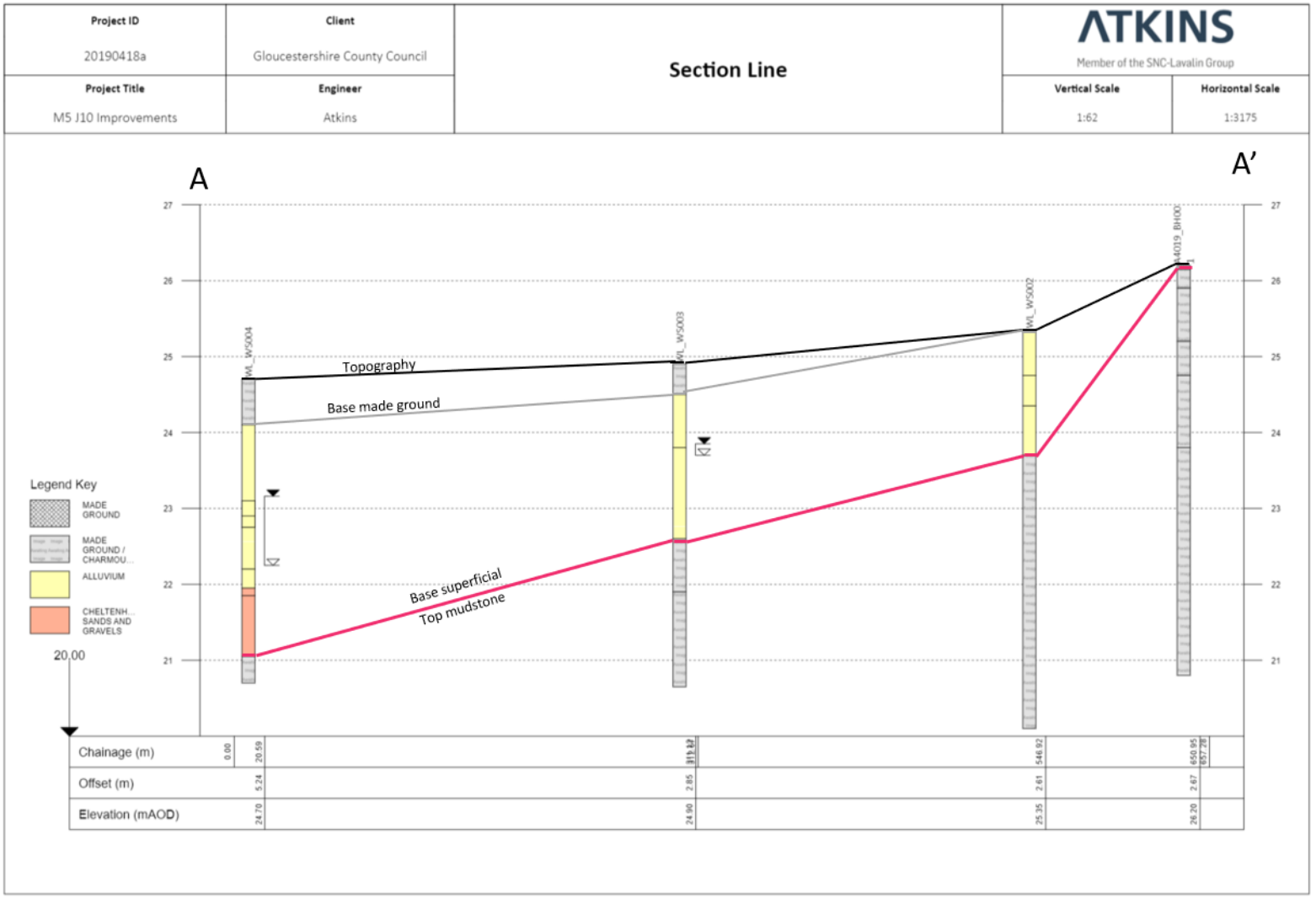

Figure 4 – Geological cross section for line A-A'

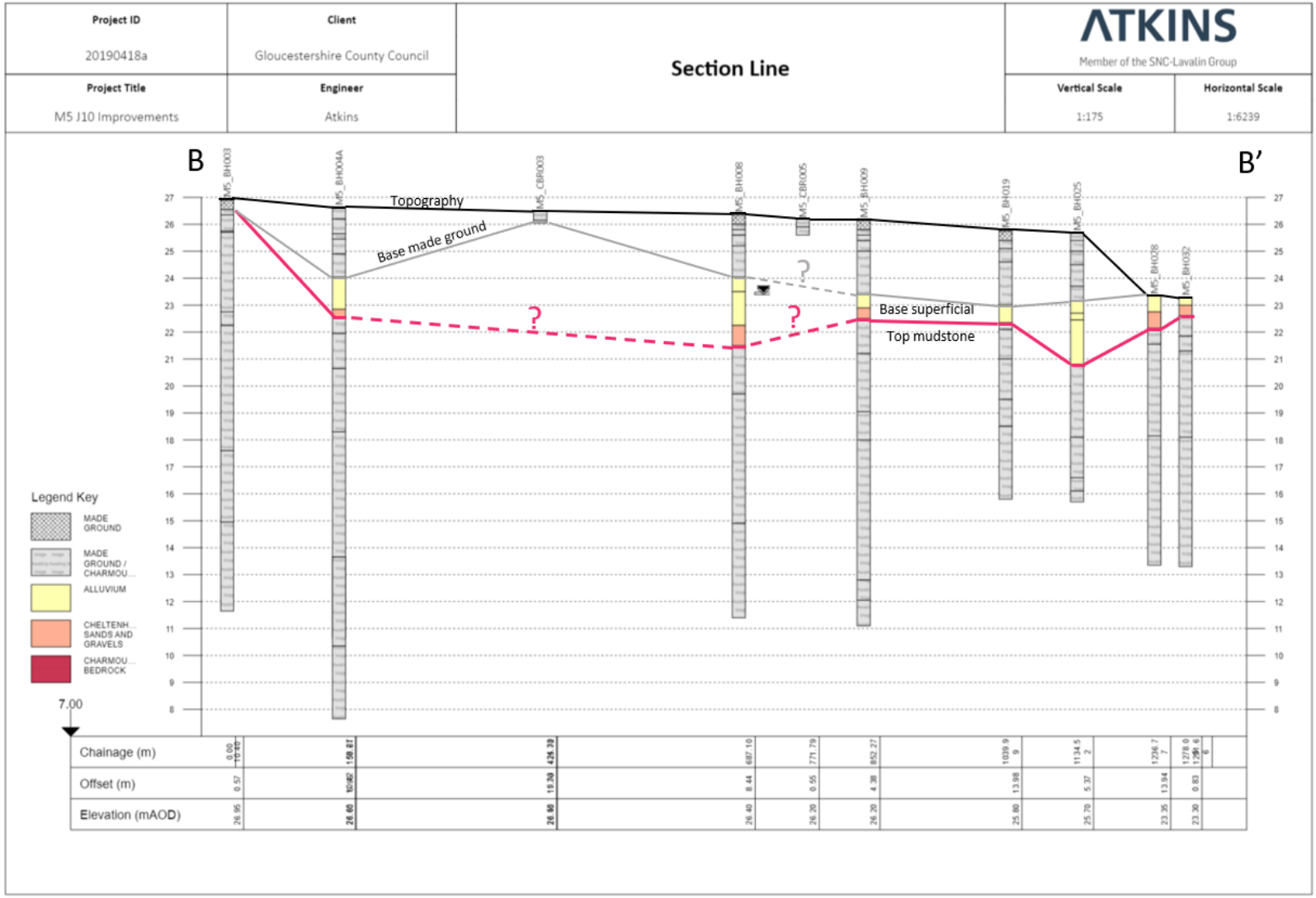

Figure 5 – Geological cross section for line B-B'

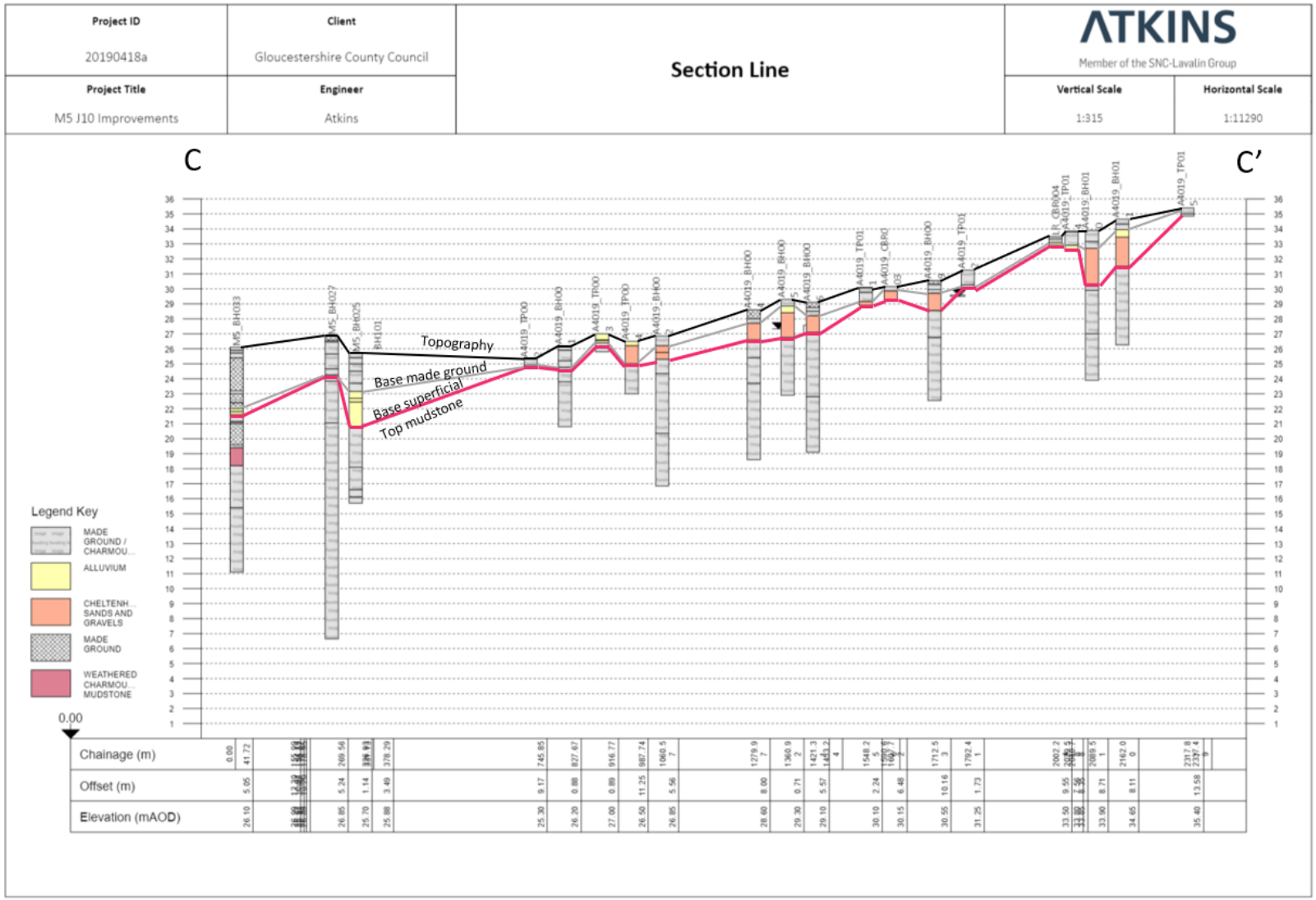

Figure 6 – Geological cross section for line C-C'

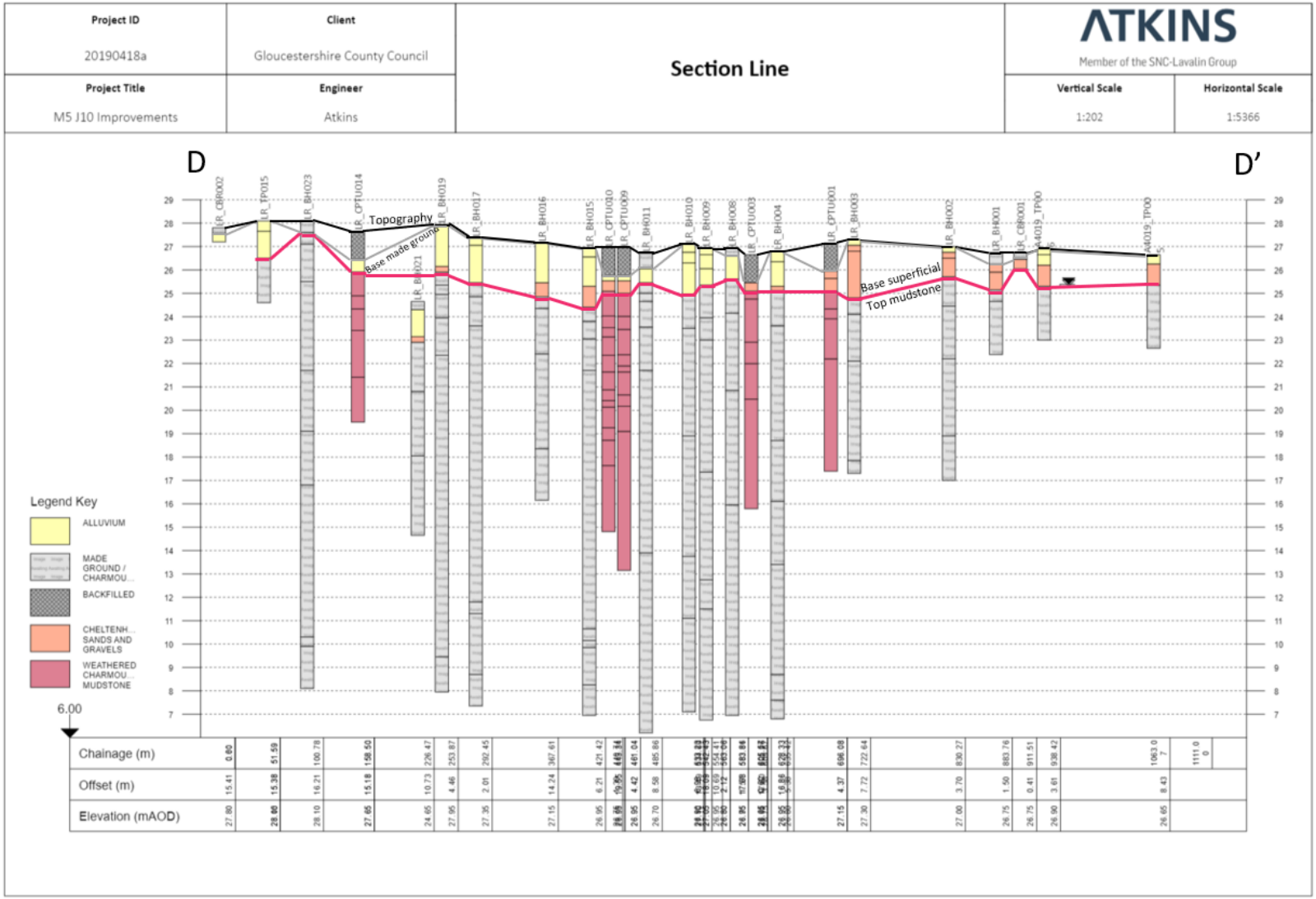

Figure 7– Geological cross section for line D-D'

3.2. Water levels

3.2.1. The majority of groundwater level monitoring is in the Charmouth Mudstone Formation, which is generally separated from the groundwater in the overlying superficial deposits by the clayey weathered Charmouth Mudstone. There are three locations where groundwater levels in the superficial deposits have been measured close to the proposed CFSA: A4019_BH002, WL_WS002 and WL_WS004.

3.2.2. Groundwater levels were monitored from September 2021 to February 2022, although two of the three locations only have data available from December 2021 to February 2022 (see Table 3 and Figure 8). Whilst this is a relatively short period of monitoring, it includes the winter period when groundwater levels would be higher. These data are representative of high groundwater conditions when flooding would be more likely. Groundwater levels in the shallow superficial deposits were between 1.34 and 0.22 mbgl. The average water level at A4019_BH002 which has the longest record is 0.61 mbgl.

3.2.3. Whilst it is challenging to interpret groundwater flow direction based on this limited dataset, an approximation taking into account the topography and the location of the River Chelt has been estimated and presented in Figure 9.

3.2.4. It should be noted that numerous locations had groundwater strikes during drilling and water level 20 minutes after first strike were recorded. Due to the practice of flushing/introducing fluid into boreholes these readings were not analysed as part of this work as they are not representative of the groundwater in the aquifer.

Table 3 – Superficial deposits groundwater monitoring data from ground investigation

	Borehole ID	**A4019_BH002**	**WL_WS002**	**WL_WS004**
Date	Datum (mAOD)	26.85	25.35	24.7
20/09/2021	mbgl	1.34	-	-
	maod	25.51	-	-
05/10/2021	mbgl	0.75	-	-
	maod	26.1	-	-
19/10/2021	mbgl	0.71	-	-
	maod	26.14	-	-
22/11/2021	mbgl	0.22	-	-
	maod	26.63	-	-
13/12/2021	mbgl	0.30	0.49	0.87
	maod	26.55	24.86	23.83
24/01/2022*	mbgl	0.37	0.72	0.98
	maod	26.48*	24.63*	23.72*
14/02/2022	mbgl	0.61	0.39	0.56
	maod	26.24	24.96	24.14
20/09/2021	mbgl	1.34	-	-

* January 2022 data represented in Figure 9.

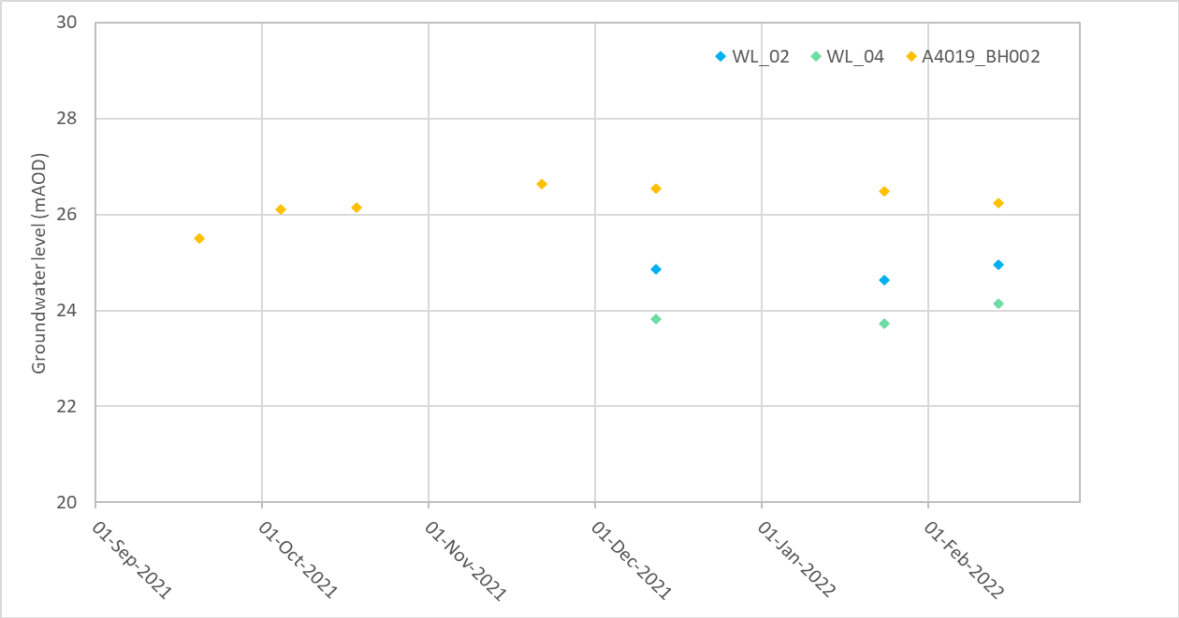

Figure 8 – Groundwater level monitoring data for locations in the superficial deposits in the vicinity of the proposed CFSA

Figure 9 – Potential groundwater flow direction in the superficial deposits January 2022 (groundwater level shown in blue text)

3.3. Estimate of groundwater flow

3.3.1. The proposed CFSA is located on permeable superficial deposits with a groundwater flow direction broadly from east to west. Groundwater is understood to emerge in a ditch parallel to the M5 and discharge through an existing culvert at Piffs Elms interchange. The proposed design for the CFSA is to maintain a culvert at this same location at the same capacity (approximately 2 m^3/s) which will drain the CFSA. The invert level of the culvert will remain at 22.7 mAOD.

3.3.2. An estimate of the possible flow of groundwater which could discharge to the CFSA through the superficial deposits has been made. An estimate of the volume of water that would be held in the CFSA post construction has also been made. This estimate has been made assuming no outflow through the culvert as a precautionary calculation.

Volume of water

3.3.3. A rough estimate of the volume of groundwater that is likely to be held in the CFSA under a steady-state, post-scheme scenario has been derived assuming:

- An areal extent of the CFSA of 118,000 m^2;
- A saturated thickness of 1.65 m (based on average groundwater level in the superficial deposits from the ground investigation);
- CFSA excavation depth of 2 m (this is an estimate, likely to be between 1.5 and 3 mbgl across the CFSA);
- CFSA excavation will be to the base of the superficial deposits which is the surface of the weathered Charmouth Mudstone Formation; and
- Porosity of the superficial deposits is between 0.24 and 0.61[4].

3.3.4. Based on these assumptions, the likely depth of groundwater that would remain in the base of the CFSA would be between **0.3 and 0.7 m**. This would be a volume of between **32,900 and 83,500 m^3** which is between **14 and 35%** of the total capacity of the CFSA based on the previous assumptions on size of the CFSA.

Flow rate

3.3.5. The approximate instantaneous flow rate (Q) through the superficial deposits into the CFSA via the eastern edge (across Withybridge Lane) for a variety of scenarios can be calculated using Darcy's law:

$$Q = kA \times \left(\frac{\Delta h}{\Delta l}\right)$$

Where:

- Q = Volumetric flow rate (m^3/d),
- k = hydraulic conductivity (m/d),
- A = cross-sectional area of flow path (m^2)
- Δh = head difference (m) and
- Δl = horizontal distance (m).

3.3.6. A range of flow rates into the CFSA have been estimated assuming:

- A minimum k value of 0.02 m/d as calculated from falling head tests at WL_WS003 field testing and maximum k value of 8.64 m/d (based on literature values for a superficial deposit between coarse sand and gravel)[4].
- A saturated aquifer thickness of 1.16 m along the eastern edge of the CFSA, meaning the cross-sectional area of the flow path is 1.16 m x 350 m.

3.3.7. Two different scenarios were assessed:

[4] Domenico, P.A. and Schwartz, F.W. (1990) Physical and Chemical Hydrogeology. John Wiley and Sons, New York, 824

1. Scenario 1: Based on observed data measured at WL_WS002 and WL_WS004. A head difference of 0.58 m and a distance between WL_WS002 and WL_WS004 of 535 m, resulting in a head gradient of 0.001.
2. Scenario 2: Based on topography. A larger head gradient following topography of the proposed CFSA from Withybridge Lane to the culvert invert level, resulting in a head gradient of 0.011 m.

3.3.8. The available groundwater level data is relatively sparse, and so whilst Scenario 1 reflects the groundwater conditions encountered during the ground investigation, Scenario 2 has been selected to reflect a worst case scenario where groundwater levels are very high and are at ground surface. This simulates the scenario where fluvial flooding happens at the same time as high groundwater levels or groundwater flooding.

3.3.9. Based on these assumptions, the groundwater flow into the CFSA is likely to be between 0.01 and 37.18 m^3/d (9.2×10^{-5} and 0.43 l/s). The full range of flow estimates is presented in Table 4.

Table 4 – Calculated estimates of groundwater flow rates

Scenario	Head gradient	Hydraulic conductivity (m/s)	Groundwater flow rate estimate		
			m^3/s	l/s	m^3/d
Scenario 1	0.001	2.1×10^{-7}	9.2×10^{-8}	9.2×10^{-5}	0.01
		1.0×10^{-4}	4.4×10^{-5}	4.4×10^{-2}	3.80
Scenario 2	0.011	2.1×10^{-7}	9.0×10^{-7}	9.0×10^{-4}	0.08
		1.0×10^{-4}	4.3×10^{-4}	4.3×10^{-1}	37.18

3.3.10. Even for the highest (worst case) estimate of the groundwater flow, this equates to only 0.02% of the capacity of the culvert. As such, and assuming that the base of the CFSA is not below the invert level of the culvert, groundwater will not build up in the storage area and instead present a steady but small flow through the Piffs Elm culvert.

3.3.11. Following construction of the CFSA, the groundwater flow regime will remain as per the pre-scheme flow regime, with the existing flow to the culvert being largely unchanged.

4. Summary

4.1.1. Based on the available data and analysis presented here, it should be expected that following excavation of the CFSA, some groundwater inflow to the CFSA will occur. It is expected that groundwater will accumulate in the CFSA to a level that is in continuity with the groundwater level in the surrounding aquifer. This supports the desire for a permanent body of water forming a new wetland in the base of the flood storage area.

4.1.2. Without any outlet, the depth of water in the flood storage area could rise to 0.3 m to 0.7 m above the base of the storage area. However, given the presence of the Piffs Elm culvert as an outflow, it is expected that following construction of the CFSA, there will be a small flow through the culvert. Any wetland feature would need to be excavated below this invert to create the desired permanent body of water forming a wetland.

4.1.3. The flow of groundwater into the flood storage excavation could be in the order of 0.00009 l/s to 0.43 l/s. This will not impact on operation of the flood storage area.

4.1.4. Following construction of the CFSA, the groundwater flow regime will remain as per the pre-scheme flow regime, with the existing flow to the culvert being largely unchanged.

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