

High Speed Rail (West Midlands - Crewe)

Environmental Statement

Volume 5: Technical appendices

Water resources

Route-wide Water Framework Directive compliance assessment
(WR-001-000) Part 1

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Route-wide Water Framework Directive compliance assessment (WR-001-000) Part 1



Department for Transport

High Speed Two (HS2) Limited has been tasked by the Department for Transport (DfT) with managing the delivery of a new national high speed rail network. It is a non-departmental public body wholly owned by the DfT.

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1 Introduction

1.1 Structure of water resources and flood risk appendices

1.1.1 The appendices to the water resources and flood risk assessment comprise both community area reports and route-wide reports, as follows:

- a route-wide Water Framework Directive (WFD) compliance assessment (this Appendix);
- a water resources assessment for each community area (Environment Statement (ES) Volume 5: Appendix WR-002-001 to WR-002-005);
- a flood risk assessment for each community area (ES Volume 5: Appendix WR-003-001 to WR-003-005); and
- a route-wide draft water resources and flood risk operation and maintenance plan (ES Volume 5: Appendix WR-005-000).

1.1.2 Additionally, hydraulic modelling reports are set out in Background Information and Data (BID)¹. These comprise reports describing the approach to assessing key flood risk issues identified within each study area.

1.1.3 Issues associated with the WFD compliance assessment are also summarised in ES Volume 3, Route-wide effects, Section 16.

1.2 Purpose of this appendix

1.2.1 This appendix reports on compliance of the Proposed Scheme with the objectives of the WFD 2000/60/EC².

1.2.2 The Proposed Scheme will cross a number of surface water bodies and groundwater bodies. An assessment of the Proposed Scheme's compliance against the WFD objectives of each of the water bodies potentially affected is required (see Section 2).

1.2.3 This appendix summarises the assessment approach, results and additional mitigation requirements with respect to achieving compliance with WFD objectives.

1.2.4 The WFD assessment is based on consideration of the baseline condition of the relevant surface water bodies and groundwater bodies and the Proposed Scheme design (as shown in the ES Volume 2 Map Books, Map Series CT-05 and CT-06), which incorporates a range of mitigation measures. The assessment will be updated during the detailed design stage of the Proposed Scheme, in order to reflect the latest iteration of the design and assessment process.

¹ HS2 Ltd (2017), *High Speed Two (HS2) Phase 2a (West Midlands - Crewe), Background Information and Data*. Hydraulic modelling reports, BID WR-004-001 to WR-004-004. www.gov.uk/hs2

² *Water Framework Directive - Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy*. Strasbourg, European Parliament and European Council

- 1.2.5 The assessment methodology has been developed in accordance with the WFD Compliance Assessment Technical Note (ES Volume 5: Appendix CT-001-002) and in agreement with the Environment Agency.

1.3 Scope of the WFD compliance assessment

- 1.3.1 The spatial scope of the assessment includes all WFD designated surface water and groundwater bodies potentially affected by the Proposed Scheme (as outlined in Sections 4 and 5, respectively).
- 1.3.2 The assessment has been undertaken at the water body scale. For surface water bodies, the assessment considers all tributary watercourses that are affected by the Proposed Scheme.
- 1.3.3 The assessment considers the impacts on all of the quality elements associated with the surface water and groundwater bodies affected by the Proposed Scheme.
- 1.3.4 Temporary impacts (defined in the Environmental Impact Assessment Scope and Methodology Report Addendum³ as those which would last less than three years) are not considered to result in deterioration in WFD status and so are not included within the assessment. Adverse impacts are not considered to result in a deterioration of status if the water body:
- is only impacted for a short time period (less than three years);
 - is likely to recover within a short time period (less than three years); and/or
 - is likely to recover without the need for any restoration measures.

1.4 Assumptions and limitations

- 1.4.1 The WFD water body classification data presented in ES Volume 2, Community area reports and ES Volume 5, Appendices is taken from the Environment Agency 2015 Cycle 2 River Basin Management Plan (RBMP) data⁴. These classifications are considered to provide the current best estimate of status and are the formal baseline against which the Environment Agency will assess compliance with the 'no deterioration' objective in 2017.
- 1.4.2 Limitations with respect to baseline information have been identified. Where baseline data is limited, professional judgement has been used in the assessment and a precautionary approach has been taken with regard to both scoping and impact assessment.
- 1.4.3 The WFD assessment takes into account the embedded mitigation within the design and assumes that all the mitigation measures described in the Volume 2, Community area reports will be adopted.
- 1.4.4 The assumptions presented in ES Volume 1, Introduction to the Environmental Statement, Section 8.16 also apply to this assessment.

³ see WFD Compliance Assessment Technical Note in the Environmental Impact Assessment Scope and Methodology Report Addendum (Volume 5: Appendix CT-001-002)

⁴ Environment Agency, *Catchment Data Explorer*, <http://environment.data.gov.uk/catchment-planning/>

2 Overview of the WFD

2.1 Aims

- 2.1.1 The WFD aims to protect and enhance the quality of the water environment across all European Union (EU) Member States. It takes a holistic approach to the sustainable management of water by considering the interactions between surface water, groundwater and water-dependent ecosystems.
- 2.1.2 Under the WFD, 'water bodies' are the basic management units and are defined as all or part of a river system or aquifer. These water bodies form part of a larger River Basin District (RBD), for which RBMPs are developed by EU Member States and environmental objectives are set. These RBMPs are produced every six years, in accordance with the river basin management planning cycle.
- 2.1.3 The WFD requires all EU Member States to classify the current condition or 'status or potential' of surface water and groundwater bodies and to set a series of objectives for maintaining or improving conditions so that water bodies maintain or reach 'good status or potential'.

2.2 WFD requirements for new developments

- 2.2.1 To ensure compliance with the WFD, decision makers must consider whether proposals for new developments have the potential to:
 - cause a deterioration of a water body from its current status or potential;
 - prevent future attainment of good status or potential where not already achieved;
 - impact on protected or priority species and habitats; and/or
 - provide opportunities to improve the water environment.
- 2.2.2 A ruling by the European Union Court of Justice on 1 July 2015⁵ has significant implications for projects that may impact water bodies, namely:
 - consent for development must not be granted by an authorising authority – unless a derogation is granted - where the project may cause a deterioration in the status of a body of surface water or where it jeopardises the attainment of good ecological surface water status or of good ecological potential and good surface water chemical status by the date laid down in the Directive;
 - that deterioration of the status of the relevant body of surface water includes a fall by one class of any element of the quality elements within the meaning of Annex V of the WFD even if the fall does not result in a fall of the classification of the body of surface water as a whole; and

⁵ Case 461/13 Bund für – Umwelt Und Naturschutz Deutschland v Bundesrepublik Deutschland ('the Bund case') concerning the interpretation of Article 4(1)(a)(i) to (iii) of the Water Framework Directive 2000/60/EC (WFD)

- if the quality element is already in the lowest class, any deterioration of that element represents deterioration of status within the meaning of Article 4(1)(a)(i).

2.2.3 In the event that a proposed development does not fully mitigate the risks of deterioration occurring, or it prevents future attainment of good status or potential, then evidence would need to be provided to satisfy all the requirements of Article 4.7 of the WFD legislation in order to be compliant, namely that:

- all practicable steps have been taken to mitigate the adverse impact on the status of the water body;
- the reasons for the modifications or alterations are specifically set out and explained in the RBMP;
- the reasons for the modifications or alterations are of overriding public interest and/or the benefits to the environment and to society of achieving the WFD objectives are outweighed by the benefits of the new modifications or alterations to (among other things) sustainable development; and
- the beneficial objectives served by the modifications or alterations of the water body cannot for reasons of technical feasibility or disproportionate cost be achieved by other means, which are a significantly better environmental option.

2.2.4 Thus, with regard to the Proposed Scheme, if the hybrid Bill design and Environmental Impact Assessment (EIA) Report cannot demonstrate that there will be no deterioration, then a derogation will need to be prepared under Article 4.7 to ensure that the Proposed Scheme is compliant under the WFD legislation and the Bill can pass through Parliament. Further information that would be prepared through the design process may alleviate the need for a derogation on particular water bodies but will have to be prepared to ensure compliance can be attained.

2.3 Determination of WFD status

2.3.1 Surface water bodies and groundwater bodies are defined within WFD legislation. There are three types of surface water body: natural water bodies, heavily modified water bodies (HMWB) and artificial water bodies (AWB).

2.3.2 The overall status of natural surface water bodies is determined on the basis of their ecological status and chemical status. The overall status of HMWBs and AWBs is classified based on their ecological potential and chemical status. The overall status of groundwater bodies is determined on the basis of their quantitative status and chemical status.

2.3.3 The means by which these determinations are made for surface water and groundwater bodies is described in Annex A.

3 WFD assessment methodology

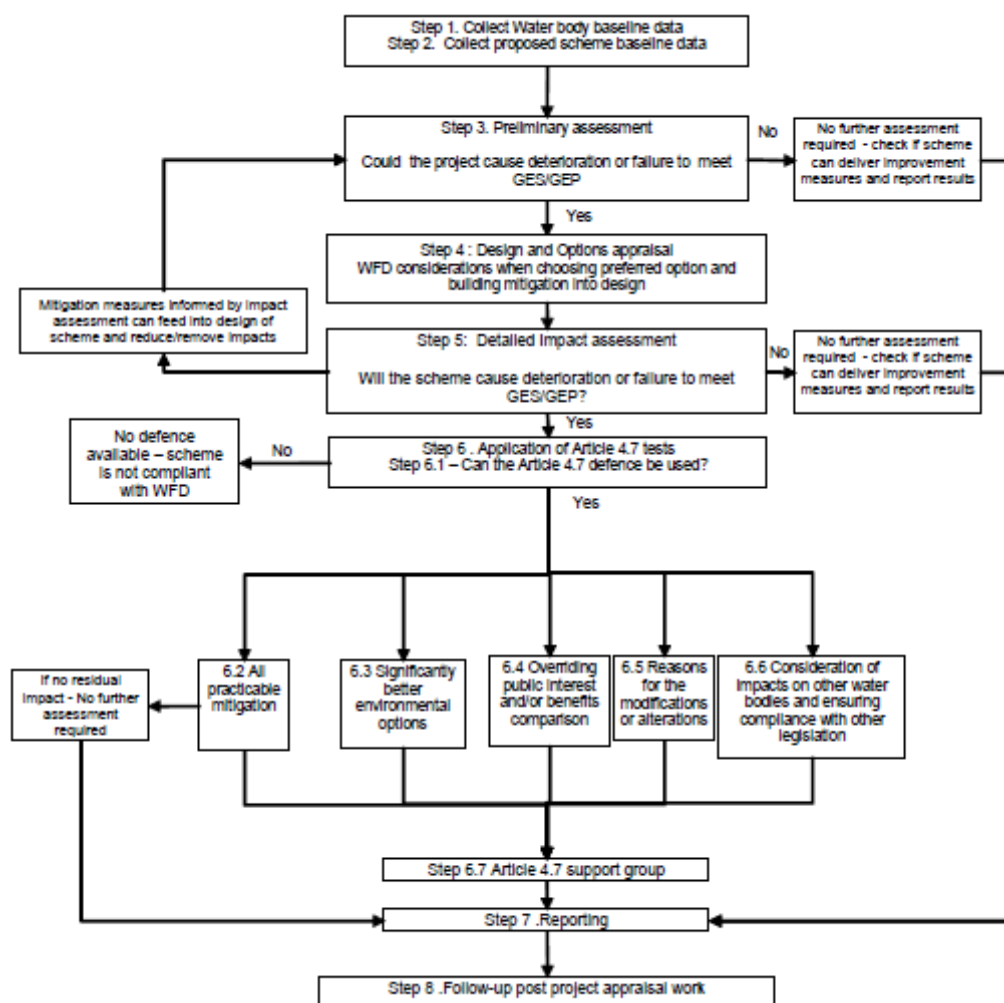
3.1 Overview

3.1.1 The WFD assessment is undertaken as a stepped process, which can be summarised in the following steps:

- **Step 1:** Collect water body baseline data
- **Step 2:** Collect Proposed Scheme baseline data
- **Step 3:** Preliminary assessment
- **Step 4:** Design options appraisal and selection of preferred option;
- **Step 5:** Detailed impact assessment;
- **Step 6:** Application of Article 4.7 where applicable;
- **Step 7:** Reporting;
- **Step 8:** Follow-up post-project appraisal work.

3.1.2 This process is illustrated in Figure 1.

Figure 1: Steps in the WFD assessment process



- 3.1.3 A detailed description of the WFD compliance assessment process is provided in Annex B. The assessment process and methodology applied has been developed in accordance with the WFD Compliance Assessment Technical Note (Volume 5, Appendix CT-001-002) and in agreement with the Environment Agency. The following sections summarise the key steps of the process.

3.2 Steps 1 and 2: baseline assessment (scoping)

- 3.2.1 The objective of the baseline assessment is to identify the relevant WFD surface water and groundwater bodies, including all watercourses and groundwater related features potentially affected by the Proposed Scheme, and to establish their baseline condition.
- 3.2.2 The water body baseline condition has been identified via desk-top assessment and, where possible (subject to access constraints), baseline field surveys.
- 3.2.3 Desk-top assessment has utilised readily available information and environmental, asset and operations data obtained from relevant stakeholders, including the Environment Agency, Natural England, Severn Trent Water Ltd and United Utilities.
- 3.2.4 Field surveys of watercourses affected by the Proposed Scheme have involved hydromorphological and ecological walkovers, comprising reconnaissance site visits and fluvial audit and ecological baseline surveys (based on accessibility and the nature of the sites being assessed). Groundwater surveys have also been undertaken, including identification of potential groundwater-surface water interactions, estimates of spring flows and basic groundwater quality (e.g. temperature, pH, etc.) and recording of abstraction details.
- 3.2.5 Following baseline assessment, all watercourses have been categorised to inform the scoping of sites requiring detailed impact and mitigation assessment. All groundwater bodies crossed by the Proposed Scheme have been scoped into the assessment.
- 3.2.6 The baseline assessment has also established the scheme baseline, identifying the scheme components of relevance and their generic potential impacts to surface water and groundwater bodies. This has included the identification of all relevant impact mitigation embedded within the Proposed Scheme design and construction strategy.
- 3.2.7 Further details of the water body baseline and scheme baseline assessment methodology are provided in Annex B2 and B3, respectively. The baseline assessment has informed the subsequent preliminary assessment (screening) stage.

3.3 Step 3: preliminary assessment (screening)

- 3.3.1 The objective of the preliminary assessment is to (following consideration of embedded mitigation) establish the relevant impacts of the various scheme components and the associated likely effects on the WFD status elements of the relevant surface water and groundwater bodies. Effects are considered with regard to the risk of the Proposed Scheme causing a deterioration in current status and/or a failure to achieve status objectives. Only those impacts that could potentially affect current status or status objectives are taken forward for more detailed impact assessment.

3.3.2 The preliminary assessment therefore comprises two key parts, as follows:

- likely effects on current status or potential, including:
 - the screening of the potential generic impacts of all relevant scheme components against the proposed 'embedded mitigation', in order to identify relevant residual impacts with the potential to cause a deterioration in WFD status; and
 - the identification of relevant surface water and groundwater WFD status elements potentially affected by the residual impacts of each of the scheme components.
- likely effects on status objectives, including:
 - the screening of all relevant scheme components against Environment Agency surface water and groundwater body 'reasons for not achieving good' (RNAG) and 'programme of measures' (PoM) datasets, in order to identify where the Proposed Scheme poses a potential risk of worsening existing pressures responsible for status failures and/or adversely affecting or preventing the implementation of measures identified to address existing status failures; and
 - the screening of all relevant scheme components against Environment Agency HMWB and AWB 'mitigation measure assessments' (MMA), in order to identify where the Proposed Scheme poses a potential risk of inhibiting the implementation of measures derived to mitigate the impacts of existing physical modifications and operational regimes to support the achievement of good ecological potential objectives.

3.3.3 The preliminary assessment has considered both the beneficial and adverse effects of the Proposed Scheme components and their associated embedded mitigation.

3.3.4 Further details of the preliminary assessment methodology are provided in Annex B4. The preliminary assessment has informed the subsequent detailed impact assessment, which is focused on the relevant water bodies / watercourses and scheme components identified under the baseline assessment stage, together with the relevant scheme component impacts and WFD status elements identified under the preliminary assessment stage.

3.4 Step 4: design and options appraisal

3.4.1 An iterative design approach has been adopted, with WFD specialists involved with both:

- identifying which options are best aligned with WFD objectives, so that these considerations have appropriate weighting, relative to wider environmental issues such as heritage and community impact; and
- developing the design of the preferred option to help to mitigate the potentially adverse impacts on WFD water bodies.

3.4.2 Consequently, mitigation is embedded into the design of the Proposed Scheme prior to the detailed impact assessment being undertaken, allowing the detailed impact assessment to focus on any additional mitigation required, as outlined below.

3.5 Step 5: detailed impact assessment

- 3.5.1 The objective of the detailed impact assessment is to establish the nature and anticipated magnitude of the effects of relevant scheme components on the WFD quality elements of the surface water and groundwater bodies affected by the Proposed Scheme. These effects are considered in terms of the potential for deterioration of current status and/or the prevention of status objectives.
- 3.5.2 As with the preliminary assessment stage, the detailed impact assessment therefore comprises of two key parts, as follows:
- assessment of effects on current status of quality element, including:
 - the assessment of the effects of individual scheme components at quality element level;
 - the assessment of 'cumulative' effects on quality elements at the water body scale, relating to the impacts of scheme components located within other (typically adjacent) water bodies; and
 - the assessment of the overall 'in-combination' effects of scheme components on quality elements at the water body scale, in order to assess potential for status change.
 - assessment of effects on status objectives, including further assessment of the effects of scheme components on those surface water and groundwater body RNAG, PoM, HMWB and AWB mitigation measures identified as being at risk as a result of the Proposed Scheme during the preliminary assessment stage.
- 3.5.3 Further details of the detailed impact assessment methodology are provided in Annex B5. The assessment of effects has utilised the assessment matrix described in Annex B5.2. Where significant effects are identified with regard to the risk of status deterioration and/or the prevention of status objectives, the assessment has identified 'additional mitigation' requirements (beyond those measures embedded within the Proposed Scheme) in order to avoid and/or minimise risks and the residual effects on quality elements at the water body scale.

3.6 Step 6: application of Article 4.7 test

- 3.6.1 Article 4.7 of the WFD states that Member States will not be in breach of the Directive when failure to meet its environmental objectives is the result of either new modifications to the physical characteristics of a water body or as a result of new human sustainable development, on the proviso that the modifications or new development proposed are compliant with four key conditions as outlined in Annex B6. In doing so, Article 4.7 provides a means whereby a derogation for a proposed modification or sustainable development may be granted where it meets these four conditions.
- 3.6.2 Whilst every effort has been made to ensure that an Article 4.7 test is not required, where unavoidable, the WFD assessment identifies where such a test must be prepared for particular water bodies. No instances where an Article 4.7 test is required have been identified in this assessment.

4 Surface water baseline

4.1 WFD water bodies

- 4.1.1 The WFD surface water bodies affected by the Proposed Scheme are shown in Table 1. The table summarises the relevant RBD / RBMP and Environment Agency management catchment for each water body, together with the current status (2015 Cycle 2) of the water bodies.
- 4.1.2 A total of 13 surface water bodies are affected by the Proposed Scheme. This includes 11 river water bodies, two of which are designated as a HMWB; Blithe - Tad Bk to R Trent (G104028046491) and Sow- Doxey Bk to R Penk (GB104028046790).
- 4.1.3 The Proposed Scheme crosses one canal water body, which is designated as an AWB; Trent and Mersey Canal, summit to Alrewas (GB70410142).
- 4.1.4 The Proposed Scheme also has the potential to affect one lake water body, which is designated as a HMWB: Betley Mere (GB31234330).
- 4.1.5 The Proposed Scheme also crosses small areas of the Sow from R Penk to R Trent (GB104028047190), Meece Brook from Chatcull Brook to R Sow (GB104028053010) and the Checkley Brook – Lower (GB112068055240) river water body catchments. However, no watercourses will be crossed or affected by the Proposed Scheme within these areas and so these water bodies have been scoped out of the assessment.
- 4.1.6 Nine of the 13 surface water bodies affected are located within the Staffordshire Trent Valley management catchment, which forms part of the Humber RBD. The remaining four water bodies are located within the Weaver and Gowry management catchment, which forms part of the North West RBD.
- 4.1.7 The location of these surface water bodies and their catchment extents in relation to the route of the Proposed Scheme are shown in Annex C1, Figure 4 - Figure 7.
- 4.1.8 The current status and status objectives of each water body are summarised in the following sections.

Table 1: Summary of all WFD surface water bodies affected by the Proposed Scheme and their 2015 Cycle 2 status classifications⁴

WFD water body	Water body ID	River Basin District / Management Plan	EA management catchment	Water body type (designation)	Overall status	Ecological status / potential	Chemical status
Pyford Brook Catchment (trib of Trent)	GB104028047250	Humber	Staffordshire Trent Valley	River (not A/HMWB)	Bad	Bad	Good
Bourne-Bilson Brook Catchment (trib of Trent)	GB104028047270	Humber	Staffordshire Trent Valley	River (not A/HMWB)	Moderate	Moderate	Good
Trent from Moreton Brook to River Tame	GB104028047290	Humber	Staffordshire Trent Valley	River (not A/HMWB)	Poor	Poor	Good
Blithe - Tad Bk to R Trent	G104028046491	Humber	Staffordshire Trent Valley	River (HMWB)	Moderate	Moderate	Good
Moreton Brook from Source to River Trent	GB104028047380	Humber	Staffordshire Trent Valley	River (not A/HMWB)	Moderate	Moderate	Moderate
Trent from Tittensor to River Sow	GB104028053272	Humber	Staffordshire Trent Valley	River (not A/HMWB)	Bad	Bad	Good
Trent and Mersey Canal, summit to Alrewas	GB70410142	Humber	Staffordshire Trent Valley	River (AWB)	Good	Good	Good
Sow- Doxey Bk to R Penk	GB104028046790	Humber	Staffordshire Trent Valley	River (HMWB)	Poor	Poor	Good
Meece Brook from Source to Chatcull Brook	GB104028053080	Humber	Staffordshire Trent Valley	River (not A/HMWB)	Poor	Poor	Good
Lea	GB112068055200	North West	Weaver and Gowy	River (not A/HMWB)	Bad	Bad	Good
Checkley Brook - Upper	GB112068055230	North West	Weaver and Gowy	River (not A/HMWB)	Good	Good	Good
Wistaston Brook	GB112068055280	North West	Weaver and Gowy	River (not A/HMWB)	Bad	Bad	Good
Betley Mere	GB31234330	North West	Weaver and Gowy	Lake (HMWB)	Poor	Poor	Good

Pyford Brook Catchment (trib of Trent) (GB104028047250)

- 4.1.9 The Pyford Brook Catchment (trib of Trent) (GB104028047250) water body is currently assessed as having bad overall status, bad ecological status, and good chemical status. The water body currently has an objective to achieve an overall status of good by 2027.
- 4.1.10 The 2015 Cycle 2 status classification data for the water body are shown in Table 2. The water body is currently failing the good ecological status objective due to invertebrates (bad), macrophytes and phytobenthos (moderate), ammonia (bad), dissolved oxygen (bad) and phosphate (bad).

Table 2: Pyford Brook Catchment (trib of Trent) – 2015 Cycle 2 status classification and objectives⁴

Status element	Status (2015)	Status objective
Overall status	Bad	Good by 2027
Ecological status	Bad	Good by 2027
Biological status	Bad	Good by 2027
Invertebrates	Bad	Good by 2027
Macrophytes and phytobenthos	Moderate	Good by 2027
Hydromorphological status	Supports good	Supports good by 2015
Hydrological regime	Supports good	-
Morphology	-	-
Physicochemical status	Moderate	Good by 2021
Ammonia (phys-chem)	Bad	Good by 2021
Dissolved oxygen	Bad	Good by 2021
pH	High	Good by 2015
Phosphate	Bad	Good by 2021
Temperature	High	Good by 2015
Specific pollutants status	High	High by 2015
Chemical status	Good	Good by 2015

Bourne-Bilson Brook Catchment (trib of Trent) (GB104028047270)

- 4.1.11 The Bourne-Bilson Brook Catchment (trib of Trent) (GB104028047270) water body is currently assessed as having moderate overall status, moderate ecological status, and good chemical status. The water body currently has an objective to achieve an overall status of good by 2027.

- 4.1.12 The 2015 Cycle 2 status classification data for the water body are shown in Table 3. The water body is currently failing the good ecological status objective due to macrophytes and phytobenthos (moderate), hydrological regime (does not support good), and phosphate (moderate).

Table 3: Bourne-Bilson Brook Catchment (trib of Trent) – 2015 Cycle 2 status classification and objectives⁴

Status element	Status (2015)	Status objective
Overall status	Moderate	Good by 2027
Ecological status	Moderate	Good by 2027
Biological status	Moderate	Good by 2027
Invertebrates	High	Good by 2015
Macrophytes and phytobenthos	Moderate	Good by 2027
Hydromorphological status	Support good	-
Hydrological regime	Does not support good	-
Morphology	Supports good	-
Physicochemical status	Moderate	Good by 2027
Ammonia (phys-chem)	High	Good by 2015
Dissolved oxygen	High	Good by 2015
pH	High	Good by 2015
Phosphate	Moderate	Good by 2027
Temperature	High	Good by 2015
Specific pollutants status	High	High by 2015
Chemical status	Good	Good by 2015

Trent from Moreton Brook to River Tame (GB104028047290)

- 4.1.13 The Trent from Moreton Brook to River Tame (GB104028047290) water body is currently assessed as having poor overall status, poor ecological status, and good chemical status. The water body currently has an objective to achieve an overall status of good by 2027.
- 4.1.14 The 2015 Cycle 2 status classification data for the water body are shown in Table 4. The water body is currently failing the good ecological status objective due to fish (poor), macrophytes and phytobenthos (moderate), and phosphate (poor).

Table 4: Trent from Moreton Brook to River Tame – 2015 Cycle 2 status classification and objectives⁴

Status element	Status (2015)	Status objective
Overall status	Poor	Good by 2027

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Status element	Status (2015)	Status objective
Ecological status	Poor	Good by 2027
Biological status	Poor	Good by 2027
Fish	Poor	Good by 2027
Invertebrates	Good	Good by 2015
Macrophytes and phytobenthos	Moderate	Good by 2027
Hydromorphological status	Supports good	Supports good by 2015
Hydrological regime	Supports good	Supports good by 2015
Morphology	-	-
Physicochemical status	Moderate	Good by 2021
Acid neutralising capacity	High	Good by 2015
Ammonia (phys-chem)	Good	Good by 2015
Dissolved oxygen	High	Good by 2015
pH	High	Good by 2015
Phosphate	Poor	Good by 2021
Temperature	High	Good by 2015
Specific pollutants status	High	High by 2015
Chemical status	Good	Good by 2015

Blithe - Tad Bk to R Trent (GB1040280046491)

- 4.1.15 The Blithe - Tad Bk to R Trent (GB1040280046491) water body is a HMWB and is currently assessed as having moderate overall status, moderate ecological potential, and good chemical status. The water body currently has an objective to achieve an overall status of moderate by 2015.
- 4.1.16 The 2015 Cycle 2 status classification data for the water body are shown in Table 5. The water body is currently failing the good ecological potential objective due to macrophytes and phytobenthos (moderate), phosphate (poor), and its mitigation measure assessment (moderate or less). The latter relates to HMWB mitigation measures identified for the water body not yet being in place.

Table 5: Blithe - Tad Bk to R Trent – 2015 Cycle 2 status classification and objectives⁴

Status element	Status (2015)	Status objective
Overall status	Moderate	Moderate by 2015
Ecological potential	Moderate	Moderate by 2015

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Status element	Status (2015)	Status objective
Biological status	Moderate	Good by 2027
Fish	Good	Good by 2015
Invertebrates	Good	Good by 2015
Macrophytes and phytobenthos	Moderate	Good by 2027
Hydromorphological status	Not assessed	-
Hydrological regime	Not assessed	-
Physicochemical status	Moderate	Good by 2027
Acid neutralising capacity	High	Good by 2015
Ammonia (phys-chem)	High	Good by 2015
Dissolved oxygen	High	Good by 2015
pH	High	Good by 2015
Phosphate	Poor	Good by 2027
Temperature	High	Good by 2015
Specific pollutants status	-	-
Supporting elements	Moderate or less	Moderate or less by 2015
Mitigation measure assessment	Moderate or less	Moderate or less by 2015
Chemical status	Good	Good by 2015

Moreton Brook from Source to River Trent (GB104028047380)

- 4.1.17 The Moreton Brook from Source to River Trent (GB104028047380) water body is currently assessed as having moderate overall status, moderate ecological status, and good chemical status. The water body currently has an objective to achieve an overall status of good by 2021.
- 4.1.18 The 2015 Cycle 2 status classification data for the water body are shown in Table 6. The water body is currently failing the good ecological status objective due phosphate (moderate).

Table 6: Moreton Brook from Source to River Trent – 2015 Cycle 2 status classification and objectives⁴

Status element	Status (2015)	Status objective
Overall status	Moderate	Good by 2021
Ecological status	Moderate	Good by 2021
Biological status	Good	Good by 2015

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Status element	Status (2015)	Status objective
Invertebrates	Good	Good by 2015
Macrophytes and phytobenthos	Good	Good by 2015
Hydromorphological status	Supports good	Supports good by 2015
Hydrological regime	Supports good	Supports good by 2015
Morphology	-	-
Physicochemical status	Moderate	Good by 2021
Ammonia (phys-chem)	High	Good by 2015
Dissolved oxygen	High	Good by 2015
pH	High	Good by 2015
Phosphate	Moderate	Good by 2021
Temperature	High	Good by 2015
Specific pollutants status	-	-
Chemical status	Good	Good by 2015

Trent from Tittensor to River Sow (GB104028053272)

- 4.1.19 The Trent from Tittensor to River Sow (GB104028053272) water body is currently assessed as having bad overall status, bad ecological status, and good chemical status. The water body currently has an objective to achieve an overall status of poor by 2027.
- 4.1.20 The 2015 Cycle 2 status classification data for the water body are shown in Table 7. The water body is currently failing the good ecological status objective due to fish (bad), invertebrates (moderate) and phosphate (poor).

Table 7: Trent from Tittensor to River Sow – 2015 Cycle 2 status classification and objectives⁴

Status element	Status (2015)	Status objective
Overall status	Bad	Poor by 2027
Ecological status	Bad	Poor by 2027
Biological status	Bad	Poor by 2027
Fish	Bad	Poor by 2027
Invertebrates	Moderate	Good by 2027
Macrophytes and phytobenthos	-	-
Hydromorphological status	Supports good	Supports good by 2015

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Status element	Status (2015)	Status objective
Hydrological regime	Supports good	Supports good by 2015
Morphology	Supports good	-
Physicochemical status	Moderate	Good by 2027
Ammonia (phys-chem)	Good	Good by 2015
BOD	Good	Good by 2015
Dissolved oxygen	High	Good by 2015
pH	High	Good by 2015
Phosphate	Poor	Good by 2027
Temperature	High	Good by 2015
Specific pollutants status	High	High by 2015
Chemical status	Good	Good by 2015

Trent and Mersey Canal, summit to Alrewas (GB70410142)

4.1.21 The Trent and Mersey Canal, summit to Alrewas (GB70410142) water body is an AWB and is currently assessed as having good overall status, good ecological potential, and good chemical status. The water body has therefore achieved its objective of an overall status of good by 2015.

4.1.22 The 2015 Cycle 2 status classification data for the water body are shown in Table 8.

Table 8: Trent and Mersey Canal, summit to Alrewas – 2015 Cycle 2 status classification and objectives⁴

Status element	Status (2015)	Status objective
Overall status	Good	Good by 2015
Ecological potential	Good	Good by 2015
Biological status	-	Not assessed by 2015
Invertebrates	-	-
Macrophytes and phytobenthos	-	-
Hydromorphological status	-	Not assessed by 2015
Hydrological regime	-	-
Morphology	-	-
Physicochemical status	High	Good by 2015
Ammonia (phys-chem)	High	Good by 2015

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Status element	Status (2015)	Status objective
Dissolved oxygen	Good	Good by 2015
pH	High	Good by 2015
Phosphate	-	-
Temperature	High	Good by 2015
Specific pollutants status		Not assessed by 2015
Supporting elements	Good	Good by 2015
Mitigation measure assessment	Good	Good by 2015
Chemical status	Good	Good by 2015

Sow- Doxey Bk to R Penk (GB104028046790)

- 4.1.23 The Sow - Doxey Bk to R Penk (GB104028046790) water body is a HMWB and is currently assessed as having poor overall status, poor ecological potential, and good chemical status. The water body currently has an objective to achieve an overall status of moderate by 2015.
- 4.1.24 The 2015 Cycle 2 status classification data for the water body are shown in Table 9. The water body is currently failing the good ecological potential objective due to fish (moderate), macrophytes and phytobenthos (poor), hydrological regime (does not support good), phosphate (poor), and its mitigation measure assessment (moderate or less). The latter relates to HMWB mitigation measures identified for the water body not yet being in place.

Table 9: Sow - Doxey Brook to River Penk – 2015 Cycle 2 status classification and objectives⁴

Status element	Status (2015)	Status objective
Overall status	Poor	Moderate by 2015
Ecological potential	Poor	Moderate by 2015
Biological status	Poor	Moderate by 2015
Fish	Moderate	Moderate by 2015
Invertebrates	Good	Good by 2015
Macrophytes and phytobenthos	Poor	Moderate by 2015
Hydromorphological status	Supports good	Supports good by 2015
Hydrological regime	Does not support good	Supports good by 2021
Physicochemical status	Moderate	Good by 2027
Ammonia (phys-chem)	High	Good by 2015

Status element	Status (2015)	Status objective
Dissolved oxygen	Good	Good by 2015
pH	High	Good by 2015
Phosphate	Moderate	Good by 2027
Temperature	High	Good by 2015
Specific pollutants status	-	-
Supporting elements	Moderate or less	Moderate or less by 2015
Mitigation measure assessment	Moderate or less	Moderate or less by 2015
Chemical status	Good	Good by 2015

Meece Brook from Source to Chatcull Brook (GB104028053080)

- 4.1.25 The Meece Brook from Source to Chatcull Brook (GB104028053080) water body is currently assessed as having poor overall status, poor ecological status, and good chemical status. The water body currently has an objective to achieve an overall status of good by 2027.
- 4.1.26 The 2015 Cycle 2 status classification data for the water body are shown in Table 10. The water body is currently failing the good ecological status objective due to fish (poor), invertebrates (moderate), macrophytes and phytobenthos (moderate), hydrological regime (does not support good) and phosphate (poor).

Table 10: Meece Brook from Source to Chatcull Brook – 2015 Cycle 2 status classification and objectives⁴

Status element	Status (2015)	Status objective
Overall status	Poor	Good by 2027
Ecological status	Poor	Good by 2027
Biological status	Poor	Good by 2027
Fish	Poor	Good by 2027
Invertebrates	Moderate	Good by 2027
Macrophytes and phytobenthos	Moderate	Good by 2027
Hydromorphological status	Supports good	Supports good by 2015
Hydrological regime	Does not support good	Supports good by 2021
Morphology	Supports good	-
Physicochemical status	Moderate	Good by 2027
Ammonia (phys-chem)	High	Good by 2015
Dissolved oxygen	Good	Good by 2015

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Status element	Status (2015)	Status objective
pH	High	Good by 2015
Phosphate	Poor	Good by 2027
Temperature	High	Good by 2015
Specific pollutants status	-	-
Chemical status	Good	Good by 2015

Lea (GB112068055200)

- 4.1.27 The Lea (GB112068055200) water body is currently assessed as having bad overall status, bad ecological status, and good chemical status. The water body currently has an objective to achieve an overall status of good by 2027.
- 4.1.28 The 2015 Cycle 2 status classification data for the water body are shown in Table 11. The water body is currently failing the good ecological status objective due to macrophytes and phytobenthos (bad), invertebrates (poor) and phosphate (poor).

Table 11: Lea – 2015 Cycle 2 status classification and objectives⁴

Status element	Status (2015)	Status objective
Overall status	Bad	Good by 2027
Ecological status	Bad	Good by 2027
Biological status	Bad	Good by 2027
Fish	Good	Good by 2015
Invertebrates	Poor	Good by 2021
Macrophytes and phytobenthos	Bad	Good by 2027
Hydromorphological Status	Supports good	Supports good by 2015
Hydrological regime	Supports good	Supports good by 2015
Morphology	Supports good	-
Physicochemical status	Moderate	Good by 2027
Ammonia (phys-chem)	High	Good by 2015
Dissolved oxygen	High	Good by 2015
pH	High	Good by 2015
Phosphate	Poor	Good by 2027
Temperature	High	Good by 2015
Specific pollutants status	-	-

Status element	Status (2015)	Status objective
Chemical status	Good	Good by 2015

Checkley Brook – Upper (GB112068055230)

4.1.29 The Checkley Brook – Upper (GB112068055230) water body is currently assessed as having good overall status, good ecological status, and good chemical status. The water body has therefore achieved its objective of an overall status of good by 2015.

4.1.30 The 2015 Cycle 2 status classification data for the water body are shown in Table 12.

Table 12: Checkley Brook – Upper – 2015 Cycle 2 status classification and objectives⁴

Status element	Status (2015)	Status objective
Overall status	Good	Good by 2015
Ecological status	Good	Good by 2015
Biological status	High	Good by 2015
Invertebrates	High	Good by 2015
Macrophytes and phytobenthos	High	Good by 2015
Hydromorphological status	Supports good	Supports good by 2015
Hydrological regime	Supports good	Supports good by 2015
Morphology	Supports good	Supports good by 2015
Physicochemical status	High	Good by 2015
Ammonia (phys-chem)	High	Good by 2015
Dissolved oxygen	High	Good by 2015
pH	High	Good by 2015
Phosphate	High	Good by 2015
Temperature	High	Good by 2015
Specific pollutants status	-	-
Chemical status	Good	Good by 2015

Wistaston Brook (GB112068055280)

4.1.31 The Wistaston Brook (GB112068055280) water body is currently assessed as having bad overall status, bad ecological status, and good chemical status. The water body currently has an objective to achieve an overall status of good by 2027.

- 4.1.32 The 2015 Cycle 2 status classification data for the water body are shown in Table 13. The water body is currently failing the good ecological status objective due to fish (bad), macrophytes and phytobenthos (poor), dissolved oxygen (moderate) and phosphate (poor).

Table 13: Wistaston Brook – 2015 Cycle 2 status classification and objectives⁴

Status element	Status (2015)	Status objective
Overall status	Bad	Good by 2027
Ecological status	Bad	Good by 2027
Biological status	Bad	Good by 2027
Fish	Bad	Good by 2027
Invertebrates	Good	Good by 2015
Macrophytes and phytobenthos	Poor	Good by 2027
Hydromorphological status	Supports good	Supports Good by 2015
Hydrological regime	Supports good	Supports good by 2015
Morphology	Supports good	-
Physicochemical status	Moderate	Good by 2027
Ammonia (phys-chem)	High	Good by 2015
BOD	High	-
Dissolved oxygen	Moderate	Good by 2015
pH	High	Good by 2015
Phosphate	Poor	Good by 2027
Temperature	High	Good by 2015
Specific pollutants status	-	-
Chemical status	Good	Good by 2015

Betley Mere (GB31234330)

- 4.1.33 The Betley Mere (GB31234330) water body is a HMWB and is currently assessed as having poor overall status, poor ecological status and good chemical status. The water body currently has an objective to achieve an overall status of poor by 2015.
- 4.1.34 The 2015 Cycle 2 status classification data for the water body are shown in Table 14. The water body is currently failing the good ecological status objective due to phytoplankton (poor), total phosphorous (bad) and its HMWB mitigation measure assessment (moderate or less). The latter relates to HMWB mitigation measures identified for the water body not yet being in place.

Table 14: Betley Mere – 2015 Cycle 2 status classification and objectives⁴

Status element	Status (2015)	Status objective
Overall status	Poor	Poor by 2015
Ecological status	Poor	Poor by 2015
Biological status	Poor	Poor by 2015
Phytoplankton	Poor	Poor by 2015
Hydromorphological status	Supports good	Supports good by 2015
Hydrological regime	High	Supports good by 2015
Physico-chemical status	Moderate	Moderate by 2015
Salinity	High	Good by 2015
Total phosphorus	Bad	Bad by 2015
Specific pollutant status	-	Not assessed by 2015
Supporting elements	Moderate	Good by 2027
Expert judgement	Moderate	-
Mitigation measures assessment	Moderate or less	Good by 2027
Chemical status	Good	Good by 2015

4.2 Watercourses

- 4.2.1 A total of 54 watercourses within the catchment areas of the WFD surface water bodies outlined in Section 4.1 have been identified as being directly crossed by or potentially affected by the Proposed Scheme.
- 4.2.2 All of the watercourses identified have been subject to a desk study and (where accessible) a field survey assessment in order to identify baseline hydromorphological and ecological condition (as described in Annex B2).
- 4.2.3 Based on the outcomes of the baseline assessment, all watercourses have been assigned a category based on a range of criteria relating to the estimated baseflow, geomorphological condition, and aquatic habitat potential at each site (see Annex C2 for details). These categories have been used to inform the scoping of detailed impact and mitigation assessment requirements at each of the watercourse sites. This scoping assessment has been undertaken in consultation with the Environment Agency.
- 4.2.4 The location, catchment characteristics, and baseline condition of all watercourses affected by the Proposed Scheme, together with their category and scoping outcome,

have been catalogued and are summarised in Annex C2. Watercourses have been grouped according to the relevant WFD surface water body catchment.

- 4.2.5 As a result of this baseline assessment, a total of 25 watercourses have been scoped in for detailed impact and mitigation assessment (see Annex C2 for details). This includes watercourses located within each of the surface water bodies affected by the Proposed Scheme (as outlined in Section 4.1), with the exception of the Blithe - Tad Bk to R Trent (GB1040280046491) water body. Consequently, the Blithe - Tad Bk to R Trent (GB1040280046491) water body has not been taken forward for detailed assessment.

5 Groundwater baseline

5.1 WFD water bodies

- 5.1.1 The WFD groundwater bodies crossed by or within 1km of the Proposed Scheme are shown in Table 15. The table summarises the relevant RBD / RBMP and Environment Agency operational catchment for each water body, together with the current (2015 Cycle 2 RBMP) status of the water bodies.
- 5.1.2 A total of six groundwater bodies are crossed by the Proposed Scheme. Three of these water bodies are located within the Humber RBD and three are located within the North West RBD.
- 5.1.3 Two additional groundwater bodies are within 1 km of the route of the Proposed Scheme, both of which are within the Humber RBD.
- 5.1.4 The water body catchment extents in relation to the route of the Proposed Scheme are shown in Annex D1, Figure 60 - Figure 63.
- 5.1.5 The current status and status objectives of each water body is summarised in the following sections.

Table 15: Summary of all WFD groundwater bodies crossed by or 1km within Proposed Scheme and their 2015 Cycle 2 status classifications⁴

WFD water body	Water Body ID	River Basin District / Management Plan	EA operational catchment	Overall status	Quantitative status	Chemical status
Tame Anker Mease - Secondary Combined	GB40402G990800	Humber	Tame Anker Mease - Secondary Combined	Good	Good	Good
Staffordshire Trent Valley - Mercia Mudstone East and Coal Measures	GB40402G300300	Humber	Staffordshire Trent Valley - Mercia Mudstone East and Coal Measures	Good	Good	Good
Staffordshire Trent Valley – Permo-Triassic (PT) Sandstone Staffordshire	GB40401G300500	Humber	Staffordshire Trent Valley - Permo-Triassic Sandstone Staffordshire	Poor	Poor	Poor
Staffordshire Trent Valley - Mercia Mudstone West	GB40402G300400	Humber	Staffordshire Trent Valley - Mercia Mudstone West	Good	Good	Good
Staffordshire Trent Valley - Coal Measures Stoke	GB40402G304600	Humber	Staffordshire Trent Valley - Coal Measures Stoke	Poor	Good	Poor
Manchester and East Cheshire Carboniferous Aquifers	GB41202G102900	North West	Manchester and Cheshire East Carboniferous Aquifers	Poor	Good	Poor
South Cheshire and North Staffordshire Permo-Triassic Sandstone Aquifers	GB41201G103400	North West	Cheshire South and Staffordshire North Permo-Triassic Sandstone Aquifers	Good	Good	Good
Weaver and Dane Quaternary Sand and Gravel Aquifers	GB41202G991700	North West	Weaver and Dane Quaternary Sand and Gravel Aquifers	Poor	Good	Poor

Tame Anker Mease - Secondary Combined (GB40402G990800)

5.1.6 The Tame Anker Mease - Secondary Combined (GB40402G990800) water body, which is within 1 km of the route of the Proposed Scheme, is currently assessed as having a good overall status, good quantitative status, and good chemical status. The water body has therefore achieved its overall status objective of good by 2015.

5.1.7 The 2015 Cycle 2 status classification data for the water body are shown in Table 16.

Table 16: Tame Anker Mease – Secondary Combined – 2015 Cycle 2 status classification and objectives⁴

Status element	Status (2015)	Status objective
Overall status	Good	Good by 2015
Quantitative status	Good	Good by 2015
Quantitative dependent surface water body status	Good	Good by 2015
Quantitative GWDTEs test	Good	Good by 2015
Quantitative saline intrusion	Good	Good by 2015
Quantitative water balance	Good	Good by 2015
Chemical status	Good	Good by 2015
Chemical dependent surface water body status	Good	Good by 2015
Chemical drinking water protected area	Good	Good by 2015
Chemical GWDTEs test	Good	Good by 2015
Chemical saline intrusion	Good	Good by 2015
General chemical test	Good	Good by 2015

Staffordshire Trent Valley - Mercia Mudstone East and Coal Measures (GB40402G300300)

5.1.8 The Staffordshire Trent Valley - Mercia Mudstone East and Coal Measures (GB40402G300300) water body is currently assessed as having a good overall status, good quantitative status, and good chemical status. The water body has therefore achieved its overall status objective of good by 2015.

5.1.9 The 2015 Cycle 2 status classification data for the water body are shown in Table 17.

Table 17: Staffordshire Trent Valley – Mercia Mudstone East and Coal Measures – 2015 Cycle 2 status classification and objectives⁴

Status element	Status (2015)	Status objective
Overall status	Good	Good by 2015
Quantitative status	Good	Good by 2015

Status element	Status (2015)	Status objective
Quantitative dependent surface water body status	Good	Good by 2015
Quantitative GWDTEs test	Good	Good by 2015
Quantitative saline intrusion	Good	Good by 2015
Quantitative water balance	Good	Good by 2015
Chemical status	Good	Good by 2015
Chemical dependent surface water body status	Good	Good by 2015
Chemical drinking water protected area	Good	Good by 2015
Chemical GWDTEs test	Good	Good by 2015
Chemical saline intrusion	Good	Good by 2015
General chemical test	Good	Good by 2015

Staffordshire Trent Valley - PT Sandstone Staffordshire (GB40401G300500)

- 5.1.10 The Staffordshire Trent Valley - PT Sandstone Staffordshire (GB40401G300500) water body is currently assessed as having a poor overall status, poor quantitative status, and poor chemical status. The water body currently has an objective to achieve an overall status of poor by 2015.
- 5.1.11 The 2015 Cycle 2 status classification data for the water body are shown in Table 18. The water body is currently failing the good quantitative status objective due to quantitative dependent surface water body status (poor) and quantitative water balance (poor) and the good chemical status objective due to chemical dependent surface water body status (poor) and chemical drinking water protected area (poor).

Table 18: Staffordshire Trent Valley – PT Sandstone Staffordshire – 2015 Cycle 2 status classification and objectives⁴

Status Element	Status (2015)	Status Objective
Overall status	Poor	Poor by 2015
Quantitative status	Poor	Poor by 2015
Quantitative dependent surface water body status	Poor	Good by 2027
Quantitative GWDTEs test	Good	Good by 2015
Quantitative saline intrusion	Good	Good by 2015
Quantitative water balance	Poor	Poor by 2015
Chemical status	Poor	Good by 2027

Status Element	Status (2015)	Status Objective
Chemical dependent surface water body status	Poor	Good by 2027
Chemical drinking water protected area	Poor	Good by 2027
Chemical GWDTEs test	Good	Good by 2015
Chemical saline intrusion	Good	Good by 2015
General chemical test	Good	Good by 2015

Staffordshire Trent Valley - Mercia Mudstone West (GB40402G300400)

5.1.12 The Staffordshire Trent Valley - Mercia Mudstone West (GB40402G300400) water body is currently assessed as having good overall status, good quantitative status, and good chemical status. The water body has therefore achieved its overall status objective of good by 2015.

5.1.13 The 2015 Cycle 2 status classification data for the water body are shown in Table 19.

Table 19: Staffordshire Trent Valley – Mercia Mudstone West – 2015 Cycle 2 status classification and objectives⁴

Status Element	Status (2015)	Status Objective
Overall status	Good	Good by 2015
Quantitative status	Good	Good by 2015
Quantitative dependent surface water body status	Good	Good by 2015
Quantitative GWDTEs test	Good	Good by 2015
Quantitative saline intrusion	Good	Good by 2015
Quantitative water balance	Good	Good by 2015
Chemical status	Good	Good by 2015
Chemical dependent surface water body status	Good	Good by 2015
Chemical drinking water protected area	Good	Good by 2015
Chemical GWDTEs test	Good	Good by 2015
Chemical saline intrusion	Good	Good by 2015
General chemical test	Good	Good by 2015

Staffordshire Trent Valley - Coal Measures Stoke (GB40402G304600)

5.1.14 The Staffordshire Trent Valley - Coal Measures Stoke (GB40402G304600) water body, which is within 1 km of the route of the Proposed Scheme, is currently assessed as

having a poor overall status, good quantitative status, and poor chemical status. The water body currently has an objective to achieve an overall status of poor by 2015.

- 5.1.15 The 2015 Cycle 2 status classification data for the water body are shown in Table 20. The water body is currently achieving the good quantitative status objective, but failing the good chemical status objective due to chemical dependent surface water body status (poor).

Table 20: Staffordshire Trent Valley – Coal Measures Stoke – 2015 Cycle 2 status classification and objectives⁴

Status Element	Status (2015)	Status Objective
Overall status	Poor	Poor by 2015
Quantitative status	Good	Good by 2015
Quantitative dependent surface water body status	Good	Good by 2015
Quantitative GWDTEs test	Good	Good by 2015
Quantitative saline intrusion	Good	Good by 2015
Quantitative water balance	Good	Good by 2015
Chemical status	Poor	Poor by 2015
Chemical dependent surface water body status	Poor	Poor by 2015
Chemical drinking water protected area	Good	Good by 2015
Chemical GWDTEs test	Good	Good by 2015
Chemical saline intrusion	Good	Good by 2015
General chemical test	Good	Good by 2015

Manchester and East Cheshire Carboniferous Aquifers (GB41202G102900)

- 5.1.16 The Manchester and East Cheshire Carboniferous Aquifers (GB41202G102900) water body is currently assessed has having poor overall status, good quantitative status, and poor chemical status. The water body currently has an objective to achieve an overall status of good by 2027.
- 5.1.17 The 2015 Cycle 2 status classification data for the water body are shown in Table 21. The water body is currently achieving the good quantitative status objective, but is currently failing the good chemical status objective due to chemical drinking water protected area (poor).

Table 21: Manchester and East Cheshire Carboniferous Aquifers – 2015 Cycle 2 status classification and objectives⁴

Status Element	Status (2015)	Status Objective
Overall status	Poor	Good by 2027

Status Element	Status (2015)	Status Objective
Quantitative status	Good	Good by 2015
Quantitative dependent surface water body status	Good	Good by 2015
Quantitative GWDTEs test	Good	Good by 2015
Quantitative saline intrusion	Good	Good by 2015
Quantitative water balance	Good	Good by 2015
Chemical status	Poor	Good by 2027
Chemical dependent surface water body status	Good	Good by 2015
Chemical drinking water protected area	Poor	Good by 2027
Chemical GWDTEs test	Good	Good by 2015
Chemical saline intrusion	Good	Good by 2015
General chemical test	Good	Good by 2015

South Cheshire and North Staffordshire Permo-Triassic Sandstone Aquifers (GB41201G103400)

5.1.18 The South Cheshire and North Staffordshire Permo-Triassic Sandstone Aquifers (GB41201G103400) water body is currently assessed as having a good overall status, good quantitative status, and good chemical status. The water body has therefore achieved its overall status objective of good by 2015.

5.1.19 The 2015 Cycle 2 status classification data for the water body are shown in Table 22.

Table 22: South Cheshire and North Staffordshire Permo-Triassic Sandstone Aquifers – 2015 Cycle 2 status classification and objectives⁴

Status Element	Status (2015)	Status Objective
Overall status	Good	Good by 2015
Quantitative status	Good	Good by 2015
Quantitative dependent surface water body status	Good	Good by 2015
Quantitative GWDTEs test	Good	Good by 2015
Quantitative saline intrusion	Good	Good by 2015
Quantitative water balance	Good	Good by 2015
Chemical status	Good	Good by 2015
Chemical dependent surface water body status	Good	Good by 2015

Status Element	Status (2015)	Status Objective
Chemical drinking water protected area	Good	Good by 2015
Chemical GWDTes test	Good	Good by 2015
Chemical saline intrusion	Good	Good by 2015
General chemical test	Good	Good by 2015

Weaver and Dane Quaternary Sand and Gravel Aquifers (GB41202G991700)

- 5.1.20 The Weaver and Dane Quaternary Sand and Gravel Aquifers (GB41202G991700) water body is currently assessed as having a poor overall status, good quantitative status, and poor chemical status. The water body currently has an objective to achieve an overall status of good by 2027.
- 5.1.21 The 2015 Cycle 2 status classification data for the water body are shown in Table 23. The water body is currently achieving the good quantitative status objective, but is failing the good chemical status objective due to chemical dependent surface water body status (poor), chemical GWDTes test (poor), and general chemical test (poor).

Table 23: Weaver and Dane Quaternary Sand and Gravel Aquifers – 2015 Cycle 2 status classification and objectives⁴

Status Element	Status (2015)	Status Objective
Overall status	Poor	Good by 2027
Quantitative status	Good	Good by 2015
Quantitative dependent surface water body status	Good	Good by 2015
Quantitative GWDTes test	Good	Good by 2015
Quantitative saline intrusion	Good	Good by 2015
Quantitative water balance	Good	Good by 2015
Chemical status	Poor	Good by 2027
Chemical dependent surface water body status	Poor	Good by 2027
Chemical drinking water protected area	Good	Good by 2015
Chemical GWDTes test	Poor	Good by 2027
Chemical saline intrusion	Good	Good by 2015
General chemical test	Poor	Good by 2027

5.2 Characterisation of groundwater bodies (survey sites)

- 5.2.1 Environment Agency groundwater level monitoring data, from boreholes in proximity to the route, have been used to supplement the RBMP baseline information summarised above. This information is described in Volume 5, Appendix WR-002.
- 5.2.2 No monitoring boreholes have yet been drilled specifically for the Proposed Scheme. Where no baseline data is available, the assessment takes a precautionary approach in terms of assumed groundwater levels.
- 5.2.3 Several features, which have potential to characterise the baseline groundwater body quantity or chemistry, were identified through desk study. Where access has been available, these features – including potential springs, potential ground water dependant terrestrial ecosystems (GWDTE) and groundwater abstraction sites – have been reviewed in the field. Where potential springs or GWDTE have been assessed as being true expressions of groundwater or having dependence on groundwater, basic water quality and flow measurements have been taken (as described in Annex B2).
- 5.2.4 Details of the features identified within the study area, with potential merit for characterisation of the groundwater bodies, are provided in Annex D2. Potential springs that have been identified from Ordnance Survey (OS) maps, but that have not been surveyed due to land access constraints, have been included within this assessment. It is possible, however, that these are not expressions of groundwater and are related to land drainage. If this is proven to be the case via further baseline investigations undertaken during the detailed design stage of Proposed Scheme, then these features will not be relevant to the WFD Assessment.
- 5.2.5 Where features used for the baseline characterisation of the relevant groundwater body are also potential receptors of the impacts of the Proposed Scheme, in terms of chemical or quantitative status elements, these have been reviewed as part of the detailed assessment.

6 Scheme baseline

6.1 Scheme components

- 6.1.1 The key construction (Map Series CT-05) and operation (Map Series CT-06) maps in Volume 2: Map Books are the primary source of Proposed Scheme design information.
- 6.1.2 The assessment has considered all 'scheme components' that have the potential to permanently affect surface water and groundwater bodies, and therefore have the potential to impact upon WFD status. All scheme components have been assessed individually (with the exception of where a proposed realignment or diversion involves the removal of an existing culvert), before the combined effect on quality element status is considered.

Surface water

- 6.1.3 A total of ten different scheme components have been identified that will directly or indirectly affect the surface water bodies along the route of the Proposed Scheme. These include:
- viaducts;
 - culverts (a pipe or box shaped structure that carries a watercourse under a road or railway crossing);
 - drop inlet culverts (a form of culvert used on sloping ground where the water level has to be lowered in order to pass under the road or railway crossings; constructed using either an open, stepped cascade or an enclosed chamber on the upstream side of the crossing only);
 - inverted siphons (a form of culvert used on level ground where the water level has to be lowered in order to pass under a road or railway crossings; constructed using enclosed chambers on both sides of the crossing);
 - underbridges (a bridge carrying the Proposed Scheme over a watercourse and other features);
 - realignments (permanent, localised realignment of a watercourse involving the creation of a new section of river channel tying back into the existing watercourse at the downstream extent);
 - diversions (permanent, localised diversion of a watercourse involving the creation of a new section of river channel whereby the location of the watercourse's confluence with the downstream watercourse is changed);
 - daylighting of existing culverts (removal of an existing culvert structure without any associated realignment / diversion of the watercourse);
 - removal of existing culverts associated with a proposed watercourse diversion/realignment; and

- borrow pits (areas where the excavation of sand and gravels for use during the construction of the Proposed Scheme is proposed);

6.1.4 All scheme components affecting the 54 watercourses outlined in Section 4.2 have been catalogued and are summarised in relation to the relevant watercourse and surface water body catchment in Annex E1.1, Table 37. The scheme component, related crossing type (i.e. track, access road or highway realignment) and any available details regarding the design are provided, and a unique reference code has been applied for each scheme component. A total of 152 scheme component locations have been identified, which are shown in Annex E1.1, Figure 64 - Figure 78.

Groundwater

6.1.5 A total of seven different scheme components have been identified that could directly or indirectly affect groundwater bodies along the route of the Proposed Scheme. These include:

- viaducts;
- cuttings;
- embankments;
- major overbridges;
- retaining walls;
- cut-and-cover tunnels (tunnels built by excavating the ground, building a tunnel structure, and then restoring the land over the top to integrate it with the landscape, thus minimising visual impacts and making the presence of a railway less noticeable);
- bored tunnels (tunnels constructed where the depth between the railway and existing ground is such that open excavation is not practicable, and where the tunnel length is sufficient to make the use of tunnelling equipment viable); and
- borrow pits.

6.1.6 All scheme components potentially affecting the groundwater bodies outlined in Section 5 have been catalogued and are summarised in Annex E1.2, Table 38. The scheme component and any available details regarding the design are provided, and a unique reference code has been applied to each scheme component. A total of 64 scheme component locations have been identified.

Generic scheme component impacts

6.1.7 The range of generic impacts that may be caused by each of the various scheme components outlined in Section 6.1 have been identified in accordance with the WFD Compliance Assessment Technical Note (Volume 5, Appendix CT-001-002).

6.1.8 The generic impacts identified for each of the scheme components affecting surface water bodies and groundwater bodies are summarised in Annex E1.3 (see Table 39 and Table 40, respectively).

- 6.1.9 Embankments have been scoped out of the groundwater assessment as having no significant impacts on groundwater bodies along the route of the Proposed Scheme. All other scheme components identified for groundwater bodies have been taken forward for further assessment.

6.2 Design assumptions and embedded mitigation

- 6.2.1 Mitigation has been embedded within the Proposed Scheme in order to minimise any effects on the water environment and to ensure that the scheme is, where possible, inherently compliant with the objectives of the WFD for both surface water and groundwater bodies. This includes mitigation embedded within the design, construction methodology and operational phase of the Proposed Scheme. This is described in the following sections.

Avoidance

- 6.2.2 The principal strategy adopted to limit the temporary and permanent effects of the Proposed Scheme is through avoidance of sensitive receptors wherever reasonably practicable. Where receptors could not be avoided, mitigation measures have been incorporated where necessary to limit the potential effects.
- 6.2.3 The avoidance of sensitive receptors has reduced the risks associated with impacts on water resources and of the Proposed Scheme not complying with the requirements of the WFD. Examples of this avoidance strategy include:
- avoidance of channels and floodplain areas – the route of the Proposed Scheme will avoid passing along river or stream valleys and their associated floodplains. Instead it will pass over larger watercourses on viaducts spanning the floodplain, with piers set back from the channel;
 - avoidance, where reasonably practicable, of GWDTE, including natural springs that can play a key role in the hydrology and hydrogeology of such ecosystems; and
 - avoidance, where reasonably practicable, of major public water supplies and smaller licensed and unlicensed abstractions of surface water and groundwater.
- 6.2.4 The presence of any unregistered private water supplies, their function and the means of protecting or if necessary replacing them will be discussed with any landowners potentially affected by the Proposed Scheme.
- 6.2.5 The temporary works shown in the key construction maps (Map Series CT-05) in Volume 2: Map Books have been informed by a detailed consideration of the water resources constraints and have sought to avoid sensitive features (such as those listed above) wherever reasonably practicable.

Embedded mitigation

- 6.2.6 Embedded mitigation has been incorporated within the design of specific scheme components, in order to reduce adverse effects to the water environment as far as is reasonably practicable. The embedded mitigation of relevance to the water environment for each of the scheme components assessed is summarised in Table 24.

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Table 24: Water environment related design 'embedded mitigation' for relevant scheme component affecting surface water and groundwater bodies

Scheme Component	Design embedded mitigation and assumptions
Surface water scheme components	
Viaducts	Viaduct piers avoid the river channel and riparian zone. Viaducts have been designed to cross perpendicular to river channels wherever possible, in order to reduce potential shading effects.
Culverts	Culvert lengths have been reduced as far as reasonably practicable. Culverts have been designed to be perpendicular to associated track and road crossings where possible, in order to minimise culvert lengths and reduce potential shading effects. Culverts have been designed to accommodate flood flows up to and including the 1 in 100 (1%) annual probability storm with an allowance for climate change based on latest guidance issued by the Environment Agency⁶. The invert level of each culvert is to be buried below the existing bed level of the watercourse, in order to reduce disruption to sediment transfer and to allow build-up of natural substrate, whilst culvert dimensions have been sized to minimise impacts on flow continuity. The detailed design of all culverts is to be developed in general accordance with CIRIA⁷ and Environment Agency guidance and will ensure appropriate low-flow water depths and velocities for fish passage. The detailed design will, where reasonably practicable, aim to incorporate hydromorphological improvements on the river channel, which will be undertaken immediately upstream and downstream of the culvert to compensate for footprint loss.
Drop invert culverts	No drop inlet culverts have been proposed on Main Rivers. Drop inlet culvert lengths have been reduced as far as reasonably practicable. Drop inlet culverts have been designed to accommodate flood flows up to and including the 1 in 100 (1%) annual probability flood with an allowance for climate change based on latest guidance issued by the Environment Agency⁶. The downstream invert level of each drop inlet culvert is to be buried below the existing bed level of the watercourse on the downstream end, in order to reduce disruption to sediment transfer and to allow build-up of natural substrate, whilst drop inlet culvert dimensions have been sized to minimise impacts on flow continuity. The detailed design of all drop inlet culverts is to be developed in general accordance with CIRIA⁷ and Environment Agency guidance and will ensure appropriate low-flow water depths and velocities for fish passage. The detailed design will, where reasonably practicable, aim to incorporate hydromorphological improvements on the river channel, which will be undertaken immediately upstream and downstream of the drop inlet culvert to compensate for footprint loss.
Inverted siphons	No inverted siphons have been proposed on Main Rivers. Inverted siphon lengths have been reduced as far as reasonably practicable. Inverted siphons have been designed to accommodate flood flows up to and including the 1 in 100 (1%) annual probability storm with an allowance for climate change based on latest guidance issued by the Environment Agency.

⁶ Environment Agency (2016), *Adapting to Climate Change: Advice for Flood and Coastal Erosion Risk Management Authorities*, <https://consult.environment-agency.gov.uk/engagement/bostonbarriertwao/results/appendix-15---adapting-to-climate-change-advice-to-fcerm-authorities--13-april-2016-.pdf>

⁷ Balkham, M., Fosbeary C., Kitchen, A. and Rickard, C. (2010), *Culvert design and operation guide (C689)*, CIRIA, London; Wallerstein, N., Arthur, S. and Blanc, J. (2013), *Culvert design and operation guide supplementary technical note*, CIRIA, London

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Scheme Component	Design embedded mitigation and assumptions
	The detailed design of all siphons is to be developed in consultation with the Environment Agency. The detailed design will, where reasonably practicable, aim to incorporate hydromorphological improvements on the river channel, which will be undertaken immediately upstream and downstream of the siphon to compensate for footprint loss.
Realignments / Diversions	Where permanent watercourse diversions and/or realignments are proposed, the aim will be to design these with equivalent hydraulic capacity to the existing channels. The detailed design will aim to ensure that field subsurface drainage systems can be adapted to discharge into the new diverted / realigned channels. The detailed design of permanent watercourse diversions / realignments will aim to incorporate appropriate features to retain, and, where reasonably practicable, enhance the watercourse's hydromorphological condition. The new diverted / realigned channels will be designed in consultation with the Environment Agency and with input from a suitable qualified Fluvial Geomorphologist and Aquatic Ecologist. The detailed design of permanent watercourse diversions / realignments will aim, where reasonably practicable, to incorporate measures to improve the watercourse's hydromorphological status (provided this is compatible with the watercourse's flood risk and land drainage functions). This may include but not be restricted to the following in-channel enhancements (as appropriate to the hydromorphological regime of the watercourse at the site location), which will be designed in consultation with the Environment Agency and with input from a suitable qualified Fluvial Geomorphologist and Aquatic Ecologist: • re-meandering of watercourses (where site extent allows); • provision of in-channel fluvial geomorphological features such as berms and bars to promote flow sinuosity and width/depth variation and provide marginal habitat; • improvement of morphological flow types such as pools, riffles and runs, to provide aquatic habitat diversity; • provision of defined low-flow channels to sustain appropriate flow depths and velocities and improve potential for fish passage; and • provision of varied channel bank profiles to improve morphological diversity, included areas of shallow-graded channel banks to allow for marginal vegetation growth. Proposed realignments / diversions have incorporated a 10m wide buffer strip on both sides of the new channel in order to allow for, where practicable, the implementation of marginal and riparian habitat improvements.
Underbridges	Underbridge lengths have been reduced as far as reasonably practicable. Underbridges have been designed to cross perpendicular to river channel wherever possible, in order to reduce potential shading effects. The detailed design of any localised modifications to the river channel passing beneath underbridges (including the potential provision of localised bank protection) is to be developed in general accordance with Environment Agency guidance and with input from a suitable qualified Fluvial Geomorphologist and Aquatic Ecologist to ensure that appropriate low-flow water depths and velocities for fish passage are maintained.
Borrow pits	Following construction, the areas excavated as borrow pit will be restored to the existing levels and land use (as detailed within the restoration strategy for the borrow pits, ES Volume 5: Appendix CT-009-000). The materials used to backfill the borrow pit as part of the restoration plan are assumed to consist of a material with lower permeability than the current material. Drainage measures will be designed to control groundwater levels and to sustain baseflow to the watercourse in question.

Groundwater scheme components

Where appropriate the effect on groundwater for each scheme component will be assessed following ground investigation and mitigation designed appropriately. As such, at this stage, there is limited embedded mitigation for ground water scheme components in comparison to surface water scheme components. There are, however, standard design methods which will be applied in order to protect the groundwater environment. These are also outlined below.

At grade	With regards to track drainage, where ground conditions are suitable, discharge to groundwater should be considered the first option – subject to consideration of pollution risk and the presence of any groundwater
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Scheme Component	Design embedded mitigation and assumptions
	source protection zones.
Embankments	Where ground conditions are suitable, track drainage will discharge to groundwater – subject to consideration of pollution risk and the presence of any groundwater source protection zones. When excavated material is placed, consideration will be given to the origin of the material in the context of where it is to be placed. If the material to be placed will have a significantly lower permeability than the underlying soils then the impact will be assessed. Materials that come into contact with groundwater shall be approved by the Environment Agency including those used in grout for backfilling of voids and water sealing, which can affect groundwater and watercourses.
Cuttings	The impact of cuttings in areas of existing groundwater flooding shall be assessed. Measures to reduce effect of cuttings on groundwater flows and water quality include: • cut-off structures such as sheet piles, driven/installed to depths underlying strata of lower permeability, will be used as a barrier to flow, reducing the flow into excavations, reducing the influence of dewatering on local water tables; • passive bypasses used to allow groundwater to bypass a barrier. Such bypasses could comprise a 'blanket' of permeable material (e.g. gravel) placed below cuttings or around the tunnel perimeter allowing groundwater to bypass the structure without a groundwater level raise upstream of the underground structure. • barriers / collars will discourage groundwater flowing in zones in which the hydraulic conductivity has been increased due to the gravel blankets or the disturbance of rock/soils outside of linear structures. Without such barriers such artificially created groundwater flow paths could act as draining features resulting in dewatering post-construction of cuttings and tunnel walls. • promotion of groundwater recharge, such as discharging pumped water to recharge trenches around excavations to maintain baseline groundwater and surface water conditions; and • where reasonably practicable, drainage would be designed to encourage water to soak back into the ground, for example where cuttings intercept groundwater flows.
Retaining walls	Measures similar to those outlined above will be taken to ensure that the impact of structures and construction processes on groundwater flow regimes remains negligible.
Bored tunnels	Tunnel boring machines will be used, meaning that dewatering will generally not be required unless for the excavation of tunnel portals, ventilation and intervention shafts, cross passages and adits. Where soil conditioning polymers are required, wherever practicable, biodegradable substances which break down to non-contaminating substances should be used in preference. Once constructed, the potential for groundwater ingress into any bored tunnels will be limited by the tunnel lining design.
Cut-and-cover tunnels	Cut-and-cover tunnels use a cut and cover construction method (see measures outlined above for 'cuttings'). Once constructed, the potential for groundwater ingress into any tunnel will be limited by the tunnel lining design.
Viaduct foundations	Where piling and penetrative procedures are to be used, environmental considerations including the presence of groundwater, the potential for contamination and any risks arising from the development to the environment will be considered through an appropriate risk assessment. Reference shall be made to the Environment Agency's guide 'Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention'. The properties of any materials being added to soils for soil mixed columns will be considered to ensure a pollution risk is not created. The properties of any soil stabilisation materials being added will be considered to ensure a pollution risk is not created.

- 6.2.7 In addition to the measures outlined in Table 24, the design of the Proposed Scheme includes sustainable drainage systems, where reasonably practicable, to control the rate, volume and quality of runoff from the rail corridor and other infrastructure, taking projected climate change impacts into account. These systems will encourage storm water to soak into the ground or, where that is not reasonably practicable, discharge it into watercourses or surface water/combined sewers at a rate matching existing runoff rates, or at an otherwise agreed rate at each location. These systems will also help to remove any suspended material within runoff from the Proposed Scheme through filtration, vegetative adsorption or settlement and, as such, will aim to ensure that the quantity and quality of water draining from the Proposed Scheme during its operational phase will have a negligible impact on the water environment.

Construction phase mitigation

- 6.2.8 Section 16 of the Draft Code of Construction Practice (CoCP)⁸ includes a range of mitigation measures that are developed to reduce construction impacts as far as is reasonably practicable. The measures that are of particular relevance to the water environment are described below.
- 6.2.9 The CoCP⁸ will include requirements to protect water bodies and their associated water resources from the potential impacts of pollution from construction site runoff, including as appropriate:
- provision of maps showing sensitive areas and buffer zones where no pollutants are to be stored or used; and
 - preparation of method statements for silt management, site drainage at compounds and satellite compounds, for the storage and control of oils and chemicals and the prevention of accidental spillages, in consultation with the Environment Agency, and if appropriate, the Lead Local Flood Authority and other relevant authorities as part of the approvals process. These method statements will cover, where applicable:
 - the avoidance of discharges of site runoff to ditches, watercourses, drains, sewers or soakaways without the prior agreement of the appropriate authority;
 - measures to prevent silt-laden runoff and other pollutants entering the water environment; and
 - restrictions or controls on excavation within watercourses to limit effects on water quality, sedimentation, fisheries and aquatic ecology.
- 6.2.10 Method statements will be required for all watercourse crossings and channel realignments required by construction traffic routes. The method statements will describe how potential changes to flood risk, water quality and channel hydromorphology will be safeguarded during the establishment, use and decommissioning of all construction traffic routes.

⁸ Draft Code of Construction Practice, Volume 5: Appendix CT-003-000

- 6.2.11 Existing groundwater abstraction boreholes or monitoring points will be protected from physical damage, in so far as reasonably practicable, including appropriate decommissioning of abandoned boreholes in order to prevent pollution pathways. If boreholes are to be decommissioned and replaced with alternatives, the contractors will follow the latest good practices, as far as reasonably practicable. This will also be applicable to springs potentially affected by construction works, although additional measures may be required to mitigate temporary construction impacts on springs that are to be relocated. Additional measures required to mitigate temporary construction impacts on springs that are to be relocated are outlined in the relevant Volume 2, Community area reports.
- 6.2.12 Measures will be introduced, as required, to mitigate the temporary and permanent effects on groundwater flows and water quality during excavation and construction of foundations, tunnels and cuttings, as far as is reasonably practicable. The exact requirements will be refined and method of mitigation will be designed following ground investigation at cutting locations. The types of measure likely to be adopted could include:
- installation of cut-off structures (impermeable barrier preventing water flow) around excavations;
 - ensuring cut-off structures are driven to sufficient depths to meet an underlying strata or zone of lower permeability;
 - promoting groundwater recharge, such as discharging pumped water to recharge trenches around excavations to maintain baseline groundwater and surface water conditions;
 - incorporating passive bypasses within the design, which could comprise a 'blanket' of permeable material, such as gravel, placed around temporary structures allowing groundwater to bypass the below-ground works, without a rise in groundwater levels on the upstream side; and
 - the Tunnel Boring Machine (TBM) will be operated in a closed face mode when tunnelling within water bearing strata and the tunnel lining will be designed to reduce leakage rates as far as is reasonably practicable, thereby reducing the requirements for dewatering and drainage.
- 6.2.13 A total of six borrow pits are proposed during the construction phase of the Proposed Scheme. These will be excavated into Glaciofluvial Deposits and River Terrace Deposits within areas of floodplain nearby to watercourses.
- 6.2.14 A minimum 50m buffer zone has been incorporated between borrow pit sites and nearby watercourses, wherein excavation will not take place. Depending on the permeability of the underlying strata between a watercourse and the borrow pit excavation, there is the potential for dewatering and excavation activities to affect watercourse flow regime. Therefore, site investigation and monitoring before, during and after excavation and dewatering activities will be implemented, to protect the integrity of nearby watercourses. Monitoring data will be used to ensure construction activities at borrow pit sites are compliant with the CoCP⁸ and so do not significantly impact upon nearby watercourses.

- 6.2.15 At one of the proposed borrow pit sites (borrow pit west of Netherset Hey Farm), the excavation will involve the temporary loss and diversion of the lower reach of a minor tributary of the River Lea. The excavation strategy at this site will apply a phased approach, allowing for the provision of an appropriately designed, temporary diversion channel comprising equivalent hydraulic capacity and hydromorphological condition as the existing watercourse. This temporary diversion will be in place for no longer than three years, with the existing watercourse being fully reinstated within this timeframe.
- 6.2.16 Approximately half of the proposed borrow pit north of Checkley Lane falls within the surface water catchment of Betley Mere SSSI. There is a potential surface water connection between the borrow pit and the drains discharging to the mere. The mere is also believed to have interaction with the Glaciofluvial Deposit aquifer as both a source and sink of water. Therefore excavation and dewatering of the borrow pit would have the potential to disrupt surface and groundwater flows towards the mere, without appropriate avoidance measures. These may include:
- provision of a vertical buffer between the base of the borrow pit excavations and the groundwater level. This will ensure that there are no impacts on groundwater flows;
 - excavations in accordance with the measures described in the Draft CoCP⁸;
 - treatment of any rainfall and surface water runoff intercepted by the borrow pit and re-circulation into the downstream catchment at an appropriate rate and location, therefore ensuring that there is no significant impact on the volume or quality of water reaching the mere; and
 - such reasonable ancillary measures as may be required.
- 6.2.17 The details of this mitigation will be agreed with the Environment Agency in consultation with Natural England to ensure that there are no significant effects on Betley Mere or Mere Gutter. There is the possibility that alternative methods of avoidance to those specified above may be developed in the period prior to excavation that would be equally effective in preventing the likelihood of significant effects. If that were to be the case, HS2 Ltd would secure Environment Agency approval to such an alternative, in consultation with Natural England, prior to the excavation commencing.

Operation phase mitigation

- 6.2.18 Generic examples of design mitigation that will reduce potentially significant adverse impacts on the quality and flow characteristics of surface water and groundwater bodies during operation and management of the Proposed Scheme are described in Volume 1, Section 6.
- 6.2.19 A draft operation and maintenance plan for the Proposed Scheme is provided in Volume 5: Appendix WR-005-000, which outlines measures to manage possible sources of pollution of the water environment as a result of rail operations.

Monitoring

Construction Phase

- 6.2.20 The nominated undertaker will require its lead contractors to implement appropriate surface water and groundwater inspection and monitoring procedures as part of their Environment Method Statement (EMS). This will include, but will not be limited to, procedures to monitor the effectiveness of the mitigation measures associated with potentially significant effects outlined in the water resources and flood risk sections of the Volume 2, Community area reports.
- 6.2.21 Requirements will cover monitoring of potentially adverse effects on WFD water bodies identified in this WFD Assessment (see Section 8).
- 6.2.22 The nominated undertaker will require its contractors to consult the Environment Agency regarding water quality, flow and level monitoring to be undertaken for watercourses and groundwater that will be affected by construction works or discharge of surface water runoff, which will include the following, as appropriate:
- pre-construction monitoring to establish baseline water quality conditions for watercourses and groundwater;
 - monitoring during construction works to enable the effectiveness of mitigation measures to limit pollution risk to be monitored and any pollution incidents to be identified; and
 - monitoring of watercourses or groundwater receiving surface water runoff during construction to enable the effectiveness of treatment and other sustainable drainage systems measures to be determined and to ensure that an unacceptable rise in groundwater levels does not occur.
- 6.2.23 The nominated undertaker will require its contractors to carry out appropriate monitoring to identify:
- pollution risks that are unacceptably high;
 - spillages and leakages;
 - non-compliance with the CoCP⁸; and
 - suspected pollution incidences.
- 6.2.24 Appropriate actions will be taken where pollution risks are unacceptably high, where there is non-compliance with the CoCP⁸, where spillages and leakages are unacceptable or where there are any suspected pollution incidents.
- 6.2.25 Groundwater monitoring will be undertaken at any groundwater sensitive areas, as required, to inform the detailed design of the Proposed Scheme and the development of construction methods to mitigate potential impacts.
- 6.2.26 The contractors will also consult with the relevant regulatory body regarding the pollution incident control plan which will set out the measures to be implemented to address any adverse findings from the monitoring procedures during and following completion of construction works.

Operational Phase

- 6.2.27 The nominated undertaker will be responsible for ensuring that monitoring is undertaken to identify any residual impacts following construction and confirm the efficacy of implemented mitigation. This will include monitoring of potentially adverse effects on WFD water bodies identified in this WFD Assessment (see Section 8).
- 6.2.28 The duration of this monitoring will be agreed with the Environment Agency and will depend on the nature of the potential impact concerned. However, in general terms, water quality monitoring in sensitive area is likely to continue for a period of up to two years and monitoring of biological and hydromorphological effects for up to five years post-construction.
- 6.2.29 Provided the construction phase mitigation proves effective, as demonstrated through post-construction monitoring, the remaining measures comprise procedures for inspection, operation and maintenance of the Proposed Scheme as set out in the draft operation and maintenance plan provided in Volume 5: Appendix WR-005-000.

7 Preliminary assessment

7.1 Likely effects on current status

- 7.1.1 The baseline assessment has scoped the relevant WFD surface water and groundwater bodies affected by the Proposed Scheme (see Sections 4 and 5, respectively), together with the relevant scheme components and their generic impacts (see Section 6.1).
- 7.1.2 A preliminary assessment has then been undertaken to screen potential scheme component impacts against the mitigation embedded within the Proposed Scheme (as summarised in Section 6.2), in order to identify the likely effects on the various WFD status elements.
- 7.1.3 The likely effects of each of the scheme components (following consideration of embedded mitigation) on the various WFD status elements of surface water and groundwater bodies are summarised in the following sections.

Surface water

Biological effects

- 7.1.4 Effects on biological status are considered in terms of likely change in composition and abundance of phytobenthos, macrophytes and macroinvertebrate communities and for fish on composition, abundance and age structure. The likely effects of the various scheme components on biological status are summarised in Table 25.

Table 25: Likely biological effects of scheme components for surface water bodies (after consideration of embedded mitigation)

Scheme Component	Likely biological effects of scheme component
Viaducts	Viaducts will likely cause some minor, localised and periodic shading of the river channel. This may result in some localised reduction in photosynthetic activity for macrophytes and phytobenthos. However, due to the height and alignment of the structure, this is anticipated to have a negligible effect on macrophytes and phytobenthos, macroinvertebrates and fish.
Culverts	Culverts will cause a localised but permanent loss of a section of existing river channel habitat with a subsequent localised but permanent shading of the watercourse within the footprint of the culvert. This is anticipated to have a minor, localised adverse effect on macrophytes, phytobenthos, macroinvertebrates and fish. Where the length of proposed culverts is significant, however, this may have an adverse effect on fish due to potential disruption of fish passage and spawning migrations. Culverts will also cause a localised but permanent change to the hydromorphological regime, which may lead to changes in river processes and habitat upstream and downstream. However, given mitigation embedded within the design of the culverts to minimise impacts on sediment transfer and flow continuity, this is anticipated to have a negligible effect on macrophytes, phytobenthos, macroinvertebrates and fish. Culverts will be assessed in detail on a case-by-case basis, taking in to consideration the baseline condition of the reaches to be culverted and upstream and downstream (including potential fish habitat upstream).
Realignments / Diversions	Permanent realignments and diversions will result in the loss of existing river habitat at these locations. However, realigned / diverted channels will provide features equivalent to those lost in the existing channel and, where reasonably practicable, will aim to provide hydromorphological improvements over the existing condition. Resultantly, realignments and diversions will (in most cases) result in a net gain in river habitat over the existing condition. In addition, proposed realignments and diversions have incorporated a 10m wide buffer strip in order to allow for the implementation of marginal and riparian habitat improvements / creation. In most cases, this is therefore anticipated to have a minor, localised beneficial effect on macrophytes, phytobenthos, macroinvertebrates and fish.

Scheme Component	Likely biological effects of scheme component
	However, where the localised realignment of larger Ordinary Watercourses and Main Rivers is proposed (whereat the existing aquatic habitat is deemed to be good and/or existing riparian habitats are well-developed), this may have a minor, localised but temporary adverse effect on macrophytes, phytobenthos, macroinvertebrates and fish (until new habitats are established and re-colonised). Realignments and diversions will also result in a localised but permanent change in hydromorphological regime, with potential resultant changes to river processes and habitat upstream and downstream. However, this is anticipated to have a negligible effect on macrophytes, phytobenthos, macroinvertebrates and fish. Realignment / diversion sites will be assessed in detail on a case-by-case basis, taking in to consideration the baseline condition of the reaches of existing channel to be lost and the total net gain / loss of river habitat following realignment / diversion.
Underbridges	Underbridges will cause localised but permanent shading of the river channel. This may result in some localised reduction in photosynthetic activity for macrophytes and phytobenthos. This may have a minor, localised adverse effect on macrophytes, phytobenthos, macroinvertebrates and fish. Underbridges may also require some localised but permanent modifications to the river channel within the footprint of the bridge (e.g. via local re-profiling and/or the installation of bank protection). However, this is anticipated to have a negligible effect on macrophytes, phytobenthos, macroinvertebrates and fish.
Daylighting / removal of existing culverts	Daylighting / removal of existing culverts will result in a localised but permanent increase in open river channel and a reduction in shading of the watercourse. This is anticipated to have a minor, localised beneficial effect on macrophytes, phytobenthos, macroinvertebrates and fish. Where the existing culvert length is significant and/or the existing culvert dimensions are restricting river continuity, daylighting may also provide beneficial effects on fish due to improvements in fish passage and spawning migration. Daylighting / removal of existing culverts will also cause localised but permanent changes in hydromorphological regime, which may lead to improvements in river processes and habitats upstream and downstream. In most cases, this is anticipated to have a negligible effect on macrophytes, phytobenthos, macroinvertebrates and fish. However, where existing culverts are significantly impacting upon river continuity and sediment transfer, daylighting / removal of existing culverts may provide beneficial effects on habitats downstream.
Borrow pits	During construction, borrow pits may cause a localised and temporary change in river flow regime due to a reduction in water table resulting from dewatering activities. This may have a minor, localised adverse effect on macrophytes, phytobenthos, macroinvertebrates and fish. In most cases, borrow pits will cause a localised loss of an area of floodplain during the construction phase, but will have no direct physical impact on the river channel or riparian zone (with a minimum 50m buffer zone being applied between the excavated area and watercourse). Excavated areas will be restored to their existing levels and land use following construction. This is therefore anticipated to have a negligible effect on macrophytes, phytobenthos, macroinvertebrates and fish. At one borrow pit site, however, the proposed excavation pit will result in the temporary loss and diversion of the lower reach of a minor tributary of the River Lea during the construction phase. This will result in a localised but temporary change in hydromorphological regime, which in turn may also lead to changes in river processes and habitats upstream and downstream. This is therefore anticipated to have a minor, localised but temporary adverse effect on macrophytes, phytobenthos, macroinvertebrates and fish. Borrow pit sites will be assessed in detail on a case-by-case basis, based on the location, size and depth of the proposed excavation area and the anticipated level of groundwater connectivity between the excavation site and nearby watercourses.

Physico-chemical effects

- 7.1.5 Impacts on physico-chemical status are considered in relation to likely changes in the chemical composition of phosphate and ammonia and for physical changes which cause variations in dissolved oxygen and temperature within a water body. The likely impacts of the various scheme components on physico-chemical status are summarised in Table 26.

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Table 26: Likely physico-chemical effects of scheme components for surface water bodies (after consideration of embedded mitigation)

Scheme Component	Likely physico-chemical effects of scheme component
Viaducts	Viaducts will likely cause some minor, localised and periodic shading of the river channel. This is anticipated to have a negligible effect on water temperature and dissolved oxygen (due to a potential reduction in photosynthetic activity by aquatic flora).
Culverts	Culverts will cause localised but permanent shading of the watercourse. This is anticipated to have a minor, localised adverse effect on water temperature and dissolved oxygen levels (due to a reduction in photosynthetic activity by aquatic flora). Culverts will also cause a localised but permanent change in hydromorphological regime, which may lead to changes in river processes and habitat upstream and downstream. However, given mitigation embedded within the design of the culverts to minimise impacts on sediment transfer and flow continuity, this is anticipated to have a negligible effect on dissolved oxygen.
Realignments / Diversions	Permanent realignments and diversions have incorporated a 10m wide buffer strip in order to allow for the implementation of marginal and riparian habitat improvements / creation. This, in turn, may reduce bank erosion (e.g. via poaching by livestock) and surface water runoff from agricultural land (with a potential associated localised reduction in fine sediment input and nutrient loading). However, this is generally anticipated to have a negligible effect on dissolved oxygen, phosphate and ammonia concentrations. Realignments and diversions will also result in a localised and permanent change in hydromorphological regime, which may lead to changes in river processes and habitat upstream and downstream. However, this is anticipated to have a negligible effect on dissolved oxygen.
Underbridges	Underbridges will cause localised but permanent shading of the river channel. This is anticipated to have a minor, localised adverse effect on water temperature and dissolved oxygen levels (due to a reduction in photosynthetic activity by aquatic flora).
Daylighting / removal of existing culverts	Daylighting / removal of existing culverts will result in a localised but permanent reduction in shading of the watercourse. This will have a minor, localised beneficial effect on water temperature and dissolved oxygen levels (due to a potential increase in photosynthetic activity by aquatic flora). Daylighting / removal of existing culverts will also cause localised but permanent changes in hydromorphological regime, which may lead to improvements in river processes and habitats upstream and downstream. However, this is anticipated to have a negligible effect on dissolved oxygen.
Borrow pits	During the construction phase, borrow pits may cause a change in river flow regime due to a reduction in water table resulting from dewatering activities. This may have a minor, localised adverse effect on dissolved oxygen and concentrations of phosphate and ammonia. In most cases, borrow pits will cause a localised loss of an area of floodplain during the construction phase, but will have no direct physical impact on the river channel or riparian zone (applying a minimum 50m buffer zone between the excavated area and watercourse). This will result in a localised reduction in agricultural activity, including livestock grazing and/or arable crop production (with potential associated reductions in the application of organic and inorganic fertilizer), during the construction phase. Excavated areas will be restored to their existing levels and land use following construction. This is therefore anticipated to have a negligible effect on dissolved oxygen, phosphate and ammonia concentrations. At one borrow pit site, however, the proposed excavation pit will result in the temporary loss and diversion of the lower reach of a minor tributary of the River Lea during the construction phase. This will result in a localised but temporary change in hydromorphological regime, which in turn may also lead to changes in river processes and habitats upstream and downstream. This is therefore anticipated to have a minor, localised but temporary adverse effect on dissolved oxygen (including due to a potential, temporary reduction in photosynthetic activity by aquatic flora). Borrow pit sites have been assessed on a case-by-case basis, based on the location, size and depth of the proposed excavation area and the anticipated level of groundwater connectivity between the excavation site and nearby watercourses.

Specific pollutants effects

- 7.1.6 Effects on specific pollutants are considered in relation to likely changes in the concentrations of relevant substances, such as copper, triclosan, and zinc. The likely effects of the various scheme components on specific pollutants status are summarised in Table 27.

Table 27: Likely specific pollutants effects of scheme components for surface water bodies (after consideration of embedded mitigation)

Scheme Component	Likely specific pollutant effects of scheme component
Viaducts	No anticipated effects
Culverts	No anticipated effects
Realignments / Diversions	No anticipated effects
Underbridges	No anticipated effects
Daylighting / removal of existing culverts	No anticipated effects
Borrow pits	During the construction phase, borrow pits may cause change in river flow regime due to a reduction in water table resulting from dewatering activities. This may have a minor, localised adverse effect on concentrations of specific pollutants. At one borrow pit site, the proposed excavation pit will result in the temporary loss and diversion of the lower reach of a minor tributary of the River Lea during the construction phase. This will result in a localised but temporary change in hydromorphological regime, which in turn may also lead to changes in river processes and habitats upstream and downstream. However, this is anticipated to have a negligible effect on concentrations of specific pollutants.

Hydromorphological effects

- 7.1.7 Effects on hydromorphological status are considered in relation to quantity and dynamics of flow, river continuity (including existing restrictions such as sluices), river depth and width variation, structure and substrate and structure of the riparian zone. The likely effects of the various scheme design components on hydromorphological status are summarised in Table 28.

Table 28: Likely hydromorphological effects of scheme components for surface water bodies (after consideration of embedded mitigation)

Scheme Component	Likely hydromorphological effects of scheme design component
Viaducts	No anticipated effects
Culverts	Culverts will cause a localised but permanent loss of a section of existing river channel within the footprint of the culvert. This will have a minor, localised adverse effect on local flow dynamics, connection to groundwater, river continuity, river depth and width, the structure and substrate of the river bed, and the structure of the riparian zone. Culverts will also cause a localised but permanent change in hydromorphological regime, which may lead to changes in river processes and habitat upstream and downstream. However, given mitigation embedded within the design of the culverts to minimise impacts on sediment transfer and flow continuity, this is anticipated to have a negligible effect on flow dynamics, river width and depth, and structure and substrate of the river bed.

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Scheme Component	Likely hydromorphological effects of scheme design component
Realignments / Diversions	Permanent realignments and diversions will result in the loss of a section of existing river channel. However, realigned / diverted channels will provide features equivalent to those lost in the existing channel and, where reasonably practicable, will aim to provide hydromorphological improvements over the existing condition. Resultantly, realignments / diversions will (in most cases) result in a net gain in river habitat over the existing condition. In addition, realignments and diversions will incorporate 10m wide buffer strips for the implementation of marginal and riparian habitat improvements / creation. In most cases, this is therefore anticipated to have a minor, localised beneficial effect on quantity and dynamics of flow and structure of riparian zone, with a negligible effect on river continuity, river depth and width, and the structure and substrate of the river bed. However, where the localised realignment of larger Ordinary Watercourses and Main Rivers is proposed (whereat the existing hydromorphological condition is deemed to be good and/or existing riparian habitats are well-developed), this may have a localised but temporary adverse effect on structure of riparian zone (while vegetation re-establishes). Realignments and diversions will also result in a localised but permanent change in hydromorphological regime, which may lead to changes in river processes and habitat upstream and downstream. However, this is anticipated to have a negligible effect on flow dynamics, river continuity, river depth and width, and the structure and substrate of the river bed. Realignment / diversion sites will be assessed in detail on a case-by-case basis, taking in to consideration the baseline condition of the reaches of existing channel to be lost and the total net gain / loss of river channel following realignment / diversion.
Underbridges	No anticipated effects.
Daylighting / removal of existing culverts	Daylighting / removal of existing culverts will result in a localised but permanent increase in river channel and a reduction in shading of the watercourse within the footprint of the existing culvert. This will have a minor, localised beneficial effect on local flow dynamics, connection to groundwater, river continuity, river depth and width, structure and substrate of the river bed, and structure of riparian zone. Daylighting / removal of existing culverts will also cause a localised but permanent change in hydromorphological regime, which may lead to changes in river processes and habitat upstream and downstream. However, this will have a negligible effect on flow dynamics, river depth and width, the structure and substrate of the river bed.
Borrow pits	During the construction phase, borrow pits may cause a change in river flow regime due to a reduction in water table resulting from dewatering activities. This may have an adverse effect on quantity and dynamics of water flow, groundwater connection, and river depth and width variation, and a minor, localised adverse effect on the structure and substrate of the river bed (due to a potential, resultant increase in sediment deposition). In most cases, borrow pits will cause a localised loss of an area of floodplain during the construction phase, but will have no direct physical impact on the river channel or riparian zone (with a minimum 50m buffer zone being applied between the excavated area and watercourse). Excavated areas will be restored to their existing level and land use following construction. This is therefore anticipated to have a negligible effect on the hydromorphological regime. At one borrow pit site, the proposed excavation pit will result in the temporary loss and diversion of the lower reach of a minor tributary of the River Lea during the construction phase. This will result in a localised but temporary change in hydromorphological regime, which in turn may also lead to changes in river processes and habitats upstream and downstream. This is therefore anticipated to have a minor, localised but temporary adverse effect on quantity and dynamics of water flow, river continuity, river depth and width variation, structure and substrate of the river bed, and structure of the riparian zone. Borrow pit sites will be assessed in detail on a case-by-case basis, based on the location, size and depth of the proposed excavation area and the anticipated level of groundwater connectivity between the excavation site and nearby watercourses.

Surface water body results summary

- 7.1.8 The results of the preliminary assessment of the likely effects of the relevant scheme components on the WFD status elements of surface water bodies are summarised in Annex F1.1.
- 7.1.9 The assessment has identified which WFD status elements are likely to be affected by each of the scheme components, in relation to the relevant watercourse and WFD surface water body catchment. Where likely effects are anticipated on a WFD status element, this status element has been carried forward for detailed impact assessment (see Section 8).

Groundwater

Quantitative status effects

- 7.1.10 Effects on quantitative status elements are considered in terms of the likely changes in groundwater levels, groundwater flows and the hydraulic regime, spring flows and rates of baseflow to surface waters or GWDTE. The issues considered in the preliminary assessment are outlined below.

Saline or other intrusions

- 7.1.11 Saliferous beds are present within the Mercia Mudstone in the Stafford area. This has resulted in salt springs emerging at the surface, reflected by the formation of saltmarshes such as Pasturefields SSSI, which is located approximately 900m to the north of the route of the Proposed Scheme. In addition, there are reportedly saltwater springs feeding a saltmarsh at Lionlodge Covert to the south of Pasturefields, directly under the route of the Proposed Scheme.
- 7.1.12 There is the potential for scheme components to affect salinity of shallow groundwater where dewatering is required e.g. cuttings or tunnels, or where drainage from a localised source of saline groundwater may be transferred to an area of fresh groundwater.
- 7.1.13 The structures associated with the Proposed Scheme are relatively shallow in the context of the aquifers. The majority of below ground design elements which have potential to alter existing groundwater levels or flow will be much less than 50 m deep. The Proposed Scheme therefore poses a limited risk of inducing intrusion of saline waters from depth. The majority of near surface halite has been removed or commercially extracted as brine.

Surface water

- 7.1.14 Potential quantitative impacts on surface water can be split into two categories:
- lowering of groundwater levels due to abstraction, dewatering or drainage. This is relevant for below ground excavations such as cuttings, tunnels or deep excavations, which interact with the aquifer. They have potential to influence the flow regime within surface watercourses through a reduction in baseflow or through a reduction in spring flows; and
 - local alterations to the groundwater flow regime, and adjacent surface waters, due to new barriers or preferential pathways. This is relevant for structures

which extend beneath the groundwater table including cuttings, tunnels, retaining walls and foundations.

- 7.1.15 The impacts of changes to the groundwater flow regime on surface water flows are likely to be most significant during low flow conditions. During dry weather, the proportion of surface runoff inputs will reduce and groundwater will contribute a greater proportion of the total flows.
- 7.1.16 Changes in flows in surface waters may have a subsequent impact on the aquatic ecology and hydromorphology.
- 7.1.17 The impacts of groundwater abstraction are assumed to be negligible where the abstracted groundwater is planned to be returned to the subsurface using sustainable drainage systems or to surface waters within the same part of the surface water catchment.
- 7.1.18 Potential impacts on surface waters have been allocated to the closest surface water features except where there are geological constraints that would influence local surface water-groundwater interactions. Similarly, groundwater catchments for surface water bodies are assumed to be the same as the surface water catchment except where there is a geological constraint. The radius of influence for an individual cutting or tunnel has been taken into account when considering if a significant change in spring flows or baseflow is likely to occur; the radius of influence assumptions are aligned with those presented in the water resources assessment reports (see Volume 5: Appendix WR-002-001 to WR-002-005). Where surface water features are outside the predicted radius of influence but the design element is within the likely catchment, the potential for influence on baseflow due to changes in recharge patterns has also been taken into account.
- 7.1.19 Initially, a qualitative assessment of potential effects was undertaken. Where groundwater was predicted to be removed from the catchment of a surface water feature, further semi-quantitative assessment was undertaken. No numerical modelling of surface water-groundwater interactions has been undertaken at this stage. The assessment also takes into account the spatial scale of the Proposed Scheme compared to the spatial scale of the groundwater body and status of the surface water body catchments.
- 7.1.20 It must be noted that there is uncertainty with respect to both the estimates of likely groundwater abstractions and the estimates of low-flow rates in the surface watercourses. The estimates for groundwater flows are influenced by the limitations on the available site-specific data on groundwater levels and local hydraulic properties. The estimates for surface water flows are influenced by the locations of the nearest gauging stations and scale effects; it is recognised that standard hydrological scaling methods do not always provide reliable estimates for smaller tributaries, particularly where these are fed by springs.
- 7.1.21 The assumptions regarding surface water-groundwater interactions will require review once site-specific intrusive ground investigation including water level and flow monitoring for the Proposed Scheme has been undertaken. In particular, data regarding spring flows and surface water flows in the headwaters and tributaries of the surface water bodies will help verify the conceptual hydrogeological models.

- 7.1.22 Both designated surface water bodies and ordinary watercourses have been considered as potential receptors for the assessment of impacts at the scale of individual scheme components. However, it has been assumed that the overall impact at the groundwater body scale will only be significant if a significant impact (i.e. change in status) is predicted for a designated surface water body.
- 7.1.23 The groundwater assessment has been undertaken in consultation with the surface water and ecology specialists to determine the likely significance of the predicted effect.

Groundwater dependent terrestrial ecosystems

- 7.1.24 The potential GWDTE considered in the assessment include designated statutory and non-statutory sites plus any non-designated groundwater dependent ecological habitats identified through the EIA process. Potential groundwater dependency has been assumed based on the available hydrogeological and ecological evidence and site surveys where land access has been available. The assumptions regarding groundwater dependency of individual habitats will require review once site-specific investigation, including water and ecological monitoring for the Proposed Scheme, has been undertaken (see Section 6.2).
- 7.1.25 The loss of GWDTE locally due to land required for the construction or operation of the Proposed Scheme is discounted when assessing groundwater body status. Instead, this issue is considered in the EIA process (see Volume 2, Community area reports).
- 7.1.26 The potential quantitative impacts from the Proposed Scheme to GWDTE are the same as those for surface water and the assessment is focussed on scheme components which have potential to impact the groundwater flow regime towards a GWDTE (as summarised above).
- 7.1.27 Where GWDTE features are within 1 km of the scheme component but outside the predicted radius of influence of a feature, the potential for influence of the local hydraulic regime due to changes in recharge or groundwater flow patterns has also been taken into account.
- 7.1.28 All identified potential GWDTE have been considered as potential receptors for the assessment of impacts at the scale of individual scheme components. However, to align with the Environment Agency's current WFD assessment methodology, it has been assumed that the overall impact at the groundwater body scale will only be significant if a significant impact is predicted at a designated statutory site that is classified as a GWDTE. The Environment Agency has been consulted and have confirmed the list of designated sites that are considered to be GWDTE for the purposes of WFD groundwater body assessments. These sites are described in the water resources assessment reports (see Volume 5: Appendix WR-002-001 to WR-002-005) and included in the detailed impact assessment.
- 7.1.29 The groundwater assessment has been undertaken in consultation with the ecology specialists to determine the likely significance of the predicted effects.

Water balance

- 7.1.30 The sustainable rate of combined total abstraction from a groundwater body is less than the estimated recharge rate minus the water required to support ecological flow requirements. When the total groundwater abstraction from a groundwater body is greater than the predicted recharge to the groundwater body, this can cause reduction in groundwater levels.
- 7.1.31 Scheme components which could affect the water balance include all those which may require dewatering or drainage i.e. removal of groundwater. These include cuttings, tunnels and any other deep excavations below existing groundwater level. Where scheme components are at grade or above ground level and may reduce existing recharge areas this has also been considered in terms of water balance. This is scoped out for at grade linear features where the potential impact of recharge is considered negligible on a regional scale.
- 7.1.32 The majority of the abstractions (dewatering or drainage) for the Proposed Scheme are considered to be effectively non-consumptive with the water remaining within the local environment. Key risks to the water balance of individual bodies could occur if abstracted groundwater is discharged back to ground within a different groundwater body or to a different surface water body. It is noted that the current UKTAG⁹ guidance states that abstracted groundwater that has been locally returned to the aquifer or to a river should be discounted from the water balance test.
- 7.1.33 The water balance assessment is semi-quantitative. The impact on the water balance is assumed to be negligible where the abstracted groundwater is planned to be returned to the subsurface using sustainable drainage systems within the same groundwater body, or to a nearby surface water course within the groundwater body. Where groundwater is not planned to be returned to the same groundwater body using sustainable drainage systems, potential dewatering rates have been estimated. The current estimates use the same permeability and drawdown assumptions as were used in the ES for the radius of influence calculations. These dewatering estimates will require review once site-specific intrusive ground investigation and groundwater level monitoring for the Proposed Scheme has been undertaken.
- 7.1.34 The current WFD status of the groundwater body has been taken into account. Current water balance data regarding recharge, environmental requirements and current abstractions (licensed and actual) provided by the Environment Agency have been utilised in the assessment of significance. A comparison has been made between the estimated total rate of dewatering and the available water balance capacity within the groundwater body. For conservatism, all groundwater abstractions within a groundwater body are assumed to occur concurrently; in reality, construction dewatering requirements will vary over time.
- 7.1.35 It has been assumed that the overall impact at the groundwater body scale will only be significant if a significant impact to water availability within the aquifer as a whole is

⁹ UK Technical Advisory Group (UKTAG) on the Water Framework Directive (2007), *Paper 11b(ii): Groundwater Quantitative Classification for the purposes of the Water Framework Directive*, https://www.wfduk.org/sites/default/files/Media/Environmental%20standards/Proposal%20for%20groundwater%20classification%20system_Final_100308.pdf

predicted. Potential impacts on water availability at individual abstractions are dealt with primarily via the EIA process (see Volume 2, Community area reports and Volume 5, Appendix WR-002, water resources assessment reports) and are assumed not to affect groundwater body status.

Chemical status effects

- 7.1.36 Effects on chemical sub-elements are considered in terms of the likely changes in water quality. The issues considered in the preliminary assessment are outlined below.

Saline or other intrusions

- 7.1.37 The chemical status of a groundwater body could be at risk if groundwater quality is deteriorating due to saline intrusion. Saliferous beds are present within the Mercia Mudstone in the Stafford area. There is therefore the potential for scheme elements to affect salinity of shallow groundwater where dewatering is required e.g. cuttings or tunnels, or where drainage from a localised source of saline groundwater may be transferred to an area of fresh groundwater.
- 7.1.38 The Proposed Scheme is relatively shallow and poses a limited risk of inducing intrusion of saline waters from depth. The majority of below ground design elements which have potential to alter existing groundwater levels or flow will be much less than 50m deep.

Surface water

- 7.1.39 Changes to the proportion of baseflow entering a surface watercourse may have consequences for surface water chemistry. Scheme components which could cause lowering of the groundwater table or changes to flow are therefore assessed. These include the scheme components outlined in the quantitative assessment (cuttings, tunnels, retaining walls and foundations). These scheme components may also create new or enhanced preferential pathways for contaminant migration from groundwater to surface water.
- 7.1.40 There may be an influence on natural hydrochemistry factors such as alkalinity. Contaminant concentrations in the surface water course may be influenced due to changes in dilution and mixing. A reduction in baseflow would normally be anticipated to have an adverse impact on surface water quality but occasionally there may be a beneficial impact if groundwater is found to be more contaminated than surface waters.
- 7.1.41 Changes in water quality in surface waters may have a subsequent impact on the aquatic ecology.
- 7.1.42 The findings of the assessment for quantitative status with respect to surface waters (described above) were used to inform the assessment of chemical status. The assessment is predominantly qualitative. No numerical modelling of surface water-groundwater interactions or of hydrochemistry has been undertaken at this stage. The assumptions regarding surface water-groundwater interactions will require review once site-specific intrusive groundwater investigation including water quality monitoring for the Proposed Scheme has been undertaken.

7.1.43 Both designated surface water bodies and ordinary watercourses scoped in the surface water assessment have been considered as potential receptors for the assessment of impacts at the scale of individual scheme components. Again, it has been assumed that the overall impact at the groundwater body scale will only be significant if a significant impact (i.e. change in status) is predicted for a designated surface water body.

7.1.44 The groundwater assessment has been undertaken in consultation with the surface water and ecology specialists to determine the likely significance of the predicted effects. The current WFD status of both the groundwater body and surface water body has been taken into account.

Groundwater dependent terrestrial ecosystems

7.1.45 Changes to the groundwater flows entering a GWDTE may have consequences for groundwater chemistry at the GWDTE. Scheme components which could cause lowering of the groundwater table or changes to flow are therefore assessed. These include the scheme components outlined in the quantitative assessment (cuttings, tunnels, retaining walls and foundations). These scheme components may also create new or enhanced preferential pathways for contaminant migration from groundwater to GWDTEs.

7.1.46 There may be an influence on natural hydrochemistry factors such as alkalinity. Contaminant concentrations may be influenced due to changes in dilution and mixing.

7.1.47 The findings of the assessment for quantitative status with respect to GWDTE (described above) were used to inform the assessment of chemical status.

7.1.48 The assessment is qualitative. No numerical modelling of groundwater chemistry has been undertaken at this stage. The assumptions regarding groundwater quality pressures on individual habitats will require review once site-specific investigation including water and ecological monitoring for the Proposed Scheme has been undertaken.

7.1.49 All identified potential GWDTE have been considered as potential receptors for the assessment of impacts at the scale of individual scheme components. Again, to align with the Environment Agency's current WFD assessment methodology, it has been assumed that the overall impact at the groundwater body scale will only be significant if a significant impact (as demonstrated in the Volume 2, Community area reports, Section 15) is predicted at a designated statutory site that is classified as a GWDTE.

7.1.50 The groundwater assessment has been undertaken in consultation with the ecology specialists to determine the likely significance of the predicted effects.

Drinking water protected areas

7.1.51 Dewatering abstractions or groundwater drainage may induce the migration of existing poor quality groundwater. The Proposed Scheme may also create new or enhanced preferential pathways for contaminant migration between or within aquifers.

- 7.1.52 The groundwater is considered to be of greater sensitivity where the aquifer has been designated by the Environment Agency as a Drinking Water Protected Area (DrWPA). Each of the groundwater bodies listed in the baseline assessment is also a DrWPA.
- 7.1.53 All groundwater abstractions with designated source protection zone (SPZ) are considered to be of strategic importance. The groundwater receptor is considered to be of greater sensitivity where the site falls within a designated SPZ.
- 7.1.54 Relevant scheme components include cuttings, tunnels, retaining walls and foundations, however where at grade sections or embankments are in close proximity to a strategic abstraction, these are also considered in terms of potential creation of pollution pathways through removal of topsoil or at surface work.
- 7.1.55 It has been assumed that the overall impact at the groundwater body scale will only be significant if a significant impact is predicted on a strategically important potable abstraction. Any potential impacts on water quality at other individual abstractions are dealt with primarily via the EIA process and are assumed not to affect groundwater body status.
- 7.1.56 The assessment is predominantly qualitative. No numerical modelling of regional groundwater quality was undertaken at this stage. The assumptions regarding risks to individual strategic potable abstractions will require review once site-specific intrusive ground investigation and monitoring for the Proposed Scheme has been undertaken.

General water quality

- 7.1.57 Dewatering abstractions or groundwater drainage may induce the migration of existing poor quality groundwater. The Proposed Scheme may also create new or enhanced preferential pathways for contaminant migration between or within aquifers. Scheme components of relevance include cutting, tunnels, deep excavations, foundations or retaining walls.
- 7.1.58 The assessment of risks to general water quality takes into account the aquifer type and the depth to groundwater beneath the Proposed Scheme. It also takes into account the spatial scale of the Proposed Scheme compared to the spatial scale of the groundwater body.
- 7.1.59 Where groundwater bodies are currently at poor status due to mine waters or nutrients, it is considered unlikely that the Proposed Scheme will significantly affect this status or prevent them from achieving good status.
- 7.1.60 The assessment is qualitative. No numerical modelling of regional groundwater quality was considered necessary at this stage. The assumptions regarding risks to general water quality will require review once site-specific intrusive ground investigation and monitoring for the Proposed Scheme has been undertaken.

Groundwater body results summary

- 7.1.61 The results of the preliminary assessment of the likely effects of relevant scheme components on the WFD status elements of groundwater bodies are summarised in Annex F1.2. The assessment has identified which WFD status elements have potential to be affected by each of the scheme components, in relation to the relevant WFD groundwater body.

- 7.1.62 The majority of the Proposed Scheme is predicted to result in local or temporary effects that are considered unlikely to affect WFD status at the groundwater body scale. However, potential risks to individual WFD status elements have been identified for a number of the groundwater bodies. Where likely effects are anticipated on a WFD status element, this element has been carried forward for detailed impact assessment (see Section 8).

7.2 Likely effects on status objectives

- 7.2.1 WFD legislation requires consideration of whether new developments have the potential to prevent the future attainment of good status or potential objectives for water bodies (where not already achieved).
- 7.2.2 As part of the preliminary assessment, a screening exercise has therefore been carried out to ensure that the construction and operation of the Proposed Scheme will not prevent any of the relevant water bodies from achieving their status objectives in the future.
- 7.2.3 The assessment has included only those water bodies affected by the Proposed Scheme that are currently failing to meet their good ecological status / potential or good quantitative status (with regards to surface water and groundwater bodies, respectively).
- 7.2.4 This has included assessing the likely effects of the Proposed Scheme on the following Environment Agency 2015 Cycle 2 RBMP investigation outputs:
- 'Reasons for not achieving good' status (RNAG), which identifies the relevant category, business sector, surface water management issue (SWMI) and activity responsible for the various quality elements currently failing their status objectives;
 - 'Programme of measures' (PoM), which identifies the actions proposed for relevant business sectors to address confirmed RNAG; and
 - 'HMWB / AWB mitigation measure assessments', which identify techniques and actions required to implement measures to mitigate the impacts of existing physical modifications, assets and operations related to the 'use' of heavily modified and artificial water bodies (e.g. flood defence, water resource management, navigation, etc.).
- 7.2.5 The likely effects of the Proposed Scheme on each of the above are summarised in the following sections.

Screening of reasons for not achieving good status

- 7.2.6 The RNAG identify the pressures that are currently impacting the status classification of a water body and therefore provide an indication of the high-level causes of status objective failure. The RNAG for the relevant water bodies have therefore been considered in order to ensure that the Proposed Scheme does not further contribute to these.
- 7.2.7 The 2015 RBMP RNAG for the quality elements of each of the surface water and groundwater bodies affected by the Proposed Scheme have been screened against

the relevant scheme components proposed within the water body catchment area (as outlined in Section 6.1).

- 7.2.8 The assessment has identified those RNAG that are likely to be adversely or beneficially effected by the scheme components, following consideration of embedded mitigation.
- 7.2.9 A precautionary approach has been taken, whereby any identification of a potential adverse effect on a RNAG is used to highlight the potential for the Proposed Scheme to prevent or inhibit the attainment of the status objective of the relevant quality element.
- 7.2.10 The RNAG for the surface water and groundwater bodies affected by the Proposed Scheme, together with the relevant scheme components and associated potential adverse or beneficial effects, are provided in Annex F2.1, Table 43 and Table 44.
- 7.2.11 From the assessment in Annex F2.1, RNAG potentially at risk as a result of the Proposed Scheme have been identified for four surface water bodies. These RNAG each relate to the quality element fish and are summarised in Table 29.

Table 29: Surface water body RNAG identified as potentially at risk from Proposed Scheme

Water body (ID)	Element	Category / Business Sector	SWMI/ Activity
Trent from Moreton Brook to River Tame (GB104028047290)	Fish	Urban and transport	Physical modification / Barriers to fish migration
Trent from Tittensor to River Sow (GB104028053272)	Fish	Sector under investigation	Physical modification / Barriers to fish migration
Sow - Doxey Bk to R Penk (GB104028046790)	Fish	Industry	Physical modification / Barriers to fish migration
Wistaston Brook (GB112068055280)	Fish	Urban and transport / railways	Point source / incidents

- 7.2.12 One RNAG potentially at risk as a result of the Proposed Scheme has been identified for one groundwater body. This relates to the quality element quantitative water balance and is summarised in Table 30.

Table 30: Groundwater body RNAG identified as potentially at risk from Proposed Scheme

Water body (ID)	Element	Category / Business Sector	SWMI / Activity
Staffordshire Trent Valley – PT Sandstone Staffordshire (GB4041G300500)	Quantitative water balance	Water Industry (water supply)	Groundwater abstraction

- 7.2.13 The RNAG summarised in Table 29 and Table 30 for surface water and groundwater bodies, respectively, have been taken forward for detailed impact and mitigation assessment (see Section 8). The potential effects of the relevant scheme components at these locations have been reviewed in further detail with reference to the water body baseline condition and design proposals and in consultation with the Environment Agency.

Screening of programme of measures

- 7.2.14 The PoM identify cost-effective measures required for supporting the achievement of the good status or potential objectives of a water body. These measures are linked to the RNAG identified for the quality elements of a water body that are not currently at good status/potential (see Section 7.2.6). The planning, implementation and evaluation of the PoM involves an iterative process developed through the river basin management plan cycles.
- 7.2.15 The available 2015 RBMP PoM for the surface water affected by the Proposed Scheme are provided in Annex F2.2, Table 45. These have been screened against the Proposed Scheme in order to identify the potential for measures to be adversely effected. No surface water body measures were deemed to be at risk by the Proposed Scheme.
- 7.2.16 To date, no PoMs have been derived by the Environment Agency for the groundwater bodies affected by the Proposed Scheme.
- 7.2.17 No PoM for the relevant water bodies affected by the Proposed Scheme have been identified as requiring further detailed impact and mitigation assessment.

Screening of A/HMWB mitigation measures

- 7.2.18 The ecological potential of HMWB and AWB is principally classified according to an assessment of a suite of 'mitigation measures'; with good ecological potential being assigned to water bodies where all applicable mitigation is in place, and moderate ecological potential being assigned where some or all relevant mitigation is missing (see Annex A3.1 for further details). These measures are derived by the Environment Agency and are designed to address biological and hydromorphological pressures caused by physical modifications and/or operations associated with the anthropogenic 'uses' attached to the water body's heavily modified or artificial designation (e.g. flood defence, water resource management, navigation, etc.).
- 7.2.19 The available 2015 RBMP HMWB mitigation measure assessments for the HMWBs affected by the Proposed Scheme have been screened in order to identify the potential for the Proposed Scheme to inhibit or prevent the successful implementation of measures.
- 7.2.20 The 2015 RBMP HMWB mitigation measures identified for the Sow – Doxey Bk to R Penk (GB104028047220) water body are provided in Annex F2.3, Table 47. This includes 19 measures required to address the impacts of existing physical modifications, assets and operations, in order to support the achievement of the water body's good ecological potential objective. These measures have been identified in relation to specific assets and/or reaches of the water body.
- 7.2.21 The Proposed Scheme passes through the far north-eastern edge of the Sow – Doxey Bk to R Penk (GB104028047220) water body catchment only. From the assessment in Annex F2.3, none of the 2015 RBMP HMWB mitigation measures identified for the water body apply to, or are located within the vicinity of, the three unnamed tributaries of the Kingston Brook affected by the Proposed Scheme (see Annex C2 for details of relevant watercourses). The measures identified apply to the River Sow itself and its main tributary watercourses (including the Pearl Brook, Sandyford Brook and Marston Brook), which are not affected by the Proposed Scheme.

- 7.2.22 To date, no HMWB mitigation measures have been derived by the Environment Agency for the Blithe - Tad Bk to R Trent (G104028046491) or Betley Mere (GB31234330) HMWBs as part of their 2015 Cycle 2 status classifications.
- 7.2.23 No mitigation measures for the relevant HMWB affected by the Proposed Scheme have therefore been identified as requiring further detailed impact and mitigation assessment.

8 Detailed impact assessment

8.1 Overview

- 8.1.1 Following baseline and preliminary assessment, a detailed impact assessment has been undertaken for all water bodies and scheme components where a potential for the Proposed Scheme to have an effect on the current status and status objectives has been identified.
- 8.1.2 The detailed impact assessment process is described in Section 3.5 and Annex B5. This includes the methodology applied for assessing the effects of the Proposed Scheme on the current status and status objectives of the quality elements of water bodies, which is outlined in Annex B5.2 and Annex B5.3, respectively. This relates to the requirement under the WFD for the consideration of whether new developments have the potential to result in:
- a deterioration in current status; and/or
 - prevention of the achievement of good status/potential objectives in the future.
- 8.1.3 The assessment process for determining the potential for a deterioration of current status uses the following traffic light rating system as agreed with the Environment Agency, in order to assign the magnitude of the effect anticipated on the quality elements of the affected watercourse:
- **dark blue**: beneficial effect of a scale sufficient to increase status class for the quality element at water body scale;
 - **light blue**: minor beneficial effect resulting in a localised improvement, but insufficient to increase status class for the quality element at water body scale;
 - **green**: no measureable change to (or effect on) status class for the quality element at water body scale;
 - **yellow**: minor localised and/or temporary effect when balanced against likely embedded mitigation – insufficient to affect status class for the quality element at water body scale;
 - **amber**: an adverse effect is possible when balanced against likely embedded mitigation – the extent of effect is uncertain and there remains a potential to affect status class for the quality element at water body scale; and
 - **red**: adverse effect of sufficient scale to impact on status class for the quality element at a water body scale.
- 8.1.4 The outcome of the assessment identifies the overall effect of all of the relevant scheme components on each quality element at a water body scale. As part of this process, the assessment also considers the 'cumulative effects' on quality elements associated with the impacts of scheme components located within other, adjacent water bodies.

- 8.1.5 Where adverse (amber or red) effects on quality elements are identified, the assessment identifies additional mitigation requirements and the resultant residual effect.
- 8.1.6 The detailed impact assessment results for surface water and groundwater bodies are summarised in Sections 8.2 and 8.3, respectively.

8.2 Surface water

No deterioration of status

- 8.2.1 The baseline assessment has identified 13 surface water bodies (including 54 watercourses) as being affected by the Proposed Scheme (see Section 4 and Annex C). Of these, a total of 25 watercourses have been scoped in for detailed assessment on the basis of their baseline hydromorphological and ecological condition. No watercourses have been scoped in within the Blithe - Tad Bk to R Trent (GB1040280046491) water body, which has consequently been scoped out of detailed assessment. The baseline assessment has also identified all of the scheme components located on each watercourse and the associated embedded mitigation (see Section 6 and Annex E1.1).
- 8.2.2 The preliminary assessment has then identified the relevant impacts of the various scheme components and the associated likely effects on the different WFD status elements of the surface water bodies affected by the Proposed Scheme (see Section 7.1 and Annex F1.1). This, in turn, has identified which quality elements are screened-in for detailed assessment for each watercourse.
- 8.2.3 This detailed assessment has identified the magnitude of the effects of the scheme components on the current status of the quality elements of the water body, together with any associated additional mitigation requirements. The detailed impact assessment results for the surface water bodies affected by the Proposed Scheme are provided in Annex G2.
- 8.2.4 Of the 12 surface water bodies scoped-in for detailed assessment:
- four water bodies are anticipated to experience negligible (green) overall effects on one or more quality elements, with no measurable change in quality elements;
 - four water bodies are anticipated to experience minor, localised adverse (yellow) overall effects on one or more quality elements, but with no change in status;
 - three water bodies are anticipated to experience adverse (amber) overall effects on one or more quality elements, with a potential risk of status deterioration (requiring consideration of additional mitigation); and
 - one water body is anticipated to experience minor, localised beneficial (light blue) overall effects on one or more quality elements, but with no change in status.
- 8.2.5 A summary of the results is provided in the following sections.

Negligible overall effects

- 8.2.6 Within the following four surface water bodies, the assessment has identified the potential for negligible (green) overall effect on one or more quality elements as a

result of the Proposed Scheme. This is expected to result in no measureable change in quality element status:

- Trent and Mersey Canal, summit to Alrewas (GB70410142);
- Checkley Brook - Upper (GB112068055230);
- Wistaston Brook (GB112068055280); and
- Betley Mere (GB31234330).

Viaducts

- 8.2.7 Within the Trent and Mersey Canal, summit to Alrewas (GB70410142) and Checkley Brook - Upper (GB112068055230) water bodies, the Proposed Scheme will cause some localised and period shading from a single viaduct crossing only. This is anticipated to have negligible (green) effects on biological quality elements, water temperature and dissolved oxygen concentrations at the water body scale.

Borrow pit

- 8.2.8 The Wistaston Brook (GB112068055280) and Betley Mere (GB31234330) water bodies may be subject to negligible effects during the construction phase associated with the excavation of the borrow pit north of Checkley Lane.
- 8.2.9 The northern part of the borrow pit area falls within the catchment area of the Wistaston Brook (GB112068055280) water body; located at a minimum distance of approximately 200m to the south-west of the 'Unnamed tributary of Mere Gutter 6' watercourse. Approximately half of the borrow pit also falls within and comprises approximately 2.5% of the surface water catchment area of the Betley Mere (GB31234330) lake water body (also a designated RAMSAR and SSSI site), which is located approximately 460m to the north-east.
- 8.2.10 The borrow pit area is located within Glaciofluvial Deposits that form a high point in the local topography, elevated above the 'Unnamed tributary of Mere Gutter 6' watercourse and Betley Mere. There is a potential surface water connection between the borrow pit and the drains discharging to the mere. The mere is also believed to have interaction with the Glaciofluvial Deposit aquifer as both a source and sink of water. Therefore excavation of the borrow pit and associated dewatering activities would have the potential to disrupt surface and groundwater flows towards the mere.
- 8.2.11 As such, the Proposed Scheme has embedded appropriate measures to avoid potential impacts on Betley Mere and Mere Gutter due to the excavation and dewatering of the borrow pit north of Checkley Lane during the construction phase (see Section 6.2). These may include:
- provision of a vertical buffer between the base of the borrow pit excavations and the groundwater level. This will ensure that there are no impacts on groundwater flows;
 - excavations in accordance with the measures described in the Draft CoCP⁸;
 - treatment of any rainfall and surface water runoff intercepted by the borrow pit and re-circulation into the downstream catchment at an appropriate rate and

location, therefore ensuring that there is no significant impact on the volume or quality of water reaching the mere; and

- such reasonable ancillary measures as may be required.

8.2.12 The details of this mitigation will be agreed with the Environment Agency in consultation with Natural England. These measures will ensure that the potential effects on biological, physico-chemical, and hydromorphological quality elements of the Wistaston Brook (GB112068055280) and Betley Mere (GB31234330) water bodies will be negligible.

Bridge at Basford East

8.2.13 The Basford Brook bridge will cross the Wistaston Brook (GB112068055280) water body (referred to locally as Basford Brook) at the Basford East Development Site. A bridge crossing over the watercourse has previously been successful in securing planning permission (12/4115N) as part of the Crewe Green Link Road (South) application. Development of the bridge has not been implemented under this planning permission, and the location of the consented bridge falls within the land required for the Proposed Scheme. As such, the Basford Brook bridge has been included within the Proposed Scheme. An assessment has been undertaken of the WFD compliance issues associated with this bridge. The conclusions of this assessment are that the bridge will have no direct, physical impact upon the river channel but will cause some localised shading of the watercourse. This localised shading is assessed as having a negligible (green) effects on biological quality elements, water temperature and dissolved oxygen concentrations at the water body scale.

Localised / minor adverse overall effects

8.2.14 Within the following four surface water bodies, the assessment has identified the potential for a minor, localised adverse (yellow) overall effect on one or more quality elements as a result of the Proposed Scheme. These effects are anticipated to cause no change in quality element status, however, when balanced against the embedded mitigation of the scheme:

- Pyford Brook Catchment (trib of Trent) (GB104028047250);
- Moreton Brook from Source to River Trent (GB104028047380);
- Sow - Doxey Bk to R Penk (GB10402804679); and
- Meece Brook from Source to Chatcull Brook (GB104028053080).

Culverts

8.2.15 Each of the water bodies listed above will experience minor, localised adverse effects from access road and highway realignment culverts. This includes effects on biota, dissolved oxygen, water temperature and hydromorphological condition associated with the localised but permanent loss and shading of short sections of river channel at the proposed culvert locations. The design of the Proposed Scheme has embedded mitigation measures to minimise the impacts of these culverts on flow and sediment transfer and biological continuity, however, and will also aim to provide

hydromorphological improvements to sections of the affected watercourse immediately upstream and downstream of the culvert locations (see Table 24).

- 8.2.16 One larger culvert is also proposed within the Moreton Brook from Source to River Trent (GB104028047380) waterbody and the Sow - Doxey Bk to R Penk (GB10402804679) waterbody. This includes the 69m long Stockwell Heath culvert (located on the 'Unnamed tributary of Moreton Brook 1' watercourse) and the 33m long Hopton culvert (located on the 'Unnamed tributary of Kingston Brook 2' watercourse), respectively.
- 8.2.17 Given the length of these culverts, there is a potential further risk with regards to fish passage and spawning migration at these sites. However, both of the affected watercourses comprise minor, headwater tributaries only. These have been observed during field survey to comprise poor hydromorphological condition and poor fish habitat potential upstream of the proposed culvert locations (see also ES Volume 5: Appendix EC-014-000, Ecological baseline assessment - fish; undertaken as part of the ecology and biodiversity assessment within the Volume 2, Community area reports, Section 8). As such, these culverts are anticipated to cause minor, localised adverse effects on fish only.

Realignments

- 8.2.18 The Moreton Brook from Source to River Trent (GB104028047380) water body is anticipated to experience a minor, localised but temporary adverse effect on aquatic biota and riparian zone structure associated with the permanent realignment of a 135m section of Moreton Brook. The watercourse has been observed during baseline field surveys as comprising good existing hydromorphological condition and aquatic habitat potential together with a narrow but well-established riparian zone. Accordingly, a minor, localised but temporary effect is anticipated until the new, realigned section of channel is colonized by aquatic biota and marginal/riparian vegetation establishes.
- 8.2.19 The Moreton Brook from Source to River Trent (GB104028047380), Sow - Doxey Bk to R Penk (GB10402804679) and Meece Brook from Source to Chatcull Brook (GB104028053080) water bodies will all also experience minor, localised benefits associated with the realignment of sections of tributary watercourse (with the provision of hydromorphological and riparian improvements; see Table 24). This includes sections of the 'Unnamed tributary of Moreton Brook 1', 'Unnamed tributary of Kingston Brook 2' and 'Unnamed tributary of Meece Brook 2' watercourses, respectively.

Adverse overall effects

- 8.2.20 Within the following three surface water bodies the assessment has identified the potential for an adverse (amber) overall effect on one or more quality elements, driven by the impacts associated with the excavation of borrow pits during the construction phase. These effects have the potential to cause a deterioration in quality element status, which therefore requires the consideration of additional mitigation to appropriately manage the risk:

- Bourne-Bilson Brook Catchment (trib of Trent) (GB104028047270);

- Trent from Moreton Brook to River Tame (GB104028047290); and
- Lea (GB112068055280).

Borrow pits

- 8.2.21 Within the Bourne-Bilson Brook Catchment (trib of Trent) (GB104028047270) water body, the borrow pit at Kings Bromley North (located adjacent to the realigned A515 Lichfield Road) will involve the excavation of floodplain River Terrace Deposits or Glaciofluvial Deposits (to a maximum depth of 8.8 mbgl) within a minimum distance of 145m to the Bourne Brook and 87m to the Crawley Brook tributary. The borrow pit at Kings Bromley North (located adjacent to the realigned Shaw Lane) will also involve the excavation of floodplain River Terrace Deposits or Glaciofluvial Deposits (to a maximum depth of 8.8 mbgl) within a minimum distance of 50m to the Crawley Brook tributary.
- 8.2.22 Within the Trent from Moreton Brook to River Tame (GB104028047290) water body, the borrow pit to north-east of the River Trent viaduct (between the River Trent and Pipe Lane) will involve the excavation of floodplain River Terrace Deposits or Glaciofluvial Deposits (to a maximum depth of 16 mbgl) within a minimum distance of 60m to the River Trent.
- 8.2.23 Within the Lea (GB112068055280) water body, the borrow pit west of Netherset Hey farm will involve the excavation of floodplain Glaciofluvial Deposits (to a maximum depth of 18 mbgl) within a minimum distance of 50m to the River Lea.
- 8.2.24 Depending on the permeability of the underlying strata between the watercourse and the borrow pit, dewatering activities associated with the borrow pit excavations may result in some reductions in the volume of flow within the Crawley Brook, Bourne Brook, River Trent, and River Lea during the construction phase. This, in turn, may result in associated adverse effects on aquatic biota, physicochemical water quality and hydromorphological regime.
- 8.2.25 Consequently, additional mitigation requirements (beyond those embedded within the design and construction methodology of the Proposed Scheme; see Table 24), have been identified at each of these borrow pit sites (see also Volume 2, Fradley to Colton area and Whitmore Heath to Madeley area reports). These additional mitigation requirements are summarised in Sections 8.2.39 – 8.2.42.
- 8.2.26 The borrow pit to the west of Netherset Hey Farm will also have a direct physical impact on the lower 400m of the 'Unnamed tributary of River Lea 5' watercourse, which will be temporarily diverted around the excavation area. The excavation strategy at this borrow pit site will apply a phased approach, allowing for the provision of an appropriately designed, temporary diversion channel comprising equivalent hydraulic capacity and hydromorphological condition as the existing watercourse. This temporary diversion will be in place for no longer than three years, with the existing watercourse being fully reinstated within this timeframe. Resultantly, the borrow pit is anticipated to have only a localised, minor and temporary adverse effect on aquatic biota, dissolved oxygen and hydromorphological regime (including flow dynamics, river depth/width, structure and substrate of river bed, and structure of riparian zone) of this tributary watercourse.

Culverts

- 8.2.27 Each of the water bodies listed above will also be subject to minor, localised adverse effects on aquatic biota, dissolved oxygen, water temperature, and hydromorphological condition associated with a number of short access road and highway realignment culverts (as described in Section 8.2.15).
- 8.2.28 One larger, 60m long culvert is also proposed on the 'Unnamed tributary of Bentley Brook 2' watercourse within the Trent from Moreton Brook to River Tame (GB104028047290). However, this culvert is located on a reach upstream of the B5014 that is currently already culverted for approximately 250m within a suspected 1.2m diameter pipe (which will be day-lighted upstream and downstream of the highway realignment as part of the Proposed Scheme). The new culvert will therefore provide a localised and permanent improvement over the existing condition with regards to both culvert length and design and associated impacts on flow continuity, sediment transfer, biological continuity and substrate. As such, this culvert is anticipated to provide a minor, localised beneficial effect on fish and other aquatic biota at this site.

Realignments, diversions and day-lighting / removal of existing culverts

- 8.2.29 Each of the water bodies will also experience minor, localised benefits at several locations as a result the realignment / diversion of sections of tributary watercourse and the daylighting / removal of a number of existing culverts. This includes localised diversions and the associated removal of large lengths of existing culverts on the 'Unnamed tributary of Bentley Brook 1', 'Unnamed tributary of Bentley Brook 2', 'Unnamed tributary of Bentley Brook 3' watercourses within the Trent from Moreton Brook to River Tame (GB104028047290) waterbody, as well as the 'Unnamed tributary of River Lea 3', 'Unnamed tributary of River Lea 6' and 'Unnamed tributary of River Lea 7' watercourses within the Lea (GB112068055280) water body.

Localised / minor beneficial overall effects

- 8.2.30 An overall minor, localised beneficial (blue) effect is anticipated on a number of the quality elements as a result of the combined effects of the Proposed Scheme within the remaining Trent from Tittensor to River Sow (GB104028053272) water body.

Culverts

- 8.2.31 The water body will be subject to minor, localised adverse effects on aquatic biota, dissolved oxygen, water temperature, and hydromorphological condition associated with a number of short access road and highway realignment culverts (as described in Section 8.2.15).
- 8.2.32 Three larger culverts are also proposed on tributary watercourses within the water body, as follows:
- 'Unnamed tributary of River Trent 1 (T to RS)' – 61m long Tolldish culvert, located at far upstream end of the watercourse;
 - Filly Brook – 50m extension to an existing railway crossing culvert, located on the mid-reaches of the watercourse (adjacent to the Stone golf course); and

- Filly Brook – 70m long highway realignment culvert, located towards the upstream end of the watercourse immediately to the west of the M6 (which will replace an existing, approximately long 67m highway culvert at the Yarnfield Lane crossing).

- 8.2.33 Given the length of these culverts, there is a potential further risk with regards to fish passage and spawning migration at these sites. However, baseline field surveys have confirmed that the watercourses upstream of the proposed culvert locations comprises poor hydromorphological condition and poor fish habitat potential (see also Volume 5: Appendix EC-014-000; undertaken as part of the ecology and biodiversity assessment within the Volume 2, Community area reports, Section 8).
- 8.2.34 In addition, a number of existing structures are present on both of these watercourses downstream of the proposed culvert locations, which are likely to be inhibiting fish passage upstream from the River Trent.
- 8.2.35 On the 'Unnamed tributary of River Trent 1 (T to RS)' watercourse, this includes several existing road crossing culverts on the 'Unnamed tributary of River Trent 1 (T to RS)' (including the A51, Tolldish Lane, and Mill Lane culverts) as well as a siphon where the watercourse passes underneath the Trent and Mersey Canal immediately upstream of the confluence with the River Trent.
- 8.2.36 On the Filly Brook, this includes an existing weir¹⁰ adjacent to the stone golf course as well as a number of existing culverts (including beneath Yarnfield Lane, the M6, Pool House Farm, the Stone to Stafford railway crossing, St Vincent Road, and the A34).
- 8.2.37 As such, the three proposed culverts listed above are anticipated to cause negligible or minor, localised adverse effects on fish only.

Realignments, diversions and day-lighting/ removal of existing culverts

- 8.2.38 The minor, localised adverse effects associated with the new culverts described above is considered to be outweighed by the localised beneficial effects of the daylighting / removal of significant lengths of existing culverts within the water body. This is combined with minor, localised benefits associated with the realignment and diversion of several reaches of tributary watercourses that are of poor existing hydromorphological condition (with the associated implementation of hydromorphological and riparian habitat / buffer strip improvements; as outlined in Table 24). This includes the creation of approximately 1230m of new, realigned channel on the 'Unnamed tributary of River Trent 1 (T to RS)' and Filly Brook tributary watercourses, including the removal of an approximate 300m long existing culvert on the mid-reaches of the Filly Brook at Pool House Farm.

Additional mitigation of potential risks to surface water status

- 8.2.39 Where the detailed impact assessment has identified adverse (amber) effects with the potential risk of deterioration in status of water body quality elements, additional mitigation requirements have been defined. These are described below.

¹⁰ See Environment Agency (2012), *Fisheries Failure Investigations*; M12009-12957

- 8.2.40 Borrow pits are proposed as part of the Proposed Scheme within the vicinity of a number of watercourses. These include Bourne Brook, Crawley Brook, the River Trent, and the River Lea (see Annex E1.1, Table 37 for details).
- 8.2.41 The detailed impact assessment has identified potential adverse (amber) effects to these watercourses during the construction phase, related to the potential for a reduction in baseflow as a result of dewatering activities. These effects are considered to pose a potential risk of deterioration of status of one or more quality elements within these water bodies.
- 8.2.42 Consequently, additional mitigation measures for the management of groundwater baseflow to the watercourses during the construction phase will be required to ensure that there is no significant impact on the water environment (see also Volume 2, Community area reports, Section 15). Mitigation measures will be designed in detail following ground investigation and monitoring of surface water and groundwater levels and in consultation with the Environment Agency. Mitigation could take the form of:
- a wider buffer strip, or shallower batter on the excavations;
 - installation of a groundwater cut off;
 - adoption of wet working techniques that avoid the need for dewatering; and
 - creation of a new lined channel and temporary diversion.

Residual effects

- 8.2.43 The implementation of the additional mitigation measures described above will ensure that there are no residual risks to status as a result of the potential adverse effects of borrow pits within the Bourne-Bilson Brook Catchment (trib of Trent) (GB104028047270), Trent from Moreton Brook to River Tame (GB104028047290), and Lea (GB112068055280) water bodies.

Cumulative effects

- 8.2.44 No cumulative effects associated with the impacts of scheme component located within other, adjacent water bodies (upstream or downstream) have been identified for any of the surface water bodies affected by the Proposed Scheme.
- 8.2.45 Whilst a number of water bodies are located either upstream or downstream of other water bodies that are also affected by the Proposed Scheme, no widespread adverse effects have been identified within any of the surface water bodies that have the potential to propagate upstream / downstream (e.g. significant impacts on flow regime, sediment transfer or biological continuity).

Enhanced monitoring of effects on quality element status

- 8.2.46 The detailed impact assessment has identified a number of effects on the following 'high' or 'very high' receptor value water bodies / watercourses:
- Pyford Brook Catchment (trib of Trent) (GB104028047250) – Pyford Brook;
 - Bourne-Bilson Brook Catchment (trib of Trent) (GB104028047270) – Bourne Brook;

- Trent from Moreton Brook to River Tame (GB104028047290) – River Trent;
- Moreton Brook from Source to River Trent (GB104028047380) – Moreton Brook;
- Trent from Tittensor to River Sow (GB104028053272) – Filly Brook; and
- Betley Mere (GB31234330).

- 8.2.47 Enhanced WFD monitoring will be implemented on each of these watercourses / water bodies prior to, during and following construction, in order to assess the effects of the Proposed Scheme and the suitability and effectiveness of the embedded mitigation applied to the relevant scheme components.
- 8.2.48 This monitoring strategy will be developed in consultation with the Environment Agency, tailored around the relevant quality elements anticipated to be affected.
- 8.2.49 Monitoring outcomes will be utilised to inform the development of any corrective measures and/or further mitigation measures if/where deemed necessary by the Environment Agency.
- 8.2.50 The detailed impact assessment has also identified a number of effects on several 'moderate' receptor value watercourses. A proportional monitoring strategy will be developed in consultation with Environment Agency for each of these sites, in order to assess the suitability and effectiveness of the embedded mitigation applied to the relevant scheme components.

No prevention of status objectives

- 8.2.51 The preliminary assessment has screened the Proposed Scheme against the 2015 RBMP RNAG, PoM, and HMWB mitigation measures derived for the relevant surface water bodies (see Section 7.2).
- 8.2.52 RNAG potentially at risk as a result of the Proposed Scheme have been identified for the four following surface water bodies:
- Trent from Moreton Brook to River Tame (GB104028047290);
 - Trent from Tittensor to River Sow GB104028053272);
 - Sow - Doxey Bk to R Penk (GB104028047190); and
 - Wistaston Brook (GB112068055280).
- 8.2.53 These RNAG each relate to the quality element fish (see Table 29). The potential effects of the scheme components proposed within these surface water bodies have been reviewed in further detail with reference to the baseline condition of the relevant watercourses and the available design proposals, and in consultation with the Environment Agency. These are discussed in the following sections.

Barriers to fish migration

- 8.2.54 The Trent from Moreton Brook to River Tame (GB104028047290), Trent from Tittensor to River Sow (GB104028053272), and Sow - Doxey Bk to R Penk (GB104028046790) water bodies each have RNAG relating to urban and transport

physical modifications causing barriers to fish migration, which in turn are deemed to be contributing to fish failing their good status objective¹¹.

- 8.2.55 The Proposed Scheme will introduce a number of larger culverts on four minor tributary watercourses located within these water bodies; which given their length may pose a potential permanent adverse effect on fish passage in the future. These are summarised in Table 31 (see also Annex C2 and Annex E1.1 for further details of the baseline condition of the watercourses and scheme components, respectively).
- 8.2.56 All of the watercourses affected by these culverts have been assessed as comprising poor fish habitat potential (see also Volume 5: Appendix EC-014-000; undertaken as part of the ecology and biodiversity assessment within the Volume 2, Community area reports, Section 8) and baseline field surveys have confirmed that fish habitat, including potential spawning habitat, is limited upstream of each of the culvert locations.
- 8.2.57 Each of the culverts will be subject to the embedded mitigation outlined in Section 6.2 (Table 24), which will minimise potential adverse effects on biological continuity. When balanced against this embedded mitigation, and based on the assessment of baseline hydromorphological condition and fish habitat potential of the affected watercourses and reaches upstream of the proposed culvert locations, these culverts are not expected to inhibit the relevant water bodies from achieving their good status objective for fish in the future due to an exacerbation of barriers to fish migration. Accordingly, additional mitigation is not deemed required with regards to the potential for these culverts to prevent the achievement of status objectives of fish in the future.
- 8.2.58 However, due to access restrictions, there is currently a lack of available field survey data concerning the baseline hydromorphological and ecological condition of the Filly Brook at the immediate location of the proposed extension of existing railway culvert (WFD-TTS-T-08-01). As such, further baseline fish monitoring and field survey assessment is required during the detailed design phase of the Proposed Scheme, in order to establish the existing fish population, existing potential barriers to fish passage, and the quality of fish habitat (including potential spawning habitat) present along this reach of the watercourse. Additional baseline monitoring and assessment will be undertaken in consultation with the Environment Agency and, where necessary, outcomes utilised to inform the refinement and development of design mitigation requirements required at this site with regards to potential future impacts of fish migration.

¹¹ Environment Agency (2012), *Fisheries Failure Investigations*; MI7740_0028; MIT2-00073; MI2009-12957

Table 31: Summary of baseline condition at locations of proposed culverts posing a potential risk to surface water body RNAG with regards to barriers to fish migration

Water body (ID)	Watercourse	Culvert (Ref ID)	Description of baseline condition
Trent from Moreton Brook to River Tame (GB104028047290)	Unnamed tributary of Bentley Brook 2	Highway realignment culvert (WFD-TMT-T-05-05)	The Proposed Scheme will introduce a 60m long highway realignment culvert on the 'Unnamed tributary of Bentley Brook 2' watercourse, immediately upstream (west) of the existing B5014 road crossing. The watercourse at this location has an estimated Q95 flow of $\leq 0.002\text{m}^3/\text{s}$. The proposed culvert is located on a reach of the watercourse that is currently culverted for approximately 250m within a suspected 1.2m diameter pipe. Downstream of this culvert, the watercourse was observed during field survey to comprise an approximately 1-1.5m wide channel with: shallow, typically ponded low-flows (typically 0.02-0.1m deep); no well-defined morphological flow types; no well-developed fluvial geomorphological features; and gravel substrates overlain in places with fine sediment deposits. The watercourse at this location has been assessed as providing poor riverine habitat for fish. A number of existing road crossing culverts are present along the lower reaches of the watercourse (including the School Lane crossing), which may be inhibiting fish passage upstream from the River Trent. As part of the proposed highway realignment, the existing culvert will be removed and the channel upstream and downstream of the new culvert will be day-lighted over a total of approximately 180m. The Proposed Scheme will therefore provide a benefit over the existing condition with regards to fish passage and habitat, via the removal and partial replacement of an existing restrictive and extensive pipe culvert.
Trent from Tittensor to River Sow (GB104028053272)	Unnamed tributary of River Trent 1	Tolldish culvert (WFD-TTS-T-01-02)	The Proposed Scheme will introduce a 61m long track culvert (the Tolldish Culvert) on the 'Unnamed tributary of River Trent 1' watercourse, to the north east of Great Haywood. The proposed culvert is located towards the upstream extent of the watercourse, approximately 700m upstream of the existing A51 road crossing. The watercourse at this location has an estimated Q95 flow of $\leq 0.002\text{m}^3/\text{s}$. Field survey has confirmed that the watercourse upstream of the proposed culvert location comprises a small, poorly defined and heavily vegetated channel, with silt substrates and shallow and ponded low-flows only (typically 0.1m deep). Approximately 110m upstream of the proposed culvert location, the channel was observed to run dry and to be overgrown with vegetation. The watercourse at this location has been assessed as providing poor riverine habitat for fish. A number of existing road crossing culverts are present along the lower reaches of the watercourse (including the A51, Tolldish Lane, and Mill Lane culverts), whilst the watercourse also passes underneath the Trent and Mersey Canal within a siphon immediately upstream of the confluence with the River Trent; which are likely to be inhibiting fish passage upstream from the River Trent.
	Filly Brook	Extension of existing railway culvert (WFD-TTS-T-08-01)	The Proposed Scheme will extend the existing railway culvert on the mid-reaches of the Filly Brook, adjacent to the Stone Golf Club. The scheme will result in this 1.68m by 1.5m box culvert being extended by 50m to a total length of 80m. The watercourse at this location has an estimated Q95 flow of $\leq 0.012\text{m}^3/\text{s}$. Access to the watercourse at this immediate location was not possible during this assessment. Approximately 600m upstream of the proposed culvert location, the watercourse was observed during field survey to comprise an approximately 1m wide, heavily vegetated channel, with: shallow, typically ponded low-flows; no well-developed fluvial geomorphological features; and coarse substrates overlain in places with fine sediment deposit. The watercourse at this location has been assessed as providing poor riverine habitat for fish. Further upstream, the watercourse is currently culverted within an approximately 300m long pipe culvert (which will be day-lighted under the Proposed Scheme) and the approximately 50m long concrete box culvert beneath the M6 motorway crossing. The Environment Agency has confirmed the presence of a 1.9m high weir located at the upstream end of the existing railway culvert

Water body (ID)	Watercourse	Culvert (Ref ID)	Description of baseline condition
			(at SJ8898033480) ¹⁰ , which is suspected to represent a barrier to fish passage. A number of existing road crossing culverts are also present along the lower reaches of the watercourse (including the A34 and St Vincent Road crossings), which may be inhibiting fish passage upstream from the River Trent.
		Highway realignment culvert (WFD-TTS-T-08-06)	The Proposed Scheme will introduce a 70m long highway realignment culvert on the upper reaches of the Filly Brook (tributary of the River Trent), immediately upstream (west) of the existing M6 motorway crossing. This culvert will replace the existing, approximately 67m long Yarnfield Lane culvert at this location. The watercourse at this location has an estimated Q95 flow of $\leq 0.012\text{m}^3/\text{s}$. The headwater reaches of the watercourse upstream of this location were observed during field survey to comprise an approximately 1m wide channel with: heavily vegetated banks; shallow and predominately ponded low-flow (typically 0.02m-0.1m deep); no definable morphological flow types or well-developed fluvial geomorphological features; and predominately cobble substrate overlain with silt deposits. The watercourse at this location has been assessed as providing poor riverine habitat for fish. Downstream of the proposed culvert location, the watercourse is culverted beneath the M6 motorway, before entering an existing approximately 300m long pipe culvert (which will be day-lighted as part of the Proposed Scheme, as described above). As part of the proposed highway realignment, the watercourse will also be realigned for approximately 285m and 190m upstream and downstream of the new culvert, respectively; with incorporated hydromorphological and riparian habitat improvements (as described in Table 24). Overall, therefore, the Proposed Scheme will provide a benefit over the existing condition with regards to fish passage and fish habitat along the mid and upper reaches of the watercourse.
Sow - Doxey Brook to River Penk (GB104028046790)	Unnamed tributary of Kingston Brook 2	Hopton Culvert (WFD-SDP-T-02-01)	The Proposed Scheme will introduce a new 33m track culvert on the upper reaches of the 'Unnamed tributary of Kingston Brook 2' watercourse, immediately to the south of Hopton. The proposed culvert is located approximately 575m downstream of the Hopton Pools, which presently impound the far upstream reach of the watercourse. The watercourse at this location has an estimated Q95 flow of $\leq 0.004\text{m}^3/\text{s}$. However, the headwater reaches of the watercourse have been observed to run dry during low-flow conditions. The watercourse at and upstream of the proposed culvert location were observed to comprise an approximately 0.3m wide, poorly define and heavily vegetated channel, with predominately fine sediment substrates and isolated areas of shallow, ponded water only. The watercourse at this location has been assessed as providing poor riverine habitat for fish. The watercourse at this location has been observed to experience shallow flows during wet conditions, however (preliminary site visit, February 2016), when water levels within the Hopton Pools upstream exceed the invert level of the outlet culverts.

Pollution incidents from railway

- 8.2.59 The Wistaston Brook (GB11206805280) water body has a RNAG relating to pollution incidents from railway infrastructure / activities, which in turn is deemed to be contributing to the water body failing its good status objective for fish.
- 8.2.60 The Proposed Scheme has the potential to exacerbate this pressure via the introduction of new railway infrastructure and traffic within the water body catchment, with an associated risk of pollution spillages and/or runoff entering the river system.
- 8.2.61 The construction of the Proposed Scheme will adhere to method statements derived in accordance with Section 16, Draft CoCP⁸, including measures to appropriately manage surface water and sediment runoff prior to discharge to the watercourse.
- 8.2.62 During the operational phase of the Proposed Scheme, the scheme design has integrated a drainage strategy ensuring the incorporation of sustainable drainage systems (including balancing ponds), where reasonably practicable, to intercept and control the rate, volume and quality of runoff from the rail corridor and other infrastructure in a manner that will not significantly adversely impact upon the existing flow regime or water quality of receiving watercourse.
- 8.2.63 The risk of the pollution of the water environment from spillages during operation is considered very low, as the majority of trains will be electric passenger trains, and the Proposed Scheme will not be used to transport freight. Spillages on the route are only likely following derailments, collisions, or major on board incidents, all of which are considered highly improbable.
- 8.2.64 If a spillage of a pollutant does occur, it will not necessarily lead to a pollution incident, as the pollutant may not reach a receiving water body, either because of prompt action by emergency personnel or as a result of pollution control measures, such as shut-off valves, balancing ponds, and silt traps, or because the pollutant is absorbed by soil or vegetation. Nonetheless, specific mitigation proposed to address this risk includes:
- inclusion of shut-off valves on attenuation ponds which can be used to isolate pollutants before they enter the wider water environment. If the procedures for closing valves on these systems were not operated in time, the ponds would still significantly reduce the amount of pollutant entering the wider water environment; and
 - the draft operation and maintenance plan for the Proposed Scheme (Volume 5: Appendix WR-002-000) outlines measures to manage possible sources of pollution of the water environment as a result of rail operations. This makes specific provision for notifying the emergency and environmental services and procedures for isolating pollutants within the drainage systems.
- 8.2.65 It is therefore concluded that there are not likely to be significant adverse effects on the water environment related to operational phase accident and spillage risks.
- 8.2.66 When balanced against this embedded mitigation, the Proposed Scheme is therefore not expected to inhibit the water body from achieving its good status objective for fish

in the future due to an exacerbation of pressures associated with pollution incidents from railway infrastructure.

8.3 Groundwater

No deterioration of status

- 8.3.1 The baseline assessment has identified six groundwater bodies as being affected by the Proposed Scheme (see Section 5 and Annex D). The baseline assessment has also identified all of the relevant scheme components located within each of these water bodies and the associated embedded mitigation (see Section 6 and Annex E1.2).
- 8.3.2 The preliminary assessment has then identified the relevant impacts of the various scheme components and the associated likely effects on the different WFD status elements of the surface water bodies affected by the Proposed Scheme (see Section 7.1 and Annex F1.2). This, in turn, has identified which quality elements are screened-in for detailed assessment for each water body.
- 8.3.3 This detailed assessment has identified the magnitude of the effects of the scheme components on the current status of the quality elements of the water body, together with any associated additional mitigation requirements. The detailed impact assessment results for the groundwater bodies affected by the Proposed Scheme are provided in Annex G3.
- 8.3.4 The Basford Brook bridge will cross the Weaver and Dane Quaternary Sand and Gravel Aquifers groundwater body (GB41202G991700) at the Basford East Development Site. This bridge has previously been subject to a successful planning permission (12/4115N) as part of the Crewe Green Link Road (South) application. Development of the bridge has not been implemented under this planning permission, and the location of the consented bridge falls within the land required for the Proposed Scheme. As such, the Basford Brook bridge has been included within the Proposed Scheme. An assessment has been undertaken of the WFD compliance issues associated with this bridge. The conclusions of this assessment are that the bridge will have negligible impact on the groundwater body.
- 8.3.5 Minor, localised and/or temporary effects (yellow) have been identified for a number of quality elements for all six groundwater bodies crossed by the scheme. These effects are not anticipated to cause a deterioration in current status of the water bodies, however, when balanced against the embedded mitigation of the scheme.
- 8.3.6 The assessment has identified one adverse (amber) overall effect with potential risk to deteriorate the status of the DrWPAs element of the Staffordshire Trent Valley PT Sandstone Staffordshire (GB4041G300500) groundwater body. This relates to the potential temporary construction impacts on the quality of the water at the public water supply abstraction near Whitmore. Whilst no permanent significant effects are predicted on this element as a result of the Proposed Scheme, additional mitigation measure requirements for the construction phase are under discussion with the Environment Agency in consultation with Severn Trent Water Ltd (as described in Section 8.3.7).

Additional mitigation of potential risks to groundwater status

- 8.3.7 Additional mitigation options for the temporary impacts on the public water abstraction near Whitmore, and the associated risk of deterioration of the status of the DrWPA element of the Staffordshire Trent Valley PT Sandstone Staffordshire (GB4041G300500) groundwater body, are being discussed with the owner and the Environment Agency. Such mitigation options may include the temporary suspension of abstraction at this location. Options to mitigate this temporary loss of water supply may include:
- increasing existing outputs of alternative potential water supplies, for example, by enhancing treatment of other supplies;
 - importing water from another source unaffected by construction of the Proposed Scheme;
 - provision of replacement borehole sources; and
- initiatives to reduce the quantity of water required, for example, reducing consumption in the zone.

Residual effects

- 8.3.8 The implementation of the additional mitigation measures described above will ensure that the residual effects on the DrWPA element of the Staffordshire Trent Valley PT Sandstone Staffordshire (GB4041G300500) groundwater body will be negligible.

Cumulative effects

- 8.3.9 No cumulative effects associated with the impacts of scheme components located within other, adjacent water bodies have been identified for any of the groundwater bodies affected by the Proposed Scheme.

Further groundwater baseline investigation and monitoring

- 8.3.10 The groundwater aspect of the WFD assessment has been based primarily on desk study information. In many areas, due to the lack of site-specific ground investigation or monitoring data, there is therefore a residual uncertainty regarding hydrogeological characteristics. As such, site-specific ground investigation and monitoring is required during the detailed design phase of the Proposed Scheme, in order to further establish baseline conditions for groundwater.
- 8.3.11 This additional baseline ground investigation and monitoring will be undertaken in consultation with the Environment Agency and Severn Trent Water Ltd and, where necessary, the outcomes utilised to inform the refinement and development of construction and design mitigation requirements required to ensure no significant effects to the groundwater environment.
- 8.3.12 Key areas that will be addressed by further baseline investigation and monitoring during the detailed design process include the following:
- detailed characterisation of ground conditions;
 - measurement of site-specific hydraulic properties;

- site-specific monitoring of groundwater levels and quality;
- monitoring of spring flows;
- monitoring of surface water flows and quality;
- ecological assessment and monitoring, particularly for GWDTE; and
- characterisation of existing contamination.

8.3.13 Areas where mitigation may be developed further during the detailed design process include the design and management of temporary dewatering during construction and the design of individual sustainable drainage system features to optimise groundwater recharge without causing significant risks to groundwater quality.

8.3.14 In accordance with the Section 16, Draft CoCP⁸, site-specific monitoring will also be undertaken in consultation with the Environment Agency prior to, during and post-construction, if required, to confirm the effectiveness of agreed temporary and permanent construction mitigation measures (see Section 6.2).

Enhanced monitoring of effects on quality element status

8.3.15 The detailed impact assessment has identified a number of minor, localised adverse effects on a number of quality elements within all six groundwater bodies crossed by the scheme.

8.3.16 Enhanced WFD monitoring will be implemented at each of these sites prior to, during and following construction, in order to assess the effects of the Proposed Scheme and the suitability and effectiveness of the embedded mitigation applied to both the construction methodology of the Proposed Scheme and design of the relevant scheme components.

8.3.17 This monitoring strategy will be developed in consultation with the Environment Agency, tailored around the relevant quality elements anticipated to be effected.

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

No prevention of status objectives

8.3.19 The preliminary assessment has screened the Proposed Scheme against the 2015 RBMP RNAG derived for the relevant groundwater bodies (see Section 7.2).

8.3.20 One RNAG has been identified as being potentially at risk as a result of the Proposed Scheme. This relates to the quantitative water balance element of the Staffordshire Trent Valley – PT Sandstone Staffordshire (GB4041G300500) water body (see Table 30).

8.3.21 The assessment has shown that there will be a potential significant, temporary effect on the water quality at the public abstraction near Whitmore (as described in Section 8.3.6). As a result of this predicted effect, a mitigation solution is being agreed with Severn Trent Water Ltd and the Environment Agency for the construction period. As stated within Section 8.3.7, the solution is likely to require temporarily taking this abstraction site out of supply and providing an alternative source of water.

- 8.3.22 The quantitative water balance element of the relevant Staffordshire Trent Valley – PT Sandstone Staffordshire (GB4041G300500) groundwater body is currently failing its good status objective due to water industry groundwater abstraction. Whilst, the potential reduction in the quantity of groundwater abstracted during the construction phase is likely to have a positive effect on the quantitative water balance, the alternative water source (location, source, quantity) has the potential to have an adverse effect on the overall quantitative water balance within the groundwater body.
- 8.3.23 To ensure that any effects are negligible and will not inhibit the achievement of the status objective of the quantitative water balance element of the water body, additional mitigation measures are being discussed with the owner and the Environment Agency. Measures will ensure that the alternative water source used during construction of the Proposed Scheme will involve abstraction of the same or lower quantities of water than are currently abstracted at Whitmore. Pressure on the water resources available within this water body will therefore not be worsened by the Proposed Scheme.

9 Conclusions

9.1 Overview

- 9.1.1 The Proposed Scheme will cross a number of surface water bodies and groundwater bodies. This appendix reports on an assessment of the Proposed Scheme's compliance against the WFD objectives of those water bodies potentially affected.
- 9.1.2 The WFD assessment methodology has been developed in accordance with the WFD Compliance Assessment Technical Note (Volume 5, Appendix CT-001-002) and in consultation with the Environment Agency.
- 9.1.3 The assessment is based on the Proposed Scheme design, current Environment Agency WFD baseline data, and baseline hydromorphological, ecological and hydrogeological data derived via desk study and field survey. The assessment has taken into account the mitigation built into the design and construction methodology of the Proposed Scheme (as outlined in Section 6.2). The assessment will be updated during the detailed design stage of the Proposed Scheme, in order to reflect the latest iteration of the design and assessment process.
- 9.1.4 The Proposed Scheme lies within the Staffordshire Trent Valley catchment of the Humber River Basin District (as far north as Baldwin's Gate/Whitmore) and the Upper Weaver catchment of the North West River Basin District (between Baldwin's Gate/Whitmore and Crewe). The statutory objectives of relevance to all surface water and groundwater bodies potentially affected by the Proposed Scheme are recorded within the 2015 Cycle 2 Humber RBMP and the North West RBMP.
- 9.1.5 The Environment Agency 2015 Cycle 2 WFD water body classification data have been used within this assessment. These data are considered to provide the current best estimate of status and are the formal baseline against which the Environment Agency will assess compliance with WFD objectives in 2017.
- 9.1.6 The assessment has identified a total of 13 surface water bodies (including 54 watercourses) and six groundwater bodies that will be impacted by the Proposed Scheme.

9.2 No deterioration of current status

- 9.2.1 A detailed impact assessment has been undertaken of all components of the Proposed Scheme identified as having the potential to have an effect on the status elements of the relevant WFD water bodies.
- 9.2.2 The assessment process for determining the potential for a deterioration of status uses a traffic light rating system agreed with the Environment Agency, in order to assign the magnitude of the effect on the quality elements of the affected water body. The outcome of the assessment identifies the overall effect of all of the relevant scheme components on each quality element at a water body scale.

Surface Water

- 9.2.3 Of the 13 surface water bodies impacted by the Proposed Scheme:
 - one water body is anticipated to experience no likely effects on quality elements;

- four water bodies are anticipated to experience negligible (green) overall effects on one or more quality elements, with no measurable change in quality elements;
- four water bodies are anticipated to experience minor, localised adverse (yellow) overall effects on one or more quality elements, but with no change in status;
- three water bodies are anticipated to experience adverse (amber) overall effects on one or more quality elements, with a potential risk of status deterioration (requiring consideration of additional mitigation); and
- one water body is anticipated to experience minor, localised beneficial (light blue) overall effects on one or more quality elements, but with no change in status.

9.2.4 The assessment has identified a number of minor, localised adverse (yellow) and minor, localised beneficial (light blue) effects on several watercourses within the relevant surface water bodies. These effects are not anticipated to cause a deterioration in current status of the water bodies.

9.2.5 The assessment has also identified the potential for an adverse (amber) overall effect on one or more quality elements, with the potential to cause a deterioration in quality element status, within the following three surface water bodies:

- Bourne-Bilson Brook Catchment (trib of Trent) (GB104028047270);
- Trent from Moreton Brook to River Tame (GB104028047290); and
- Lea (GB112068055280).

9.2.6 These effects are driven by the impacts associated with the excavation of borrow pits during the construction phase. Resultantly, there is a requirement for additional mitigation to be implemented at these borrow pit sites in order to appropriately manage the risk to quality element status. Mitigation measures will be designed in detail following ground investigation and monitoring of surface water and groundwater levels. Mitigation could take the form of:

- a wider buffer strip, or shallower batter on the excavations;
- installation of a groundwater cut off;
- adoption of wet working techniques that avoid the need for dewatering; and
- creation of a new lined channel and temporary diversion.

9.2.7 These additional mitigation measures will be developed in consultation with the Environment Agency to ensure that there is no significant impact on the water environment (see also Volume 2, Community area reports, Section 15).

9.2.8 The implementation of the additional mitigation measures described above will ensure that there are no residual risks to status as a result of the potential adverse effects of borrow pits within the Bourne-Bilson Brook Catchment (trib of Trent) (GB104028047270), Trent from Moreton Brook to River Tame (GB104028047290), and Lea (GB112068055280) water bodies.

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

Groundwater

- 9.2.10 Minor, localised and/or temporary adverse (yellow) overall effects have been identified for one or more quality elements within all six of the groundwater bodies impacted by the Proposed Scheme. These effects are not anticipated to cause a deterioration in current status of the water bodies.
- 9.2.11 One adverse (amber) overall effect with potential risk to deteriorate the status of the DrWPAs element of the Staffordshire Trent Valley PT Sandstone Staffordshire (GB4041G300500) groundwater body has been identified. This relates to the potential temporary construction impacts on the quality of the water at the public water supply abstraction near Whitmore. Whilst no permanent significant effects are predicted on this element as a result of the Proposed Scheme, additional mitigation measure requirements for the construction phase are being discussed with the owner and the Environment Agency. Such mitigation options may include the temporary suspension of abstraction at this location (as described in Section 8.3.7).
- 9.2.12 With the implementation of additional mitigation measures, the residual overall effect on the DrWPAs element of the Staffordshire Trent Valley PT Sandstone Staffordshire (GB4041G300500) groundwater body is anticipated to be negligible (green).
- 9.2.13 No cumulative effects associated with the impacts of scheme components located within other, adjacent water bodies have been identified for any of the groundwater bodies affected by the Proposed Scheme.

WFD monitoring of effects on surface water and groundwater status

- 9.2.14 Targeted and proportional WFD monitoring will be implemented prior to, during and following construction at all sites where a potential effect has been identified on a water body quality element.
- 9.2.15 The WFD monitoring strategy will be developed in consultation with the Environment Agency and tailored around the relevant quality elements anticipated to be effected.
- 9.2.16 Monitoring outcomes will be utilised to assess the suitability and effectiveness of the embedded mitigation applied to the relevant scheme components and, where deemed necessary by the Environment Agency, inform the development of any required corrective measures and/or further mitigation measures.

9.3 No prevention of status objectives

- 9.3.1 The Proposed Scheme has been screened against the available 2015 RBMP 'Reasons for Not Achieving Good Status' (RNAG), 'programme of measures' (PoM), and HMWB 'mitigation measure assessments' (MMA) data for the relevant surface water and groundwater bodies.

Surface Water

- 9.3.2 The Proposed Scheme is not considered to pose a significant risk to the status objectives of the relevant surface waterbodies.

- 9.3.3 Within the Trent from Tittensor to River Sow (GB104028053272) water body, however, due to access restrictions there is a current lack of available field survey data concerning the baseline hydromorphological and ecological condition of the Filly Brook tributary at the immediate location of the proposed extension of an existing railway culvert (WFD-TTS-T-08-01).
- 9.3.4 As such, further baseline fish monitoring and field survey assessment is required during the detailed design stage of the Proposed Scheme, in order to establish the existing fish population, existing potential barriers to fish passage, and the quality of fish habitat (including potential spawning habitat) present along this reach of the watercourse. Additional baseline monitoring and assessment will be undertaken in consultation with the Environment Agency and, where necessary, outcomes utilised to inform the refinement and development of design mitigation requirements required at this site with regards to potential future impacts of fish migration.

Groundwater

- 9.3.5 The assessment has shown that there will be a potential significant, temporary impact on the water quality at the public abstraction near Whitmore during the construction phase of the Proposed Scheme. As a result of this predicted impact, a mitigation solution is currently being agreed with Severn Trent Water Ltd and the Environment Agency for the construction period. The solution is likely to require temporarily taking this abstraction site out of supply and providing an alternative source of water.
- 9.3.6 The quantitative water balance element of the relevant Staffordshire Trent Valley – PT Sandstone Staffordshire (GB4041G300500) groundwater body is currently failing its status objective due to water industry groundwater abstraction. Whilst, the potential reduction in the quantity of groundwater abstracted during the construction phase is likely to have a positive effect on the quantitative water balance, the alternative water source (location, source, quantity) has the potential to have an adverse effect on the overall quantitative water balance within the groundwater body.
- 9.3.7 To ensure that any effects are negligible and will not inhibit the achievement of the status objective of the quantitative water balance element of the water body, additional mitigation measures are being discussed with the owner and the Environment Agency. These measures will ensure that the alternative water source used during construction of the Proposed Scheme will involve abstraction of the same or lower quantities of water than are currently abstracted at Whitmore. Pressure on the water resources available within this water body will therefore not be worsened by the Proposed Scheme.

9.4 Compliance

- 9.4.1 The WFD assessment provides an indication of the likely compliance of the Proposed Scheme at the time the assessment was prepared.
- 9.4.2 The assessment has concluded that the additional mitigation identified will ensure that the Proposed Scheme will not cause a deterioration of the current status or potential of the relevant surface and groundwater bodies or prevent any water bodies from achieving their status objectives. The Proposed Scheme will therefore be compliant with the objectives of the WFD.

- 9.4.3 No instances where an Article 4.7 test is required have been identified in this assessment.

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Annex A: Determination of WFD status

1 Introduction

- 1.1.1 Surface water bodies and groundwater bodies are defined within WFD legislation. There are three types of surface water body, as follows:
- natural water bodies;
 - Heavily Modified Water Bodies (HMWBs); and
 - Artificial Water Bodies (AWBs).
- 1.1.2 The overall status of natural surface water bodies is determined on the basis of their ecological status and chemical status. The overall status of Heavily Modified and Artificial Water Bodies is classified based on their ecological potential and chemical status. The overall status of groundwater bodies is determined on the basis of their quantitative status and chemical status.
- 1.1.3 Groundwater bodies are defined within WFD legislation as Groundwater Management Units (GWMU) and Water Resource Management Units (WRMU) and their status is determined on the basis of quantitative and chemical elements.
- 1.1.4 The means by which these determinations are made for both surface water and groundwater bodies is described below.

2 Determination of status of natural surface water bodies

2.1 Ecological status

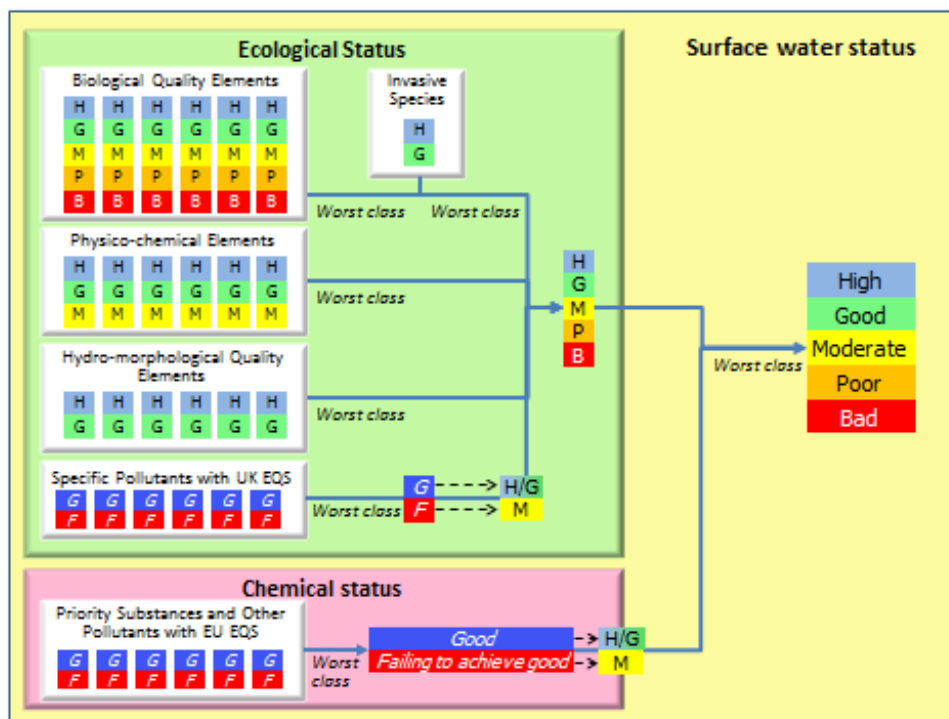
2.1.1 Ecological Status is defined by the overall quality of the structure and functioning of aquatic ecosystems associated with surface waters, i.e. the condition of the watercourse. This is assigned on a scale of high, good, moderate, poor or bad, and on the basis of four classification elements or 'tests', as follows:

- biological - this test is designed to assess the status indicated by a biological quality element such as fish, invertebrates, macrophytes or phytobenthos (diatoms). The biological quality elements can influence an overall water body status from bad through to high. It is also important to note that the presence of invasive species prevents a water body from achieving high status when all other elements attain high;
- physico-chemical - this test is designed to assess the status indicated by physico-chemical quality elements such as dissolved oxygen, phosphorus and ammonia, against environmental standards. The physico-chemical quality elements can only influence an overall water body status from moderate through to high;
- specific pollutants - this test is designed to assess compliance with environmental standards for concentrations of specific pollutants, such as zinc, cypermethrin or arsenic. As with the physico-chemical test, the specific pollutant assessment can only influence an overall water body status from moderate through to high; and
- hydromorphology - for natural surface water bodies this test¹² is undertaken by the Environment Agency during classification when the biological and physico-chemical tests indicate that a water body may be of High status. It specifically assesses hydromorphological quality elements such as water flow, sediment composition and movement, continuity, and structure of the habitat against reference or 'largely undisturbed' conditions. If the hydromorphological quality elements do not support high ecological status, then the status of the water body is limited to good overall status. Hydromorphological assessments are used to determine high overall ecological status only, and are not used to drive a water body status class below good. The 'does not support good' classification should be reported for the purposes of identifying water bodies which fail the flow test.

2.1.2 The worst case classification is assigned as the overall surface water body status, in a 'one-out all-out' system. This system is summarised in Figure 2.

¹² Environment Agency (2015), *Rules for assessing Surface Water Body Status and Potential, Decision document for 2015 new building block (cycle 2) Water Framework Directive classifications (version 2.0)*

Figure 2: WFD classification elements for surface water body status. Source: Environment Agency Rules for Assessing Surface Water Body Status and Potential (2015)



2.2 Chemical status

- 2.2.1 Chemical status is defined by compliance with environmental standards for chemicals that are priority substances and/or priority hazardous substances, in accordance with the Environmental Quality Standards Directive (2008/105/EC)¹³. This is assigned on a scale of good or fail.
- 2.2.2 Surface water bodies are only monitored for priority substances where there are known discharges of these pollutants; otherwise surface water bodies are reported as being of good chemical status.

¹³ Directive 2008/105/EC of the European Parliament and of the Council of 16 December on environmental quality standards in the field of water policy. Strasbourg, European Parliament and European Council

3 Determination of status of heavily modified (and artificial) water bodies

3.1 Ecological potential

- 3.1.1 Ecological potential is assigned to Artificial Water Bodies (AWB) (such as reservoirs and canals), or natural water bodies which, as a result of physical alterations by human activity, are substantially changed in character. The latter are termed Heavily Modified Water Bodies (HMWB). The term 'ecological potential' is used to classify AWBs and HMWBs as it may be impossible for these water bodies to achieve good ecological status (GES) because of their creation or modification for a specific use, such as navigation, water supply or flood protection. The ecological potential of an AWB or HMWB represents the degree to which the quality of the water body approaches the optimum condition it could achieve given its artificial or heavily modified state.
- 3.1.2 AWB and HMWBs are subject to an additional set of rules that need to be implemented prior to running the one-out-all-out process. These rules determine which biological quality elements should be used in the water body ecological potential classification. Under normal circumstances, AWB and HMWBs are classified according to an assessment of mitigation measures, which defines good ecological potential in water bodies where all applicable mitigation is in place, and moderate ecological potential in water bodies where some or all relevant mitigation is missing. However, to prevent AWB and HMWBs being incorrectly classified as good potential in situations where all mitigation is in place, but other pressures are causing an impact (e.g. nutrient enrichment or pollution from toxic substances), the methodology adopted in the UK additionally considers biological indicators providing they are not sensitive to the heavily modified nature of the water body.
- 3.1.3 AWB and HMWB hydromorphological elements are assessed using a three-stage process, firstly looking at flow, then mitigation measures and biological quality elements.
- 3.1.4 Flow conditions are assessed initially on a fail or pass basis to determine which of the biological and physico-chemical quality elements should be used in the classification of ecological potential.
- 3.1.5 Where the flow conditions are unaffected by the physical modification (flow conditions pass), the water body potential is determined by the worst of either the mitigation measures assessment, or any element that is not sensitive to the modified nature of the water body.
- 3.1.6 Where the flow conditions are significantly impacted by the physical modification (flow conditions fail), the water body potential is determined by the worst of any of the Mitigation Measures assessments or the assessment of biological quality elements, physico-chemical quality elements or specific pollutants.
- 3.1.7 Where a water body is designated as Artificial or Heavily Modified for water resources usage, either solely or jointly with other uses, the flow condition is assumed to be good (pass).

4 Determination of the status of groundwater bodies

- 4.1.1 Under the WFD, groundwater body status is classified on the basis of quantitative status and chemical status. The groundwater bodies are separated into Groundwater Management Units (GWMU) and Water Resource Management Units (WRMU). GWMU are sub-divisions of the groundwater to aid the resource assessment process. WRMU are sub-divisions according to the water resource availability and the management of water.

4.2 Quantitative status

- 4.2.1 Quantitative status is defined by the quantity of groundwater available as base flow to watercourses and water-dependent ecosystems and as 'resource' available for use as drinking water and other consumptive purposes. It is assigned on a scale of good or poor, and on the basis of four classification elements or 'tests' as follows:

- saline or other intrusions - this test is designed to identify groundwater bodies where the intrusion of poor quality water, such as saline water or water of different chemical composition, as a result of groundwater abstraction is leading to sustained upward trends in pollutant concentrations or significant impact on one or more groundwater abstractions;
- surface water - this test is designed to identify groundwater bodies where groundwater abstraction is leading to a significant diminution of the ecological status of associated surface water bodies;
- Groundwater Dependent Terrestrial Ecosystems (GWDTE) - this test is designed to identify groundwater bodies where groundwater abstraction is leading to significant damage¹⁴ to associated GWDTE; and
- water balance - this test is designed to identify groundwater bodies where groundwater abstraction exceeds the 'available groundwater resource', defined as the rate of overall recharge to the groundwater body itself less the rate of flow required to meet the ecological needs of associated surface water bodies and GWDTE.

4.3 Chemical status

- 4.3.1 Chemical status is defined by the concentrations of a range of key pollutants, by the quality of groundwater feeding into watercourses and water-dependent ecosystems and by the quality of groundwater available for drinking water purposes. This is assigned on a scale of good or poor, and on the basis of five classifications elements or 'tests', as follows:

- saline or other intrusions - this test is designed to identify groundwater bodies where the intrusion of poor quality water, such as saline water or water of

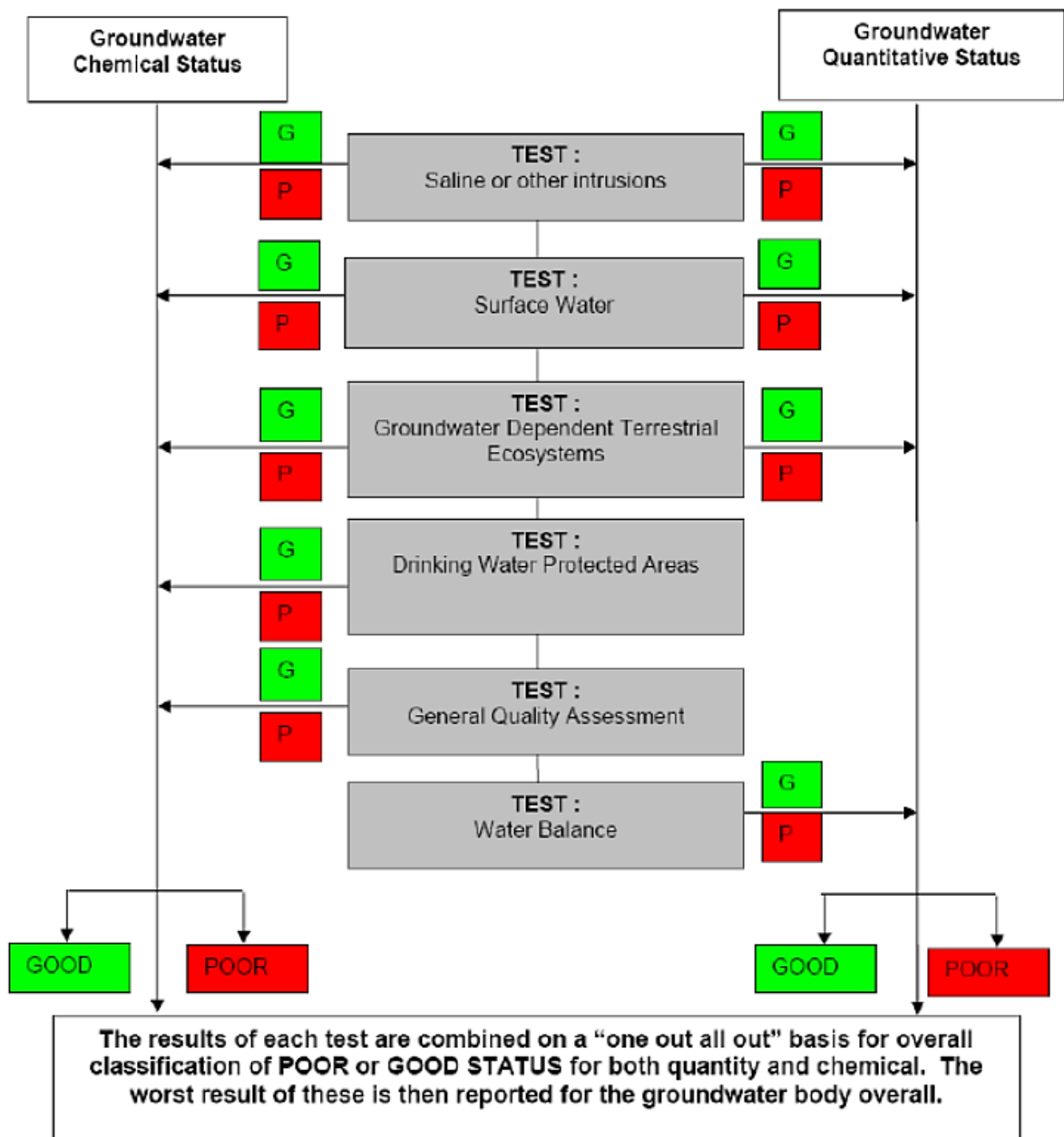
¹⁴ As described in Environment Agency Method Statement for Groundwater Quantitative Status Assessment (Classification)

different chemical composition, as a result of groundwater abstraction is leading to sustained upward trends in pollutant concentrations or significant impact on one or more groundwater abstractions;

- surface water - this test is designed to identify groundwater bodies where groundwater is leading to a significant diminution of the chemical status of associated surface water bodies;
- GWDTE - this test is designed to identify groundwater bodies where groundwater is leading to significant damage to associated GWDTE;
- Drinking Water Protected Areas (DrWPA) - this test is designed to identify groundwater bodies failing to meet the DrWPA objectives defined in Article 7 of the WFD or at risk of failing in the future. The aim is no deterioration in quality of waters for human consumption; and
- general quality assessment - this test is designed to identify groundwater bodies where widespread deterioration in quality has, or will, compromise the strategic use of groundwater. The aim is no significant impairment of human use of groundwater and no significant environmental risk from pollutants across a groundwater body.

4.3.2 Status is assessed primarily using data collected from the Environment Agency monitoring network; therefore, the scale of assessment means that groundwater status is mainly influenced by larger scale effects such as significant abstraction or widespread diffuse pollution. The worst case classification is, as with surface water bodies, assigned as the overall groundwater body status, in a 'one-out all-out' system. This system is summarised below in Figure 3.

Figure 3: WFD classification elements for groundwater body status. Source: Environment Agency Groundwater Quantitative Status Assessment (Classification) Method Statement



Annex B: Assessment methodology

1 Introduction

- 1.1.1 This annex summarises the key steps involved in undertaking the WFD Assessment. This includes an overview of the scope, methodology and data requirements of each step.

2 Establishment of water body baseline

2.1 Overview

- 2.1.1 The baseline condition of the water bodies potentially affected by the Proposed Scheme has been identified via a combination of desk-top assessment and, where possible (subject to access constraints), baseline field surveys.

2.2 Desk study

- 2.2.1 The WFD Assessment has included a desk-top exercise to collate and review the available environmental baseline information in relation to the WFD surface water and groundwater bodies potentially affected by the Proposed Scheme.
- 2.2.2 Desk-top assessment has utilised readily available information and environmental, asset and operations data obtained from relevant stakeholders, including the Environment Agency, Natural England, Severn Trent Water and United Utilities.
- 2.2.3 The water body status and status objectives information for the relevant WFD water bodies assessed has been derived based on Environment Agency data (2015 Cycle 2 Water Body Status Classification data^{15,16}). These data are considered to provide the current best estimate of status and are the formal baseline against which the Environment Agency will assess compliance with the 'no deterioration' objective in 2017.
- 2.2.4 A summary of the available baseline data relating to fish for the watercourses affected by the Proposed Scheme is provided in Volume 5: Appendix EC-014-000 (undertaken as part of the ecology and biodiversity assessment within the Volume 2, Community area reports, Section 8). This report also identifies those watercourses which have not been included in the scope of requirements for further detailed fish baseline survey following initial habitat assessment.
- 2.2.5 A summary of the available baseline data relating to aquatic invertebrates for the watercourses affected by the Proposed Scheme is provided in Volume 5: Appendix EC-013-000 (undertaken as part of the ecology and biodiversity assessment within the Volume 2, Community area reports, Section 8). This includes a summary of the results of baseline aquatic invertebrate surveys undertaken in autumn 2016 on watercourses affected by the Proposed Scheme (where possible subject to access restrictions).
- 2.2.6 The following datasets have also been used to further establish the nature and existing condition of those watercourses located within WFD surface water bodies that are directly crossed by or affected by the Proposed Scheme:
- Ordnance Survey (OS) mapping;
 - historical OS mapping (<http://maps.nls.uk>; www.old-maps.co.uk);

¹⁵ Environment Agency (2015a), *River Basin Management Plan Humber river basin district*, <https://www.gov.uk/government/collections/river-basin-management-plans-2015#humber-river-basin-district-rbmp-2015>

¹⁶ Environment Agency (2015b), *River Basin Management Plan North West river basin district* <https://www.gov.uk/government/collections/river-basin-management-plans-2015#north-west-river-basin-district-rbmp-2015>

- aerial photography (<http://www.google.co.uk/maps>; <http://www.bing.com/maps>);
- statutory environmental designations (Natural England; <http://www.natureonthemap.naturalengland.org.uk>);
- LiDAR data (Environment Agency);
- digital river network (Environment Agency);
- river gauge data (National River Flow Archive (NRFA); <http://nrfa.ceh.ac.uk/>);
- river catchment characteristics (Flood Estimation Handbook (FEH); <http://www.ceh.ac.uk/services/flood-estimation-handbook>);
- bedrock and superficial geology (British Geological Survey (BGS));
- licensed groundwater abstractions (Environment Agency);
- unlicensed groundwater abstractions (Local councils including: Lichfield District Council, Stafford Borough Council, Newcastle-under-Lyme Borough Council and Cheshire East Council); and
- Environment Agency water level and water quality monitoring boreholes (Environment Agency).

- 2.2.7 The baseline assessment has also included analysis of the low-flow (baseflow) characteristics of each watercourse. Low flows provide an area of continuously wetted habitat that helps to maintain ecological productivity with regard to populations of aquatic plants and animals¹⁷. For fish, this includes sufficient flow and sufficient water depth to facilitate spawning and egg and juvenile growth. In addition, the low flow regime is important for maintaining physico-chemical water quality, including suitable water temperatures and dissolved oxygen concentrations.
- 2.2.8 Q95 flow value estimates (denoting the flow that is exceeded 95% of the time i.e. low flows) have been derived for all watercourses directly crossed by or potentially affected by the Proposed Scheme. Flow estimates have been derived at the location where the Proposed Scheme intercepts the watercourse. On watercourses that are crossed by multiple scheme components, the furthest downstream point was used for the flow estimate calculation in order to ensure a conservative approach.
- 2.2.9 The watercourse catchment extent and area data used for deriving Q95 flow value estimates were attained using the FEH Web Service¹⁸. In a minority of cases the catchment area of the watercourse was too small to be recognised by the FEH Web Service (generally catchments less than 0.5km²). In which case the catchment was manually digitised using Geographical Information System (GIS software) based on OS mapping contours and LiDAR data. The user-defined catchment extent was inputted into the LowFlows 2TM (2010)¹⁹ software in GIS format, which uses hydrological estimation methods to predict flows within ungauged catchments. The

¹⁷ UKTAG (2013), *River flow for good ecological potential, final recommendations, version 1.0*

¹⁸ Centre for Ecology and Hydrology (CEH) (2017), *FEH Web Service*, <https://fehweb.ceh.ac.uk>

¹⁹ LowFlows 2TM (2010), Wallingford: Wallingford HydroSolutions Limited

methods used by the software have been developed and refined by the Centre for Ecology and Hydrology (CEH) and the Environment Agency and provides annual and monthly flow duration statistics for the natural flow regime, including an estimate of Q₉₅.

- 2.2.10 Groundwater dependent terrestrial ecosystems (GWDTEs) have been identified from statutory environmental designations in the study area whilst spring features have been identified from issues labelled on the OS maps. Licensed and unlicensed groundwater abstractions details have been respectively provided directly by the Environment Agency or local authority.

2.3 Field survey

- 2.3.1 Field surveys of watercourses affected by the Proposed Scheme have involved hydromorphological and ecological walkovers, comprising reconnaissance site visits and fluvial audit and ecological baseline surveys (based on accessibility and the nature of the sites being assessed).
- 2.3.2 Groundwater surveys have also been undertaken, including identification of potential groundwater-surface water interactions, estimates of spring flows and basic groundwater quality (e.g. temperature, pH, etc.) and recording of abstraction details.
- 2.3.3 Further details of the field survey methodology are provided in the following sections.

Surface water

- 2.3.4 The WFD surface water baseline surveys have involved geomorphological and ecological walkover surveys, undertaken by a minimum of one Geomorphologist and one Aquatic Ecologist. These surveys were undertaken following prescribed HS2 Ltd methodology for WFD data collection, involving the collection of detailed (quantitative) geomorphological and ecological information for reaches of watercourse upstream and downstream of each route intersect (where access was possible).
- 2.3.5 The geomorphological and ecological surveys have involved two levels of assessment, depending on accessibility and the nature of the watercourse at each site. Each site has been subject to an initial reconnaissance walkover. This process involved the collection of general observations about the geomorphological and aquatic ecological condition of the watercourse. Reconnaissance walkovers have informed where more detailed fluvial geomorphological surveys were required.

Fluvial geomorphological surveys

- 2.3.6 Where the initial reconnaissance walkover identified a requirement to collect further geomorphological information at the site, a full Fluvial Geomorphological Audit of the watercourse was undertaken.
- 2.3.7 Fluvial Geomorphological surveys were undertaken along a minimum 200m reach (100m upstream and downstream of the route intersect with the watercourse) and extended up to 2km upstream and downstream dependent on access constraints and variability of the watercourse.

- 2.3.8 Watercourses were broken into different 'geomorphological reaches' based upon the dominant geomorphological characteristics and controls present in the channel within each reach. Geomorphological reaches are distinguished based on key indicators of morphological change, including changes in bed and bank material, channel gradient, dominant processes, riparian character etc. as well as key controls on the system. Information concerning dominant flow types, erosion and depositional processes and forms, channel dimensions and bank composition were collected for each geomorphological reach.
- 2.3.9 The characterisation of the watercourses into separate aquatic biotope (habitat) sub-reaches was also undertaken. These sub-reaches were defined based on identification of different dominant flow types (e.g. riffles, runs, pools, etc.); which are important to the varied behavioural characteristics and habitat requirements of key target aquatic species at different stages of their life-cycles. Flow types were predominantly identified based on channel morphology and through observations of water depth and velocity.
- 2.3.10 The surveys also included extensive photographic surveys of the river channel, riparian zone and surrounding floodplain.
- 2.3.11 The survey data was collected using digital proforma and base maps utilising mobile ArcGIS software, with all data and photographs geo-referenced. Key datasets collected during the survey included the following:
- geomorphological reach – broad characterisation and summary of key characteristics and dominant processes;
 - flow types – including: waterfall, cascade, chute, run, boil, riffle, glide, pool, ponded, backwater, marginal deadwater, undefinable micro-scale variation and dry channel;
 - depositional features – including: bars (side bar, mid-channel bar, point bar, mature island), significant silty/sandy margins, berms and recent floodplain/bank-top deposits;
 - bank erosion – including: fluvial, geotechnical, sub-aerial, eroding cliff, tree scour, poaching, burrowing, and footpath;
 - sediment input sources – including: tributary, hill-slope coupling, runoff from track, runoff from gate, and wider catchment sediment pathways;
 - in-stream structures (including: weir, dam, culvert, sluice, bridge, pipe crossing, ford, flow deflector and large woody debris dam);
 - evidence of sediment management, bank modifications and channel modifications (including: realignment, bank protection, embankments, set-back embankments and dredging/sediment removal);
 - channel shading – estimated % of tree canopy/structure cover;
 - overhanging banks / low-lying;
 - riparian vegetation typology – including: grass, herbaceous, trees, mixed, wetland and bare/exposed sediment;

- invasive species – including: Giant Hogweed, Japanese Knotweed, Himalayan Balsam and Rhododendron;
- estimated bank-full width and depth cross-sections;
- estimated wetted channel width and depth cross-sections; and
- photographs.

Ecological walkover surveys

- 2.3.12 Aquatic ecology walkover surveys were undertaken alongside the fluvial geomorphological audits. This involved the ecological mapping of the watercourses within the fluvial geomorphological survey extent, to provide simplified River Corridor Surveys (RCS) highlighting key channel features and habitat characteristics. This included the assessment of the suitability of fish habitat (including spawning habitat) within the affected watercourses at the location of the Proposed Scheme and upstream. Mapping was supplemented with a photographic survey of all key features identified.
- 2.3.13 Ecological walkover surveys were also used to inform the scoping of the requirement for further WFD biological baseline monitoring (including fish and aquatic invertebrate sampling) on watercourses affected by the Proposed Scheme.

Groundwater

- 2.3.14 Two different approaches to the WFD groundwater surveys were adopted depending on the groundwater feature surveyed. For natural groundwater features, the springs and GWDTEs, the WFD groundwater surveys were undertaken as reconnaissance walkovers of the groundwater feature and surrounding site. This process involved the completion of a check-list and collection of general observations about the hydrogeological and aquatic ecological condition of the site (as detailed in the following section). For licensed and unlicensed abstraction sites, a discussion has been conducted with the owner; this process involved the completion of a checklist in order to gain necessary details about the abstraction.
- 2.3.15 The reconnaissance walkovers and discussions did not identify any sites where a more detailed hydrogeological audit was required and, therefore, a second level of assessment was not deemed necessary to inform this WFD assessment for any of the groundwater features surveyed.

Springs and GWDTEs surveys

- 2.3.16 The WFD groundwater baseline surveys for potential springs and GWDTEs have involved hydrogeological and ecological walkover surveys undertaken by a minimum of one Hydrogeologist and one Aquatic Ecologist. These surveys were undertaken following prescribed HS2 Ltd methodology for WFD data collection, using a standard proforma agreed with the Environment Agency. The surveys involved the collection of detailed hydrogeological and ecological information for key groundwater features (where access was possible).
- 2.3.17 Key hydrogeological datasets collected during the survey include the following:
- nature of water feature;

- water quality – including: appearance, pH, electrical conductivity and temperature;
- flow estimate;
- hydraulic connectivity to other water features;
- dependency of wetland ecology on groundwater;
- future monitoring recommendations – including: water level monitoring and flow monitoring; and
- photographs.

2.3.18 The ecologist's role was to highlight dependence on water at each survey location, any ecological issues that were apparent during the walkover, and scope further survey requirements. Key ecological datasets which have also been collected during the survey include the following:

- water habitat extent;
- habitat composition;
- habitat structure;
- vegetation composition – including: positive indicator species; indicators of negative change (undesirable non-woody plant species) and indicators of negative change (undesirable woody plant species);
- indicators of local distinctiveness;
- future monitoring recommendations; and
- photographs.

Licensed and unlicensed groundwater abstraction surveys

2.3.19 The WFD groundwater baseline surveys for licensed and unlicensed abstractions have involved hydrogeological surveys undertaken by a minimum of one Hydrogeologist. These surveys were undertaken using a standard proforma which was agreed with the Environment Agency. The surveys involved the collection of detailed hydrogeological information where access was possible.

2.3.20 Key information collected during the survey include the following:

- licence information (for licensed abstractions only) – including: licence holder, licence number and licensed quantity;
- abstraction type e.g. borehole, well, spring;
- well details – including: location, diameter, depth to base and datum;
- use;
- groundwater level information – including: aquifer, rest water level and pumped water level;

- pump type; and
- photographs.

3 Establishment of scheme baseline

3.1 Overview

- 3.1.1 The baseline assessment stage has also established the scheme baseline, with regards to identifying the key components of the Proposed Scheme design and their likely impacts to surface water and groundwater bodies. This has in turn been used to inform the preliminary assessment stage.

3.2 Scheme components

- 3.2.1 The construction (Map Series CT-05) and operation (Map Series CT-06) maps in Volume 2: Map Books is the primary source of Proposed Scheme design information.
- 3.2.2 The assessment has identified all proposed scheme components that have the potential to permanently affect surface water and groundwater bodies, and that therefore have the potential to impact on WFD status.
- 3.2.3 Scheme components are detailed individually, with the exception of where certain scheme components are combined as part of the proposed features (e.g. river diverted with associated removal of an existing culvert).
- 3.2.4 Scheme components have been categorised with regards to their likely impacts on surface water and/or groundwater bodies.
- 3.2.5 Establishment of the scheme baseline has included the identification of all relevant embedded mitigation measures within the Proposed Scheme construction strategy and design.

Assessment assumptions and exemptions

- 3.2.6 Key assumptions regarding the aspects of the Proposed Scheme assessed with respect to WFD status of surface water and groundwater bodies are:
- owing to the scale of the groundwater bodies, only major structures have been considered during the WFD assessment. This includes tunnels, cuttings, embankments, viaducts and stations. Selected other structures that are expected to include significant below ground works have been assessed;
 - overbridges for major roads (A and B roads) have been assessed. Overbridges for minor roads, bridlepaths and footpaths have not been assessed separately for groundwater bodies (these are expected to have shallow foundations and relatively small footprints);
 - culverts and underbridges within embankment structures are expected to only have shallow foundations. Therefore these structures have not been assessed separately to the embankments for groundwater bodies;
 - new roads and road realignments have been considered but reinstatement of existing roads affected by construction has been discounted;
 - the potential impacts associated with general construction activities, such as vehicle movements, wastewater management and storage of materials, have

not been explicitly assessed. It is assumed that adoption of best practice site management and compliance with the CoCP⁸ will mitigate the potential risks to groundwater; and

- the temporary footprint associated with construction compounds and storage areas has not been assessed.

3.3 Initial identification of potential impacts

3.3.1 The range of generic impacts to surface water and groundwater bodies likely to be associated with the various scheme components have been identified.

3.3.2 These generic impacts are set out in the WFD Compliance Assessment Technical Note (Volume 5: Appendix CT-001-002) and are summarised in Annex E1.3 (see Table 39 and Table 40, respectively).

4 Preliminary assessment

4.1 Objectives

4.1.1 The objective of the preliminary assessment stage is to establish the likely effects of the various components of the Proposed Scheme on the relevant surface water and groundwater bodies, with regard to risks of causing a deterioration in current status or a failure to achieve status objectives. Only those impacts of scheme components that could result in a deterioration or failure of this kind are taken forward for more detailed impact assessment.

4.1.2 The preliminary assessment therefore comprises two key parts, as follows:

- likely effects on current status of each quality element, including:
 - the screening of the potential generic impacts of all relevant scheme components against the proposed 'embedded mitigation', in order to identify relevant residual impact types with the potential to cause a deterioration in WFD status; and
 - the identification of relevant surface water and groundwater WFD status elements potentially affected by the residual impacts of each of the scheme components.
- likely impacts on status objectives, including:
 - the screening of all relevant scheme components against Environment Agency surface water and groundwater body 'reasons for not achieving good' (RNAG) and 'programme of measures' (PoM) datasets, in order to identify where the Proposed Scheme poses a potential risk of worsening existing pressures responsible for status failures and/or adversely affecting or preventing the implementation of measures identified to address existing status failures; and
 - the screening of all relevant scheme components against Environment Agency HMWB and AWB 'mitigation measure assessments' (MMA), in order to identify where the Proposed Scheme poses a potential risk of inhibiting the implementation of measures derived to mitigate the impacts of existing physical modifications and operational regimes to support the achievement of good ecological potential objectives.

4.1.3 These two parts of the preliminary assessment are described in further detail in the below sections.

4.2 Likely effects on current status

4.2.1 This part of the preliminary assessment stage relates to the 'no deterioration of current status' aspect of WFD compliance objectives.

4.2.2 The generic impacts of the various scheme components identified during the baseline assessment stage were initially screened against the scheme embedded mitigation (see main report, Section 6), in order to identify potential residual impacts. Both beneficial and adverse potential impacts of scheme components have been considered.

- 4.2.3 Subsequently, the likely effects of residual impact types on the various WFD status elements of surface water and groundwater bodies were identified. This includes the anticipated nature (i.e. beneficial or adverse) and magnitude (e.g. negligible, minor, etc.; see Annex B5.2 for details) of the effect. Resultantly, the preliminary assessment stage identifies the relevant WFD status elements for each scheme component, which are required to be taken through to the detailed impact assessment stage.
- 4.2.4 For surface water bodies, the likely effects of scheme components were identified for each of the relevant surface water body WFD status elements, as follows:
- biological effects – considered in terms of likely change in composition and abundance of phytobenthos, macrophytes and macroinvertebrate communities and for fish on composition, abundance and age structure;
 - physico-chemical effects – considered in terms of likely changes in the chemical composition of phosphate and ammonia and for physical changes which cause variations in dissolved oxygen and temperature;
 - specific Pollutant effects – considered in terms of likely changes in the chemical composition of specific pollutants (e.g. copper, triclosan, zinc, etc.); and
 - hydromorphological effects – considered in terms of likely changes in the quantity and dynamics of flow, river continuity (including existing restrictions such as sluices and weirs), river depth and width variation, structure and substrate and structure of the riparian zone.
- 4.2.5 For groundwater bodies, the likely effects of scheme components were identified for each of the relevant groundwater body WFD status elements, as follows:
- quantitative effects – be considered in terms of the likely changes in groundwater levels, groundwater flows and the hydraulic regime, spring flows and rates of baseflow to surface waters; and
 - chemical effects - considered in terms of the likely changes in chemical water quality.

4.3 Likely effects on status objectives

- 4.3.1 This part of the preliminary assessment stage relates to the 'no prevention of status objectives' aspect of WFD compliance objectives. The assessment has included only those water bodies affected by the Proposed Scheme that are currently failing to meet their good ecological status / potential or good quantitative status objectives (with regards to surface water and groundwater bodies, respectively).
- 4.3.2 Each of the scheme components identified during the baseline assessment stage were initially screened against the WFD status elements of the relevant water bodies that are currently failing their good status objective under WFD. This includes the surface water management issues (SWMIs), activities and business sectors associated with each failure, as well as the programme of measures derived to address failures; as identified by the Environment Agency within the 2015 Cycle 2 RBMPs.

- 4.3.3 In addition, the scheme components were screened against all A/HMWB mitigation measures identified by the Environment Agency for any artificial or heavily modified water bodies affected by the Proposed Scheme. These measures are required to be implemented in order for these water bodies to achieve their good ecological potential objectives (see Annex A3 for details).
- 4.3.4 The preliminary assessment considered whether the Proposed Scheme will worsen known 'cause of failures' and/or prevent defined measures from being implemented effectively, for each of the relevant water bodies. A precautionary approach was taken, whereby any identification of a potential adverse effect is used to highlight the potential for the Proposed Scheme to prevent the status objective of the relevant water body from being obtained. Accordingly, the relevant cause of failure or measure is taken forward for more detailed assessment (see Annex B5.3).

5 Detailed impact assessment

5.1 Objectives

- 5.1.1 The objective of the detailed impact assessment is to establish the nature and likely magnitude of the effects of relevant scheme components on the WFD quality elements of the surface water and groundwater bodies affected by the Proposed Scheme.
- 5.1.2 These effects are considered in terms of whether the Proposed Scheme has the potential to result in:
- a deterioration in current status/potential; and/or
 - prevention of the achievement of good status/potential objectives in the future.

5.2 No deterioration assessment

- 5.2.1 A detailed impact assessment has been undertaken on all components of the Proposed Scheme assessed to have the potential to have an effect on the WFD status elements of the relevant WFD surface and groundwater water bodies.
- 5.2.2 The assessment process agreed with the Environment Agency with regards to defining effects on current status has used the following traffic light rating system:
- **dark blue:** beneficial effect of a scale sufficient to increase status class for the quality element at water body scale (certain);
 - **light blue:** beneficial effect resulting in a localised improvement, but insufficient to increase status class for the quality element at water body scale (certain);
 - **green:** no measureable change to (or effect on) status class for the quality element at water body scale (certain);
 - **yellow:** minor localised and/or temporary effect when balanced against likely embedded mitigation – insufficient to affect status class for the quality element at water body scale (certain);
 - **amber:** an adverse effect is possible when balanced against likely embedded mitigation – the extent of effect is uncertain, and there remains a potential to affect status class for the quality element at water body scale; and
 - **red:** adverse effect of sufficient scale to impact on status class for the quality element at a water body scale (certain).
- 5.2.3 The approach to the assessment against the 'no deterioration' objective broadly follows the standard environmental impact assessment method of considering the value and sensitivity (i.e. to the impact) of the receptor, with the magnitude of the impact. The outcome is a decision on whether there will be an effect on the status of the quality element in question.

- 5.2.4 The Environment Agency provides guidance on the definition of no deterioration²⁰. Necessary measures must be taken to prevent deterioration from one water body status class to a lower one. Furthermore, according to the recent European Union Court of Justice ruling (see Main Report, Section 2.2.2), within-class deterioration will also be considered as an overall deterioration of the water body status.
- 5.2.5 The matrix presented in Table 32 and Table 33 has been used to assign water bodies into colour-coded categories according to the potential effect of the Proposed Scheme on current status. These effects range from a major beneficial effect i.e. a positive change in overall WFD status (dark blue) through no effect to certain deterioration in overall status class (red). The colour codes are applied in the detailed impact assessment matrices developed for each water body.

²⁰ UK Technical Advisory Group (2006), *Prevent Deterioration of Status*, https://www.wfduk.org/sites/default/files/Media/Setting%20objectives%20in%20the%20water%20environment/Prevent%20deterioration%20of%20status_Draft_010506.pdf

Table 32: Decision matrix for assessing impacts on surface water status class

Type of effect	Impact of scheme element on WFD element i.e. in individual cells	Impact on WFD element i.e. at end of row	Impact on WFD water body i.e. the combined effect on the water body as a result of all the effect on WFD elements	Examples	Outcome
Major Beneficial	Impacts when taken on their own have the potential to lead to significant improvement.	Impacts in combination with others have the potential to lead to the improvement in the class of a WFD element.	Impacts in combination with others have the potential to lead to the improvement in the WFD status of the water body.	Creation of significant areas of riparian habitats (for example, within a river diversion) which enhance the value of the water body.	Increase in status class for that water body.
Minor/localised beneficial	Impacts when taken on their own have the potential to lead to a minor localised or temporary improvement.	Impacts in combination with others have the potential to lead to a minor localised or temporary improvement of the WFD element.	Impacts in combination with others have the potential to lead to a minor localised or temporary improvement that does not affect the overall WFD status of the water body.	Minor habitat creation measures such as creation of marginal berms up/downstream of a structure.	Localised improvement, no change in status of WFD water body.
Green (no effect)	No measureable change to any quality elements.	No measureable change to any quality elements.	No measureable change to any quality elements.	Macrophytes Clear span bridge which causes no significant light shading. Invertebrates Changes to flow with no likely effect in macroinvertebrate community/contamination in areas with highly tolerant invertebrate community (e.g. ASPT <4). Fish Minor, temporary encroachment	No change

Type of effect	Impact of scheme element on WFD element i.e. in individual cells	Impact on WFD element i.e. at end of row	Impact on WFD water body i.e. the combined effect on the water body as a result of all the effect on WFD elements	Examples	Outcome
Yellow – Localised/ temporary adverse effect	Impacts when taken on their own have the potential to lead to a minor localised or temporary effect.	Impacts in combination with others have the potential to lead to a minor localised or temporary effect on the WFD elements. Consideration will be given to habitat creation measures.	Impacts in combination with others have the potential to lead to a minor localised or temporary effect on the WFD elements. Consideration will be given to habitat creation measures.	Macrophytes/phytobenthos Loss of macrophytes/phytobenthos due to shading from a bridge or other structure. Temporary loss of invertebrates/macrophytes etc. during channel re-alignment. Invertebrates Estimated loss in diversity of invertebrates for e.g. <100m of water body (due to habitat loss, changes to flow etc.). Fish Localised loss of fish habitat/numbers of fish.	No change in status of WFD water body when balanced against mitigation embedded in the scheme.
Amber – adverse widespread or prolonged effect	Impacts when taken on their own have the potential to lead to a widespread or prolonged effect. Consideration will be given to habitat creation measures.	Impacts in combination with others have the potential to have an adverse effect on the WFD element. Additional mitigation will be applied.	Impacts in combination with others have the potential to have an adverse effect on the WFD water body. Consideration will be given to habitat creation measures.	Macrophytes/phytobenthos Loss of macrophytes/phytobenthos for a significant length of water due to shading from a long (e.g. >200m) culvert or other similar structure. Invertebrates Likely significant drop in invertebrate diversity over e.g. >300m (due to habitat loss /siltation or combination of various impacts etc.). Fish Obstruction to upstream migration of fish to spawning grounds in a salmonid river therefore affecting fish in the whole of the WFD water body.	Adverse effect but risk of status change needs to be considered with any additional mitigation.

Type of effect	Impact of scheme element on WFD element i.e. in individual cells	Impact on WFD element i.e. at end of row	Impact on WFD water body i.e. the combined effect on the water body as a result of all the effect on WFD elements	Examples	Outcome
Red – adverse effect on an individual quality element and/or overall status of water body	Impacts when taken on their own have the potential to lead to a widespread or prolonged effect even with mitigation in place.	Impacts in combination with others have the potential to have an adverse effect on the WFD element and change its class. Consideration will be given to habitat creation measures.	Impacts in combination with others have the potential to have an adverse effect on the WFD water body and change its status. The current WFD risk category will be taken into account when assessing these combined impacts. Consideration will be given to habitat creation measures.	Any change in status of an element regardless of whether it leads to an overall deterioration of WFD status of a water body – this colour is only assigned when the positive benefits from mitigation for that water body are outweighed by negative impacts.	Decrease in status of WFD water body when balanced against additional mitigation. Outcome is considered to be certain.

Table 33: Decision matrix for assessing impacts on groundwater status class

Type of effect	Magnitude of impact of scheme element on WFD element i.e. in individual cells	Impact on WFD element at scale of scheme (at end of row)	Impact on WFD element at groundwater body scale (at end of row)	Example	Outcome
Green (no impact)	No measurable change to groundwater levels or quality.	No measurable change to groundwater levels or quality.	No measurable change to groundwater levels or quality.	Cutting above the water table.	No change.
Yellow – localised/ temporary adverse effect	Impacts when taken on their own have the potential to lead to a minor localised or temporary effect	Combined impacts have the potential to lead to a minor localised or temporary effect on the WFD element.	Combined impacts have the potential to lead to a minor localised or temporary effect on the WFD element. No change to groundwater body status.	Cutting above the water table but drainage returned to ground within the same groundwater body and surface water catchment.	No change in status of WFD water body when balanced against mitigation embedded in the scheme.
Amber – adverse widespread or prolonged effect	Impacts when taken on their own have the potential to lead to a widespread or prolonged effect.	Combined impacts have the potential to have an adverse effect on the WFD element.	Combined impacts have the potential to have an adverse effect on the WFD element, but not change its status at groundwater body scale.	Dewatering of cutting reduced baseflow to tributary but no adverse effect at scale of whole surface water body.	Adverse effect but risk of status change needs to be considered with any additional mitigation, and taking into account the level of confidence.
Red – adverse effect on an individual quality element and/or overall status of water body	Impacts when taken on their own have the potential to lead to a significant effect.	Combined impacts in combinations with others will have a significant adverse effect on the WFD element.	Combined impacts in combination with others will have an adverse effect on the WFD element AND change its status at groundwater body scale.	Dewatering of cutting reduces baseflow to surface water body with adverse effects at scale of whole surface water body.	Decrease in status of WFD water body when balanced against additional mitigation. Outcome is considered to be certain.

Presentation of assessments

- 5.2.6 The detailed impact assessment matrices for each of the surface water and groundwater bodies are presented in Annex G2 and Annex G3, respectively. Within each, the relevant WFD quality elements are listed in the left-hand column (along with their current status), with the relevant scheme components presented across the top of the matrix (grouped by the relevant watercourse for surface water bodies). The name of the scheme component, its unique WFD Assessment reference ID, and a summary of the available associated engineering design information and associated embedded mitigation is provided, in order to allow the reader to understand the basis for the assessment. Individual impacts arising from each scheme component (following preliminary assessment screening, as described in Annex B4.2) are grouped into a set of columns under the scheme component.
- 5.2.7 The effects of all of the scheme components affecting the main surface water body and tributary watercourses, or groundwater body (scoped in for detailed assessment during baseline assessment stage) are considered individually. The overall effect on each quality element is then presented towards the right-hand side of the matrix. Any cumulative effects from scheme components located within other water bodies (e.g. upstream or downstream) are also considered.

5.3 Prevention of status objectives assessment

- 5.3.1 All RNAG, PoM and A/HMWB mitigation measures identified as potentially being at risk from the Proposed Scheme during the preliminary assessment stage have been assessed in further detail.
- 5.3.2 This has involved a detailed review of the relevant scheme component(s) considered to pose a potential risk to water body status objectives, together with the baseline condition of the relevant water body / watercourse at the proposed scheme component(s) location. This, in turn, has been reviewed against available cause of failure, PoM and A/HMWB mitigation measures assessment investigation outputs provided by the Environment Agency, in order to derive likely effects on water body status objectives. This has been undertaken in consultation with the Environment Agency.

6 Application of Article 4.7 test

- 6.1.1 Article 4.7 of the WFD directs that Member States will not be in breach of the Directive when failure to meet its environmental objectives is the result of either new modifications to the physical characteristics of a water body or as a result of new human sustainable development, on the proviso that the modifications or new development proposed are compliant with four key conditions as outlined below. In so doing, Article 4.7 provides a means whereby a derogation for a proposed modification or sustainable development may be granted where it meets these four conditions.
- 6.1.2 The content of an Article 4.7 test report should document clearly how:
- all practicable steps have been taken to mitigate the adverse impact on the status of the water body;
 - the reasons for the modifications or alterations are of overriding public interest and/or the benefits to the environment and to society of achieving the objectives are outweighed by the benefits of the new modifications or alterations to human health, to the maintenance of human safety or to sustainable development; and
 - the beneficial objectives served by the modifications or alterations of the water body cannot for reasons of technical feasibility or disproportionate cost be achieved by other means, which are a significantly better environmental option.
- 6.1.3 In addition, the reasons for the modifications or alterations need to be clearly identified to the Environment Agency, so that they can be specifically set out and explained in the relevant RBMP (as required under Article 13). These documents are reviewed every six years. This condition will be addressed at a route-wide level.

Annex C: Surface water baseline

1 Surface water bodies

- 1.1.1 A total of 13 surface water body catchments are affected by the Proposed Scheme. The current status and status objectives of each of these water bodies has been summarised in Section 4 (main report). These include 11 river water bodies, one canal water body, and one lake water body.
- 1.1.2 Nine of the water bodies are located within the Staffordshire Trent Valley management catchment, which forms part of the Humber RBD. Four water bodies are located within the Weaver and Gowy management catchment, which forms part of the North West RBD.
- 1.1.3 The location of each of these surface water bodies and their catchment extents, in relation to the route of the Proposed Scheme, are shown in Figure 4 - Figure 7.
- 1.1.4 The Proposed Scheme also crosses small areas of the Sow from R Penk to R Trent (GB104028047190), Meece Brook from Chatcull Brook to R Sow (GB104028053010) and the Checkley Brook – Lower (GB112068055240) river water body catchments. However, no watercourses will be crossed or affected by the Proposed Scheme within these areas and so these water bodies have been scoped out of the assessment.

Figure 4: WFD surface water bodies crossed by Proposed Scheme (Part 1)

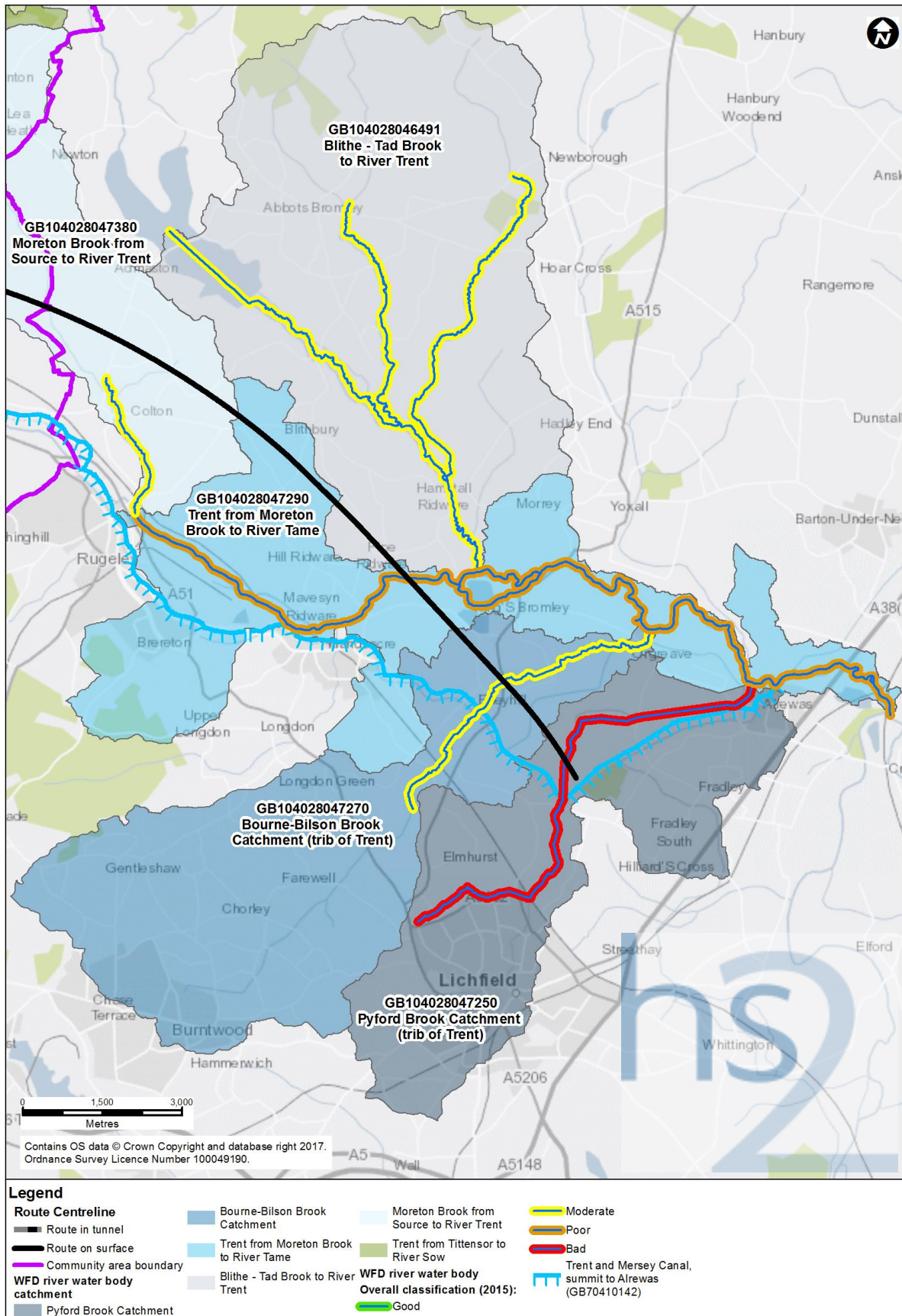


Figure 5: WFD surface water bodies crossed by Proposed Scheme (Part 2)

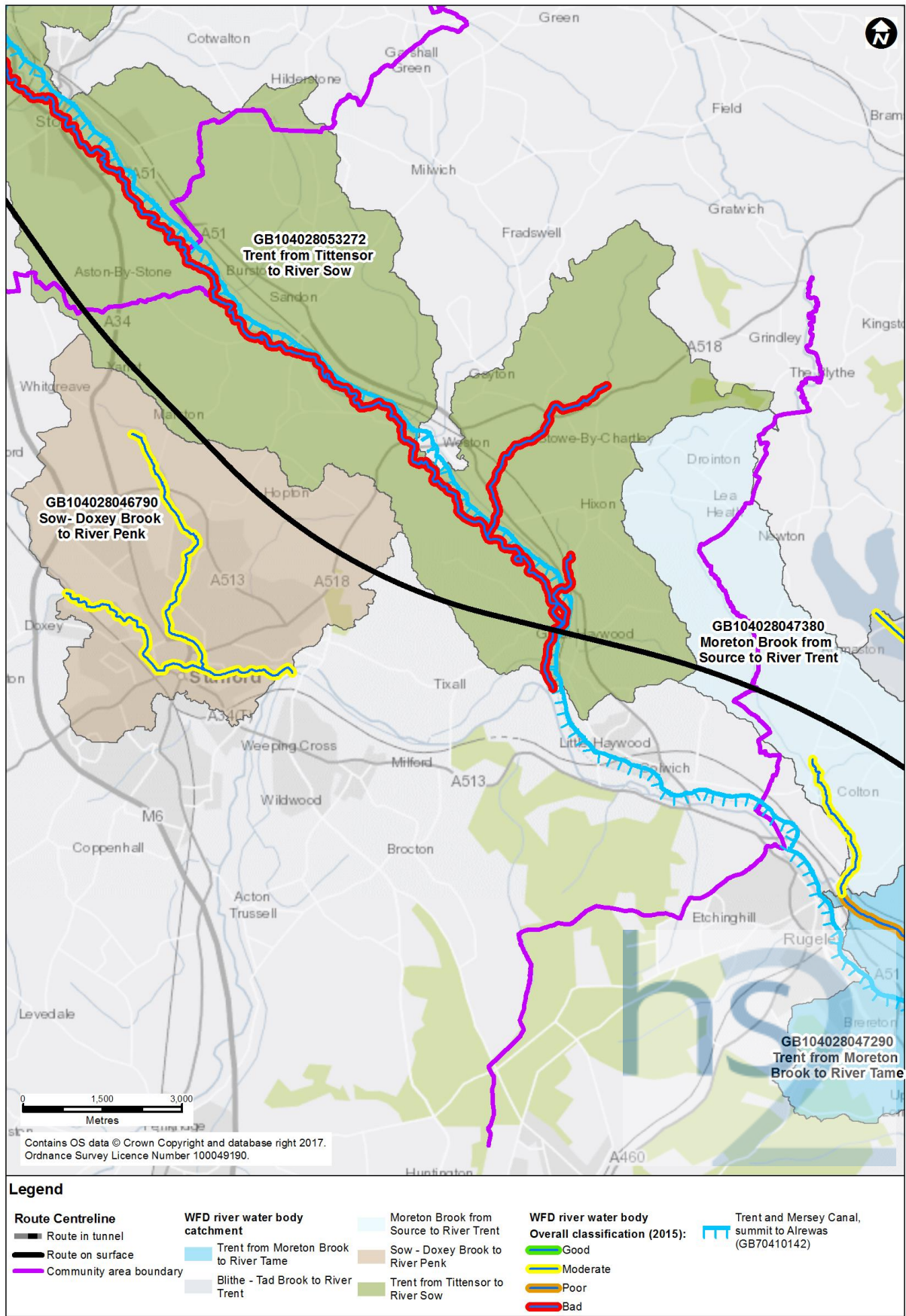


Figure 6: WFD surface water bodies crossed by Proposed Scheme (Part 3)

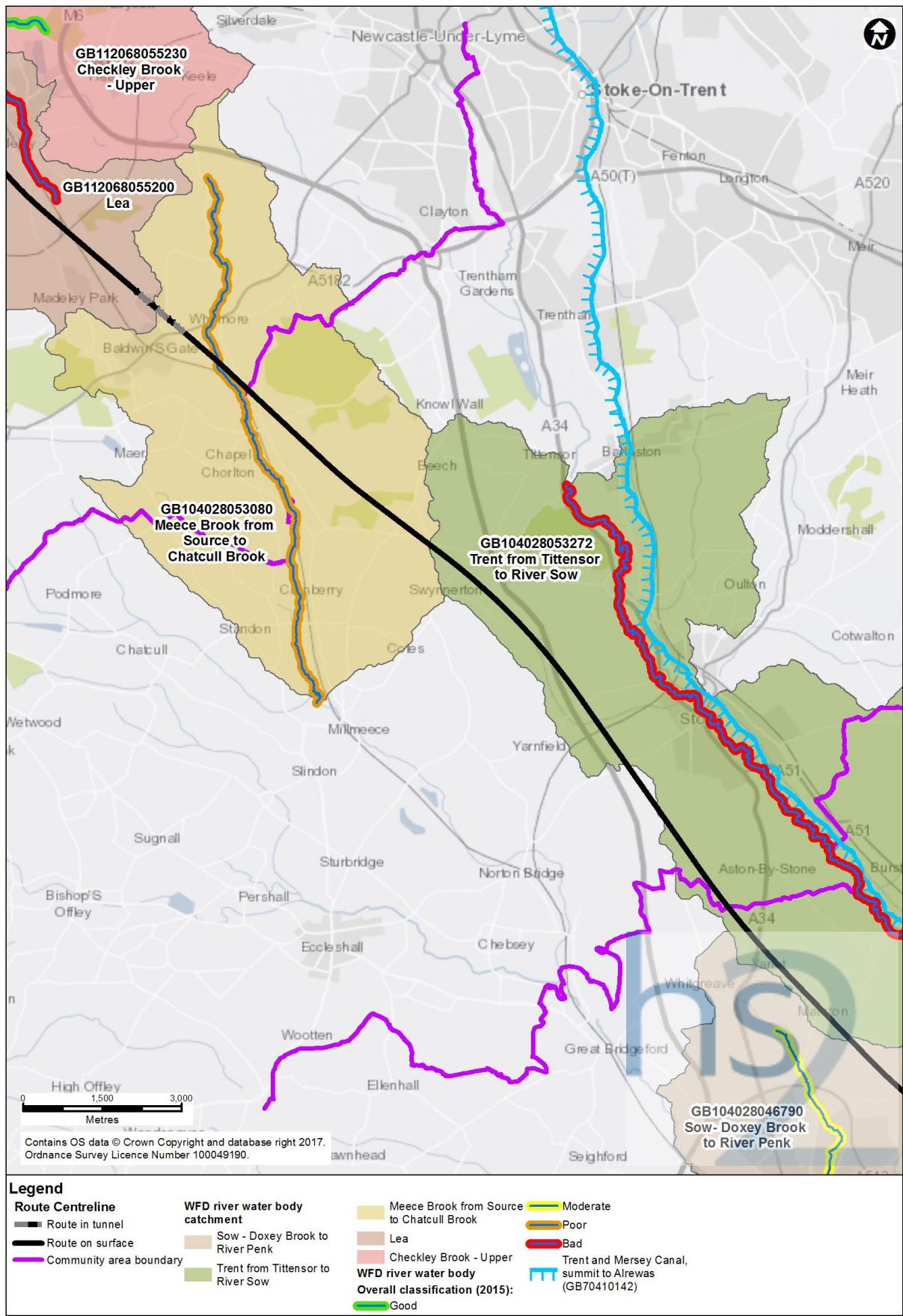
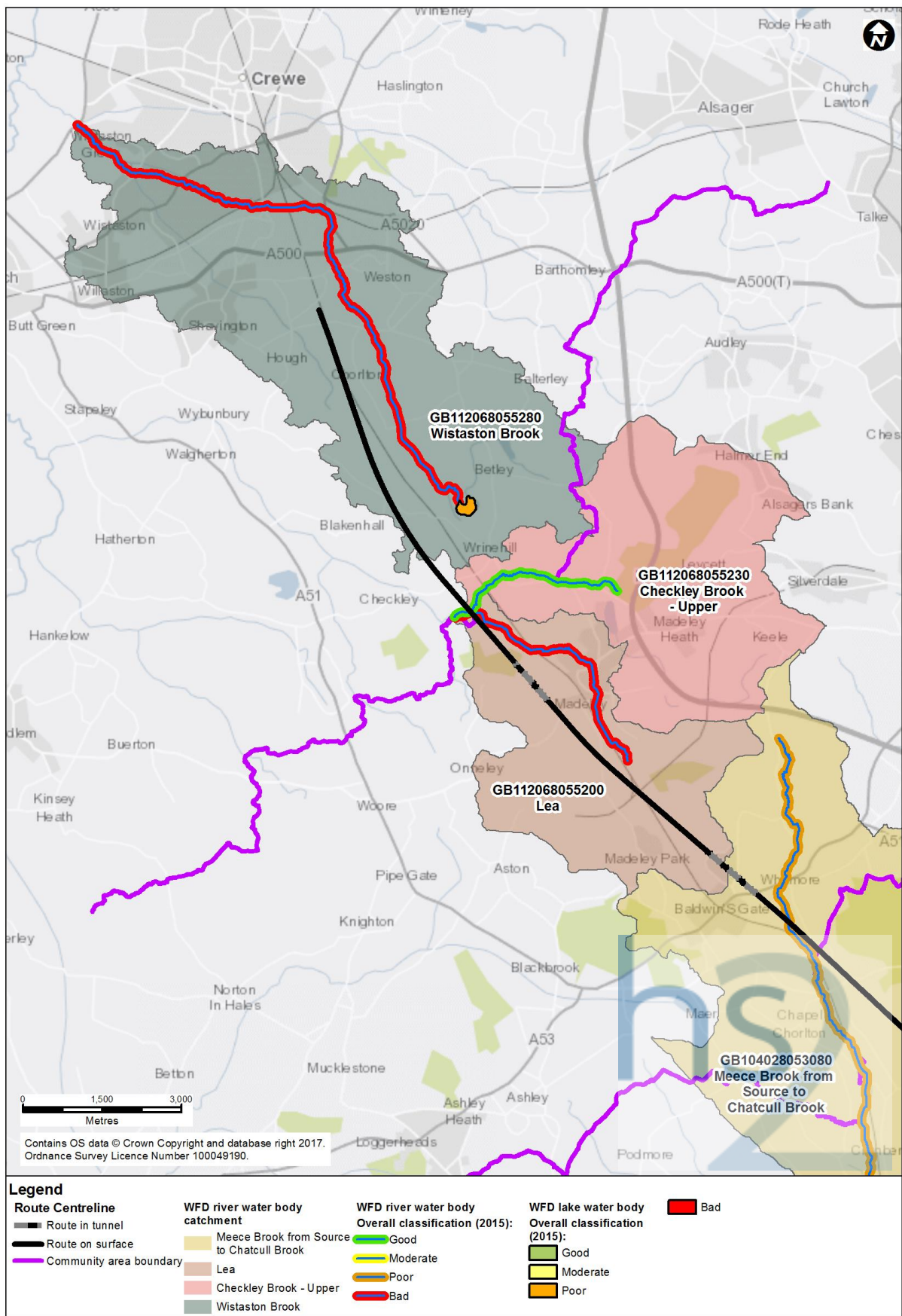


Figure 7: WFD surface water bodies crossed by Proposed Scheme (Part 4)



2 Watercourses

2.1 Overview

- 2.1.1 A total of 54 watercourses have been identified as being affected by the Proposed Scheme.
- 2.1.2 All of the watercourses have been subject to a desk study and (where accessible) field survey assessment to identify baseline hydromorphological and ecological condition (as detailed in Annex B2).
- 2.1.3 Based on the outcomes of the baseline assessment, all watercourses have been categorised (category 1 -5). These categories are based on a range of criteria relating to the estimated baseflow, geomorphological condition, and aquatic habitat potential at each site (as summarised in Table 34), and have been used to inform the scoping in or out of watercourses for detailed impact and mitigation assessment. This scoping assessment has been undertaken in consultation with the Environment Agency.
- 2.1.4 Watercourses defined as category 1 and 2 have been scoped out of detailed impact and mitigation assessment with regards to potential effects on WFD status and status objectives. In total, 29 watercourses have been scoped out of detailed assessment.
- 2.1.5 Watercourses defined as category 3, 4 and 5 have all been scoped in for detailed impact and mitigation assessment. In total, 25 watercourses have been scoped in for detailed assessment. This includes watercourses located within each of the surface water bodies affected by the Proposed Scheme (as outlined in Section 4.1, main report and Annex C1), with the exception of the Blithe - Tad Bk to R Trent (GB1040280046491) water body. Consequently, the Blithe - Tad Bk to R Trent (GB1040280046491) water body has not been taken forward for detailed assessment.
- 2.1.6 The identification, assessment and scoping of relevant watercourses undertaken as part of the baseline assessment step of the WFD Assessment will be reviewed and updated as necessary during the detailed design stage of the Proposed Scheme, in order to reflect the latest iteration of the design and assessment process.
- 2.1.7 All relevant scheme components, associated impacts, and related embedded mitigation have been identified for all watercourses affected by the Proposed Scheme. Embedded mitigation (as described in Section 6.2, main report) will be applied to all scheme components on all of the watercourses identified, regardless of the baseline assessment scoping outcome for the watercourse.

Table 34: Categories used for scoping watercourse sites in/out of detailed impact and mitigation assessment

Cat.	Description	Criteria	Example	Scoping Outcome
1	No defined channel	no evidence of presence of surface water feature (no defined channel present).	 Unnamed tributary of Meece Brook 1	Scoped out of WFD compliance assessment
2	Channel with no baseflow / low riverine habitat and hydromorphological value	- natural channel or artificially created drainage channel, with absence of flowing water for part of the year / limited connection to water table (potential to dry out completely); - Q95 typically $\leq 0.002\text{m}^3/\text{s}$; - no regular fluvial geomorphological processes or features present; - low potential to support freshwater fish, macroinvertebrate, and/or macrophyte species; - riparian zone impacted by regular land and vegetation management in some cases; and 'Low' value watercourse receptor as detailed in the SMR Addendum²¹.	 Unnamed tributary of Bentley Brook 1	Scoped out of WFD compliance detailed impact and mitigation assessment

²¹ Environmental Impact Assessment Scope and Methodology Report Addendum (Volume 5: Appendix CT-001-002)

Cat.	Description	Criteria	Example	Scoping Outcome
3	Channel with limited baseflow / moderate riverine habitat and hydromorphological value	- natural channel or artificially created drainage channel, with permanent but limited baseflow; - Q95 typically $>0.002\text{m}^3/\text{s}$ – $\leq 0.01\text{m}^3/\text{s}$; - non-definable morphological flow types, except in localised and isolated reaches; - limited and discrete active fluvial geomorphological processes and features; - limited potential to support freshwater fish, macroinvertebrate, and/or macrophyte species; - riparian zone impacted by regular land and vegetation management in some cases; and 'Moderate' value watercourse receptor as detailed in the SMR Addendum21.	 Unnamed tributary of River Lea 3	Scoped in for WFD compliance detailed impact and mitigation assessment
4	'Functioning' natural channel with baseflow / high riverine habitat and hydromorphological value	- natural channel with permanent baseflow; - Q95 $> 0.01\text{m}^3/\text{s}$; - definable flow types; - active fluvial geomorphological processes and features; - potential to support some freshwater fish, macroinvertebrate, and/or macrophyte species; and 'High' or 'Very High' value watercourse receptor as detailed in the SMR Addendum21.	 Checkley Brook	
5	Canal	- canal (designated AWB under WFD); 'Very High' value watercourse receptor as detailed in the SMR Addendum21.		

- 2.1.8 All watercourses affected by the Proposed Scheme, together with their category and scoping outcome, are summarised in Table 35. The table shows the watercourses in relation to their relevant parent WFD water body catchment.
- 2.1.9 The location of each watercourse is also shown in Figure 8 – Figure 22.
- 2.1.10 A summary of the baseline condition of each of the watercourses identified is then provided in the following sections.

Table 35: Summary of watercourses affected by Proposed Scheme (in relation to WFD surface water body catchment)

WFD Water Body	Watercourse Name	Watercourse Designation	Upstream / Downstream National Grid Reference (NGR)	Approx. Watercourse Length (km)	Estimated Catchment Area (approx. catchment area upstream of Proposed Scheme location) (km ²)	Estimated Q95 (m ³ /s) at Proposed Scheme location	Watercourse category at Proposed Scheme location	Scoped in for detailed impact assessment? (Y/N)
Pyford Brook Catchment (trib of Trent) (GB104028047250)	Pyford Brook	Main river	SK1015710900 / SK1656515492	9.9	28.7 (18)	0.039	4	Y
	Unnamed tributary of Pyford Brook 1	Ordinary watercourse	SK1290414112 / SK1306314003	0.3	0.2 (0.2)	0.000	2	N
Bourne-Bilson Brook Catchment (trib of Trent) (GB104028047270)	Ashby Sitch	Ordinary watercourse	SK1184714221 / SK1405616149	3.4	2.0 (0.8)	0.001	2	N
	Bourne Brook	Ordinary watercourse	SK1019313101 / SK1464016489	7.3	37.5 (29.3)	0.083	4	Y
	Crawley Brook	Ordinary watercourse	SK1092415296 / SK1373516231	4.2	5.0 (2.8)	0.008	3	Y
Trent from Moreton Brook to River Tame (GB104028047290)	Unnamed tributary of River Trent (MB to RT) 1	Ordinary watercourse	SK0999514512 / SK1097516720	3.7	3.3 (3.1)	0.008	3	Y
	Unnamed tributary of River Trent (MB to RT) 2	Ordinary watercourse	SK1038416837 / SK1125516964	1.1	3.5 (3.3)	0.008	3	Y
	Unnamed tributary of River Trent (MB to RT) 3	Ordinary watercourse	SK0996617075 / SK1105617233	1.5	3.0 (0.1)	0.000	2	N
	River Trent	Main river	SK0492918707 / SK1918714910 (within water body extent)	22.7 (within water body extent)	36.6 (23) (within water body extent)	4.62 (from 'Trent at Yoxall' gauge)	4	Y

WFD Water Body	Watercourse Name	Watercourse Designation	Upstream / Downstream National Grid Reference (NGR)	Approx. Watercourse Length (km)	Estimated Catchment Area (approx. catchment area upstream of Proposed Scheme location) (km ²)	Estimated Q95 (m ³ /s) at Proposed Scheme location	Watercourse category at Proposed Scheme location	Scoped in for detailed impact assessment? (Y/N)
	Unnamed tributary of Bentley Brook 1	Ordinary watercourse	SK0810219573 / SK0805119330	0.2	0.8 (0.1)	0.000	2	N
	Unnamed tributary of Bentley Brook 2	Ordinary watercourse	SK0715320263 / SK0794219359	1.4	2.0 (1.8)	0.002	3	Y
	Unnamed tributary of Bentley Brook 3	Ordinary watercourse	SK0744920599 / SK0813918058	2.9	3.4 (1.1)	0.001	2	N
Blithe - Tad Bk to R Trent (G104028046491)	Luth Burn	Ordinary watercourse	SK0860418301 / SK1141017723	3.5	3.2 (0.9)	0.002	2	N
Moreton Brook from Source to River Trent (GB104028047380)	Unnamed tributary of Moreton Brook 1	Ordinary watercourse	SK0605121979 / SK0457420775	2.1	2.3 (1.7)	0.002	3	Y
	Unnamed tributary of Moreton Brook 2	Ordinary watercourse	SK0515622499 / SK0423121389	2	1.3 (1)	0.001	2	N
	Unnamed tributary of Moreton Brook 3	Ordinary watercourse	SK0430122751 / SK0364122051	1.1	1 (1)	0.001	2	N
	Moreton Brook	Main river (ordinary watercourse at location of Proposed Scheme)	SK0239626099 / SK0495318698	20.7	22.8 (12.6)	0.012	4	Y
	Unnamed tributary of Moreton Brook 4	Ordinary watercourse	SK0238522724 / SK0330622690	1	0.7 (0.5)	0.001	2	N
Trent from	Unnamed tributary of	Ordinary	SK0165323413 /	2.6	2.5 (1.9)	0.002	3	Y

WFD Water Body	Watercourse Name	Watercourse Designation	Upstream / Downstream National Grid Reference (NGR)	Approx. Watercourse Length (km)	Estimated Catchment Area (approx. catchment area upstream of Proposed Scheme location) (km ²)	Estimated Q95 (m ³ /s) at Proposed Scheme location	Watercourse category at Proposed Scheme location	Scoped in for detailed impact assessment? (Y/N)
Tittensor to River Sow (GB104028053272)	River Trent 1	watercourse	SJ9944122707					
	River Trent	Main river	SJ 87569 37766 / SJ9949622613 (within the water body extent)	33.2 (within water body extent)	105.3 (101) (within water body extent)	2.14 (from 'Trent at Great Haywood' gauge)	4	Y
	Unnamed tributary of River Trent 2	Ordinary watercourse	SJ9928023856 / SJ9949923646	0.4	1.2 (0)	0.000	2	N
	Unnamed tributary of River Trent 3	Ordinary watercourse	SJ9838923835 / SJ9893923985	0.6	0.5 (0.2)	0.000	2	N
	Unnamed tributary of River Trent 4	Ordinary watercourse	SJ9272827531 / SJ9331628352	1.2	1.5 (0.1)	0.000	1	N
	Unnamed tributary of River Trent 5	Ordinary watercourse	SJ9115828828 / SJ9414129049	3.6	4.9 (0.3)	0.000	2	N
	Unnamed tributary of River Trent 6	Ordinary watercourse	SJ8983830653 / SJ9172431570	2.2	1.5 (0.5)	0.001	2	N
	Unnamed tributary of River Trent 7	Ordinary watercourse	SJ8960031000 / SJ8993630903	0.4	0.5 (0.0)	0.000	2	N
	Filly Brook	Ordinary Watercourse	SJ8707434802 / SJ8972533748	4.2	7.3 (6.8)	0.012	4	Y
	Unnamed tributary of Filly Brook 1	Ordinary watercourse	SJ8799033656 / SJ8824433299	0.4	0.2 (0.2)	0.000	2	N
	Unnamed tributary of Filly Brook 2	Ordinary watercourse	SJ8784034310 / SJ8847633230	1.2	0.3 (0.3)	0.000	2	N

WFD Water Body	Watercourse Name	Watercourse Designation	Upstream / Downstream National Grid Reference (NGR)	Approx. Watercourse Length (km)	Estimated Catchment Area (approx. catchment area upstream of Proposed Scheme location) (km ²)	Estimated Q95 (m ³ /s) at Proposed Scheme location	Watercourse category at Proposed Scheme location	Scoped in for detailed impact assessment? (Y/N)
	Unnamed tributary of River Trent 8	Ordinary watercourse	SJ8554836124 / SJ8602736226	0.5	0.7 (0.3)	0.001	2	N
Trent and Mersey Canal, summit to Alrewas (GB70410142)	Trent and Mersey Canal	Canal	SJ 87092 46959 / SK1717915566 (within water body extent)	57 (within water body extent)	N/a	N/a	5	Y
Sow- Doxey Bk to R Penk (GB104028046790)	Unnamed tributary of Kingston Brook 1	Ordinary watercourse	SJ9616825116 / SJ9529824728	0.7	1.3 (0.3)	0.000	2	N
	Unnamed tributary of Kingston Brook 2	Ordinary watercourse	SJ9606625977 / SJ9374324447	3.2	2.9 (2.2)	0.004	3	Y
	Unnamed tributary of Kingston Brook 3	Ordinary watercourse	SJ9378526110 / SJ9337225548	0.8	1.3 (0.8)	0.001	2	N
Meece Brook from Source to Chatcull Brook (GB104028053080)	Unnamed tributary of Meece Brook 1	Ordinary watercourse	SJ8346537877 / SJ8320937714	0.3	0.1 (0.1)	0.000	1 / 2	N
	Unnamed tributary of Meece Brook 2	Ordinary watercourse	SJ8313041561 / SJ8139239437	3.1	2.7 (2.7)	0.006	3	Y
	Meece Brook	Main river	SJ 80772 43559 / SJ8285833600 (within the water body)	12.2 (within water body extent)	42.9 (12) (within water body extent)	0.021	4	Y
Lea (GB112068055200)	Unnamed tributary of River Lea 1	Ordinary watercourse	SJ7961741567 / SJ7905741289	0.6	0.2 (0.2)	0.000	1 / 2	N
	Unnamed tributary of	Ordinary	SJ7910141876 /	0.5	0.3 (0.3)	0.000	2	N

WFD Water Body	Watercourse Name	Watercourse Designation	Upstream / Downstream National Grid Reference (NGR)	Approx. Watercourse Length (km)	Estimated Catchment Area (approx. catchment area upstream of Proposed Scheme location) (km ²)	Estimated Q95 (m ³ /s) at Proposed Scheme location	Watercourse category at Proposed Scheme location	Scoped in for detailed impact assessment? (Y/N)
	River Lea 2	watercourse	SJ7884241611					
	Unnamed tributary of River Lea 3	Ordinary watercourse	SJ7925340780 / SJ7809742594	2.5	7.7 (7.7)	0.009	3	Y
	Unnamed tributary of River Lea 4	Ordinary watercourse	SJ7807942594 / SJ7798942623	0.1	2.3 (2.3)	0.009	3	Y
	River Lea	Main river	SJ7520542295 / SJ7462945863	12.6	17.9 (5.1)	0.022 / 0.052	4	Y
	Unnamed tributary of River Lea 5	Ordinary watercourse	SJ8004643331 / SJ7791743130	1.9	2.3 (2.3)	0.002	3	Y
	Unnamed tributary of River Lea 6	Ordinary watercourse	SJ7574745222 / SJ7526145639	0.8	0.5 (0.5)	0.001	3	N
	Unnamed tributary of River Lea 7	Ordinary watercourse	SJ7565644087 / SJ7527445765	2.6	1.4 (0.9)	0.001	3	Y
Checkley Brook – Upper (GB112068055230)	Checkley Brook	Main river	SJ8058945224 / SJ7462645865 (within waterbody extent)	3.9 (within water body extent)	21.8 (21.8) (within water body extent)	0.041	4	Y
Wistaston Brook (GB112068055280)	Unnamed tributary of Mere Gutter 1	Ordinary watercourse	SJ7431647421 / SJ7444047477	0.2	0.2 (0.2)	0.000	2	N
	Unnamed tributary of Mere Gutter 2	Ordinary watercourse	SJ7392747501 / SJ7375247744	0.3	0.7 (0.7)	Cannot be calculated	2	N
	Unnamed tributary of Mere Gutter 3	Ordinary watercourse	SJ7366248218 / SJ7364348437	0.2	1.0 (1.0)	0.000	2	N

[illegible]

Figure 8: Watercourses crossed by Proposed Scheme within WFD surface water body catchments (Part 1)

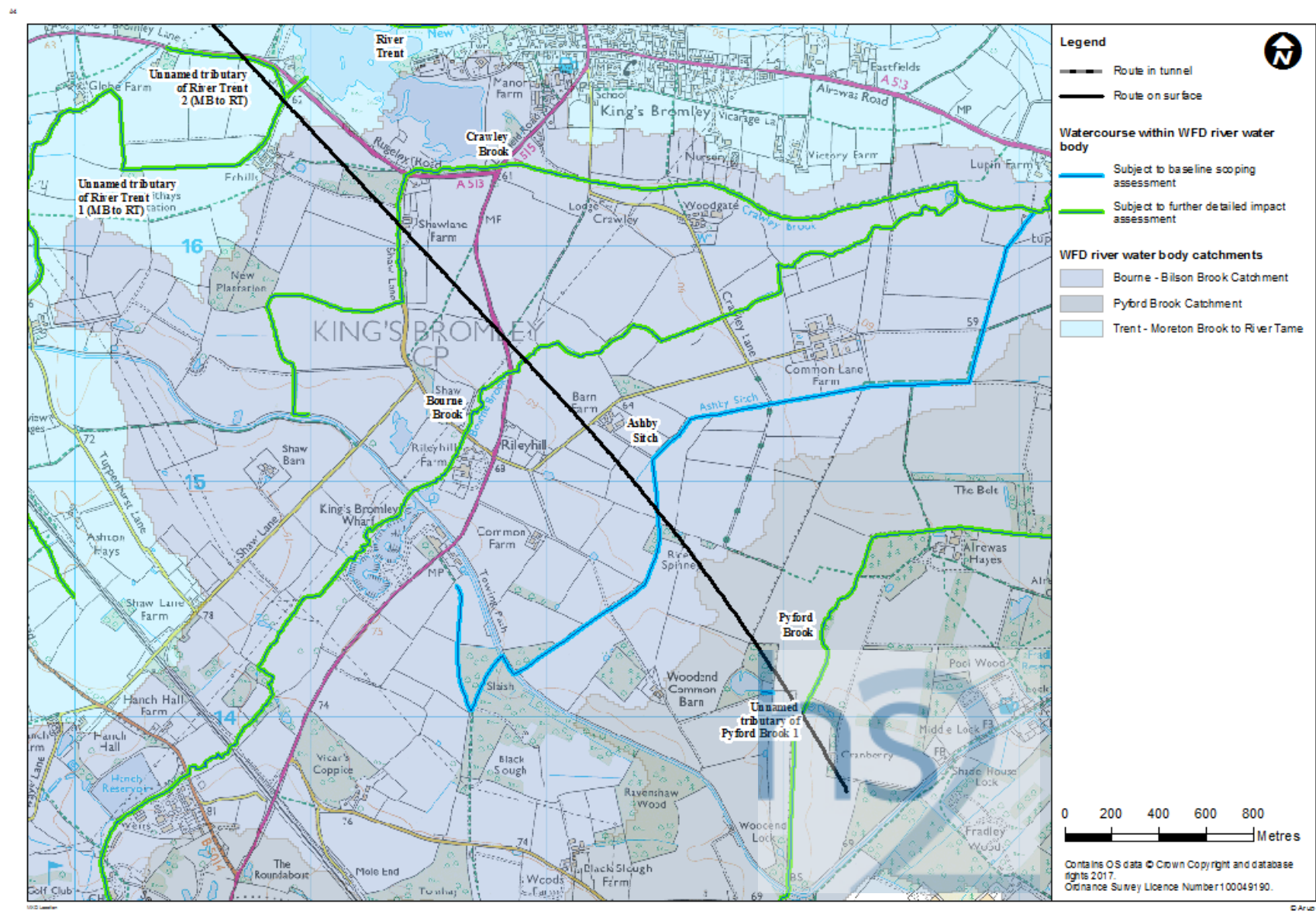


Figure 9: Watercourses crossed by Proposed Scheme within WFD surface water body catchments (Part 2)

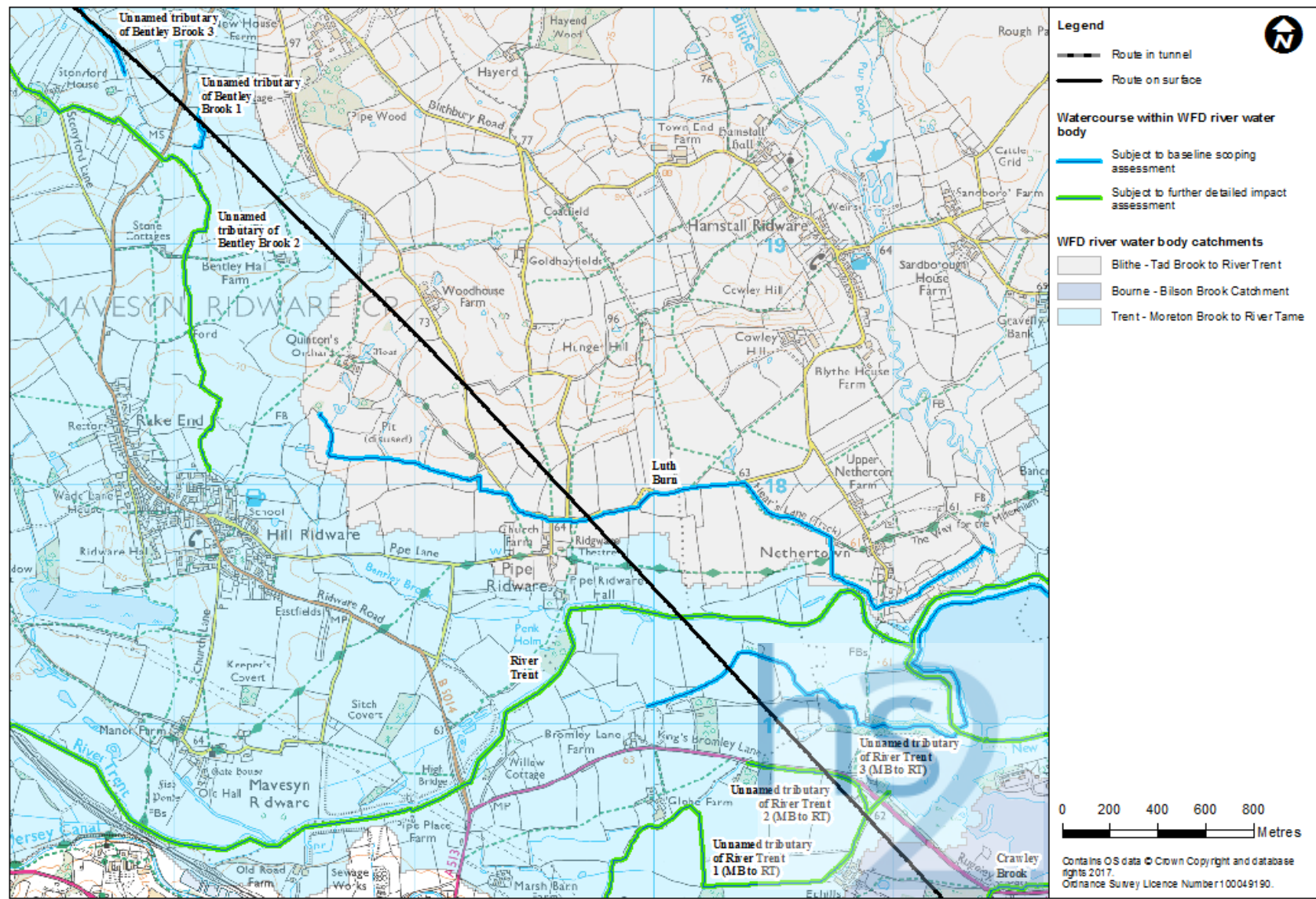


Figure 10: Watercourses crossed by Proposed Scheme within WFD surface water body catchments (Part 3)

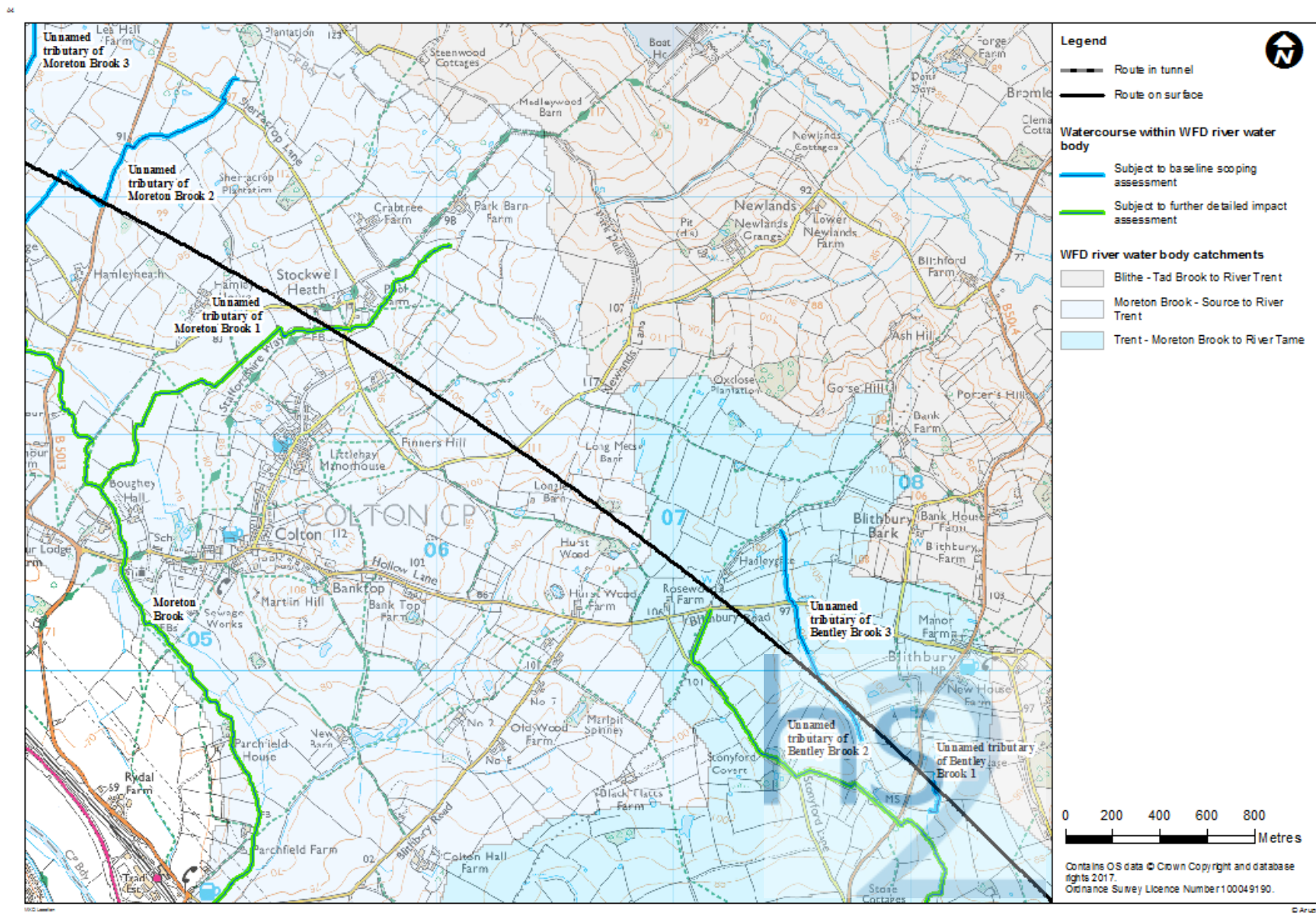


Figure 11: Watercourses crossed by Proposed Scheme within WFD surface water body catchments (Part 4)

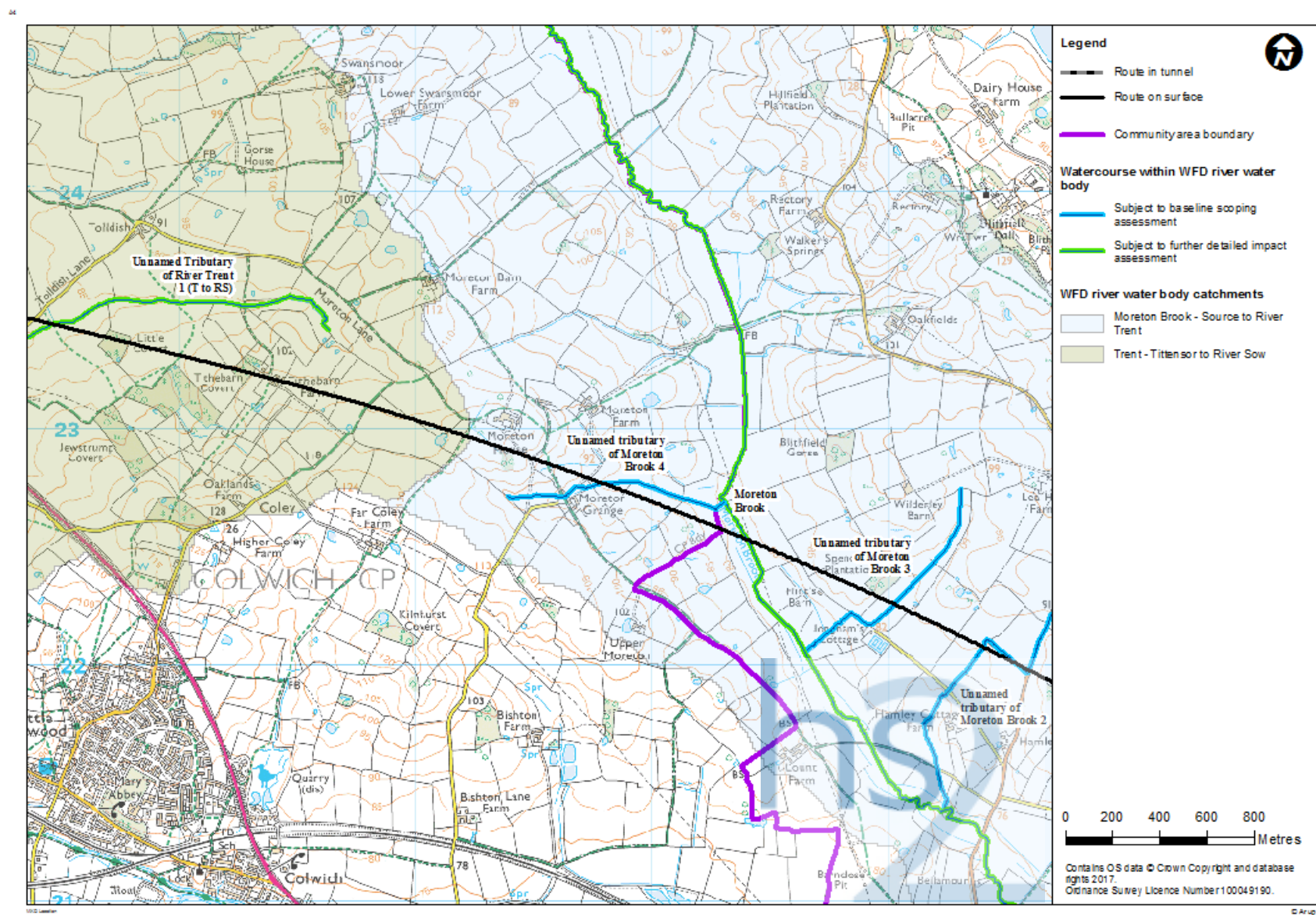




Figure 13: Watercourses crossed by Proposed Scheme within WFD surface water body catchments (Part 6)

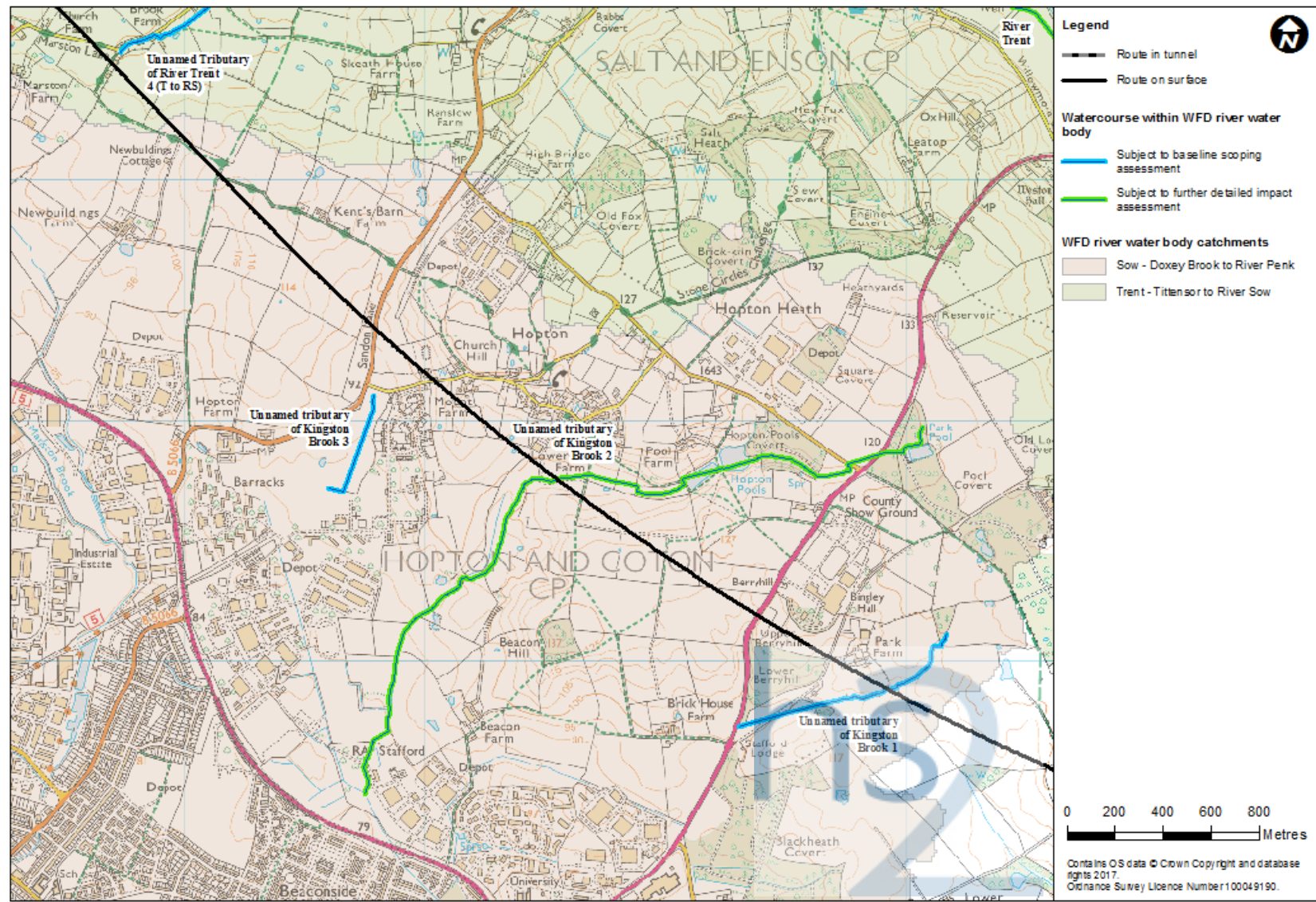


Figure 14: Watercourses crossed by Proposed Scheme within WFD surface water body catchments (Part 7)

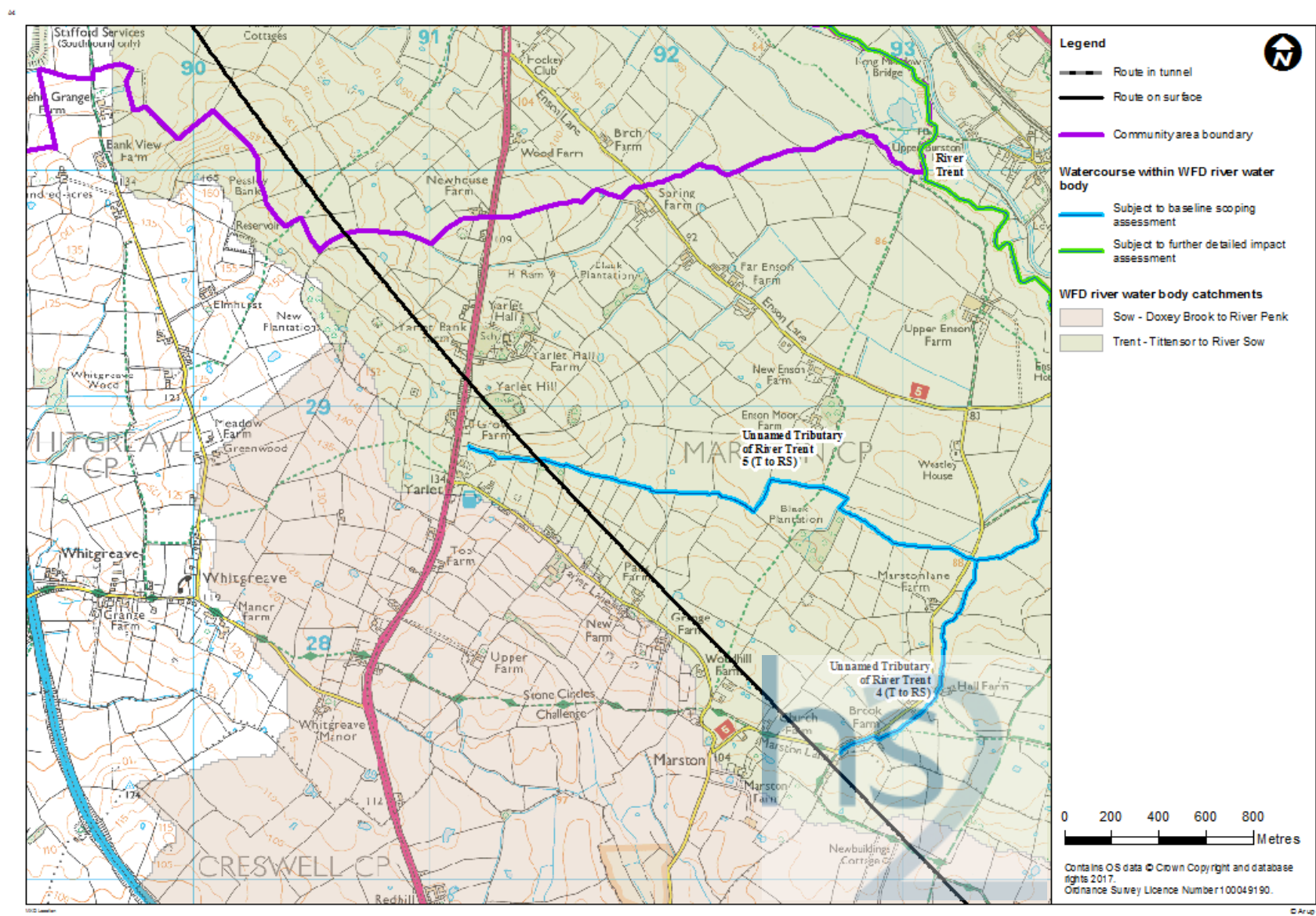




Figure 16: Watercourses crossed by Proposed Scheme within WFD surface water body catchments (Part 9)

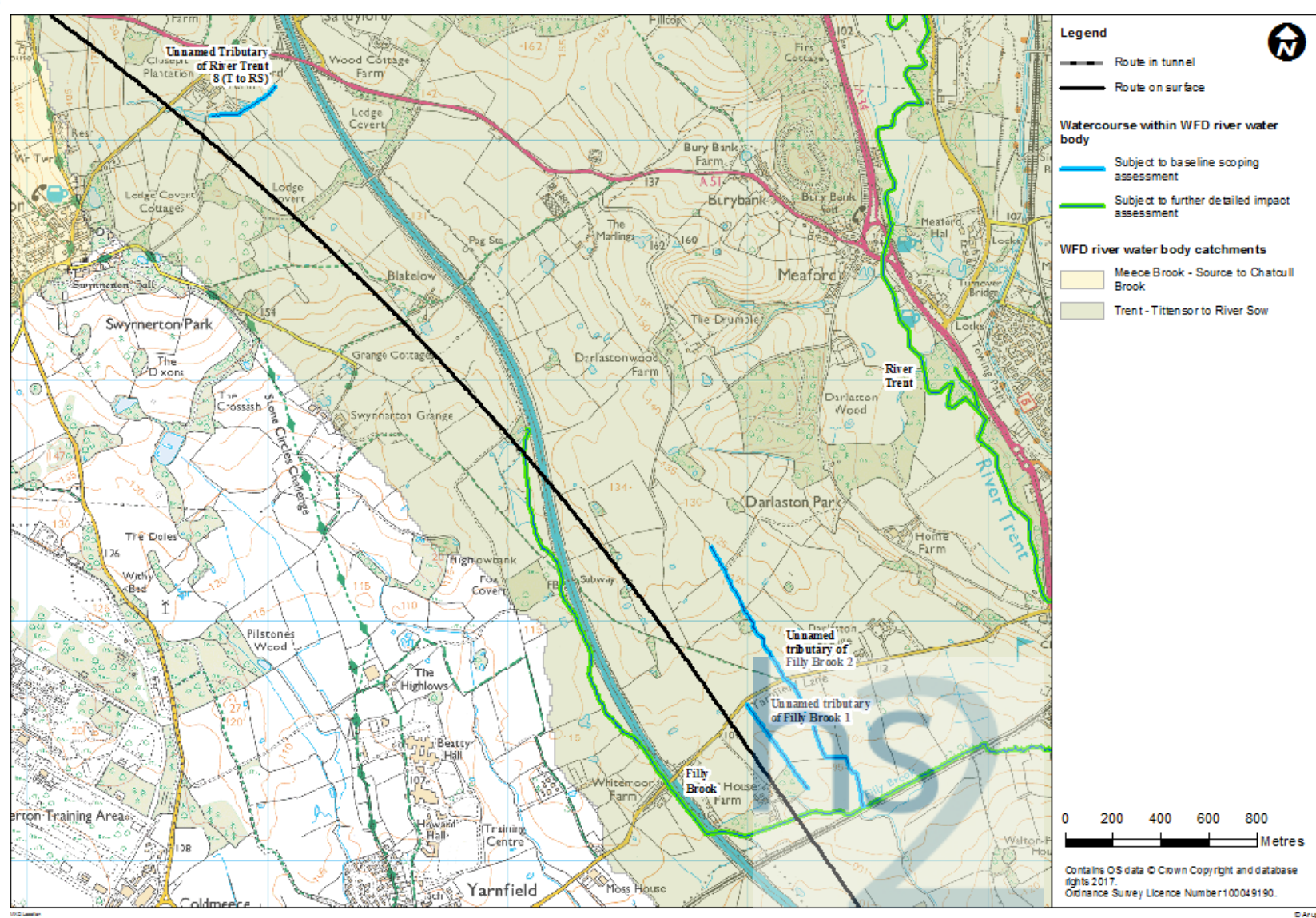


Figure 17: Watercourses crossed by Proposed Scheme within WFD surface water body catchments (Part 10)

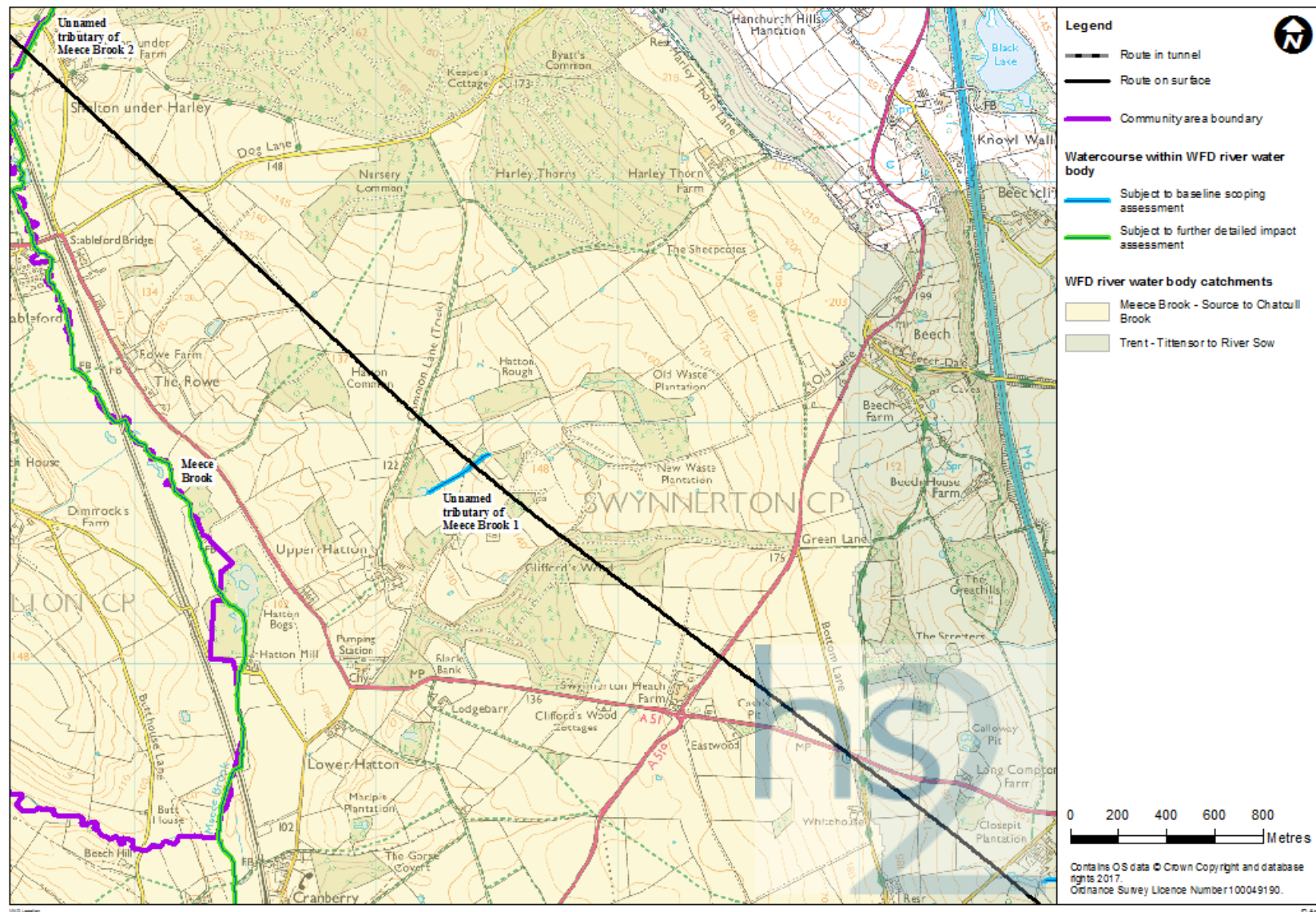
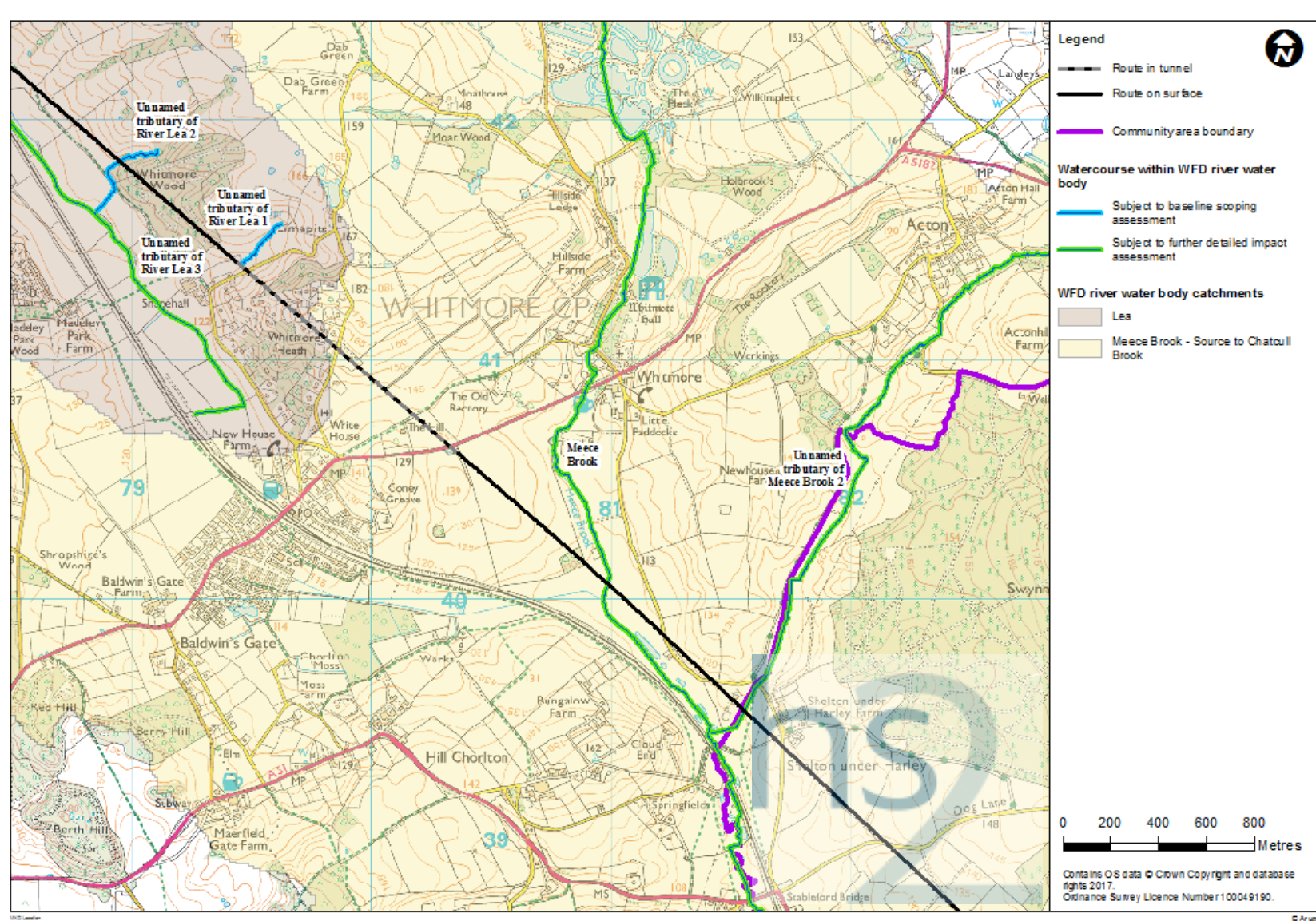


Figure 18: Watercourses crossed by Proposed Scheme within WFD surface water body catchments (Part 11)



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Figure 21: Watercourses crossed by Proposed Scheme within WFD surface water body catchments (Part 14)

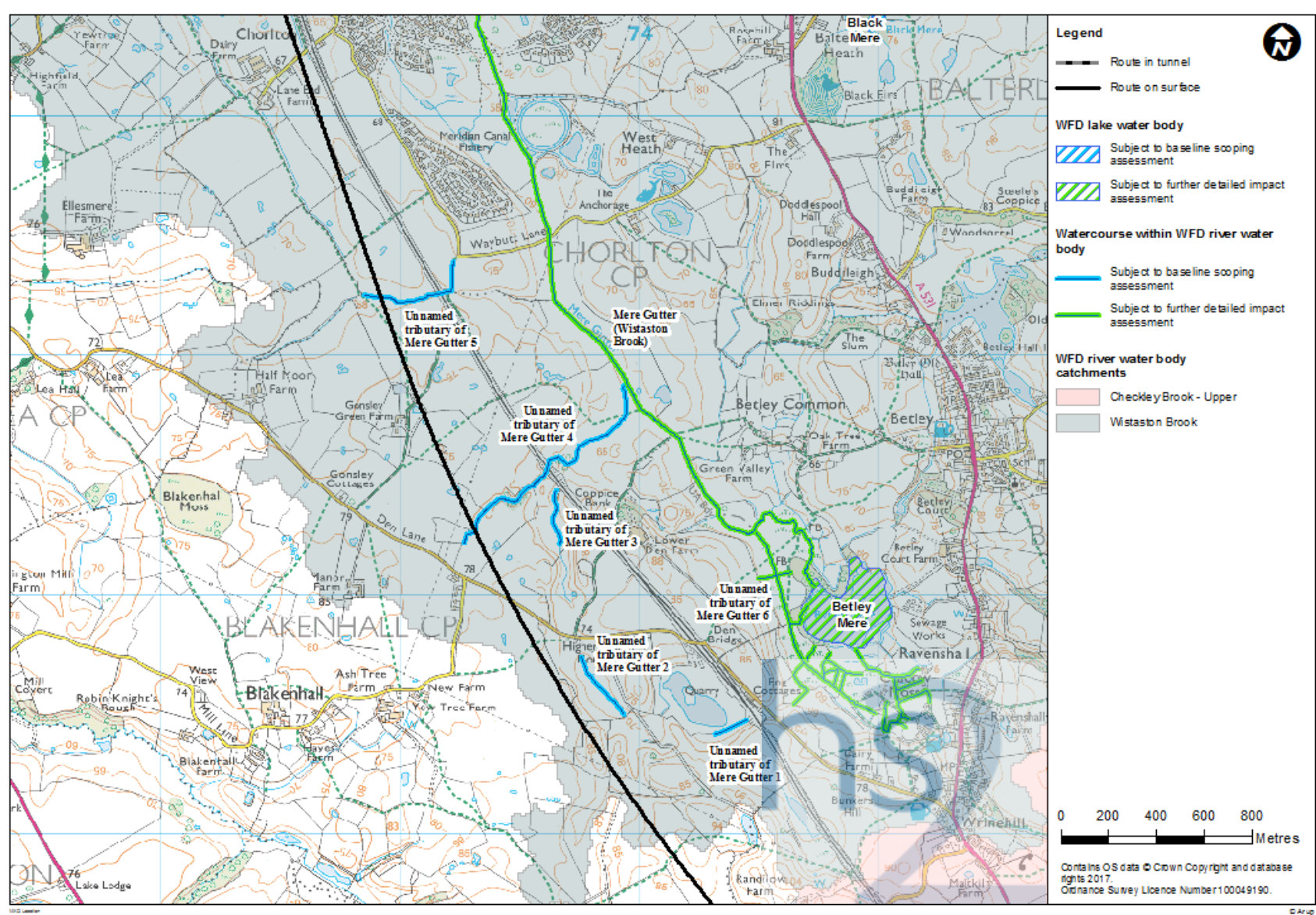
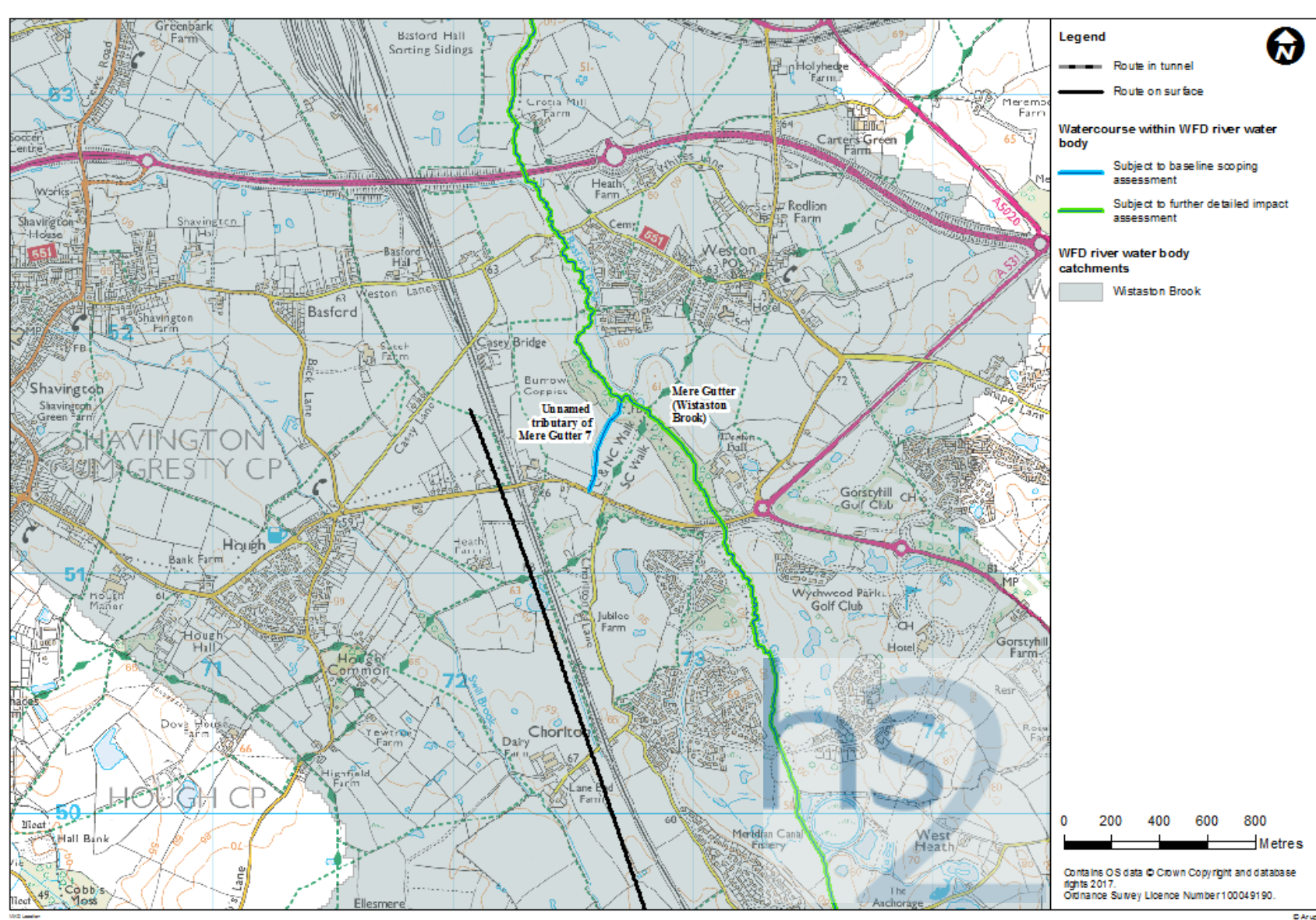


Figure 22: Watercourses crossed by Proposed Scheme within WFD surface water body catchments (Part 15)



2.2 Pyford Brook Catchment (trib of Trent) (GB104028047250)

Pyford Brook

- 2.2.1 The Pyford Brook flows from the north west of Lichfield (at SK1015710900) to its confluence at the River Trent (at SK1656515492).
- 2.2.2 Summary of baseline desk study and field survey findings:
- Environment Agency Main River;
 - Q95 flow estimate for the watercourse at the location of the Proposed Scheme is $\leq 0.039 \text{ m}^3/\text{s}$;
 - approximately 3m wide channel, appears to have been modified (straightened and potentially widened) historically for agricultural / land drainage purposes;
 - well-defined morphological flow types, predominately comprising glides and short intermittent runs;
 - presence of discrete fluvial geomorphological features, including bars and berms;
 - coarse substrate, predominately comprising gravel-sized sediments;
 - presence of aquatic vegetation and evidence of riverine habitat suitable for aquatic invertebrates and fish;
 - narrow but well-developed riparian zone, comprising grasses, shrubs and trees; and
 - floodplain comprises agricultural land use, predominately arable.
- 2.2.3 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 4' and has been **scoped in** for detailed impact and mitigation assessment.

Figure 23: Example photographs taken during field survey of Pyford Brook

Example Photographs		
		
Upstream view taken from SK 13025 13504	Upstream view taken from SK 13154 14190	Downstream view taken from SK 13200 14453

Unnamed tributary of Pyford Brook 1

- 2.2.4 The Unnamed tributary of Pyford Brook 1 watercourse flows from pond to the east of Woodend Common Barn (at SK1290414112) to its confluence with Pyford Brook (at SK1306314003).
- 2.2.5 Summary of baseline desk study and field survey findings:
- Q95 flow estimate for the watercourse at the location of the Proposed Scheme is 0.000m³/s;
 - approximately 1m wide channel, observed to be dry during field survey;
 - narrow riparian zone, comprising grasses, shrubs and trees (heavily vegetated channel banks);
 - floodplain comprises agricultural land use, predominately arable; and
 - OS mapping suggests presence of large pond feature at head of watercourse (marked 'Old Marl Pit' in historical mapping) (connectivity with watercourse unconfirmed due to lack of access).
- 2.2.6 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 2' and has been **scoped out** of detailed impact and mitigation assessment.

Figure 24: Example photographs taken during field survey of Unnamed tributary of Pyford Brook 1

Example Photographs	
	
Upstream view taken from SK 1298014120	Downstream view taken from SK 1298014120

2.3 Bourne-Bilson Brook Catchment (trib of Trent) (GB104028047270)

Ashby Sitch

- 2.3.1 The 'Ashby Sitch' watercourse flows from the south of Common Farm (at SK1184714221) to its confluence with Bourne Brook (at SK1405616149).

2.3.2 Summary of baseline desk study and field survey findings:

- Q₉₅ flow estimate for the watercourse at the location of the Proposed Scheme is $\leq 0.001\text{m}^3/\text{s}$;
- approximately 1m wide channel, appears to have been modified (straightened) historically for agricultural / land drainage purposes;
- isolated areas of shallow, ponded water present in places along the channel, but no perceivable flow observed during survey at Proposed Scheme crossing site;
- silt substrate;
- narrow riparian zone, comprising predominately grasses and shrubs with some trees (heavily vegetated channel banks, clogging channel in places); and
- floodplain comprises agricultural land use, predominately arable.

2.3.3 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 2' and has been **scoped out** for detailed impact and mitigation assessment.

Figure 25: Example photographs taken during field survey of Ashby Sitch

Example Photographs

		
Across channel view taken from SK 12537 15191	Across channel view taken from SK 12576 15235	Upstream view taken from SK 12592 15263

Bourne Brook

2.3.4 The Bourne Brook flows from immediately upstream of the Hanch Reservoir (at SK1019313101) to its confluence with the River Trent (at SK1464016489).

2.3.5 Summary of baseline desk study and field survey findings:

- Q₉₅ flow estimate for the watercourse at the location of the Proposed Scheme is $\leq 0.083\text{m}^3/\text{s}$;
- sinuous channel, approximately 4-5m wide;

- well-defined and diverse morphological flow types, including runs, glides and some pools and riffles (typically 0.3-0.6m deep);
- presence of active fluvial geomorphological processes and features, including bars and localised bank erosion;
- coarse substrate, predominantly comprising gravel-sized sediments;
- riverine habitat capable of supporting fish, aquatic invertebrates and macrophytes (diverse invertebrate assemblage sampled at site);
- narrow but well-developed riparian zone, comprising grasses, shrubs and trees;
- floodplain comprises agricultural land use, predominately arable.

2.3.6 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 4' and has been **scoped in** for detailed impact and mitigation assessment.

Figure 26: Example photographs taken during field survey of Bourne Brook

Example Photographs



Upstream view taken from SK 11648 15205



Downstream view taken from SK 11947 15555



Downstream view taken from SK 11984 15576



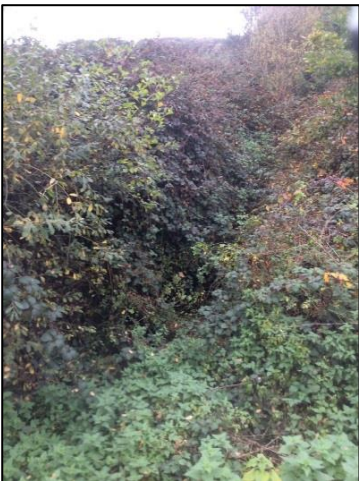
Downstream view taken from SK 12041 15588

Crawley Brook

- 2.3.7 The Crawley Brook flows from the south of Rugeley Road at Riley Hill (at SK1092415296) to its confluence with Bourne Brook (at SK1373516231).
- 2.3.8 Summary of baseline desk study and field survey findings:
- Q95 flow estimate for the watercourse at the location of the Proposed Scheme is $\leq 0.008 \text{ m}^3/\text{s}$;
 - approximately 1m wide channel, incised/entrenched (0.5m wide at base), appears to have been modified (straightened) historically alongside road and for agricultural/land drainage purposes;
 - isolated areas of shallow, ponded water present in places along channel, but no perceivable flow observed during survey at and upstream of Proposed Scheme crossing site;
 - substrate obscured;
 - little riverine habitat potential for fish or aquatic invertebrates observed at Proposed Scheme crossing site;
 - narrow riparian zone, comprising grasses, shrubs and trees (heavily vegetated channel banks, clogging channel in places); and
 - floodplain comprises agricultural land use, predominately arable.
- 2.3.9 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 3' and has been **scoped in** for detailed impact and mitigation assessment.

Figure 27: Example photographs taken during field survey of Crawley Brook

Example Photographs

		
Downstream view taken from SK 11379 15781	Across channel view taken from SK 11362 15995	Downstream view taken from SK 11393 16298

2.4 Trent from Moreton Brook to River Tame (GB104028047290)

Unnamed tributary of River Trent (MB to RT) 1

2.4.1 The 'Unnamed tributary of River Trent (MB to RT) 1' watercourse flows from north-west of Hanchwood House (at SK0999514512) to the confluence with the River Trent (at SK1097516720).

2.4.2 Summary of baseline desk study findings:

- Q95 flow estimate for the watercourse at the location of the Proposed Scheme is $\leq 0.008 \text{ m}^3/\text{s}$;
- suspected ponded flow within channel;
- straight channel, approximately 7m wide, appears to comprise an artificially created agricultural drainage network;
- watercourse is culverted beneath the Rugeley Road crossing immediately downstream of the Proposed Scheme crossing site, before discharging to a large pond to the west of Kings Bromley;
- limited riparian vegetation apparent along channel (comprising predominately grasses); and
- floodplain comprises agricultural land use, predominately arable.

2.4.3 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 3' and has been **scoped in** for detailed impact and mitigation assessment.

Unnamed tributary of River Trent (MB to RT) 2

2.4.4 The 'Unnamed tributary of River Trent (MB to RT) 2' watercourse flows from alongside King's Bromley Lane (at SK1038416837) to the confluence with 'Unnamed tributary of River Trent (MB to RT) 1' (at SK1125516964).

2.4.5 Summary of baseline desk study findings:

- Q95 flow estimate for the watercourse at the location of the Proposed Scheme is $\leq 0.008 \text{ m}^3/\text{s}$;
- watercourse appears to have been modified (straightened) historically for agricultural / land drainage and along King's Bromley Lane;
- limited riparian vegetation apparent channel (comprising predominately grasses and shrubs), appears to be managed along left bank adjacent to King's Bromley Lane; and
- floodplain comprises agricultural land use, predominately arable.

2.4.6 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 3' and has been **scoped in** for detailed impact and mitigation assessment.

Unnamed tributary of River Trent (MB to RT) 3

2.4.7 The 'Unnamed tributary of River Trent (MB to RT) 3' watercourse flows from north of King's Bromley Lane (at SK0996617075) to the confluence with the River Trent (at SK1105617233).

2.4.8 Summary of baseline desk study findings:

- Q95 flow estimate for the watercourse at the location of the Proposed Scheme is 0.000m³/s;
- watercourse appears to have been modified (straightened) historically for agricultural / land drainage purposes;
- watercourse appears to be culverted beneath farm access crossings at several locations downstream of Proposed Scheme crossing site;
- limited riparian vegetation apparent along much of channel (comprising predominately grasses and shrubs, with some trees);
- channel banks appears to be subject to poaching by livestock in places along watercourse; and
- floodplain comprises agricultural land use, mixture of pasture and arable.

2.4.9 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 2' and has been **scoped out** of detailed impact and mitigation assessment.

River Trent

2.4.10 The River Trent, within the water body extent, flows from the north east of Rugeley (at SK0494318696) to its confluence with the River Tame (at SK1918914898).

2.4.11 Summary of baseline desk study findings:

- Environment Agency Main River;
- Q95 flow estimate for the watercourse at the location of the Proposed Scheme is 4.62m³/s (gauge data at Yoxall);
- watercourse likely modified historically for agricultural / land drainage purposes (however historical OS mapping suggests no significant planform change has occurred since 1888 at the Proposed Scheme crossing site);
- limited riparian vegetation apparent along channel at Proposed Scheme crossing site (comprising predominately grasses and shrubs); and
- floodplain comprises agricultural land use, mixture of pasture and arable.

2.4.12 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 4' and has been **scoped in** for detailed impact and mitigation assessment.

Unnamed tributary of Bentley Brook 1

- 2.4.13 The 'Unnamed tributary of Bentley Brook 1' watercourse flows from south of Blithbury (at SK0810219573) to the confluence with the 'Unnamed tributary of Bentley Brook 2' watercourse (at SK0805119330).
- 2.4.14 Summary of baseline desk study and field survey findings:
- Q95 flow estimate for the watercourse at the location of the Proposed Scheme is 0.000m³/s;
 - watercourse culverted within an approximate 0.3m diameter pipe culvert upstream of Proposed Scheme crossing site;
 - approximate 1.5m wide, poorly-defined channel downstream of culvert, observed to be dry during field survey (except for isolated area of shallow and ponded water at culvert outlet);
 - no evidence of active fluvial geomorphological processes or features;
 - narrow riparian zone, comprising grasses, shrubs and trees (heavily vegetated channel banks and bed); and
 - floodplain comprises agricultural land use, mixture of pasture and arable.
- 2.4.15 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 2' and has been **scoped out** of detailed impact and mitigation assessment.

Figure 28: Example photographs taken during field survey of Unnamed tributary of Bentley Brook 1

Example Photographs



Across channel view taken from SK 08100 19540 (watercourse culverted upstream of this location)



Upstream view taken from SK 08093 19516

Unnamed tributary of Bentley Brook 2

- 2.4.16 The 'Unnamed tributary of Bentley Brook 2' watercourse flows from east of Rosewood Farmhouse (at SK0715320263) to the confluence with Bentley Brook to the north of Hill Ridware (at SK0794219359).
- 2.4.17 Summary of baseline desk study and field survey findings:

- Q95 flow estimate for the watercourse at the location of the Proposed Scheme is $\leq 0.002 \text{ m}^3/\text{s}$;
- Watercourse culverted for approximately 250m upstream of B5014 road crossing;
- approximately 1.5m wide channel downstream of B5014 and Proposed Scheme crossing sites;
- shallow low-flow observed during survey, predominantly comprising ponded flow with intermittent short runs (but no well-defined morphological flow types);
- coarse woody debris blocking channel in several locations, causing ponding of flow;
- coarse gravel substrate, overlain with a thin layer of fine sediment deposits;
- some minor fluvial bank erosion (undercutting and tree root scour), but no well-developed fluvial geomorphological features;
- narrow but well vegetated riparian zone, comprising grasses, shrubs and trees (with some sections of bare channel banks and evidence of burrowing erosion); and
- floodplain comprises agricultural land use, mixture of pasture and arable.

2.4.18 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 3' and has been **scoped in** for detailed impact and mitigation assessment.

Figure 29: Example photographs taken during field survey of Unnamed tributary of Bentley Brook 2 – downstream of Uttoxeter Road (B5014)

Example Photographs



Across channel view from SK 07974 19364



Downstream view taken from SK 08016 19355

Example Photographs



Upstream view taken from SK 08068 19292



Downstream view taken from SK 08096 19253

Unnamed tributary of Bentley Brook 3

- 2.4.19 The 'Unnamed tributary of Bentley Brook 3' watercourse flows from north-west of Blithbury (at SK0744920599) to the confluence with the 'Unnamed tributary of Bentley Brook 2' watercourse (at SK0813918058).
- 2.4.20 Summary of baseline desk study and field survey findings:
- Q95 flow estimate for the watercourse at the location of the Proposed Scheme is $\leq 0.001 \text{ m}^3/\text{s}$;
 - approximately 1-2m wide, 0.5-1m deep channel, appears to have been modified (straightened and deepened) for agricultural / land drainage purposes;
 - channel observed to be dry during field survey, with some isolated areas of shallow ponded water only;
 - silt substrate;
 - narrow riparian zone, comprising predominately grasses and shrubs (channel vegetated along banks and bed);
 - floodplain comprises agricultural land use, mixture of pasture and arable; and
 - channel culverted at multiple locations, including at Proposed Scheme crossing site.
- 2.4.21 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 2' and has been **scoped out** of detailed impact and mitigation assessment.

Figure 30: Example photographs taken during field survey of Unnamed tributary of Bentley Brook 3

Example Photographs	
	
Downstream view taken from SK 07465 20571	Downstream view taken from SK 07470 20537
	
Downstream view taken from SK 07470 20537	Downstream view taken from SK 07526 20150

2.5 Blithe - Tad Bk to R Trent (G104028046491)

Luth Burn

- 2.5.1 The Luth Burn flows from south of Quintin's Orchard (at SK0860418301) to the confluence with the River Blithe (at SK1141017723).
- 2.5.2 Summary of baseline desk study and field survey findings:
- Q95 flow estimate for the watercourse at the location of the Proposed Scheme is $\leq 0.002 \text{ m}^3/\text{s}$;
 - approximately 1-1.5m wide channel, modified and realigned alongside road at Proposed Scheme crossing site;
 - mid reaches of watercourse run across River Trent floodplain and appear to have been modified (straightened and widened) historically for agriculture / land drainage purposes;
 - shallow, ponded water present within channel, but no perceivable flow observed during field survey;

- silt substrates;
- narrow riparian zone, comprising predominately grasses and shrubs (heavily vegetated channel banks and bed along mid reaches of watercourse, clogging channel in places);
- floodplain comprises agricultural land use, predominately arable;
- watercourse impacted by numerous small existing culverts (farm access track crossings); and
- watercourse flows into a large pond adjacent to Brookhouse Farm downstream of Proposed Scheme crossing site.

2.5.3 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 2' and has been **scoped out** of detailed impact and mitigation assessment.

Figure 31: Example photographs taken during field survey of Luth Burn

Example Photographs



Downstream view taken from SK 09859 17887



Downstream view taken from SK 10432 17937

2.6 Moreton Brook from Source to River Trent (GB104028047380)

Unnamed tributary of Moreton Brook 1

2.6.1 The 'Unnamed tributary of Moreton Brook 1' watercourse flows from south of Park Barn Farm (at SK0605121979) to the confluence with Moreton Brook (at SK0457420775).

2.6.2 Summary of baseline desk study and field survey findings:

- Q95 flow estimate for the watercourse at the location of the Proposed Scheme is $\leq 0.002 \text{ m}^3/\text{s}$;
- approximately 1.5m wide channel, appears to have been modified (straightened) historically for agricultural / land drainage purposes;

- shallow low-flows observed during field survey, predominantly comprising glides and short runs with some ponded reaches;
- potential spring observed upstream of Proposed Scheme crossing site (at SK 05890 21675), contributing to channel baseflow (no baseflow upstream of this location);
- coarse substrates, predominately comprising gravel-sized sediments with thin layer of overlying fine sediment deposits;
- few well-developed fluvial geomorphological features evident, with the exception of some discrete bars and localised bank erosion;
- limited riverine habitat potential for fish and aquatic invertebrates;
- narrow riparian zone, comprising trees, shrubs and grasses;
- floodplain comprises agricultural land use, predominately pasture; and
- livestock poaching evident in places along channel banks downstream of Proposed Scheme crossing site.

2.6.3 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 3' and has been **scoped in** for detailed impact and mitigation assessment.

Figure 32: Example photographs taken during field survey of Unnamed tributary of Moreton Brook 1

Example Photographs	
	
Downstream view taken from SK 05868 21663	Upstream view taken from SK 05218 21346

Example Photographs



Upstream view taken from SK 05171 21307



Downstream view taken from SK 05003 21234

Unnamed tributary of Moreton Brook 2

- 2.6.4 The 'Unnamed tributary of Moreton Brook 2' watercourse flows from east of Lea Hall Farm (at SK0515622499) to the confluence with Moreton Brook (at SK0423121389).
- 2.6.5 Summary of baseline desk study and field survey findings:
- Q95 flow estimate for the watercourse at the location of the Proposed Scheme is $\leq 0.001\text{m}^3/\text{s}$;
 - approximately 1m wide channel, appears to have been extensively modified (straightened) historically for agricultural / land drainage purposes;
 - shallow ponded water observed during field survey within channel downstream of Proposed Scheme crossing site, but no perceivable flow;
 - silt substrate;
 - poor riverine habitat potential for fish and aquatic invertebrates; and
 - limited riparian zone vegetation present along much of watercourse, comprising predominately grasses (but heavily vegetated channel banks observed in places downstream of Proposed Scheme crossing site).
- 2.6.6 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 2' and has been **scoped out** of detailed impact and mitigation assessment.

Figure 33: Example photographs taken during field survey of Unnamed tributary of Moreton Brook 2

Example Photographs	
	
Downstream view (channel towards left of image) taken from SK 05100 22415	Upstream view taken from SK 04197 21577

Unnamed tributary of Moreton Brook 3

- 2.6.7 The 'Unnamed tributary of Moreton Brook 3' watercourse flows from west of Lea Hall Farm (at SK0430122751) to the confluence with Moreton Brook (at SK0364122051).
- 2.6.8 Summary of baseline desk study findings:
- Q95 flow estimate for the watercourse at the location of the Proposed Scheme is $\leq 0.001\text{m}^3/\text{s}$;
 - watercourse appears to potentially comprise an artificial agricultural drainage network (following field boundaries), or to have been extensively modified (straightened) historically for agricultural / land drainage purposes;
 - limited riparian zone vegetation apparent along much of watercourse, comprising predominately grasses; and
 - floodplain comprises agricultural land use, mixture of pasture and arable.
- 2.6.9 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 2' and has been **scoped out** of detailed impact and mitigation assessment.

Moreton Brook

- 2.6.10 The Moreton Brook flows from north-west of Drointon (at SK0132627110) to the confluence with the River Trent (at SK0496118673).
- 2.6.11 Summary of baseline desk study and field survey findings:
- Q95 flow estimate for the watercourse at the location of the Proposed Scheme is $\leq 0.012\text{m}^3/\text{s}$;
 - approximate 2m wide channel;

- well-defined morphological flow types, predominately comprising runs and glides with some pools (typical low flow depth of 0.3m);
- few well-developed fluvial geomorphological features such as bars or active bank erosion;
- coarse substrates, predominately comprising gravel-sized sediments;
- good riverine habitat for fish, aquatic invertebrates and macrophytes (fish observed during field survey and invertebrate sampling at site indicated a diverse assemblage);
- narrow but well-developed riparian zone, comprising trees, shrub and grasses; and
- floodplain comprises agricultural land use, mixture of pasture and arable.

2.6.12 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 4' and has been **scoped in** for detailed impact and mitigation assessment.

Figure 34: Example photographs taken during field survey of Moreton Brook

Example Photographs	
	
Downstream view taken from SK 03308 22686	Upstream view taken from SK 03688 21990

Example Photographs	
	
Downstream view taken from SK 03744 21888	Downstream view taken from SK 03882 21743

Unnamed tributary of Moreton Brook 4

- 2.6.13 The 'Unnamed tributary of Moreton Brook 4' watercourse flows from south of Moreton House (at SK0238522724) to the confluence with Moreton Brook (at SK0330622690).
- 2.6.14 Summary of baseline desk study and field survey findings:
- Q95 flow estimate for the watercourse at the location of the Proposed Scheme is $\leq 0.001\text{m}^3/\text{s}$;
 - approximately 1m wide, poorly defined channel, observed to be dry during field survey;
 - channel overgrown with grasses;
 - no riverine habitat for fish, aquatic invertebrates or macrophytes observed at site;
 - limited riparian zone vegetation along much of watercourse, comprising predominately grasses and shrubs; and
 - floodplain comprises agricultural land use, predominately pasture.
- 2.6.15 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 2' and has been **scoped out** of detailed impact and mitigation assessment.

Figure 35: Example photographs taken during field survey of Unnamed tributary of Moreton Brook 4

Example Photographs	
	
Downstream view taken from SK 02503 22719	Downstream view taken from SK 03099 22715

2.7 Trent from Tittensor to River Sow (GB104028053272)

Unnamed tributary of River Trent (T to RS) 1

- 2.7.1 The 'Unnamed tributary of River Trent 1' watercourse flows from north-east of Tithebarn Farm (at SK0165323413) to the confluence with River Trent (at SJ9944122707).
- 2.7.2 Summary of baseline desk study and field survey findings:
- Q95 flow estimate for the watercourse at the location of the Proposed Scheme is $\leq 0.002 \text{ m}^3/\text{s}$;
 - approximately 0.5m wide channel at and upstream of Proposed Crossing site;
 - isolated areas of ponded water only observed during survey at Proposed Scheme crossing site (channel observed to be dry approximately 110m upstream);
 - silt substrates, with channel heavily vegetated along banks and bed (clogging channel);
 - poor riverine habitat potential for fish or aquatic invertebrates;
 - some coarse substrates evident downstream of Proposed Scheme crossing site, with predominantly shallow glide flow types and some discrete fluvial geomorphological features;

- narrow riparian zone, predominately comprising grasses and shrubs (heavily vegetated channel banks and bed upstream of Proposed Scheme crossing site, clogging channel); and
- floodplain comprises agricultural land use (mixture of pasture and arable), urbanised along lower reaches of watercourse downstream of Proposed Scheme crossing site.

2.7.3 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 3' and has been **scoped in** for detailed impact and mitigation assessment.

Figure 36: Example photographs taken during field survey of Unnamed tributary of River Trent (T to RS) 1

Example Photographs

		
Upstream view taken from SK 00992 23537	Upstream view taken from SK 00194 23335	Upstream view taken from SK 00039 23290

River Trent

2.7.4 Within the water body extent, the River Trent watercourse flows from the south of Tittensor (at SJ8756337736) to the confluence with the River Sow (at SJ9949622601).

2.7.5 Summary of baseline desk study findings:

- Environment Agency Main River;
- Q95 flow estimate for the watercourse at the location of the Proposed Scheme is 2.14 m³/s (gauge data at Great Haywood);
- watercourse likely modified historically for agricultural / land drainage purposes;
- historical OS mapping suggests watercourse has also undergone meander cut-offs approximately 100m upstream (between 1973-2003) and 300m downstream (between 1945-1954) of Proposed Crossing site (palaeochannel evident on aerial imagery at downstream location);

- limited riparian vegetation along channel at Proposed Scheme crossing site, comprising predominately grasses; and
- floodplain comprises agricultural land use, predominately pasture.

2.7.6 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 4' and has been **scoped in** for detailed impact and mitigation assessment.

Unnamed tributary of River Trent (T to RS) 2

2.7.7 The 'Unnamed tributary of River Trent 2' watercourse flows from Hoomill Lane (at SJ9928023856) to the confluence with River Trent (at SJ9949923646).

2.7.8 Summary of baseline desk study findings:

- Q95 flow estimate for the watercourse at the location of the Proposed Scheme is 0.000m³/s;
- channel appears to comprise an artificial agricultural drainage network;
- suspected ponded water only;
- limited riparian vegetation along channel at Proposed Scheme crossing site; and
- floodplain comprises agricultural land use, predominately pasture.

2.7.9 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 2' and has been **scoped out** of detailed impact and mitigation assessment.

Unnamed tributary of River Trent (T to RS) 3

2.7.10 The 'Unnamed tributary of River Trent 3' watercourse runs between the south-western corner of Lionlodge Covert (at SJ9838923835) and Lion Lodges (at SJ9893923985).

2.7.11 Baseline desk study findings:

- Q95 flow estimate for the watercourse at the location of the Proposed Scheme is 0.000m³/s;
- channel appears to comprise a series of isolated, artificial drainage ditches located within Lionlodge Covert (connectivity with River Trent unclear from OS mapping); and
- historical mapping suggests the channels have been in place since 1888.

2.7.12 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 2' and has been **scoped out** of detailed impact and mitigation assessment.

Unnamed tributary of River Trent (T to RS) 4

- 2.7.13 The 'Unnamed tributary of River Trent 4' watercourse flows from south of Marston (at SJ9272827531) to confluence with the 'Unnamed tributary of River Trent 5' watercourse (at SJ9331628352).
- 2.7.14 Summary of baseline desk study and field survey findings:
- Q95 flow estimate for the watercourse at the location of the Proposed Scheme is 0.000m³/s;
 - no watercourse observed to be present at site during field survey;
 - historical OS mapping between 1888 and 1968 occasionally indicate the presence of a small watercourse / drainage channel at this location, however no watercourse is shown between 2003 and 2013;
 - artificial drainage ditch present alongside road and through agricultural fields downstream of Proposed Scheme crossing site; and
 - floodplain comprises agricultural land use, predominately pasture, with some urban development along Marston Lane.
- 2.7.15 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 1' and has been **scoped out** of detailed impact and mitigation assessment.

Figure 37: Example photographs taken during field survey of Unnamed tributary of River Trent (T to RS) 4 – watercourse downstream of site

Example Photographs



Upstream view taken from SJ 92726 27552 (no watercourse present at location of Proposed Scheme)



Downstream view taken from SJ 93057 27692 (drainage ditch downstream of Proposed Scheme)

Unnamed tributary of River Trent (T to RS) 5

- 2.7.16 The 'Unnamed tributary of River Trent 5' watercourse flows from east of Yarlet (at SJ9115828828) to the confluence with River Trent (at SJ9414129049).
- 2.7.17 Summary of baseline desk study findings:
- Q95 flow estimate for the watercourse at the location of the Proposed Scheme is 0.000m³/s;

- watercourse appears to comprise a small channel that has been extensive modified (straightened) for agricultural / land drainage purposes;
- Proposed Scheme crossing site located at far upstream extent of watercourse;
- heavily vegetated channel at Proposed Scheme crossing site (preventing access for survey), limited riparian vegetation apparent along much of watercourse downstream, predominately comprising grasses and shrubs; and
- floodplain comprises agricultural land use, predominately pasture.

2.7.18 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 2' and has been **scoped out** of detailed impact and mitigation assessment.

Unnamed tributary of River Trent (T to RS) 6

2.7.19 The 'Unnamed tributary of River Trent 6' watercourse flows from west of Pirehill Cottage Farm (at SJ8983830653) to the confluence with River Trent (at SJ9172431570).

2.7.20 Summary of baseline desk study and field survey findings:

- Q95 flow estimate for the watercourse at the location of the Proposed Scheme is $\leq 0.001\text{m}^3/\text{s}$;
- Proposed Scheme crosses watercourse at its far upstream extent;
- approximately 0.5m wide channel at Proposed Scheme crossing site, modified (straightened and deepened) for agricultural / land drainage purposes;
- shallow, ponded water observed within channel during field survey, with no perceivable flow;
- predominately silt substrate, with some coarse sediments evident in places downstream of Proposed Scheme crossing site;
- poor riverine habitat potential for fish and aquatic invertebrates;
- narrow riparian zone, comprising grasses, shrubs and trees (but channel banks heavily vegetated);
- floodplain comprises agricultural land use, predominately pasture;
- watercourse discharges into large pond downstream of Proposed Scheme crossing site, which is impounded by an earth embankment and approximately 1.5m wide concrete spillway structure at its downstream end;
- no outflow observed from pond during field survey, (impacting baseflow of watercourse downstream); and
- watercourse enters an approximately 340m long culvert further downstream of pond.

2.7.21 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 2' and has been **scoped out** of detailed impact and mitigation assessment.

Figure 38: Example photographs taken during field survey of Unnamed tributary of River Trent (T to RS) 6

Example Photographs	
	
Downstream view taken from SJ 89924 30686	Online pond downstream of Proposed Scheme, taken from SJ 89953 30763
	
Downstream view taken from SJ 90021 30819 (spillway outlet from online pond)	Downstream view taken from SJ 90087 30896 (downstream of online pond)

Unnamed tributary of River Trent (T to RS) 7

- 2.7.22 The 'Unnamed tributary of River Trent 7' watercourse flows from south of North Pirehill Farm (at SJ8960031000) to the Confluence with the 'Unnamed tributary of River Trent 6' watercourse (at SJ8993630903).
- 2.7.23 Summary of baseline desk study and field survey findings:
- Q95 flow estimate for the watercourse at the location of the Proposed Scheme is 0.000m³/s;
 - approximately 1m wide channel, comprising an artificial agricultural drainage ditch;
 - watercourse enters a 0.1m plastic pipe culvert at its downstream end (downstream of Proposed Scheme crossing site) discharging to Unnamed tributary of River Trent (T to RS) 6;
 - channel observed to be dry during field survey, with exception of an isolated area of shallow, ponded water at the inlet of the culvert;
 - Silt substrate;

- narrow riparian zone, predominately comprising grasses and shrubs (but heavily vegetated channel banks and bed); and
- floodplain comprises agricultural land use, predominately pasture.

2.7.24 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 2' and has been **scoped out** of detailed impact and mitigation assessment.

Figure 39: Example photographs taken during field survey of Unnamed tributary of River Trent (T to RS) 7

Example Photographs



Upstream view taken from SJ 89896 30923 (lower reach of watercourse culverted)



Downstream view taken from SJ 89936 30906

Filly Brook

2.7.25 The Filly Brook flows from east of Swynnerton Grange, alongside the M6, (at SJ8707434802) to the confluence with River Trent (at SJ8972533748).

2.7.26 Summary of baseline desk study and field survey findings:

- Q95 flow estimate for the watercourse at the location of the Proposed Scheme is $\leq 0.012 \text{ m}^3/\text{s}$;
- approximately 1.5-2m wide channel downstream of M6 motorway crossing, 0.8m wide along headwaters upstream;
- low flows observed during field survey, predominately comprising shallow and poorly defined glides and runs within intermittent ponded reaches (typically 0.1-0.3m deep);
- coarse sediments, predominately comprising coarse gravel and cobble sized sediments, overlain with fine sediment deposits;
- no well-developed fluvial geomorphological features observed at site;
- dense and overhanging riparian vegetation, comprising trees, shrub and grasses (channel obscured and heavily shaded in many places);
- poor riverine habitat potential for fish and aquatic invertebrates observed at upper and mid-reaches of watercourse (no access to lower reaches); and

- watercourse is currently culverted in numerous locations, including at the Proposed Scheme crossing site within an approximately 50m long concrete box culvert beneath the M6 motorway and an approximately 410m long and 1.2m diameter culvert immediately downstream of the M6.

2.7.27 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 4' and has been **scoped in** for detailed impact and mitigation assessment.

Figure 40: Example photographs taken during field survey of Filly Brook

Example Photographs	
	
Downstream view taken from SJ 87123 34338	Across channel view taken from SJ 87868 33139 (culvert beneath M6)
	
Upstream view taken from SJ 88293 33207	Downstream view taken from SJ 88421 33194

Unnamed tributary of Filly Brook 1

2.7.28 The 'Unnamed tributary of Filly Brook 1' watercourse flows from north of Pool House Farm, alongside Yarnfield Lane (at SJ8799033656) to the confluence with Filly Brook (SJ8824433299).

2.7.29 Summary of baseline desk study and field survey findings:

- Q95 flow estimate for the watercourse at the location of the Proposed Scheme is 0.000m³/s;
- approximately 0.5m wide channel, heavily incised/entrenched, appears to comprise an artificial agricultural drainage ditch;
- channel observed to be dry during field survey, with isolated areas of shallow, ponded water only around existing road culvert;
- silt substrate;
- limited riparian vegetation along much of watercourse, comprising predominately grasses and shrubs (with evidence of management for agriculture along right bank);
- floodplain comprises agricultural land use, predominately arable; and
- OS mapping indicates that watercourse may flow into a culvert at its downstream end (downstream of Proposed Scheme crossing site), prior to discharging to Filly Brook.

2.7.30 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 2' and has been **scoped out** of detailed impact and mitigation assessment.

Figure 41: Example photographs taken during field survey of Unnamed tributary of Filly Brook 1

Example Photographs	
	
Downstream view taken from SJ 87991 33651	Upstream view taken from SJ 87991 33651

Unnamed tributary of Filly Brook 2

2.7.31 The 'Unnamed tributary of Filly Brook 2' watercourse flows from north of Yarnfield Lane (at SJ8784034310) to the confluence with Filly Brook (at SJ8847633230).

2.7.32 Summary of baseline desk study and field survey findings:

- Q95 flow estimate for the watercourse at the location of the Proposed Scheme is $0.000\text{m}^3/\text{s}$;
- approximately 0.5m wide channel, heavily incised/entrenched, appears to have been extensively modified (straightened and deepened) historically for agricultural / land drainage purposes;
- limited, shallow flow observed during field survey, with no definable morphological flow types;
- predominately silt substrates, with some coarse sediments evident in places;
- limited riparian vegetation along much of watercourse, comprising predominately grasses and shrubs (with evidence of management for agriculture along left bank); and
- floodplain comprises agricultural land use, predominately arable.

2.7.33 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 2' and has been **scoped out** of detailed impact and mitigation assessment.

Figure 42: Example photographs taken during field survey of Unnamed tributary of Filly Brook 2

Example Photographs	
	
Upstream view taken from SJ 88147 33766	Across channel view taken from SJ 88161 33752

Unnamed tributary of River Trent (T to RS) 8

- 2.7.34 The 'Unnamed tributary of River Trent 8' watercourse flows from south-east of Long Compton Farm (at SJ8554836124) to South of Sandyford (at SJ8602736226).
- 2.7.35 Summary of baseline desk study and field survey findings:
- Q95 flow estimate for the watercourse at the location of the Proposed Scheme is $\leq 0.001\text{m}^3/\text{s}$;
 - approximately 1m wide channel, heavily modified for agricultural / land drainage purposes, including construction of two online ponds that impound flow (at Proposed Scheme crossing site);

- channel upstream and immediately downstream of ponds observed to be dry during survey and heavily vegetated with grasses, scrubs and trees;
- shallow, partially ponded low-flow observed within channel approximately 100m downstream of ponds (no well-defined morphological flow types) for approximately 70m reach, before watercourse enters culvert;
- no well-developed fluvial geomorphological features or processes observed;
- silt substrates;
- poor riverine habitat for fish and aquatic invertebrates;
- narrow riparian zone, comprising predominately grasses and shrubs with some trees (with density of vegetation reducing downstream of ponds); and
- floodplain comprises agricultural land use, mixture of arable and pasture.

2.7.36 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 2' and has been **scoped out** of detailed impact and mitigation assessment.

Figure 43: Example photographs taken during field survey of Unnamed tributary of River Trent (T to RS) 8

Example Photographs	
	
Downstream view taken from SJ 85546 36131	Upstream view taken from SJ 85613 36128
	
Online pond, taken from SJ 85737 36094	Downstream view taken from SJ 85875 36115

2.8 Trent and Mersey Canal, summit to Alrewas (GB70410142)

Trent and Mersey Canal

- 2.8.1 The Trent and Mersey Canal is crossed by the Proposed Scheme immediately north of the Great Haywood Marina (at SJ9961723655).
- 2.8.2 The watercourse was scoped in within the ecological baseline assessment for fish, but scoped out for ecological baseline assessment for invertebrates.
- 2.8.3 The watercourse has been defined as 'Category 5' and has been **scoped in** for detailed impact and mitigation assessment.

2.9 Sow- Doxey Brook to River Penk (GB104028046790)

Unnamed tributary of Kingston Brook 1

- 2.9.1 The 'Unnamed tributary of Kingston Brook 1' watercourse flows from east of Park Farm (at SJ9616825116) to Stafford Lodge (at SJ9529824728).
- 2.9.2 Summary of baseline desk study and field survey findings:
- Q95 flow estimate for the watercourse at the location of the Proposed Scheme is 0.000m³/s;
 - approximately 0.4m wide channel, appears to have been modified (straightened) historically for agricultural / land drainage purposes;
 - shallow, ponded water only observed during field survey along majority of survey reach;
 - predominately silt substrate, with some coarse sediments present in places;
 - no well-developed fluvial geomorphological features or active processes observed;
 - poor riverine habitat potential for fish and aquatic invertebrates;
 - upper reaches of watercourse located within wooded area known as Weetman's Plantation;
 - narrow riparian zone, comprising trees, shrubs and grasses (but well vegetated channel banks);
 - floodplain comprises agricultural land use, predominately pasture; and
 - watercourse a culvert downstream of the Proposed Scheme crossing site (outlet location unknown), and appears to be culverted for the majority of its mid and lower reaches.
- 2.9.3 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 2' and has been **scoped out** of detailed impact and mitigation assessment.

Figure 44: Example photographs taken during field survey of Unnamed tributary of Kingston Brook 1

Example Photographs	
	
Downstream view taken from SJ 96116 25064	Upstream view taken from SJ 95904 24877

Unnamed tributary of Kingston Brook 2

- 2.9.4 The 'Unnamed tributary of Kingston Brook 2' watercourse flows from south of Fiddlers Cottage (at SJ9606625977) to the confluence with Kingston Brook (at SJ9374324447).
- 2.9.5 Summary of baseline desk study and field survey findings:
- Q95 flow estimate for the watercourse at the location of the Proposed Scheme is $\leq 0.004 \text{ m}^3/\text{s}$;
 - upstream end of watercourse is impounded within two large ponds known as Hopton Pools;
 - approximately 0.5m wide channel downstream of ponds, poorly defined in places, appears to have been historically modified (straightened) for agricultural / land drainage purposes;
 - watercourse at Proposed Crossing site (downstream of ponds) observed to be dry during field survey, however channel was observed with shallow flow during reconnaissance site visit (February 2016) (baseflow partially regulated by invert level of outlet culverts to ponds upstream);
 - limited riparian zone vegetation at Proposed Scheme crossing site, comprising predominately grasses and shrubs (channel vegetated along bed);
 - floodplain comprises agricultural land use, predominately pasture; and
 - evidence of poaching of channel by livestock observed immediately upstream of the Proposed Scheme crossing site.
- 2.9.6 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 3' and has been **scoped in** for detailed impact and mitigation assessment.

Appendix WR-001-000

Figure 45: Example photographs taken during field survey of Unnamed tributary of Kingston Brook 2

Example Photographs	
	
Hopton Pools, taken from SJ 95076 25755	Upstream view taken from SJ 94783 25754 (dry channel)
	
Upstream view taken from SJ 94752 25762 (February 2016)	Downstream view taken from SJ 94634 25768

Unnamed tributary of Kingston Brook 3

- 2.9.7 The 'Unnamed tributary of Kingston Brook 3' watercourse flows from west of Lowerbridge Farm (at SJ9378526110) to the confluence with Kingston Brook (at SJ9337225548).
- 2.9.8 Summary of baseline desk study findings:
- Q95 flow estimate for the watercourse at the location of the Proposed Scheme is $\leq 0.001 \text{ m}^3/\text{s}$;
 - watercourse appears to comprise an artificial agricultural drainage ditch (potentially originally part of the drainage network associated with the adjacent discussed railway);

- suspected ponded flow only with no well-developed fluvial geomorphological features or active process;
- limited riparian vegetation present along watercourse, comprising predominately grasses and shrubs;
- floodplain comprises agricultural land use (pasture); and
- watercourse is potentially culverted beneath the MOD Stafford site downstream (however this is unconfirmed at this stage).

2.9.9 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 2' and has been **scoped out** of detailed impact and mitigation assessment.

2.10 Meece Brook from Source to Chatcull Brook (GB104028053080)

Unnamed tributary of Meece Brook 1

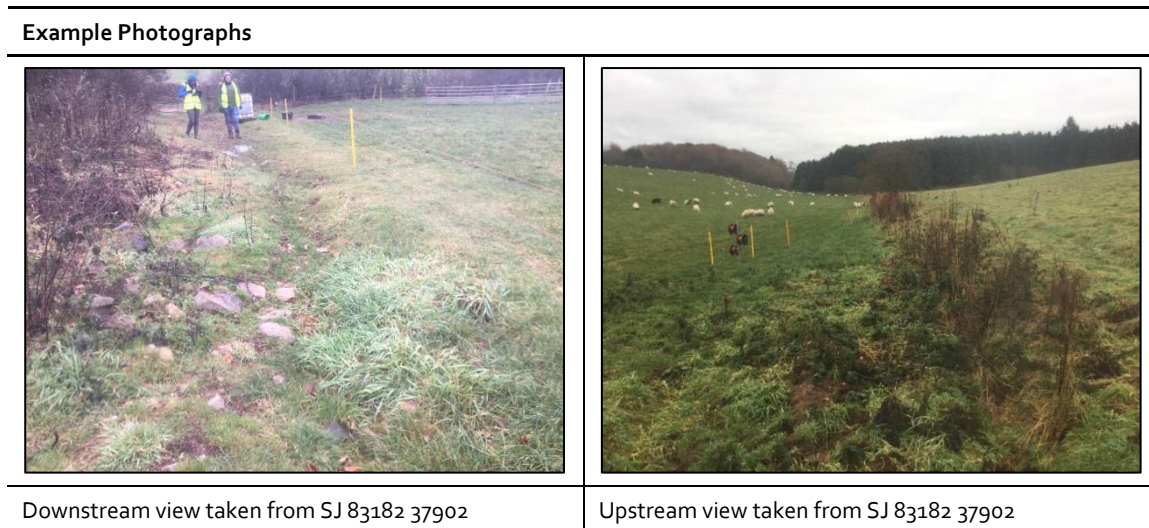
2.10.1 The 'Unnamed tributary of Meece Brook 1' watercourse flows from north east of Upper Hatton (at SJ8346537877) to an unnamed pond (at SJ8320937714).

2.10.2 Summary of baseline desk study and field survey findings:

- Q95 flow estimate for the watercourse at the location of the Proposed Scheme is 0.000m³/s;
- OS mapping suggest presence of artificial drainage ditch; however no watercourse observed to be present at site during field survey;
- evidence of wet ground at base of valley, potential surface water runoff flow path;
- no riverine habitat for fish or aquatic invertebrates; and
- flow path drains to pond feature within mall wooded area downstream of Proposed Scheme crossing site (appears no connectivity with Meece Brook).

2.10.3 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 1' (at WFD-MEE-T-01-02 and WFD-MEE-T-01-03) and 'Category 2' (at WFD-MEE-T-01-01) and has been **scoped out** of detailed impact and mitigation assessment.

Figure 46: Example photographs taken during field survey of Unnamed tributary of Meece Brook 1



Unnamed tributary of Meece Brook 2

- 2.10.4 The 'Unnamed tributary of Meece Brook 2' watercourse flows from north of Springpool Wood (at SJ8313041561) to the confluence with Meece Brook (at SJ8139239437).
- 2.10.5 Summary of baseline desk study and field survey findings:
- Q95 flow estimate for the watercourse at the location of the Proposed Scheme is $\leq 0.006 \text{ m}^3/\text{s}$;
 - approximately 0.75m wide channel, appears to have been extensively modified (straightened and deepened) historically for agricultural / land drainage purposes;
 - shallow low-flow observed during field survey, predominately comprising poorly defined runs and glides with some quasi-riffles in places;
 - predominantly sand and silt substrates, with some patches of fine gravels observed in places;
 - some discrete fluvial geomorphological features observed including small bars;
 - some localised, minor fluvial erosion evident in places along watercourse;
 - limited riparian vegetation along much of watercourse, predominately comprises grasses and shrubs (but channel banks heavily vegetated in some areas along surveyed reach); and
 - floodplain comprises agricultural land use (pasture).
- 2.10.6 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 3' and has been **scoped in** for detailed impact and mitigation assessment.

Figure 47: Example photographs taken during field survey of Unnamed tributary of Meece Brook 2

Example Photographs	
	
Downstream view taken from SJ 81960 40357	Across channel view taken from SJ 81920 40306
	
Downstream view taken from SJ 81735 39967	Downstream view taken from SJ 81592 39626

Meece Brook

- 2.10.7 With the water body extent, the Meece Brook flows from East of New Yew Tree Farm (at SJ8077543566) to the confluence with Chatcull Brook (at SJ8285733600).
- 2.10.8 Summary of baseline desk study findings:
- Environment Agency Main River;
 - Q95 flow estimate for the watercourse at the location of the Proposed Scheme is $\leq 0.021\text{m}^3/\text{s}$;
 - watercourse appears to have been modified (straightened) historically for agricultural / land drainage purposes;
 - historical maps indicate that significant planform change has occurred immediately upstream of the Proposed Scheme crossing site; and

- floodplain comprises agricultural land use, predominantly pasture, with areas of floodplain scrapes present immediately upstream of Proposed Scheme crossing site.

2.10.9 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 4' and has been **scoped in** for detailed impact and mitigation assessment.

2.11 Lea (GB112068055200)

Unnamed tributary of River Lea 1

2.11.1 The 'Unnamed tributary of River Lea 1' watercourse flows from North of Whitmore Heath (at SJ7961741567) to the confluence with the 'Unnamed Tributary of River Lea 3' watercourse (at SJ7905741289).

2.11.2 Summary of baseline desk study and field survey findings:

- Q95 flow estimate for the watercourse at the location of the Proposed Scheme is 0.000m³/s;
- small spring present at the source of watercourse, upstream of Proposed Scheme crossing site;
- approximately 0.4m wide, steep channel observed downstream of spring, with limited flow only observed during field survey;
- watercourse appears to enter a small pipe culvert at the Proposed Scheme crossing site immediately upstream of Snapehall Farm, before discharging to a small pond within farmyard of Snapehall Farm;
- watercourse appears to outlet from pond via another culvert passing beneath Snapehall Farm; and
- floodplain comprises predominately agricultural land use (pasture and farm buildings), with adjacent areas of woodland.

2.11.3 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 2' and has been **scoped out** of detailed impact and mitigation assessment.

Figure 48: Example photographs taken during field survey of Unnamed tributary of River Lea 1

Example Photographs	
	
Across channel view taken from SJ 79698 41538	Upstream view taken from SJ 79651 41568
	
Upstream view taken from SJ 79464 41418	Downstream view taken from SJ 79483 41403 (watercourse culverted)

Unnamed tributary of River Lea 2

- 2.11.4 The 'Unnamed tributary of River Lea 2' watercourse flows from North of Whitmore Wood (at SJ7910141876) to the confluence with the 'Unnamed Tributary of River Lea 3' watercourse (at SJ7884241611).
- 2.11.5 Summary of baseline desk study and field survey findings:
- Q95 flow estimate for the watercourse at the location of the Proposed Scheme is 0.000m³/s;
 - approximately 0.5m wide channel, comprising artificial drainage ditch running alongside farm access track;
 - shallow, ponded water only observed during field survey (no perceivable flow);
 - no definable morphological flow types, well-developed fluvial geomorphological features or active processes;
 - watercourse culverted beneath access track at Proposed Scheme crossing sites;
 - silt substrates;

- channel banks heavily poached by livestock along access track, high fine sediment input;
- channel bank tops vegetated with grasses, shrubs and some trees; and
- floodplain comprises agricultural land use (pasture).

2.11.6 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 2' and has been **scoped out** of detailed impact and mitigation assessment.

Figure 49: Example photographs taken during field survey of Unnamed tributary of River Lea 2



Unnamed tributary of River Lea 3

2.11.7 The 'Unnamed tributary of River Lea 3' watercourse flows from south east of Whitmore Heath (at SJ7925340780) to the confluence with the River Lea (at SJ7809742594).

2.11.8 Summary of baseline desk study and field survey findings:

- Q95 flow estimate for the watercourse at the location of the Proposed Scheme is $\leq 0.009 \text{ m}^3/\text{s}$;
- approximately 0.75m wide channel, comprising artificial agricultural drainage ditch running alongside existing WCML railway;
- predominately ponded low-flow observed during field survey, with some slow flowing glides evident in places;
- no well-developed fluvial geomorphological features or active processes;
- narrow riparian zone, but channel banks well vegetated with grass and shrubs (clogging channel in places);
- floodplain comprises agricultural land use (pasture); and
- watercourse drains to a culvert at its downstream end passing beneath the discussed railway and discharging to River Lea (watercourse not connected to WFD-LEA-T-04-01 as suggested from OS mapping).

- 2.11.9 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 3' and has been **scoped in** for detailed impact and mitigation assessment.

Figure 50: Example photographs taken during field survey of Unnamed tributary of River Lea 3

Example Photographs		
		
Downstream view taken from SJ 78241 42352	Downstream view taken from SJ 78119 42557	Downstream view taken from SJ 78098 42592 (watercourse culverted under railway)

Unnamed tributary of River Lea 4

- 2.11.10 The 'Unnamed tributary of River Lea 4' watercourse flows from south east of Whitmore Heath (at SJ7807942594) to the confluence with the River Lea (at SJ7798942623).
- 2.11.11 Summary of baseline desk study and field survey findings:
- Q95 flow estimate for the watercourse at the location of the Proposed Scheme is $\leq 0.009 \text{ m}^3/\text{s}$;
 - approximately 1.5m wide channel, comprising artificial agricultural drainage ditch running alongside existing disused railway;
 - ponded low-flow observed during field survey;
 - no well-developed fluvial geomorphological features or active processes;
 - aquatic vegetation present in places along channel;
 - limited riparian vegetation along watercourse due to grazing by livestock, but channel bank well vegetated with grass and shrubs alongside disused railway embankment;
 - floodplain comprises agricultural land use (pasture); and
 - watercourse drains to a culvert at its downstream end passing beneath the discussed railway and discharging to River Lea.

- 2.11.12 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 3' and has been **scoped in** for detailed impact and mitigation assessment.

Figure 51: Example photographs taken during field survey of Unnamed tributary of River Lea 4

Example Photographs		
		
Downstream view taken from SJ 78079 42595	Upstream view taken from SJ 78026 42602	Downstream view taken from SJ 78012 42589 (watercourse culverted under railway)

River Lea

- 2.11.13 The River Lea flows from west of Aston Cliff Farm (at SJ7520542295) to the confluence with Checkley Brook (at SJ7462945863).
- 2.11.14 Summary of baseline desk study and field survey findings:
- Environment Agency Main River;
 - Q95 flow estimate for the watercourse at the location of the Proposed Scheme is $\leq 0.052\text{m}^3/\text{s}$;
 - approximately 1-3m wide channel, appears to have been extensively modified (straightened, widened and deepened) historically for agricultural / land drainage purposes;
 - low-flows predominately comprise shallow runs and glides, with some discrete pools and ponded reaches (typically 0.1-0.3m deep);
 - some localised fluvial bank erosion;
 - some discrete fluvial geomorphological features including bars and berms;
 - evidence in places of little natural recovery from past realignment, through encroachment of marginal aquatic vegetation, re-establishment of flow sinuosity and early stages of pool and riffle development;
 - predominately coarse gravel substrates, overlain with fine sediment and sand deposits in places;

- riverine habitat with potential to support fish and aquatic invertebrates (moderate diversity of macroinvertebrate taxa identified during sampling);
- narrow riparian zone, predominately comprising grasses with some trees (stands of Himalayan Balsam observed along lower reaches of watercourse);
- floodplain comprises agricultural land use, predominately pasture; and
- watercourse upstream and downstream of Proposed Scheme crossing sites impacted by numerous existing morphological pressures, including road, railway and farm access crossing culverts.

2.11.15 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 4' and has been **scoped in** for detailed impact and mitigation assessment.

Figure 52: Example photographs taken during field survey of River Lea

Example Photographs



Downstream view taken from SJ 77973 43002



Upstream view taken from SJ 77807 43368



Upstream view taken from SJ 75040 45942



Upstream view taken from SJ 74809 45883

Example Photographs



Upstream view taken from SJ 74809 45883



Downstream view taken from SJ 74690 45882

Unnamed tributary of River Lea 5

2.11.16 The 'Unnamed tributary of River Lea 1' watercourse flows from west of New Yew Tree Farm (at SJ8004643331) to the confluence with the River Lea (at SJ7791743130).

2.11.17 Summary of baseline desk study and field survey findings:

- Q95 flow estimate for the watercourse at the location of the Proposed Scheme is $\leq 0.002 \text{ m}^3/\text{s}$;
- approximately 1m wide channel, appears to have been modified (straightened) historically for agricultural / land drainage purposes;
- mid-reaches of watercourse impounded within large pond feature near to Netherset Hey Farm (outflow controlled by raised, approximately 1.5m diameter pipe culvert set within earth embankment);
- downstream of impoundment, low-flow predominately comprise shallow runs and glides, with some discrete pools and ponded reaches towards downstream end of watercourse;
- some, localised fluvial erosion evident in places along watercourse, with some limited sinuosity recovery;
- some discrete fluvial geomorphological features present, including bars and berms;
- some marginal vegetation encroachment, particularly along lower reaches of watercourse (increasing ponding of flow);
- narrow riparian zone, comprising predominately grasses with some trees (but channel banks heavily grazed along lower reaches of watercourse with some evidence of localised poaching); and
- floodplain comprises agricultural land use (pasture).

- 2.11.18 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 3' and has been **scoped in** for detailed impact and mitigation assessment.

Figure 53: Example photographs taken during field survey of Unnamed tributary of River Lea 5

Example Photographs	
	
Wider landscape view taken from SJ 78621 43188	Upstream view taken from SJ 78384 43175
	
Downstream view taken from SJ 78189 43170	Downstream view taken from SJ 77933 43133

Unnamed tributary of River Lea 6

- 2.11.19 The 'Unnamed tributary of River Lea 6' watercourse flows from west of Beechfields (at SJ7574745222) to the confluence with the 'Unnamed tributary of River Lea 7' watercourse (at SJ7526145639).
- 2.11.20 Summary of baseline desk study and field survey findings:
- Q95 flow estimate for the watercourse at the location of the Proposed Scheme is $\leq 0.001\text{m}^3/\text{s}$;
 - approximately 0.5 wide channel, appears to have been modified (straightened) historically for agricultural / land drainage purposes;
 - upper reaches of watercourse are culverted for a significant length below agricultural land (no access to confirm upstream extent of culvert);

- shallow low-flow observed during field survey, predominantly comprising glides with some intermittent runs (but poorly defined morphological flow types);
- no well-developed geomorphological features;
- some localised, minor fluvial bank erosion in places;
- coarse gravel substrates, overlain with fine sediment and sand deposits in places;
- narrow riparian zone, comprising predominantly grasses and shrubs (but channel banks well-vegetated particularly along lower reaches);
- floodplain comprises agricultural land use (pasture); and
- watercourse joins with Unnamed tributary of River Lea 7, before entering a culvert to the confluence with River Lea.

2.11.21 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 3' and has been **scoped in** for detailed impact and mitigation assessment.

Figure 54: Example photographs taken during field survey Unnamed tributary of River Lea 6

Example Photographs



Upstream view taken from SJ 75309 45320 (watercourse culverted along upper reach)



Downstream view taken from SJ 75308 45373

Example Photographs



Downstream view taken from SJ 75285 45438



Upstream view taken from SJ 75259 45627

Unnamed tributary of River Lea 7

- 2.11.22 The 'Unnamed tributary of River Lea 7' watercourse flows from south of Beechfields (at SJ7565644087) to the confluence with the River Lea (at SJ7527445765).
- 2.11.23 Summary of baseline desk study and field survey findings:
- Q₉₅ flow estimate for the watercourse at the location of the Proposed Scheme is $\leq 0.001 \text{ m}^3/\text{s}$;
 - approximately 0.5 wide channel, appears to have been modified (straightened) historically along its lower reaches for agricultural / land drainage purposes;
 - mid-reaches of watercourse comprise a small, sinuous channel flow through Wrinehill Wood;
 - shallow low-flow observed during field survey, predominantly comprising runs (but poorly defined morphological flow types);
 - some discrete geomorphological features present along mid-reaches (upstream of the Proposed Scheme crossing site);
 - some localised, minor fluvial bank erosion in places (undercutting and tree root scour);
 - downstream of Wrinehill Wood, the lower reaches of the watercourse are heavily impacted by poaching by livestock (high fine sediment input) and the watercourse has been culverted within a 0.6m diameter pipe for approximately 125m;
 - predominately sand and silt substrates, with some gravel evidence within lower reaches; and

- the watercourse is culverted again within a 1.2m diameter pipe for approximately 130m at its far downstream end (downstream of the Proposed Scheme crossing site), between the confluence with Unnamed tributary of River Lea 6 and the River Lea.

2.11.24 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 3' and has been **scoped in** for detailed impact and mitigation assessment.

Figure 55: Example photographs taken during field survey of Unnamed tributary of River Lea 7

Example Photographs	
	
Downstream view taken from SJ 75079 45382	Downstream view taken from SJ 75106 45421
	
Across channel view taken from SJ 75204 45559	Downstream view taken from SJ 75236 45626

2.12 Checkley Brook – Upper (GB112068055230)

Checkley Brook

2.12.1 Within the water body extent, the Checkley Brook (upper) flows from Keele (at SJ8058945224) to confluence with the River Lea (at SJ7462445865).

2.12.2 Summary of baseline desk study and field survey findings:

- Environment Agency Main River;
- Q95 flow estimate for the watercourse at the location of the Proposed Scheme is $\leq 0.041 \text{ m}^3/\text{s}$;
- approximately 2-2.5m wide channel, incised, appears to have been modified (straightened) historically along its lower reaches for agricultural / land drainage purposes;
- predominately glides with intermittent short runs (typically 0.4m deep) and some discrete pools at meanders;
- active fluvial bank erosion (minor but extensive) along lower reaches, evidence of early phases of meander recovery;
- few well-developed geomorphological features such as bars or berms.
- silt substrates, with some clay sediments exposed along channel bank toes in places;
- riverine habitat with potential to support fish and aquatic invertebrate assemblages;
- narrow riparian zone, but channel banks well-vegetated with grasses, shrubs and trees along lower reaches (although left bank top heavily grazed in places); and
- floodplain comprises agricultural land use (pasture).

2.12.3 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 4' and has been **scoped in** for detailed impact and mitigation assessment.

Figure 56: Example photographs taken during field survey of Checkley Brook

Example Photographs



Downstream view taken from SJ 75035 46100



Upstream view taken from SJ 74938 45983

Example Photographs



Upstream view taken from SJ 74722 45936



Upstream view taken from SJ 74645 45873

2.13 Wistaston Brook (GB112068055280)

Unnamed tributary of Mere Gutter 1

- 2.13.1 The 'Unnamed tributary of Mere Gutter 1' watercourse is located immediately south of the disused quarry to the south west of Fog Cottages and the WCML (running between SJ7431647421 and SJ7444047477). The flow direction is unclear from the OS mapping.
- 2.13.2 Summary of baseline desk study findings:
- Q95 flow estimate for the watercourse at the location of the Proposed Scheme is $0.000\text{m}^3/\text{s}$;
 - watercourse appears to comprise an isolated, short and straight small artificial drainage ditch, located at the far upstream end the water body catchment (hydraulic connectivity with surrounding watercourses unknown);
 - watercourse is located approximately 15m south of a large existing pond situated within the adjacent disused sand and gravel quarry.
 - watercourse potentially comprises an artificial 'catch drain' created in association with the adjacent quarry in order to intercept surface runoff from the surrounding hillside; and
 - limited riparian zone vegetation apparent along channel, suspected channel banks predominately vegetated with grasses and shrubs.
- 2.13.3 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 2' and has been **scoped out** of detailed impact and mitigation assessment.

Unnamed tributary of Mere Gutter 2

- 2.13.4 The 'Unnamed tributary of Mere Gutter 2' watercourse flows from east of the disused quarry to the east of Fog Cottages Fog Cottages (at SJ7392747501) to immediately south of Den Lane (at SJ7375247744).
- 2.13.5 Baseline desk study findings:
- Q95 estimates could not be calculated (watercourse catchment area cannot be identified);
 - watercourse appears to comprise an isolated and small artificial agricultural drainage ditch located at the far upstream end the water body catchment (hydraulic connectivity with Unnamed tributary of Mere Gutter 3 located to the north of Den Lane not known);
 - limited riparian zone vegetation apparent along channel, suspected channel banks predominately vegetated with grasses and shrubs; and
 - floodplain comprises agricultural land use (pasture).
- 2.13.6 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 2' and has been **scoped out** of detailed impact and mitigation assessment.

Unnamed tributary of Mere Gutter 3

- 2.13.7 The 'Unnamed tributary of Mere Gutter 3' watercourse flows from north of Den Lane (at SJ7366248218) to the confluence with the 'Unnamed tributary of Mere Gutter 3' at (SJ7364348437).
- 2.13.8 Summary of baseline desk study findings:
- Q95 flow estimate for the watercourse at the location of the Proposed Scheme is 0.000m³/s;
 - watercourse appears to comprise a small headwater channel, likely modified (straightened) historically in places for agricultural / land drainage purposes;
 - OS mapping suggests that the watercourse is culverted beneath the existing WCML railway crossing;
 - 'Unnamed tributary of Mere Gutter 4' watercourse downstream (at approximately 450m downstream of existing WCML railway crossing) observed to be dry and overgrown with vegetation during reconnaissance site visit;
 - limited riparian zone vegetation apparent along channel, suspected channel banks predominately vegetated with grasses and shrubs (with some trees evident along reaches immediately upstream and downstream of railway crossing); and
 - floodplain comprises agricultural land use (pasture).

- 2.13.9 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 2' and has been **scoped out** of detailed impact and mitigation assessment.

Unnamed tributary of Mere Gutter 4

- 2.13.10 The 'Unnamed tributary of Mere Gutter 4' watercourse flows from north of Den Lane (at SJ7326148211) to the confluence with Mere Gutter (at SJ7394348887).

- 2.13.11 Baseline desk study and field survey findings:

- Q95 flow estimate for the watercourse at the location of the Proposed Scheme is $\leq 0.001 \text{ m}^3/\text{s}$;
- watercourse appears to comprise a small headwater channel, likely modified (straightened) historically in places for agricultural / land drainage purposes;
- OS mapping suggests that the watercourse is culverted beneath the existing WCML railway crossing;
- watercourse at approximately 450m downstream of existing WCML railway crossing observed to be dry and overgrown with vegetation during reconnaissance site visit;
- limited riparian zone vegetation apparent along channel, suspected channel banks predominately vegetated with grasses and shrubs (with some trees evident along reaches immediately upstream and downstream of railway crossing); and
- floodplain comprises agricultural land use, predominately pasture.

- 2.13.12 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 2' and has been **scoped out** of detailed impact and mitigation assessment.

Figure 57: Example photographs taken during field survey of Unnamed tributary of Mere Gutter 4

Example Photographs



Upstream view taken from SJ 73942 48770



Downstream view taken from SJ 73942 48770

Unnamed tributary of Mere Gutter 5

- 2.13.13 The 'Unnamed tributary of Mere Gutter 5' watercourse flows from north of Half Moon Farm (at SJ7323149416) to the confluence with Mere Gutter (at SJ7238548986).
- 2.13.14 Summary of baseline desk study and field survey findings:
- Q95 flow estimate for the watercourse at the location of the Proposed Scheme is $\leq 0.001\text{m}^3/\text{s}$;
 - approximately 0.2-0.3m wide, poorly defined headwater channel, appears to have been modified (straightened or artificially extended) historically in places for agricultural / land drainage purposes;
 - shallow, ponded water observed within the channel along upper reaches of watercourse during field survey (no perceivable flow);
 - no fluvial geomorphological features or active processes observed;
 - silt substrate;
 - poor riverine habitat potential for fish;
 - watercourse is culverted beneath the existing WCML railway line downstream of the Proposed Scheme crossing site (but no evidence of channel found until approximately 240m downstream of railway culvert, where the channel was observed to be dry and overgrown with vegetation);
 - some aquatic vegetation within the ponded sections of the channel;
 - limited riparian zone vegetation, comprising grasses and some shrubs only; and
 - floodplain comprises agricultural land use, predominately rough pasture.
- 2.13.15 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 2' and has been **scoped out** of detailed impact and mitigation assessment.

Figure 58: Example photographs taken during field survey of Unnamed tributary of Mere Gutter 5

Example Photographs	
	
Upstream view taken from SJ 72919 49224	Upstream view taken from SJ 72960 49239

Unnamed tributary of Mere Gutter 6

- 2.13.16 The 'Unnamed tributary of Mere Gutter 6' watercourse flows from Cracow Moss (at SJ7502747553) to the confluence with Mere Gutter (at SJ7447448278).
- 2.13.17 Summary of baseline desk study findings:
- Q95 flow estimate for the watercourse at the location of the Proposed Scheme is $0.001\text{m}^3/\text{s}$;
 - watercourse comprises a network of artificial drainage ditches that appear to have been created historically for agricultural / land drainage purposes (including the 'CO-OP main drain' which runs to the west of the adjacent Betley Mere²²);
 - a number of these drainage ditches are suspected to be spring fed;
 - floodplain comprises a mixture of wetland (low-lying marshland and wet fen grassland), agricultural land use (predominately rough pasture) and some areas of woodland; and
 - the area immediately to the east and north, including the downstream extent of the watercourse; falls within the Betley Mere SSSI site²³.
- 2.13.18 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 3' and has been **scoped in** for detailed impact and mitigation assessment.

²² Environment Agency (2015), *Betley Mere Diffuse Water Pollution Plan, version 4*

²³ Natural England (2017), *Designated Sites View, Betley Mere SSSI*, <https://designatedsites.naturalengland.org.uk/SiteDetail.aspx?SiteCode=s1002384>

Mere Gutter (upstream extent of Wistaston Brook)

- 2.13.19 The Mere Gutter (Wistaston Brook) flows from Betley Mere (at SJ7477548003) to the confluence with Valley Brook (at SJ6754555139). The mid and lower reaches of the watercourse are also referred to locally as the Basford Brook (between Newcastle Road and Crewe Railway Station) and Gresty Brook (between Crewe Railway Station and Wistaston), respectively.
- 2.13.20 Summary of baseline desk study findings:
- Q95 flow estimate for the watercourse at the location of the Proposed Scheme is $0.016\text{m}^3/\text{s}$;
 - approximately 600m downstream of Betley Mere the watercourse appears to have been modified (straightened) historically in places for agricultural / land drainage purposes;
 - riparian zone vegetation along upper reaches of channel immediately downstream of Betley Mere predominately comprises grasses and shrubs (with a small area of wet woodland evident at the far upstream end of the watercourse, around the outflow from Betley Mere);
 - floodplain comprises a mixture of wetland (low-lying marshland and wet fen grassland), agricultural land use (predominately rough pasture) and some areas of woodland; and
 - the upper reaches of the watercourses, within the impacted area, fall within the Betley Mere SSSI site.
- 2.13.21 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 4' and has been **scoped in** for detailed impact and mitigation assessment.

Figure 59: Example photographs taken during field survey of Mere Gutter (upstream extent of Wistaston Brook)

Example Photographs



Downstream view taken from SJ 73638 49238



Upstream view taken from SJ 73663 49207

Unnamed tributary of Mere Gutter 7

- 2.13.22 The 'Unnamed tributary of Mere Gutter 7' watercourse flows from north of Chorlton Bank Farm (at SJ7255851353) to the confluence with Mere Gutter (at SJ7269351726).
- 2.13.23 Summary of baseline desk study findings:
- Q95 flow estimate for the watercourse at the location of the Proposed Scheme is 0.000m³/s;
 - watercourse appears to comprise either a short artificial agricultural drainage ditch or a small headwater channel that has been modified (straightened) historically for agricultural / land drainage purposes;
 - limited riparian zone vegetation apparent along channel, suspected channel banks predominately vegetated with grasses and shrubs (with a wooded area evident at the far downstream end of the watercourse, at the confluence with Mere Gutter / Basford Brook); and
 - floodplain comprises agricultural land use, mixture of arable and pasture.
- 2.13.24 Based on the evidence from the baseline assessment the watercourse has been defined as 'Category 2' and has been **scoped out** of detailed impact and mitigation assessment.

2.14 Betley Mere (GB31234330)

- 2.14.1 The Betley Mere water body is located immediately south-west of Betley (at SJ7486547970).
- 2.14.2 Betley Mere forms part of the Betley Mere SSSI²³ and RAMSAR²⁴ site and comprises a shallow (average depth of approximately 0.7m; maximum depth of approximately 1.8m) mere located within glacial deposits at the base of a broad, shallow, north-south trending valley, bound on three sides by extensive peat deposits. The mere covers an area of approximately 9.3ha and receives water mainly from two inflowing streams on its eastern side as well as from a network of artificial drainage ditched from Cracow Moss to the south west (along with a contribution of groundwater)²⁵.
- 2.14.3 The main outflow from the mere is to Mere Gutter to the north, which forms the upstream extent of the Wistaston Brook WFD surface water body.
- 2.14.4 The mere is surrounded almost completely by a hydrosere fringe of emergent vegetation, made up of dense wet reedbeds with a narrow outer band of bulrush (*Typha latifolia*). On the west and north margins, the reedbeds are largely surrounded by wet woodland, with a narrow zone of tall, herbaceous fen. The mere is adjoined by peatland and the surrounding catchment area comprises arable and semi-improved pasture for sheep and some cattle with pockets of neutral grassland and woodland.
- 2.14.5 Water quality in the mere is currently poor, with high sediment and nutrient inputs²³.

²⁴ Natural England (2017), *Designated Sites View, Midland Meres & Mosses – Phase 1 Ramsar*, <https://designatedsites.naturalengland.org.uk/SiteGeneralDetail.aspx?SiteCode=UK11043>.

²⁵ Environment Agency (2015), *Betley Mere Diffuse Water Pollution Plan, Version 4*

- 2.14.6 The water body has been **scoped in** for detailed impact and mitigation assessment.

Annex D: Groundwater Baseline

1 Groundwater bodies

- 1.1.1 The WFD groundwater bodies crossed by or within 1km of the Proposed Scheme have been summarised in Section 5 (main report).
- 1.1.2 A total of six groundwater bodies are crossed by the Proposed Scheme. Three of these water bodies are located within the Humber RBD and three are located within the North West RBD.
- 1.1.3 Two additional groundwater bodies are within 1 km of the route of the Proposed Scheme, both of which are within the Humber RBD.
- 1.1.4 The locations of each of the groundwater bodies are shown in Figure 60 - Figure 63.

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Figure 6o: WFD groundwater bodies crossed by the Proposed Scheme (Part 1)

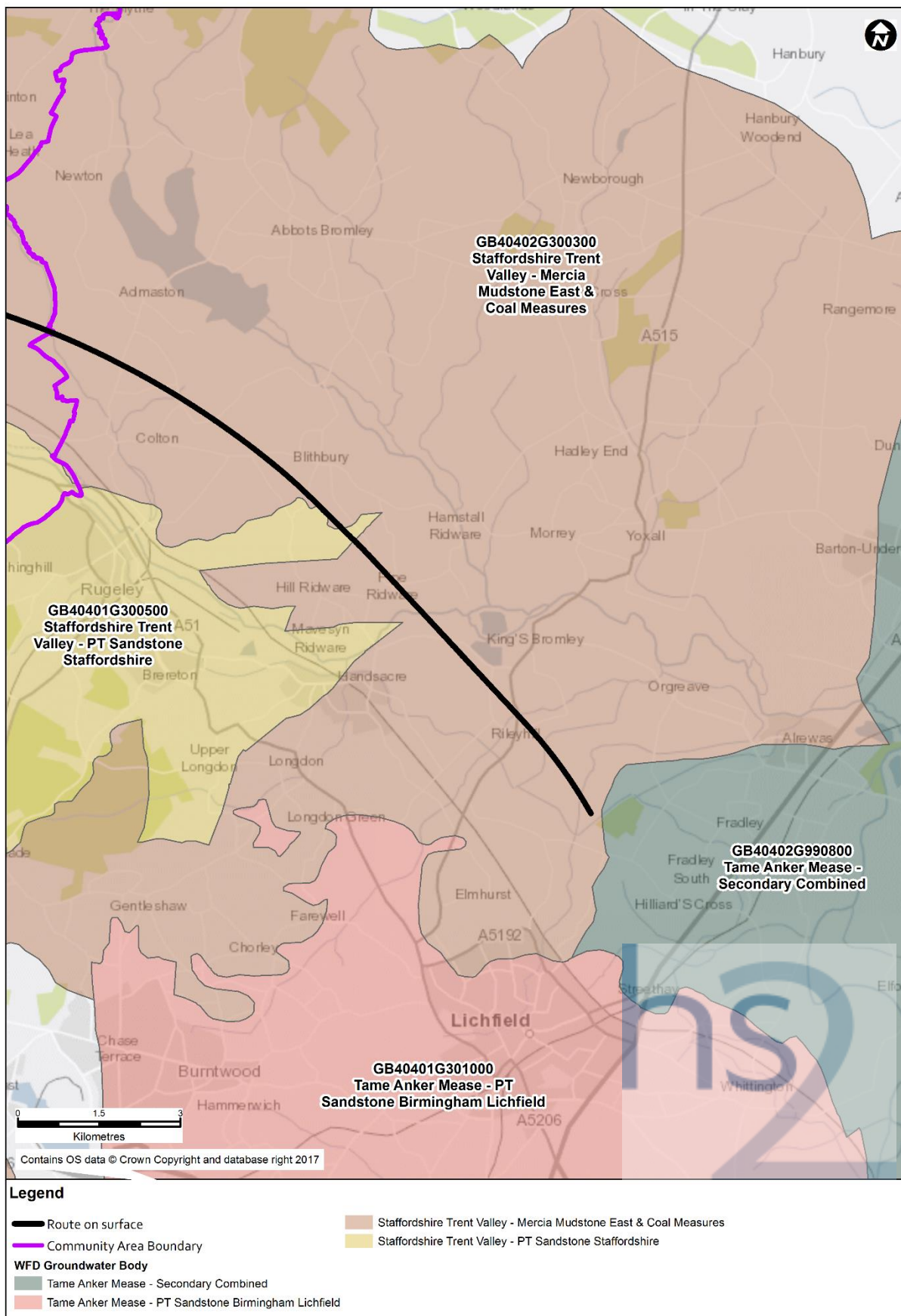


Figure 61: WFD groundwater bodies crossed by the Proposed Scheme (Part 2)

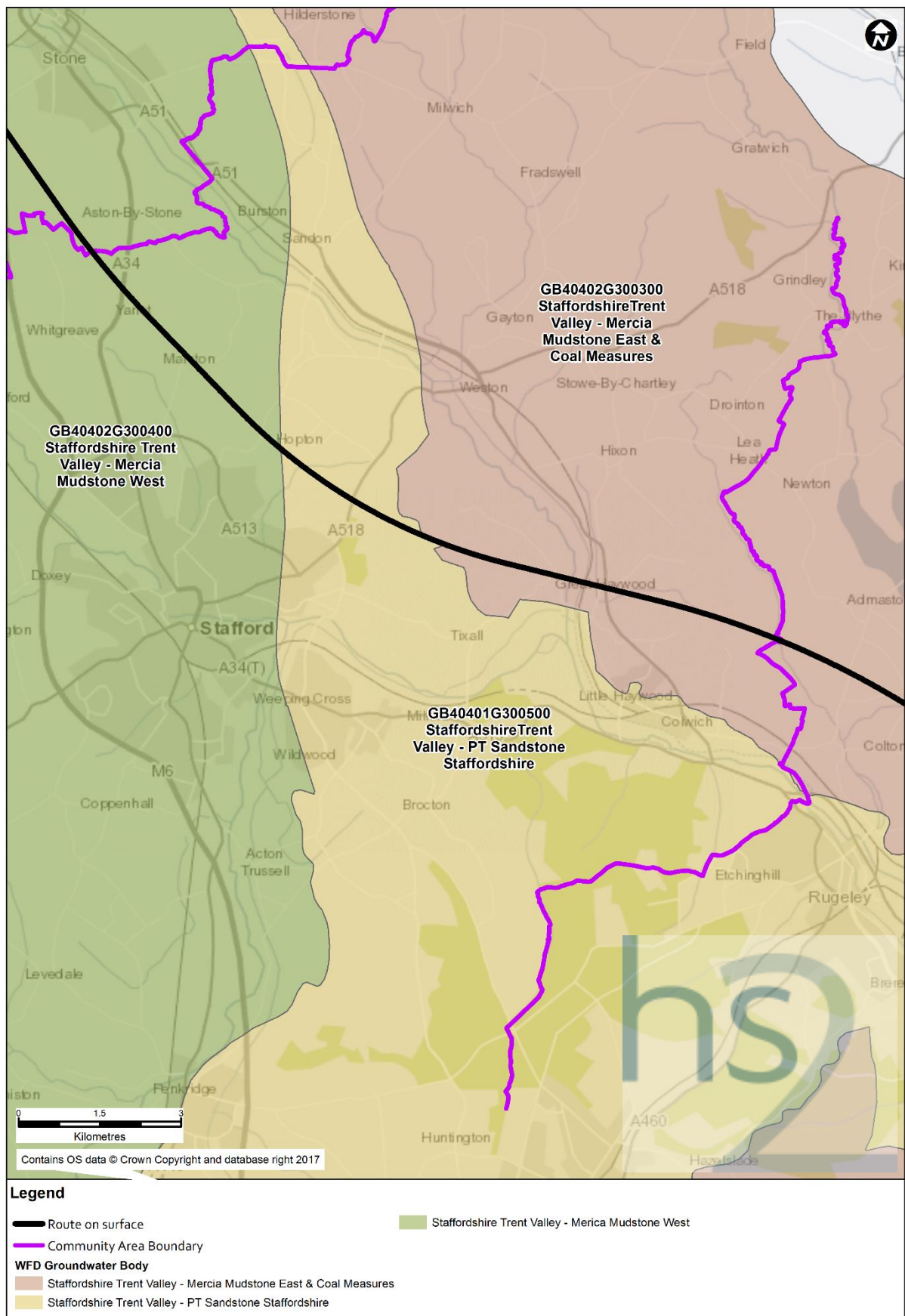
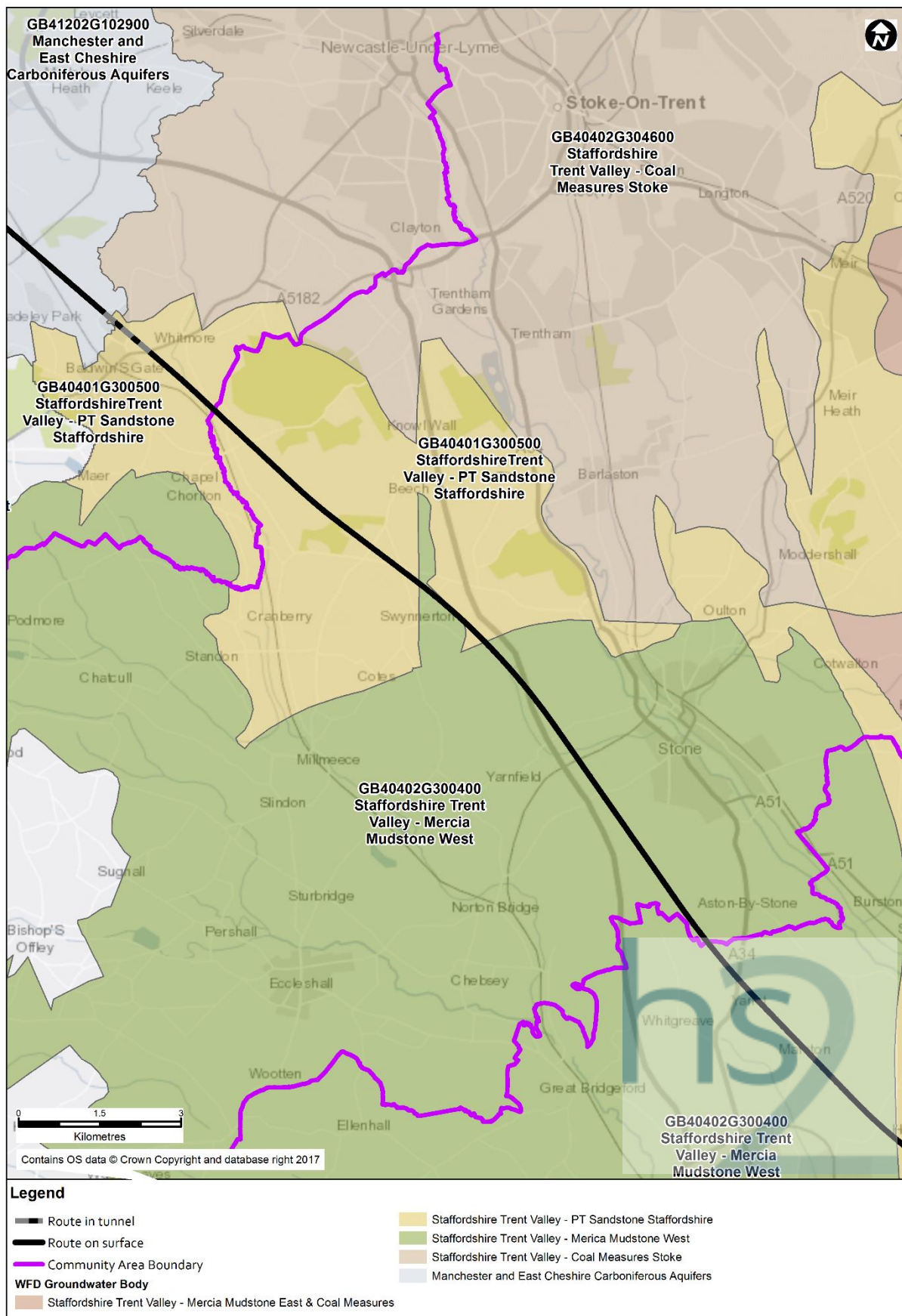
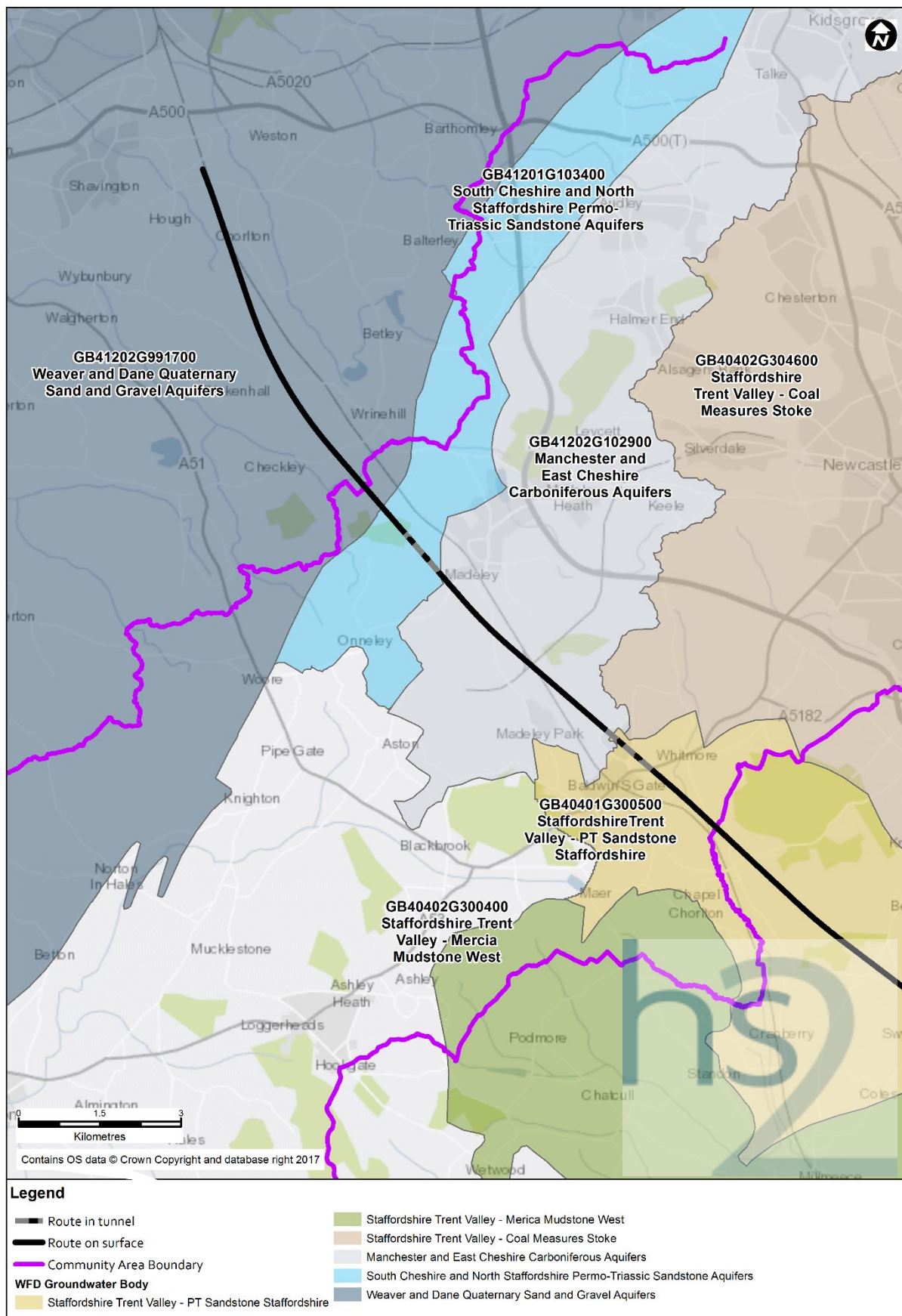


Figure 62: WFD groundwater bodies crossed by the Proposed Scheme (Part 3)



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Figure 63: WFD groundwater bodies crossed by the Proposed Scheme (Part 4)



2 Groundwater body characterisation and receptors

- 2.1.1 All groundwater bodies which are crossed by the Proposed Scheme have been scoped into the assessment.
- 2.1.2 The current WFD status of groundwater bodies is primarily based on Environment Agency data from groundwater level and groundwater quality monitoring. Environment Agency monitoring is undertaken at a regional scale, however, and therefore additional information has also been reviewed in order to provide insight into the baseline conditions of aquifers within the local scale of the Proposed Scheme.
- 2.1.3 Whilst Environment Agency monitoring sites can be used to characterise the groundwater body, these are not receptors in their own right.
- 2.1.4 Other features, such as groundwater abstraction sites, springs, GWDTE, or surface water courses that receive groundwater baseflow, can be used to characterise the groundwater body and are also receptors to potential Proposed Scheme impacts. These have been assessed in the relevant Volume 2, Community area reports and Volume 5, Appendix WR-002, Water resources assessment reports and are considered, where relevant, in this assessment. Table 36 provides a summary of those features that have been reviewed within each of the relevant groundwater bodies.
- 2.1.5 Features which have potential to be springs have been identified from OS maps. Where possible these have been surveyed to confirm if they are true expressions of groundwater or are related to land drainage. Where the latter has been proven, these features have been removed from the assessment. Where surveys have not been possible, the potential springs have been included as potential sites for future groundwater characterisation and monitoring, but may not be relevant if future surveys prove otherwise.
- 2.1.6 A standard proforma for collecting feature survey information was used as described in Annex B2.3.
- 2.1.7 Groundwater monitoring borehole data has been provided by the Environment Agency. Maximum groundwater levels from the data provided have been regarded as baseline levels, to ensure a precautionary assessment of dewatering or abstraction impacts.

Table 36: Summary of groundwater body characterisation features and receptors potentially impacted by Proposed Scheme (with reference to relevant WFD groundwater body)

WFD Groundwater Waterbody (ID)	Characterisation Feature Type	EIA Receptor (Y/N)	NGR	WFD Assessment Reference ID	Receptor / Feature Name (where referenced in Volume 5: Appendix WR-002, water resources assessment reports)	Feature Details
Tame Anker Mease - Secondary Combined (GB40402G990800)	No features to assess					
Staffordshire Trent Valley - Mercia Mudstone East and Coal Measures (GB40402G300300)	Marsh	N	SK10621697	M_o	Marshland, located to the north of Little Spinney	55m north-east of the route (35m north-east of construction boundary. Survey shows a 200m ² area of marshland, on boundary between a bog and agricultural field.
	Spring	Y	SK08381824	S_15*	Spring, Hill Ridware	710m south-west of the route (515m south-west of the construction boundary). Not surveyed. The route near the 'issue' is mainly Pipe Ridware embankment. Blithbury South Cutting is approximately 700m away.
	River Trent	Y	-	WFD-TMT* (part-surveyed by surface water)	River Trent from Moreton Brook to River Tame (WFD surface water body)	Although no specific information is available, the proximity of the permeable superficial deposits underlying the River Trent suggests that these deposits are likely to be in hydraulic connection with these surface watercourses and provide a component of baseflow, particularly during dryer periods.
	Bourne-Bilson Brook	Y	-	WFD-BRN	Bourne-Bilson Brook Catchment (tributary of the River Trent) (WFD surface water body)	Although no specific information is available, the proximity of the permeable superficial deposits underlying the Bourne Brook suggests that these deposits are likely to be in hydraulic connection with these surface watercourses and provide a component of baseflow, particularly during dryer periods.

WFD Groundwater Waterbody (ID)	Characterisation Feature Type	EIA Receptor (Y/N)	NGR	WFD Assessment Reference ID	Receptor / Feature Name (where referenced in Volume 5: Appendix WR-002, water resources assessment reports)	Feature Details
	Pyford Brook	Y	-	WFD-PYB	Pyford Brook Catchment (tributary of the River Trent) (WFD surface water body)	Although no specific information is available, the proximity of the permeable superficial deposits underlying the Pyford Brook suggests that these deposits are likely to be in hydraulic connection with these surface watercourses and provide a component of baseflow, particularly during dryer periods.
	Spring	Y	SK07611995	S_61*	Spring near Blithbury West	Under the route of the Proposed Scheme. Not surveyed. This 'issue' is directly under Blithbury Central cutting.
	Spring	Y	SK07442060	S_25*	Spring, Blithbury Bank	370m north-west of the route, in the construction boundary. Not surveyed. This 'issue' is within the construction boundary for the Hadley Gate Lane diversion. Works in this area generally above ground.
	Spring	Y	SK06501968	S_11*	Spring, Marlott Spinney	900m south-west of the route of the Proposed Scheme (590m west of the construction boundary). Not surveyed. This 'issue' is 900m down gradient of Blithbury Central cutting. Nearby construction works are for Rugeley overhead power line.
	Spring	Y	SK06052179	S_51*	Spring, Park Barn Farm	550m north-east of the route of the Proposed Scheme (450m north-east of the construction boundary). Not surveyed. This 'issue' is within the construction boundary for the Hadley Gate Lane diversion. Works in this area generally above ground.
	Licenced Abstraction	Y	SK04802276	SWWM_10*	Lea Hall Farm, 03/28/05/0046	700m north of the route of the Proposed Scheme (75m east of the construction boundary. General farming and domestic

WFD Groundwater Waterbody (ID)	Characterisation Feature Type	EIA Receptor (Y/N)	NGR	WFD Assessment Reference ID	Receptor / Feature Name (where referenced in Volume 5: Appendix WR-002, water resources assessment reports)	Feature Details
						purpose.
	Spring	Y	SK04302275	S_40*	Spring, Wilderley Barn	500m south-west of the route of the Proposed Scheme (300m south-west of the construction boundary). Not surveyed. 'Issue' is upgradient of the line, nearest works are above ground.
	Spring	Y	SK03902333	S_92*	Spring, near Oakfields Farm (i)	910m north-east of the route of the Proposed Scheme (620m north-east of the construction boundary). Not surveyed. 'Issue' is upgradient of the line, nearest works are underground diversion of overhead Western Power distribution line.
	Spring	Y	SK03542349	S_31*	Spring, near Oakfields Farm (ii)	940m north-east of the route of the Proposed Scheme (425m north-east of the construction boundary). Not surveyed. 'Issue' is upgradient of the line, nearest works are underground diversion of overhead Western Power distribution line.
	Spring	Y	SK03212158	S_93*	Spring to west of Lount Farm	1000m south of the route of the Proposed Scheme. Not surveyed. Feature is labelled on OS map as an 'issue'.
	Spring	Y	SK03182276	S_81	Spring, Moreton Brook	170m north of the route of the Proposed Scheme. During survey it was noted that there was the possibility of groundwater feeding marshland, the land is very boggy and wet, little rainfall pre-survey (and a lot more marshy than other sites visited over the two weeks). Favourable habitat in comparison to surrounding grassland, more diversity and in good condition (water supply plentiful). No outflow observed from

WFD Groundwater Waterbody (ID)	Characterisation Feature Type	EIA Receptor (Y/N)	NGR	WFD Assessment Reference ID	Receptor / Feature Name (where referenced in Volume 5: Appendix WR-002, water resources assessment reports)	Feature Details
						wetland observed at time of survey. Recommended NVC vegetation survey.
	Marsh	N	SK03032288	M_18	Lount Farm LWS	195m north of the route of the Proposed Scheme (15m north of construction boundary). Survey shows this marsh to be associated with Spring, Moreton Brook.
	Licensed Abstraction	Y	-	SWWM_12	Moreton Grange, 03/28/05/0059/R01	95m south of the route of the Proposed Scheme (10m east of the construction boundary). General farming and domestic purpose.
	Spring	Y	SK02952325	S_72*	Spring, northeast of Moreton Barn Farm	500m north of route of the Proposed Scheme. Not surveyed. Feature is labelled on the OS map as 'issue'.
	Spring	Y	SK02092294	S_96	Spring, southwest of Moreton House	70m south of route of the Proposed Scheme (within the construction boundary). During a site survey it was noted that the spring may supply a man-made pond. Although man-made, a natural habitat has been established at the pond. Monitoring of groundwater input into lake would be important to determine if the pond is spring-fed.
	Other	Y	SJ99182484	O_o*	Pasturefields SSSI	350m north of the construction boundary. Pasturefields is an inland saltmarsh.
	Other	Y	SJ98632419	O_1*	Lionlodge Covert LWS	Crossed by the route of the Proposed Scheme. Consists of a woodland and 1.5ha saltmarsh on the south side of the Lionlodge Covert.

WFD Groundwater Waterbody (ID)	Characterisation Feature Type	EIA Receptor (Y/N)	NGR	WFD Assessment Reference ID	Receptor / Feature Name (where referenced in Volume 5: Appendix WR-002, water resources assessment reports)	Feature Details
	River Trent	Y	-	WFD-TTS* (part surveyed by surface water)	River Trent from Tittensor to River Sow (WFD surface water body)	Although no specific information is available, the proximity of the permeable superficial deposits underlying the River Trent and its tributaries suggests that these deposits are likely to be in hydraulic connection with these surface watercourses and provide a component of baseflow, particularly during dryer periods.
	Moreton Brook	Y	-	WFD-MRB* (part surveyed by surface water)	Moreton Brook from source to River Trent (WFD surface water body)	Although no specific information is available, the proximity of the permeable superficial deposits underlying the Moreton Brook and its tributaries suggests that these deposits are likely to be in hydraulic connection with these surface watercourses and provide a component of baseflow, particularly during dryer periods.
Staffordshire Trent Valley - PT Sandstone Staffordshire (GB40401G300500)	Licenced Abstraction	Y	SK09021807	SWWM_3*	Luth Burn Pool, MD/028/0005/002	365m south-west of the route of the Proposed Scheme (180m south-west of the construction boundary). Agricultural purpose (spray irrigation).
	Licenced Abstraction and EA Water Quality Monitoring Borehole	Y	SJ97702400	SWWM_8*, EAQ_1*	Ingestre Park Golf Club, 03/28/01/0201	160m south of the route of the Proposed Scheme (50m east of the construction boundary). Spray irrigation purpose.
	Licenced Abstraction	Y	SJ95982548	SWWM_16	Staffordshire County Showground, MD/028/0004/001	440m north-east of the route (160m northeast of the construction boundary). Agriculture, industrial and commercial purpose.
	Private Water Supply	Y	SJ96682449	UA_5/6	Upper Hanyards Farm	The route of the Proposed Scheme passes over the abstraction, within the consolidated construction boundary. Domestic purpose.

WFD Groundwater Waterbody (ID)	Characterisation Feature Type	EIA Receptor (Y/N)	NGR	WFD Assessment Reference ID	Receptor / Feature Name (where referenced in Volume 5: Appendix WR-002, water resources assessment reports)	Feature Details
	Spring	Y	SJ95692415	S_9*	Spring, Blackheath Covert	800m south of route of the Proposed Scheme. Not surveyed. Feature is labelled on the OS map as 'issue'.
	Spring	N	SJ95742582	S_62*	Spring, North of Staffordshire County Showground	670m north of route of the Proposed Scheme. Not surveyed. This 'issue' is not in the groundwater catchment area for the construction works.
	Spring	Y	SJ95062433	S_77*	Spring, North of A518	950m south of route of the Proposed Scheme. Not surveyed. Feature is labelled on the OS map as 'issue'.
	Spring	Y	SJ95362600	S_3*	Spring, Hopton Pools Covert	640m north-east of route of the Proposed Scheme. Not surveyed. Feature is labelled on the OS map as 'issue'.
	EA Water Level Monitoring Borehole	N	SJ95142467	EAL_1*	Brickhouse Farm	Environment Agency water level monitoring borehole.
	River Trent	Y	-	WFD-TTS	River Trent from Tittensor to River Sow (WFD surface water body)	The River Trent is likely to be in hydraulic connection with the permeable superficial deposits where it crosses them. Thickness of superficial deposits and hydraulic connection with underlying bedrock aquifers in this area is not known, therefore connectivity must be assumed for a precautionary assessment.
	Licenced Abstraction	Y	-	SWWM_1*	Swynnerton	350m north-east of the route.
	Licenced Abstraction and EA Water Quality Monitoring Borehole	Y	-	SWWM_2*, EAQ_2*	Swynnerton	

WFD Groundwater Waterbody (ID)	Characterisation Feature Type	EIA Receptor (Y/N)	NGR	WFD Assessment Reference ID	Receptor / Feature Name (where referenced in Volume 5: Appendix WR-002, water resources assessment reports)	Feature Details
	Licenced Abstraction	Y	-	SWWM_0*	Swynnerton	
	EA Water Level Monitoring Borehole	N	SJ86113676	EAL_2*	Wing House	Environment Agency water level monitoring borehole.
	EA Water Level Monitoring Borehole	N	SJ84993672	EAL_3*	Stabhill	Environment Agency water level monitoring borehole.
	Spring	N	SJ85533715	S_30*	Spring, Greathills	550m north-east of the route (730m north-east of the construction boundary). Not surveyed. The 'issue' is in a different hydraulic catchment to the Proposed Scheme.
	Spring	Y	SJ83413694	S_36	Spring, Lodge Barn Cottage	675m south-west of the route (380m south-west of the construction boundary). Not surveyed. The 'issue' is down gradient of the Proposed Scheme and the Wilmslow Sandstone is continuous between the Proposed Scheme and the issue.
	Licenced Abstraction and EA Quality Monitoring Borehole	Y	-	SWWM_13*, EAQ_3*	Hatton	800m south-west of the route.
	Licenced Abstraction	Y	-	SWWM_14*	Hatton	
	Licenced Abstraction	Y	-	SWWM_9*	Hatton	
	EA Water Level Monitoring Borehole	N	SJ83173768	EAL_4*	Upper Hatton Wood	Environment Agency water level monitoring borehole.
	EA Water Level Monitoring Borehole	N	SJ82223935	EAL_5*	Shelton Under Harley	Environment Agency water level monitoring borehole.

WFD Groundwater Waterbody (ID)	Characterisation Feature Type	EIA Receptor (Y/N)	NGR	WFD Assessment Reference ID	Receptor / Feature Name (where referenced in Volume 5: Appendix WR-002, water resources assessment reports)	Feature Details
	Licenced Abstraction and EA Water Quality Monitoring Borehole	Y	-	SWWM_4*, EAQ_4*	Whitmore	30m west of the route.
	Licenced Abstraction	Y	-	SWWM_5*	Whitmore	
	Licenced Abstraction	Y	-	SWWM_6*	Whitmore	
	Meece Brook	Y	-	WFD-MEE* (part surveyed by surface water)	Meece Brook from source to Chatcull Brook (WFD surface water body)	The Meece Brook is likely to be in hydraulic connection with the permeable superficial deposits where it crosses them. Thickness of superficial deposits and hydraulic connection with underlying bedrock aquifers in this area is not known, therefore connectivity must be assumed for a precautionary assessment.
Staffordshire Trent Valley - Merica Mudstone West (GB40402G300400)	Spring	Y	SJ92372757	S_37*	Spring north of Marston Farm	140m south-west of route of the Proposed Scheme (within the construction boundary). Marked at issue point on the OS map. No access for survey so potentially doesn't exist as a spring. Located in the construction boundary in area of soft landscaping.
	Spring	Y	SJ92722752	S_16*	Spring south of Marston Cottages	80m north-east of route of the Proposed Scheme (within the construction boundary). Marked at issue point on the OS map. No access for survey so potentially doesn't exist as a spring. Located within the construction boundary, soft verge, near existing road. Appears to have been diverted.
	Spring	Y	SJ91912755	S_8*	Spring, south-west of Marston (i)	475m south-west of route of the Proposed Scheme. Not surveyed. Feature is labelled on the OS map as 'issue'.

WFD Groundwater Waterbody (ID)	Characterisation Feature Type	EIA Receptor (Y/N)	NGR	WFD Assessment Reference ID	Receptor / Feature Name (where referenced in Volume 5: Appendix WR-002, water resources assessment reports)	Feature Details
	Spring	Y	SJ91602736	S_76*	Spring, south-west of Marston (ii)	850m south-west of route of the Proposed Scheme. Not surveyed. Feature is labelled on the OS map as 'issue'.
	Spring	Y	SJ92572843	S_42*	Spring, Black Plantation	590m north-east of route of the Proposed Scheme. Not surveyed. Feature is labelled on the OS map as 'issue'.
	Spring	Y	SJ92352855	S_41*	Spring, west of Black Plantation	500m north-east of route of the Proposed Scheme. Not surveyed. Feature is labelled on the OS map as 'issue'.
	Spring	Y	SJ91952924	S_48*	Spring, east of Yarlet Hall Farm	700m north-east of the route of the Proposed Scheme. Not surveyed. Feature is labelled on the OS map as 'issue'.
	Spring	Y	SJ89702963	S_44*	Spring, south of Top Farm	800m south-west of route of the Proposed Scheme. Not surveyed. Feature is labelled on the OS map as 'issue'.
	Spring	Y	SJ89203006	S_43*	Spring, north-west of 100 Acres	1000m south-west of route of the Proposed Scheme. Not surveyed. Feature is labelled on the OS map as 'issue'.
	Spring	Y	SJ90563058	S_23*	Spring, Pirehill Cottage Farm	410m north-east of the route (adjacent to the construction boundary where there is an area of mitigation planting). Not surveyed. There is no local groundwater level information from the area so it is assumed that the 'issue' is groundwater from a permeable layer in the Mercia Mudstone.

WFD Groundwater Waterbody (ID)	Characterisation Feature Type	EIA Receptor (Y/N)	NGR	WFD Assessment Reference ID	Receptor / Feature Name (where referenced in Volume 5: Appendix WR-002, water resources assessment reports)	Feature Details
	Spring	Y	SJ89343042	S_21*	Spring near Service Area (i)	610m south-west of the route (240m west of the construction boundary). Not surveyed. The 'issue' is likely to be land drainage but taking a precautionary approach is assumed to be groundwater issuing from the Mercia Mudstone.
	Spring	Y	SJ89173041	S_22*	Spring near Service Area (ii)	740m south-west of the route (400m west of the construction boundary). Not surveyed. The 'issue' is likely to be land drainage but taking a precautionary approach is assumed to be groundwater issuing from the Mercia Mudstone.
	Spring	Y	SJ88953053	S_52*	Spring, Service Area (iii)	870m south-west of the route (590m west of the construction boundary). Not surveyed. The 'issue' is likely to be drainage from the M6 but taking a precautionary approach is assumed to be groundwater issuing from the Mercia Mudstone.
	Spring	Y	SJ90253145	S_65	Spring, New House Farm	670m north-east of the route (440m north-west of the construction boundary). Not surveyed. There is no local groundwater level information from the area so it is assumed that the 'issue' is groundwater from a permeable layer in the Mercia Mudstone.
	Private Water Supply	Y	-	UA_3*	North Pirehill Farm	150m north-east of the route (50m north-east of the construction boundary). Unknown purpose.

WFD Groundwater Waterbody (ID)	Characterisation Feature Type	EIA Receptor (Y/N)	NGR	WFD Assessment Reference ID	Receptor / Feature Name (where referenced in Volume 5: Appendix WR-002, water resources assessment reports)	Feature Details
	Spring	Y	SJ89403155	S_97	Spring, North Pirehill Farm	Adjacent to the route (Yarlet North cutting) and the construction boundary. Not surveyed. Not marked on the OS map as an issue or spring but a small pond feeding a watercourse flowing to the north east. This suggests a level of permanence that may indicate that the watercourse is spring fed. This feature has been included in the groundwater assessment following consultation with the Environment Agency.
	Spring	Y	SJ88843158	S_98*	Spring, west of the M6	330m west of the route (105m north-east of the construction boundary). Not surveyed. The feature is not marked on the OS map but has been included in the assessment at the request of the Environment Agency as it is possible that groundwater emerges at this location, though it is considered more likely that the water feature marked on the OS map shows drainage from the M6.
	Spring	Y	SJ88293163	S_70*	Spring, Cold Norton (i)	740m south-west of the route (580m south-west of the construction boundary). Not surveyed. There is no local groundwater level information from the area so it is assumed that the 'issue' is groundwater from a permeable layer in the Mercia Mudstone.
	Spring	Y	SJ88103187	S_91*	Spring, Cold Norton (ii)	760m south-west of the route (680m south-west of the construction boundary). Not surveyed. There is no local groundwater level information from the area so it is assumed that the 'issue' is groundwater from a permeable layer in the Mercia Mudstone.

WFD Groundwater Waterbody (ID)	Characterisation Feature Type	EIA Receptor (Y/N)	NGR	WFD Assessment Reference ID	Receptor / Feature Name (where referenced in Volume 5: Appendix WR-002, water resources assessment reports)	Feature Details
	Private Water Supply	Y	-	UA_1	Walton Heath Farm	200m north-east of the route (130m north-east of the construction boundary). Livestock purpose.
	Private Water Supply	Y	-	UA_11*	Little Micklow	In the path of the route (within the construction boundary). Unknown purpose.
	Spring	Y	SJ88973257	S_75*	Spring, Micklow Bungalow	230m north-east of the route (within the construction boundary - mitigation planting area). Not surveyed. There is no local groundwater level information from the area so it is assumed that the 'issue' is groundwater from a permeable layer in the Mercia Mudstone.
	Spring	Y	SJ88843267	S_29*	Spring, Micklow House Farm	200m north-east of the route (within the construction boundary). Not surveyed. There is no local groundwater level information from the area so it is assumed that the 'issue' is groundwater from a permeable layer in the Mercia Mudstone.
	Private Water Supply	Y	-	UA_8*	Micklow House Farm	130m north-east of the route (30m south of the construction boundary). Unknown purpose.
	Private Water Supply	Y	-	UA_10	Darlaston Grange	770m north-east of the route (330m north-east of the construction boundary). Domestic purpose.
	Spring	Y	SJ87843430030	S_19*	Spring, Darlaston Wood (i)	310m north-east of the route (80m north of the construction boundary). Not surveyed. There is no local groundwater level information from the area so it is assumed that the 'issue' is groundwater from a

WFD Groundwater Waterbody (ID)	Characterisation Feature Type	EIA Receptor (Y/N)	NGR	WFD Assessment Reference ID	Receptor / Feature Name (where referenced in Volume 5: Appendix WR-002, water resources assessment reports)	Feature Details
						permeable layer in the Mercia Mudstone.
	Spring	N	SJ87763472	S_18*	Spring, Darlaston Wood (ii)	520m north-east of the route (320m north of the construction boundary). Not surveyed. The Glaciofluvial Sheet Deposits are not continuous between the 'issue' and the Proposed Scheme and the 'issue' is in a different hydraulic catchment to the Proposed Scheme.
	Private Water Supply	Y	SJ87773512	UA_7*	Darlaston Wood Farm	760m north-east of the route (530m north of the construction boundary). Domestic purpose.
Staffordshire Trent Valley - Coal Measures Stoke (GB40402G304600)	Spring	Y	SJ79924204	S_79*	Spring, Moat Wood	600m north-east of the route (440m north-east of the construction boundary, adjacent to an area of mitigation planting). Not surveyed but the 'issue' is up-gradient from the Proposed Scheme. Located within a different hydraulic catchment to the proposed scheme except for the adjacent area of mitigation planting.
Manchester and East Cheshire Carboniferous Aquifers (GB41202G102900)	Spring	Y	SJ79614156	S_64	Spring west of Limepits	145m north-east of the route (within the construction boundary). Surveys confirmed groundwater seepage. This is likely due to local faulting or the topography cutting into shallow groundwater.
	Spring	Y	SJ79104187	S_39*	Spring north of Whitmore Wood	105m north-east of the route (within the construction boundary, area of mitigation planting). Not surveyed. The 'issue' is up-gradient from the engineering works but is located within an area of mitigation planting.

WFD Groundwater Waterbody (ID)	Characterisation Feature Type	EIA Receptor (Y/N)	NGR	WFD Assessment Reference ID	Receptor / Feature Name (where referenced in Volume 5: Appendix WR-002, water resources assessment reports)	Feature Details
	Spring	N	SJ78844325	S_49*	Spring east of Netherset Hey	930m north-east of the route (500m north-east of the borrow pit east of Netherset Hey Farm). Not surveyed. The 'issue' is up-gradient and not hydraulically connected with the Proposed Scheme.
	Licenced Abstraction and EA Water Quality Monitoring Borehole	Y	-	GMMC_2, EAQ_5	Netherset Hey Farm, 2568001255	800m north-east of the route (170m north-east of the construction boundary/borrow pit). General farming and domestic purpose.
	Licenced Abstraction	Y	-	GMMC_3*	Manor Farm, NW/068/0001/016	380m south-west of the route (185 west of the construction boundary). General farming and domestic purpose.
	Private Water Supply	Y	-	UA_4*	Hey House Farm	135m north-east of the route (40m from the construction boundary). Domestic supply. Not known which Formation water is abstracted from.
	River Lea	Y	-	WFD-LEA	River Lea (WFD surface water body)	The River Lea is likely to be in hydraulic connection with the permeable superficial deposits where it crosses them for example to the south of the borrow pit to the west of Netherset Hey Farm. Thickness of superficial deposits and hydraulic connection with underlying bedrock aquifers in this area is not known, therefore connectivity must be assumed for a precautionary assessment.
South Cheshire and North Staffordshire Permo-Triassic Sandstone Aquifers (GB41201G103400)	Private Water Supply and EA Water Quality Monitoring Borehole	Y	-	UA_2, EAQ_6	Bower End Farm	40m from the line of tunnel route. General farming and domestic purpose.

WFD Groundwater Waterbody (ID)	Characterisation Feature Type	EIA Receptor (Y/N)	NGR	WFD Assessment Reference ID	Receptor / Feature Name (where referenced in Volume 5: Appendix WR-002, water resources assessment reports)	Feature Details
	River Lea	Y	-	WFD-LEA	River Lea (WFD surface water body)	The River Lea is likely to be in hydraulic connection with the permeable superficial deposits where it crosses them for example to the south of the borrow pit to the west of Netherset Hey Farm. Thickness of superficial deposits and hydraulic connection with underlying bedrock aquifers in this area is not known, therefore connectivity must be assumed for a precautionary assessment.
Weaver and Dane Quaternary Sand and Gravel Aquifers (GB41202G991700)	Licenced Abstraction	Y	-	GMMC_1*	The Grange, 2568001067	360m south-west of the route (170m north-west of the construction boundary). General farming and domestic purpose.
	Licenced Abstraction	Y	-	GMMC_0*	The Grange, NW/068/0001/007	360m south-west of the route (185m north-west of the construction boundary). General farming and domestic purpose.
	Spring	Y	SJ72565135	S_67*	Spring near Basford House	325m north-east of the route (within the construction boundary). Not surveyed. The 'issue' is located in Glaciofluvial Deposits which are laterally continuous over the area of the Proposed Scheme, and within the construction boundary.
	Spring	N	SJ73115152	S_50*	Spring, Weston Hall	895m north-east of the route (245m north-east of the construction boundary). Not surveyed. The 'issue' is in a different hydraulic catchment (to the east of Basford Brook) to the Proposed Scheme, and is a significant distance away from permanent works.

WFD Groundwater Waterbody (ID)	Characterisation Feature Type	EIA Receptor (Y/N)	NGR	WFD Assessment Reference ID	Receptor / Feature Name (where referenced in Volume 5: Appendix WR-002, water resources assessment reports)	Feature Details
	Spring	N	SJ72905194	S_66*	Spring, north of Weston Hall	800m north-east of the route (395m south-east of the construction boundary). Not surveyed. The 'issue' is in a different hydraulic catchment (to the east of Basford Brook) to the Proposed Scheme, and is a significant distance away from permanent works.
	Betley Mere SSSI	Y	SJ74884793	WFD-BTL*	Betley Mere SSSI	950m north-east of route (300m north-east of the construction boundary). Betley Mere SSSI is designated as a nationally important site. It is one of the few natural standing waters in Staffordshire and occupies a shallow valley in glacial deposits, bound on three sides by extensive peat deposits on which a wide range of vegetation types have developed. It supports a series of open water and peatland sites, with rare wetland plant species, such as elongated sedge, six-stamened waterwort, needle spike-rush, cowbane and marsh fern. The Mere is found at an approximate surface elevation of 60 mAOD, down gradient of the Proposed Scheme, and may receive some surface water drainage from minor watercourses that cross the Proposed Scheme as well as some baseflow from the Glaciofluvial Deposits which are also crossed by the Proposed Scheme.

WFD Groundwater Waterbody (ID)	Characterisation Feature Type	EIA Receptor (Y/N)	NGR	WFD Assessment Reference ID	Receptor / Feature Name (where referenced in Volume 5: Appendix WR-002, water resources assessment reports)	Feature Details
	Wistaston Brook	Y	-	WFD-WST* (part surveyed by surface water)	Wistaston Brook (WFD surface water body and tributaries)	Wistaston Brook is likely to be in hydraulic connection with the underlying permeable superficial deposits, River Terrace Deposits and Glaciofluvial Deposits. Thickness of superficial deposits and hydraulic connection with underlying bedrock aquifers in this area is not known, therefore connectivity must be assumed for a precautionary assessment.
	Checkley Brook (Lower)	Y	-	WFD-CBL* (Scoped out by surface water due to location)	Checkley Brook – Lower (WFD surface water body and tributaries)	Crossed by the route at the southern extent of the study area. Checkley Brook is likely to be in hydraulic connection with the underlying permeable superficial deposits, River Terrace Deposits and Glaciofluvial Deposits. Thickness of superficial deposits and hydraulic connection with underlying bedrock aquifers in this area is not known, therefore connectivity must be assumed for a precautionary assessment.
	Checkley Brook (Upper)	Y	-	WFD-CBU	Checkley Brook – Upper (WFD surface water body and tributaries)	Crossed by the route at the southern extent of the study area. Checkley Brook is likely to be in hydraulic connection with the underlying permeable superficial deposits, River Terrace Deposits and Glaciofluvial Deposits. Thickness of superficial deposits and hydraulic connection with underlying bedrock aquifers in this area is not known, therefore connectivity must be assumed for a precautionary assessment.

WFD Groundwater Waterbody (ID)	Characterisation Feature Type	EIA Receptor (Y/N)	NGR	WFD Assessment Reference ID	Receptor / Feature Name (where referenced in Volume 5: Appendix WR-002, water resources assessment reports)	Feature Details
	River Lea	Y	-	WFD-LEA	River Lea (WFD surface water body and tributaries)	The River Lea is likely to be in hydraulic connection with the permeable superficial deposits where it crosses them. Thickness of superficial deposits and hydraulic connection with underlying bedrock aquifers in this area is not known, therefore connectivity must be assumed for a precautionary assessment.

* No access to feature during field surveys

Annex E: Scheme baseline

1 Scheme components

1.1 Surface water

- 1.1.1 All scheme components affecting surface water bodies are summarised in Table 37, in relation to the relevant watercourse and WFD surface water body catchment. The crossing type (i.e. track, highway realignment or access road), scheme component, and available design details are provided, and a unique reference code has been applied for each scheme component.
- 1.1.2 The location of each scheme component is also shown in Figure 64 - Figure 78.

Table 37: Summary of proposed scheme components (with reference to relevant surface watercourses and WFD water body catchments)

WFD Water Body (ID)	Watercourse	WFD Assessment Reference ID	Crossing Type	Scheme Component	Scheme Component Name	Scheme Components Details	CT-05 or CT-06 Map Series Number
Pyford Brook Catchment (trib of Trent) (GB104028047250)	Pyford Brook	WFD-PYB-W-01-01	Track	Viaduct	Pyford Brook Viaduct	Approx. viaduct width: 15m; Approx. viaduct length: 180m; Approx. viaduct height: 10m	CT-06-201
		WFD-PYB-W-01-02	Access road	Access Road Culvert	-	Approx. culvert length: 10m; Approx. culvert diameter: 0.9m	CT-06-201-R1
	Unnamed tributary of Pyford Brook 1	WFD-PYB-T-01-01	Track	Diversion	-	Approx. total length of new diverted channel: 180m; Approx. total length of existing channel: 175m; Total net gain: 5m	CT-06-201
Bourne-Bilson Brook Catchment (trib of Trent) (GB104028047270)	Ashby Sitch	WFD-BRN-T-01-01	Track	Culvert	Ashby Sitch Culvert	Approx. culvert length: 50m; Approx. culvert dimensions: 1.35m x 1.35m	CT-06-201
		WFD-BRN-T-01-02	Track	Realignment	-	Approx. total length of new realigned channel: 115m; Approx. total length of existing channel: 110m; Total net loss: 5m	CT-06-201
		WFD-BP01	Borrow pit	Borrow pit	Borrow pit - Kings Bromley South, located either side of Crawley Lane on the east and to the south of Ashby Sitch	Approx. total borrow pit surface area: 0.37km ² ; Assumed average excavation depth: 3.3m; Maximum excavation depth: 12.8m; Excavation material: sand and gravel; Approx. distance from borrow pit to watercourse (at nearest point): 50m; Total catchment area of watercourse: 2km ²	CT-05-201
	Bourne Brook	WFD-BRN-W-01-01	Track	Viaduct	Kings Bromley Viaduct	Approx. viaduct width: 15m; Approx. viaduct length: 980m; Approx. viaduct height: 6m	CT-06-202
		WFD-BP02	Borrow pit	Borrow pit	Borrow pit -	Approx. total borrow pit surface area: 0.16km ² ;	CT-05-202

WFD Water Body (ID)	Watercourse	WFD Assessment Reference ID	Crossing Type	Scheme Component	Scheme Component Name	Scheme Components Details	CT-05 or CT-06 Map Series Number
					Kings Bromley North, located adjacent to the realigned A515 Lichfield Road	Assumed average excavation depth: 3.3m; Maximum excavation depth: 8.8m; Excavation material: sand and gravel; Approx. distance from borrow pit to watercourse (at nearest point): 145m; Total catchment area of watercourse: 37.54km ²	
		WFD-BRN-W-01-02	Highway	Daylighting of existing highway culvert	-	Approx. existing culvert length: 9m; Approx. existing culvert dimensions: approximately 3.5m x 2.5m	CT-06-202
		WFD-BRN-W-01-03	Highway	Highway realignment culvert	-	Approx. culvert length: 10m; Approx. culvert diameter: 0.9m	CT-06-202
	Crawley Brook	WFD-BRN-T-02-01	Highway realignment	Highway realignment culvert	-	Approx. culvert length: 10m; Approx. culvert diameter 0.9m	CT-06-202
		WFD-BRN-T-02-02	Track	Viaduct	Kings Bromley Viaduct	Approx. viaduct width: 15m; Approx. viaduct length: 980m; Approx. viaduct height: 6m	CT-06-203
		WFD-BRN-T-02-03	Track	Realignment	-	Approx. total length of new realigned channel: 60m; Approx. total length of existing channel: 55m; Total net gain: 5m	CT-06-203
		WFD-BP02	Borrow pit	Borrow pit	Borrow pit - Kings Bromley North, located adjacent to the realigned A515 Lichfield Road	Approx. total borrow pit surface area: 0.16km ² ; Assumed average excavation depth: 3.3m; Maximum excavation depth: 8.8m; Excavation material: sand and gravel; Approx. distance from borrow pit to watercourse (at nearest point): 87m; Total catchment area of watercourse: 4.97km ²	CT-05-202

WFD Water Body (ID)	Watercourse	WFD Assessment Reference ID	Crossing Type	Scheme Component	Scheme Component Name	Scheme Components Details	CT-05 or CT-06 Map Series Number
		WFD-BP03	Borrow pit	Borrow pit	Borrow pit - Kings Bromley North, located adjacent to the realigned Shaw Lane	Approx. total borrow pit surface area: 0.24km ² ; Assumed average extraction depth: 3.5m; Maximum excavation depth: 8.8m; Excavation material: sand and gravel; Approx. distance from borrow pit to watercourse (at nearest point): 50m; Total catchment area of watercourse: 4.97km ²	CT-05-203
		WFD-BRN-T-02-04	Highway realignment	Highway realignment culvert	-	Approx. culvert length: 10m; Approx. culvert diameter: 0.9m	CT-06-203
Trent from Moreton Brook to River Tame (GB104028047290)	Unnamed tributary of River Trent (MB to RT) 1	WFD-TMT-T-01-01	Track	Viaduct	River Trent Viaduct	Approx. viaduct width: 15m; Approx. viaduct length: 1900m; Approx. viaduct height: 14m	CT-06-203
		WFD-TMT-T-01-02	Track	Diversion	-	Average total length of new diverted channel: 55m; Average total length of existing channel lost: 50m; Total net gain: 5m	CT-06-203
	Unnamed tributary of River Trent (MB to RT) 2	WFD-TMT-T-02-01	Track	Viaduct	River Trent Viaduct	Approx. viaduct width: 15m; Approx. viaduct length: 1900m; Approx. viaduct height: 14m	CT-06-203
	Unnamed tributary of River Trent (MB to RT) 3	WFD-TMT-T-03-01	Track	Viaduct	River Trent Viaduct	Approx. viaduct width: 15m; Approx. viaduct length: 1900m; Approx. viaduct height: 14m	CT-06-204
	River Trent	WFD-TMT-W-01-01	Track	Viaduct	River Trent Viaduct	Approx. viaduct width: 15m; Approx. viaduct length: 1900m; Approx. viaduct height: 14m	CT-06-204
		WFD-BP04	Borrow pit	Borrow pit	Borrow pit - north-east of the River Trent viaduct, between the River Trent	Approx. total borrow pit surface area: 0.25km ² ; Assumed average excavation depth: 10.3m; Maximum excavation depth: 16m; Excavation material: sand and gravel; Approx. distance from borrow pit to watercourse (at nearest point): 60m; Total catchment area of watercourse (within water body extent):	CT-05-204

WFD Water Body (ID)	Watercourse	WFD Assessment Reference ID	Crossing Type	Scheme Component	Scheme Component Name	Scheme Components Details	CT-05 or CT-06 Map Series Number
					and Pipe Lane	36.6km ²	
	Unnamed tributary of Bentley Brook 1	WFD-TMT-T-04-01	Track	Drop inlet culvert	Blithbury Drop Inlet Culvert	Approx. culvert length: 98m; Approx. culvert dimensions: 3m x 1.35m	CT-06-206
		WFD-TMT-T-04-02	Track	Realignment (with removal of existing culvert)	-	Approx. existing culvert length: 155m; Approx. total length of new realigned channel: 170m; Total net gain in open channel: 170m	CT-06-206
	Unnamed tributary of Bentley Brook 2	WFD-TMT-T-05-01	Highway	Highway realignment culvert	-	Approx. culvert length: 10m; Approx. culvert diameter: 0.9m	CT-06-206
		WFD-TMT-T-05-02	Highway	Realignment (with associated removal of existing culvert; see WFD-TMT-T-05-03)	-	Approx. total length of new realigned channel: 150m; Approx. total length of existing channel: 140m (120m open channel; 20m culverted channel); Total net gain of open channel: 30m	CT-06-206
		WFD-TMT-T-05-03	Highway	Removal of existing highway culvert (with associated realignment; see WFD-TMT-T-05-02)	-	Approx. existing culvert length: 20m; Approx. existing culvert dimensions: unknown (restricted access)	CT-06-206
		WFD-TMT-T-05-04	Highway	Daylighting of existing culvert	-	Approx. existing culvert length: 250m; Approx. existing culvert dimensions: suspected 1.2m diameter pipe (access restricted to culvert outlet only); Approx. length of new daylighted channel: 180m	CT-06-206
		WFD-TMT-T-05-05	Highway	Highway realignment culvert (on daylighted channel; see WFD-	-	Approx. culvert length: 60m; Approx. culvert dimensions: unknown (tbc at detailed design) (located on existing culverted section of watercourse to be daylighted under Proposed Scheme, see WFD-TMT-T-	CT-06-206

WFD Water Body (ID)	Watercourse	WFD Assessment Reference ID	Crossing Type	Scheme Component	Scheme Component Name	Scheme Components Details	CT-05 or CT-06 Map Series Number
				TMT-T-05-04)		05-04)	
		WFD-TMT-T-05-06	Access road	Access road culvert	-	Approx. culvert length: 10m; Approx. culvert diameter: 0.9m	CT-06-206
	Unnamed tributary of Bentley Brook 3	WFD-TMT-T-06-01	Access road	Access road culvert	-	Approx. culvert length: 10m; Approx. culvert diameter: 0.9m	CT-06-206
		WFD-TMT-T-06-02	Highway	Highway realignment culvert	-	Approx. culvert length: 10m; Approx. culvert diameter: 0.9m	CT-06-206
		WFD-TMT-T-06-03	Track	Realignment (with removal of existing culvert)	-	Approx. existing culvert length: 200m; Approx. existing culvert dimensions: unknown (restricted access); Total length of new realigned channel: 230m; Total net gain in open channel: 230m	CT-06-206
		WFD-TMT-T-06-04	Track	Drop inlet culvert	Blithbury West Drop Inlet Culvert	Approx. culvert length: 184m; Approx. culvert dimensions: 5m x 1.35m	CT-06-206
		WFD-TMT-T-06-05	Access road	Access road culvert	-	Approx. culvert length: 10m; Approx. culvert diameter: 0.9m	CT-06-206
Blithe – Tad Bk to R Trent (G104028046491)	Luth Burn	WFD-BTT-T-01-01	Track	Viaduct	River Trent Viaduct	Approx. viaduct width: 15m; Approx. viaduct length: 1900m; Approx. viaduct height: 14m	CT-06-204
		WFD-BP04	Borrow pit	Borrow pit	Borrow pit - north-east of the River Trent viaduct, between the River Trent and Pipe Lane	Approx. total borrow pit surface area: 0.25km ² ; Assumed extraction depth: 10.3m; Maximum excavation depth: 16m; Excavation material: sand and gravel; Approx. distance from borrow pit to watercourse (at nearest point): 50m; Approx. catchment area of watercourse: 0.89km ²	CT-05-204
Moreton Brook from Source to	Unnamed tributary of Moreton Brook 1	WFD-MRB-T-01-01	Track	Culvert	Stockwell Heath Culvert	Approx. culvert length: 69m; Approx. culvert dimensions: 3.7m x 1.35m	CT-06-208

WFD Water Body (ID)	Watercourse	WFD Assessment Reference ID	Crossing Type	Scheme Component	Scheme Component Name	Scheme Components Details	CT-05 or CT-06 Map Series Number
River Trent (GB104028047380)		WFD-MRB-T-01-02	Track	Realignment	-	Approx. total length of new realigned channel: 320m; Approx. total length of existing channel: 300m; Total net gain: 20m	CT-06-208
		WFD-MRB-T-01-03	Highway	Highway realignment culvert	-	Approx. culvert length: 10m; Approx. culvert diameter: 0.9m	CT-06-208
		WFD-MRB-T-01-04	Access road	Access road culvert	-	Approx. culvert length: 10m; Approx. culvert diameter: 0.9m	CT-06-208
	Unnamed tributary of Moreton Brook 2	WFD-MRB-T-02-01	Highway	Realignment	-	Approx. total length of new realigned channel: 35m; Approx. total length of existing channel: 30m; Total net gain: 5m	CT-06-209
		WFD-MRB-T-02-02	Highway	Highway realignment culvert	-	Approx. culvert length: 10m; Approx. culvert diameter: 0.9m	CT-06-209
		WFD-MRB-T-02-03	Track	Culvert	Hamley (South) Culvert	Approx. culvert length: 39m; Approx. culvert dimensions: 1.35m x 1.35m	CT-06-209
		WFD-MRB-T-02-04	Track	Realignment	-	Approx. total length of new realigned channel: 465m; Approx. total length of existing channel: 510m; Total net gain: 45m	CT-06-209
		WFD-MRB-T-02-05	Access road	Access road culvert	-	Approx. culvert length: 10m; Approx. culvert diameter: 0.9m	CT-06-209
	Unnamed tributary of Moreton Brook 3	WFD-MRB-T-03-01	Track	Drop inlet culvert	Hamley (North) Drop Inlet Culvert	Approx. culvert length: 46m; Approx. culvert dimensions: 1.5m x 1.35m	CT-06-209
		WFD-MRB-T-03-02	Track	Realignment	-	Approx. total length of new realigned channel: 155m; Approx. total length of existing channel: 145m; Total net gain: 10m	CT-06-209

WFD Water Body (ID)	Watercourse	WFD Assessment Reference ID	Crossing Type	Scheme Component	Scheme Component Name	Scheme Components Details	CT-05 or CT-06 Map Series Number
		WFD-MRB-T-03-03	Access road	Access road culvert	-	Approx. culvert length: 10m; Approx. culvert diameter: 0.9m	CT-06-209
	Moreton Brook	WFD-MRB-W-01-01	Track	Viaduct	Moreton Brook Viaduct	Approx. viaduct width: 15m; Approx. viaduct length: 195m; Approx. viaduct height: 9m	CT-06-209
		WFD-MRB-W-01-02	Track	Realignment	-	Approx. total length of new realigned channel: 150m; Approx. total length of existing channel: 135m; Total net gain: 15m	CT-06-209
	Unnamed tributary of Moreton Brook 4	WFD-MRB-T-04-01	Track	Diversion	-	Approx. total length of new diverted channel: 670m; Approx. total length of existing channel: 590m; Total net gain: 80m	CT-06-210
		WFD-MRB-T-04-02	Access road	Access road culvert	-	Approx. culvert length: 10m; Approx. culvert diameter: 0.9m	CT-06-210
Trent from Tittensor to River Sow (GB104028053272)	Unnamed tributary of River Trent (T to RS) 1	WFD-TTS-T-01-01	Track	Realignment	-	Approx. total length of new realigned channel: 120m; Approx. total length of existing channel: 115m; Total net gain: 5m	CT-06-211 CT-06-212
		WFD-TTS-T-01-02	Track	Culvert	Toldish Culvert	Approx. culvert length: 61m; Approx. culvert dimensions: 3m x 1.35m	CT-06-211
		WFD-TTS-T-01-03	Track	Realignment	-	Approx. total length of new realigned channel: 40m; Approx. total length of existing channel: 60m; Total net loss: 20m	CT-06-212
	River Trent	WFD-TTS-W-01-01	Track	Viaduct	Great Haywood Viaduct	Approx. viaduct width: 15m; Approx. viaduct length: 780m; Approx. viaduct height: 16m	CT-06-212
	Unnamed tributary of River Trent (T to	WFD-TTS-T-02-01	Track	Viaduct	Great Haywood	Approx. viaduct width: 15m; Approx. viaduct length: 780m; Approx. viaduct height: 16m	CT-06-212

WFD Water Body (ID)	Watercourse	WFD Assessment Reference ID	Crossing Type	Scheme Component	Scheme Component Name	Scheme Components Details	CT-05 or CT-06 Map Series Number
	RS) 2				Viaduct		
		WFD-TTS-T-02-02	Track	Realignment	-	Approx. total length of new realigned channel: 65m; Approx. total length of existing channel: 55m; Total net gain: 10m	CT-06-212
	Unnamed tributary of River Trent (T to RS) 3	WFD-TTS-T-03-01	Track	Culvert	Lionlodge Culvert	Approx. culvert length: 54m; Approx. culvert dimensions: 1.35m x 1.35m	CT-06-212
		WFD-TTS-T-03-02	Track	Realignment	-	Approx. total length of realigned channel: 210m; Approx. total length of existing channel: 470m; Total net loss: 260m	CT-06-213
	Unnamed tributary of River Trent (T to RS) 4	WFD-TTS-T-04-01	Access road	Access road culvert	-	Approx. culvert length: 10m; Approx. culvert diameter: 0.9m	CT-06-213
		WFD-TTS-T-04-02	Access road	Access road culvert	-	Approx. culvert length: 10m; Approx. culvert diameter: 0.9m	CT-06-217
		WFD-TTS-T-04-03	Track	Underbridge	Marston Bridleway 8 Accommodation Underbridge	Approx. total length of underbridge: 65m; Approx. total width of underbridge: 10m	CT-06-217
		WFD-TTS-T-04-04	Track	Realignment	-	Approx. total length of new realigned channel: 190m; Approx. total length of existing channel: 195 m; Total net loss: 5m	CT-06-217
	Unnamed tributary of River Trent (T to RS) 5	WFD-TTS-T-05-01	Access road	Access road culvert	-	Approx. culvert length: 10m; Approx. culvert diameter: 0.9m	CT-06-217
		WFD-TTS-T-05-02	Track	Drop inlet culvert	Yarlet Wood Drop Inlet Culvert	Approx. culvert length: 42m; Approx. culvert dimensions: 1.35m x 1.35m	CT-06-219

WFD Water Body (ID)	Watercourse	WFD Assessment Reference ID	Crossing Type	Scheme Component	Scheme Component Name	Scheme Components Details	CT-05 or CT-06 Map Series Number
		WFD-TTS-T-05-03	Track	Realignment	-	Approx. total length of new realigned channel: 110m; Approx. total length of existing channel: 120m; Total net loss: 10m	CT-06-219
	Unnamed tributary of River Trent (T to RS) 6	WFD-TTS-T-06-01	Track	Culvert	Pirehill Culvert	Approx. culvert length: 74m; Approx. culvert dimensions: 1.35m x 1.35m	CT-06-219
		WFD-TTS-T-06-02	Track	Realignment	-	Approx. total length of new realigned channel: 70m; Approx. total length of existing channel: 75m; Total net loss: 5m	CT-06-220
	Unnamed tributary of River Trent (T to RS) 7	WFD-TTS-T-07-01	Access road	Access road culvert	-	Approx. culvert length: 10m; Approx. culvert diameter: 0.9m	CT-06-220 CT-06-221
		WFD-TTS-T-07-02	Access road	Diversion	-	Approx. total length of new diverted channel: 420m; Approx. total length of existing channel: 316m; Total net gain: 104m	CT-06-220 CT-06-221
	Filly Brook	WFD-TTS-T-08-01	Offline	Extension of existing railway culvert	-	Approx. existing culvert length: 30m; Approx. length of culvert expansion: 50m; Approx. existing culvert dimensions: 1.68m width x 1.5m height	CT-06-221
		WFD-TTS-T-08-02	Track	Viaduct	Filly Brook Viaduct	Approx. viaduct width: 15m; Approx. viaduct length: 449m; Approx. viaduct height: 15m	CT-06-220
		WFD-TTS-T-08-03	Track	Underbridge	Filly Brook West Underbridge	Approx. total length of underbridge: 25m; Approx. total width of underbridge: 25m	CT-06-221
		WFD-TTS-T-08-04	Track	Realignment (with removal of existing culvert)	-	Approx. existing culvert length: suspected approx. 300m; Approx. existing culvert diameter: 1.2m; Approx. total length of new realigned channel: 385m; Total net gain in open channel: 385m	CT-06-222-R1

WFD Water Body (ID)	Watercourse	WFD Assessment Reference ID	Crossing Type	Scheme Component	Scheme Component Name	Scheme Components Details	CT-05 or CT-06 Map Series Number
		WFD-TTS-T-08-05	Track	Realignment	-	Approx. total length of new realigned channel: 285m; Approx. total length of existing channel: 285m; No loss/gain	CT-06-222
		WFD-TTS-T-08-06	Highway	Highway realignment culvert (replacement of existing highway culvert; on realigned channel)	-	Approx. culvert length: 70m; Approx. culvert diameter: 0.9m; Approx. existing culvert length: 67m; Existing culvert dimensions: unknown (restricted access).	CT-06-222
		WFD-TTS-T-08-07	Access road	Access road culvert (on realigned channel)	-	Approx. culvert length: 10m; Approx. culvert diameter: 0.9m	CT-06-222
		WFD-TTS-T-08-08	Access road	Realignment	-	Approx. total length of new realigned channel: 190m; Approx. total length of existing channel: 200m; Total net loss: 10m	CT-06-222
		WFD-TTS-T-08-09	Track	Viaduct	M6 Meaford Viaduct	Approx. viaduct width: 15m; Approx. viaduct length: 186m; Approx. viaduct height: 14m	CT-06-223-L1
		WFD-TTS-T-08-10	Track	Realignment	-	Approx. total length of new realigned channel: 210m; Approx. total length of existing channel: 200m; Total net gain: 10m	CT-06-223-L1
	Unnamed tributary of Filly Brook 1	WFD-TTS-T-09-01	Access road	Access road culvert	-	Approx. culvert length: 10m; Approx. culvert diameter: 0.9m	CT-06-223-L1
		WFD-TTS-T-09-02	Access road	Access road culvert	-	Approx. culvert length: 10m; Approx. culvert diameter: 0.9m	CT-06-224
	Unnamed tributary of Filly Brook 2	WFD-TTS-T-10-01	Highway	Highway realignment culvert	-	Approx. culvert length: 10m; Approx. culvert diameter: 0.9m	CT-06-224

WFD Water Body (ID)	Watercourse	WFD Assessment Reference ID	Crossing Type	Scheme Component	Scheme Component Name	Scheme Components Details	CT-05 or CT-06 Map Series Number
	Unnamed tributary of River Trent (T to RS) 8	WFD-TTS-T-11-01	Access road	Access road culvert (on realigned channel; see WFD-TTS-T-11-03)	-	Approx. culvert length: 10m; Approx. culvert diameter: 0.9m	CT-06-223
		WFD-TTS-T-11-02	Track	Culvert	Swynnerton Culvert	Approx. culvert length: 37m; Approx. culvert dimensions: 1.35m x 1.35m	CT-06-222
		WFD-TTS-T-11-03	Track	Realignment	-	Approx. total length of new realigned channel: 160m; Approx. total length of existing channel: 30m; Total net gain: 130m	CT-06-223
		WFD-TTS-T-11-04	Access road	Access road culvert	-	Approx. culvert length: 10m; Approx. culvert diameter: 0.9m	CT-06-225
Trent and Mersey Canal, summit to Alrewas (GB70410142)	Trent and Mersey Canal	WFD-TMT-W-01-01	Track	Viaduct	Great Haywood Viaduct	Approx. viaduct width: 15m; Approx. viaduct length: 780m; Approx. viaduct height: 16m	CT-06-212
Sow – Doxey Bk to R Penk (GB104028046790)	Unnamed tributary of Kingston Brook 1	WFD-SDP-T-01-01	Track	Culvert	Berryhill (South) Culvert	Approx. culvert length: 48m; Approx. culvert dimensions: 1.35m x 1.35m	CT-06-215
		WFD-SDP-T-01-02	Track	Realignment	-	Approx. total length of new realigned channel: 55m; Approx. total length of existing channel: 55m; No loss/gain	CT-06-215
	Unnamed tributary of Kingston Brook 2	WFD-SDP-T-02-01	Track	Culvert	Hopton Culvert	Approx. culvert length: 33m; Approx. culvert dimensions: 4.2m x 1.35m	CT-06-216
		WFD-SDP-T-02-02	Track	Realignment	-	Approx. total length of new realigned channel: 125m; Approx. total length of existing channel: 100m; Total net gain: 25m	CT-06-216

WFD Water Body (ID)	Watercourse	WFD Assessment Reference ID	Crossing Type	Scheme Component	Scheme Component Name	Scheme Components Details	CT-05 or CT-06 Map Series Number
		WFD-SDP-T-02-03	Access road	Access road culvert	-	Approx. culvert length: 10m; Approx. culvert diameter: 0.9m	CT-06-216
	Unnamed tributary of Kingston Brook 3	WFD-SDP-T-03-01	Access road	Access road culvert	-	Approx. culvert length: 10m; Approx. culvert diameter: 0.9m	CT-06-216
Meece Brook from Source to Chatcull Brook	Unnamed tributary of Meece Brook 1	WFD-MEE-T-01-01	Track	Diversion	-	Approx. total length of new diverted channel: 170m; Approx. total length of existing channel: 150m; Total net loss: 20m	CT-06-227
		WFD-MEE-T-01-02	Track	Culvert	Plantation Culvert	Approx. culvert length: 50m; Approx. culvert dimensions: 1.35m x 1.35m	CT-06-227
		WFD-MEE-T-01-03	Track	Diversion	-	Approx. total length of new diverted channel: 80m; Approx. total length of existing channel: 150m; Total net loss: 70m	CT-06-227
		WFD-MEE-T-01-04	Access road	Access road culvert (on diverted channel)	-	Approx. culvert length: 10m; Approx. culvert diameter: 0.9m	CT-06-227
	Unnamed tributary of Meece Brook 2	WFD-MEE-T-02-01	Highway	Realignment (with removal of existing highway culvert)	-	Approx. total length of new realigned channel: 100m; Approx. total length of existing channel: 95m (85m open channel; 10m culverted); Total net gain: 5m	CT-06-228
		WFD-MEE-T-02-02	Highway	Highway realignment culvert (on realigned channel) (replacement of existing highway culvert; see WFD-MEE-T-02-01)	-	Approx. culvert length: 10m; Approx. culvert dimensions: 0.9m	CT-06-228

WFD Water Body (ID)	Watercourse	WFD Assessment Reference ID	Crossing Type	Scheme Component	Scheme Component Name	Scheme Components Details	CT-05 or CT-06 Map Series Number
		WFD-MEE-T-02-03	Access road	Access road culvert (on realigned channel)	-	Approx. culvert length: 10m; Approx. culvert dimensions: 0.9m	CT-06-228
		WFD-MEE-T-02-04	Access road	Access road culvert (on realigned channel)	-	Approx. culvert length: 10m; Approx. culvert dimensions: 0.9m	CT-06-228
		WFD-MEE-T-02-05	Track	Underbridge	Swynnerton Footpath 10 Underbridge	Approx. total length of underbridge: 70m; Approx. total width of underbridge: 15m	CT-06-228
		WFD-MEE-T-02-06	Access road	Access road culvert (on realigned channel)	-	Approx. culvert length: 10m; Approx. culvert dimensions: 0.9m	CT-06-228
		WFD-MEE-T-02-07	Track	Realignment	-	Approx. total length of new realigned channel: 45m; approx. total length of existing channel: 30m; Total net gain: 15m	CT-06-228
	Meece Brook	WFD-MEE-W-01-01	Track	Viaduct	Meece Brook Viaduct	Approx. viaduct width: 15m; Approx. viaduct length: 240m; Approx. viaduct height: 12m	CT-06-229
		WFD-MEE-W-01-02	Track	Realignment	-	Approx. total length of new realigned channel: 65m; Approx. total length of existing channel: 55m; Total net gain: 10m	CT-06-229
Lea (GB112068055200)	Unnamed tributary of River Lea 1	WFD-LEA-T-01-01	Track	Drop inlet culvert	Snape Hall Road Drop Inlet Culvert	Approx. culvert length: 230m; Approx. culvert dimensions: 1.35m x 1.35m	CT-06-230
		WFD-LEA-T-01-02	Access road	Access road culvert (on diverted channel; see WFD-LEA-T-01-04)	-	Approx. culvert length: 10m; Approx. culvert diameter: 0.9m	CT-06-230

WFD Water Body (ID)	Watercourse	WFD Assessment Reference ID	Crossing Type	Scheme Component	Scheme Component Name	Scheme Components Details	CT-05 or CT-06 Map Series Number
		WFD-LEA-T-01-03	Access road	Access road culvert (on diverted channel; see WFD-LEA-T-01-04)	-	Approx. culvert length: 10m; Approx. culvert diameter: 0.9m	CT-06-230
		WFD-LEA-T-01-04	Track	Diversion (with removal of existing culvert)	-	Approx. total length of new diverted channel: 270m; Approx. total length of existing channel: 225m (culverted); Total net gain in open channel: 270m	CT-06-230
	Unnamed tributary of River Lea 2	WFD-LEA-T-02-01	Track	Realignment	-	Approx. total length of new realigned channel: 160m; Approx. total length of existing channel: 110m; Total net gain: 50m	CT-06-231
		WFD-LEA-T-02-02	Access road	Access road culvert	-	Approx. culvert length: 10m; Approx. culvert diameter: 0.9m	CT-06-231
		WFD-LEA-T-02-03	Track	Culvert	Whitmore Wood Culvert	Approx. culvert length: 63m; Approx. culvert dimensions: 1.35m x 1.35m	CT-06-231
		WFD-LEA-T-02-04	Track	Realignment	-	Approx. total length of new realigned channel: 105m; Approx. total length of existing channel: 105m; No net loss/gain	CT-06-231
		WFD-LEA-T-02-05	Track	Daylighting (of existing culvert)	-	Approx. existing culvert length: 7m; Approx. existing culvert dimensions: unknown (restricted access)	CT-06-231
		WFD-LEA-T-02-06	Access road	Access road culvert	-	Approx. culvert length: 10m; Approx. culvert diameter: 0.9m	CT-06-231
	Unnamed tributary of River Lea 3	WFD-LEA-T-03-01	Track	Diversion (of partially culverted channel)	-	Approx. total length of new diverted channel: 210m; Approx. total length of existing channel: 330m (145m open channel; 185m culverted; 0.9m diameter culvert); Total net gain of open channel: 65m	CT-06-231 CT-06-232

WFD Water Body (ID)	Watercourse	WFD Assessment Reference ID	Crossing Type	Scheme Component	Scheme Component Name	Scheme Components Details	CT-05 or CT-06 Map Series Number
	Unnamed tributary of River Lea 4	WFD-LEA-T-04-01	Track	Viaduct	River Lea Viaduct	Approx. viaduct width: 15m; Approx. viaduct length: 785m; Approx. viaduct height: 21m	CT-06-232
	River Lea	WFD-LEA-W-01-01	Track	Viaduct	River Lea Viaduct	Approx. viaduct width: 15m; Approx. viaduct length: 785m; Approx. viaduct height: 21m	CT-06-232
		WFD-BP05	Borrow pit	Borrow pit	Borrow pit - west of Netherset Hey Farm	Approx. total borrow pit surface area: 0.36km ² ; Assumed average extraction depth: 4.5m; Maximum extraction depth: 18m; Excavation material: sand and gravel; Approx. distance from borrow pit to watercourse (at nearest point): 50m; Total catchment area of watercourse: 17.9km ²	CT-06-232
		WFD-LEA-W-01-02	Track	Viaduct	Checkley Brook Viaduct	Approx. viaduct width: 15m; Approx. viaduct length: 180m; Approx. viaduct height: 15m	CT-05-232
	Unnamed tributary of River Lea 5	WFD-BP05	Borrow pit	Borrow pit	Borrow pit - west of Netherset Hey Farm	Approx. total borrow pit surface area: 0.36km ² ; Assumed average extraction depth: 4.5m; Maximum extraction depth: 18m; Excavation material: sand and gravel; Approx. distance from borrow pit to watercourse (at nearest point): watercourse within footprint; Total catchment area watercourse: 2.28km ²	CT-05-232 CT-05-232-R1
	Unnamed tributary of River Lea 6	WFD-LEA-T-06-01	Track	Diversion (with removal of existing culvert)	-	Approx. total length of new diverted channel: 365m; Approx. total length of existing channel: 425m (suspected to be all culverted; restricted access, tbc at detailed design); Total net gain of open channel: 425m	CT-05-232
		WFD-LEA-T-06-02	Access road	Access road culvert (on diverted channel; see WFD-LEA-T-06-01)	-	Approx. culvert length: 10m; Approx. culvert diameter: 0.9m	CT-05-232-R1

WFD Water Body (ID)	Watercourse	WFD Assessment Reference ID	Crossing Type	Scheme Component	Scheme Component Name	Scheme Components Details	CT-05 or CT-06 Map Series Number
		WFD-LEA-T-06-03	Track	Culvert (on diverted channel; WFD-LEA-T-06-01)	Wrinehill Wood Culvert	Approx. culvert length: 55m; Approx. culvert dimensions: 1.35m x 1.35m	CT-06-234
		WFD-LEA-T-06-04	Track	Diversion	-	Approx. total length of new diverted channel: 90m; Approx. total length of existing channel: 160m; Total net loss: 70m	CT-06-234
	Unnamed tributary of River Lea 7	WFD-LEA-T-07-01	Access road	Access road culvert	-	Approx. culvert length: 10m; Approx. culvert diameter: 0.9m	CT-06-234
		WFD-LEA-T-07-02	Access road	Access road culvert (on realigned channel; see WFD-LEA-T-07-04)	-	Approx. culvert length: 10m; Approx. culvert diameter: 0.9m	CT-06-234
		WFD-LEA-T-07-03	Track	Underbridge	Madeley Bridleway 2 Accommodation Underbridge	Approx. total length of underbridge: 80m; Approx. total width of underbridge: 10m	CT-06-234
		WFD-LEA-T-07-04	Track	Realignment (with removal of existing culvert) (through underbridge; see WFD-LEA-T-07-03)	-	Approx. total length of new diverted channel: 267m; Approx. total length of existing channel: 255m (130m open channel; 125m culverted); Total net gain of open river channel: 137m	CT-06-234
Checkley Brook – Upper (GB112068055230)	Checkley Brook	WFD-CBU-W-01-01	Track	Viaduct	Checkley Brook Viaduct	Approx. viaduct width: 15m; Approx. viaduct length: 180m; Approx. viaduct height: 15m	CT-06-235
Wistaston Brook (GB112068055280)	Unnamed tributary of Mere Gutter 1	WFD-BPo6	Borrow pit	Borrow pit	Borrow pit - north of Checkley	Approx. total borrow pit surface area: 0.4km ² ; Excavation material: sand and gravel; Approx. distance from borrow pit to watercourse (at nearest point): 50m;	CT-05-236

WFD Water Body (ID)	Watercourse	WFD Assessment Reference ID	Crossing Type	Scheme Component	Scheme Component Name	Scheme Components Details	CT-05 or CT-06 Map Series Number
					Lane	Approx. catchment area of watercourse: 0.2km ²	
	Unnamed tributary of Mere Gutter 2	WFD-WST-T-01-01	Track	Realignment	-	Approx. total length of new realigned channel: 240m; Approx. total length of existing channel: 250m; Total net loss: 10m	CT-06-236
		WFD-BPo6	Borrow pit	Borrow pit	Borrow pit - north of Checkley Lane	Approx. total borrow pit surface area: 0.4km ² ; Excavation material: sand and gravel; Approx. distance from borrow pit to watercourse (at nearest point): watercourse within footprint; Approx. catchment area of watercourse: 0.15km ²	CT-05-236
	Unnamed tributary of Mere Gutter 3	WFD-WST-T-02-01	Offline	Realignment	-	Approx. total length of new realigned channel: 50m; Approx. total length of existing channel: 80m; Total net loss: 30m	CT-06-236
		WFD-WST-T-02-02	Offline	Extension of existing WCML culvert	WCML Culvert 1	Approx. existing culvert length: 45m; Approx. culvert expansion length: 36m; Culvert dimensions: unknown (restricted access)	CT-06-236
	Unnamed tributary of Mere Gutter 4	WFD-WST-T-03-01	Track	Realignment	-	Approx. total length of new realigned channel: 150m; Approx. total length of existing channel: 135m; Total net gain: 15m	CT-06-237
		WFD-WST-T-03-02	Track	Drop inlet culvert	Gonsley Drop Inlet Culvert	Approx. culvert length: 120m; Approx. culvert dimensions: 1.35m x 1.35m	CT-06-237
		WFD-WST-T-03-03	Offline	Extension of existing WCML railway culvert	WCML Culvert 2	Approx. existing culvert length: 60m (assumed, restricted access); Approx. culvert expansion length: 35m; Culvert dimensions: unknown (restricted access)	CT-06-237
	Unnamed tributary of Mere Gutter 5	WFD-WST-T-04-01	Offline	Extension of existing WCML railway culvert	WCML Culvert 3	Approx. existing culvert length: 25m; Approx. culvert expansion length: 50m; Culvert dimensions: unknown (restricted access)	CT-06-237
		WFD-WST-T-	Track	Realignment	-	Approx. total length of new realigned channel: 20m;	CT-06-237

WFD Water Body (ID)	Watercourse	WFD Assessment Reference ID	Crossing Type	Scheme Component	Scheme Component Name	Scheme Components Details	CT-05 or CT-06 Map Series Number
		04-02				Approx. total length of existing channel: 20m; No net loss/gain	
		WFD-WST-T-04-03	Track	Inverted siphon	Half Moon Inverted Siphon	Approx. siphon length: 164m; Approx. siphon dimensions: 1.35m x 1.35m	CT-06-237
		WFD-WST-T-04-04	Track	Realignment	-	Approx. total length of new realigned channel: 20m; Approx. total length of existing channel: 20m; No net loss/gain	CT-06-237
		WFD-WST-T-04-05	Access road	Access road culvert	-	Approx. culvert length: 10m; Approx. culvert diameter: 0.9m	CT-06-237
	Unnamed tributary of Mere Gutter 6	WFD-BPo6	Borrow pit	Borrow pit	Borrow pit - north of Checkley Lane	Approx. total borrow pit surface area: 0.4km ² ; Excavation material: sand and gravel; Approx. distance from borrow pit to watercourse (at nearest point): 196m; Approx. catchment area of watercourse: 0.32km ²	CT-05-236-R1 CT-05-236
	Mere Gutter / Wistaston Brook	WFD—BPo6	Borrow pit	Borrow pit	Borrow pit - north of Checkley Lane	Approx. total borrow pit surface area: 0.4km ² ; Excavation material: sand and gravel; Approx. distance from borrow pit to watercourse (at nearest point): 720m; Approx. catchment area of watercourse: 8.22km ²	CT-05-236-R1 CT-05-236
		N/A	Highway	Bridge	Basford East Bridge	Proposed bridge crossing at Basford East Development Site.	N/A
	Unnamed tributary of Mere Gutter 7	WFD-WST-T-05-01	Highway	Highway realignment culvert		Approx. culvert length: 10m; Approx. culvert diameter: 0.9m	CT-05-236
	Betley Mere (GB31234330)	WFD-BPo6	Borrow pit	Borrow pit	Borrow pit - north of Checkley Lane	Approx. total borrow pit surface area: 0.4km ² ; Excavation material: sand and gravel; Approx. distance from borrow pit to watercourse (at nearest point): 475m; Total surface water catchment area: 0.2km ²	CT-05-236 CT-05-236-R1

Figure 64: Proposed scheme components directly affecting WFD surface water bodies (Part 1)

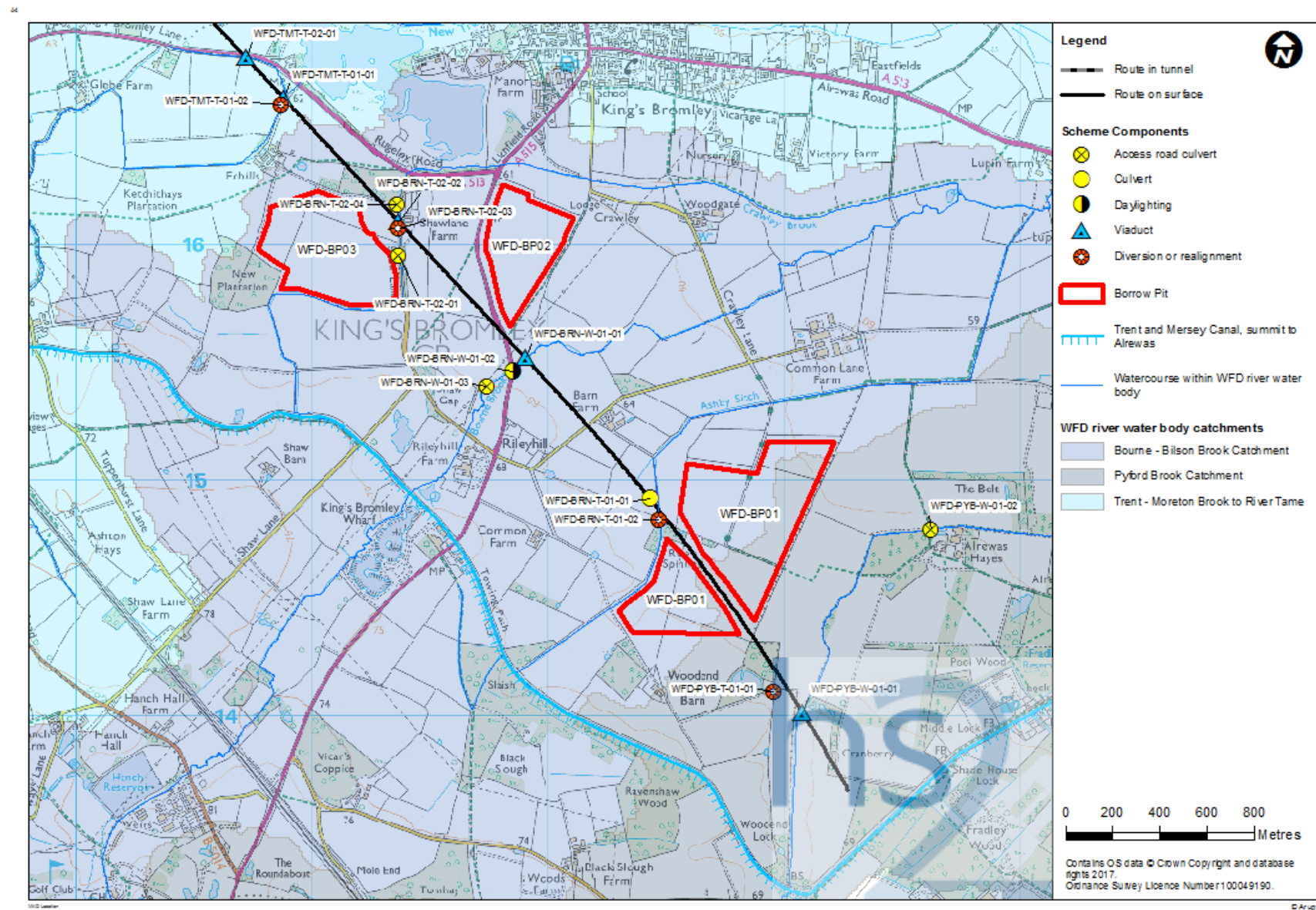


Figure 65: Proposed scheme components directly affecting WFD surface water bodies (Part 2)

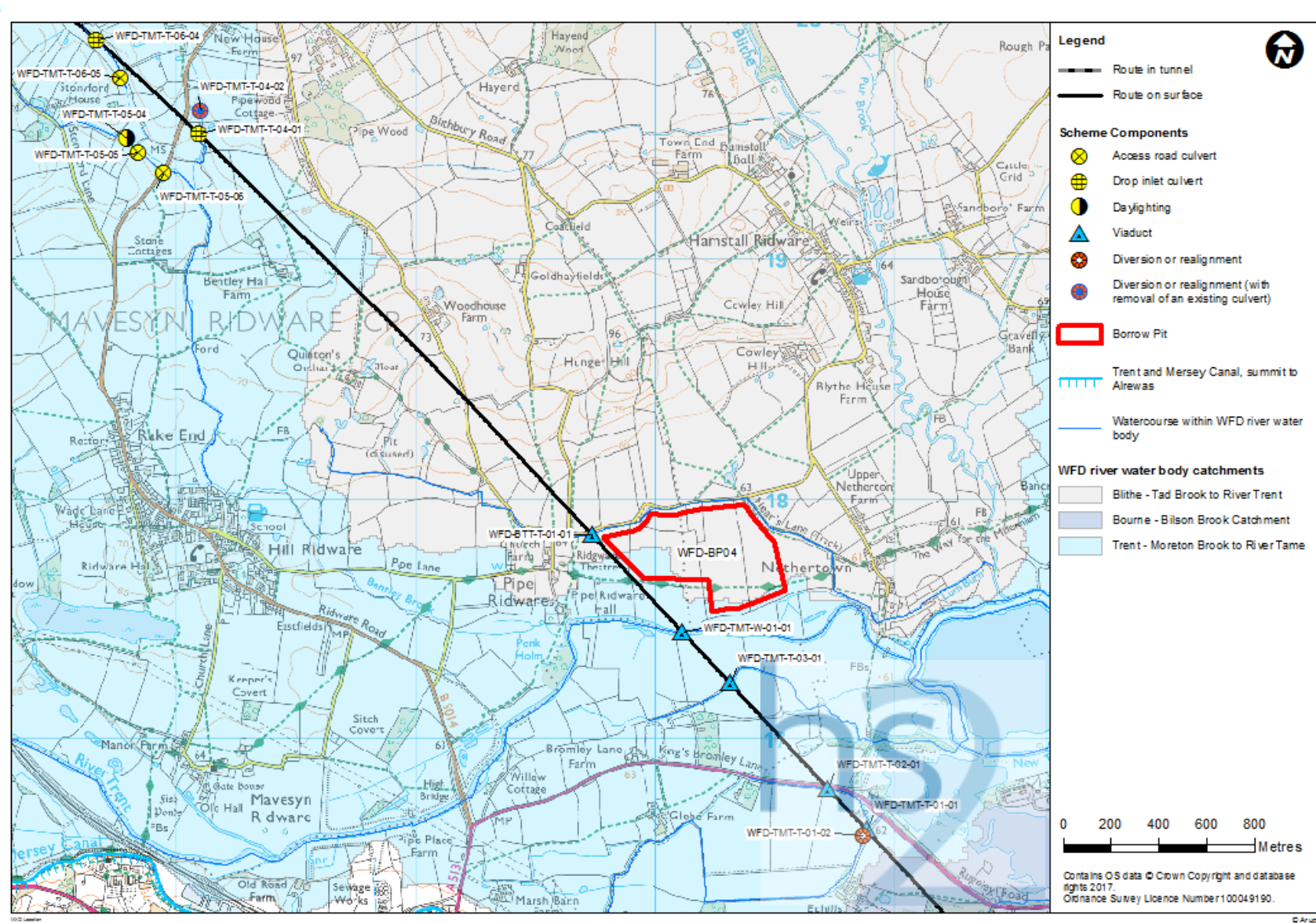


Figure 66: Proposed scheme components directly affecting WFD surface water bodies (Part 3)

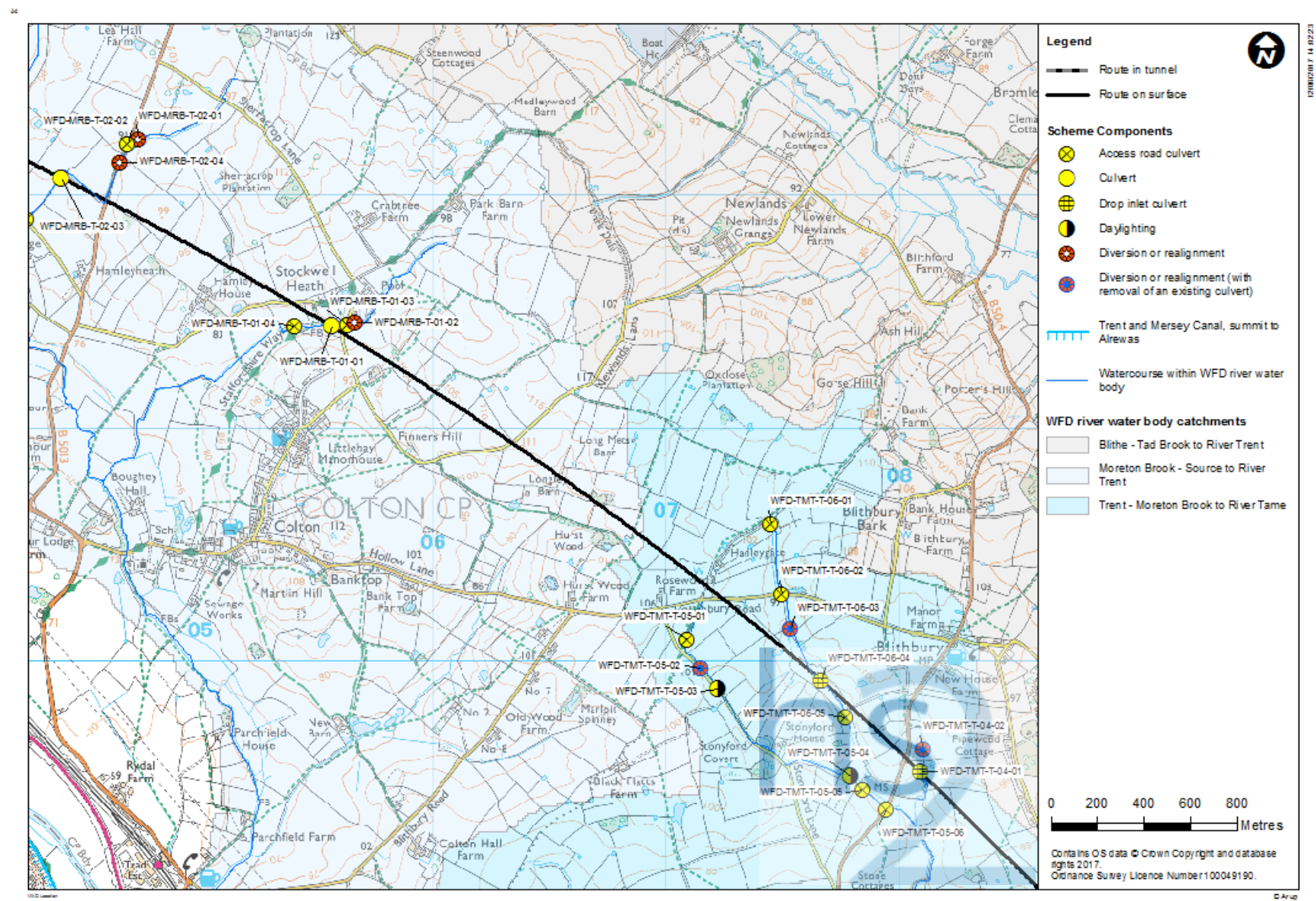


Figure 67: Proposed scheme components directly affecting WFD surface water bodies (Part 4)

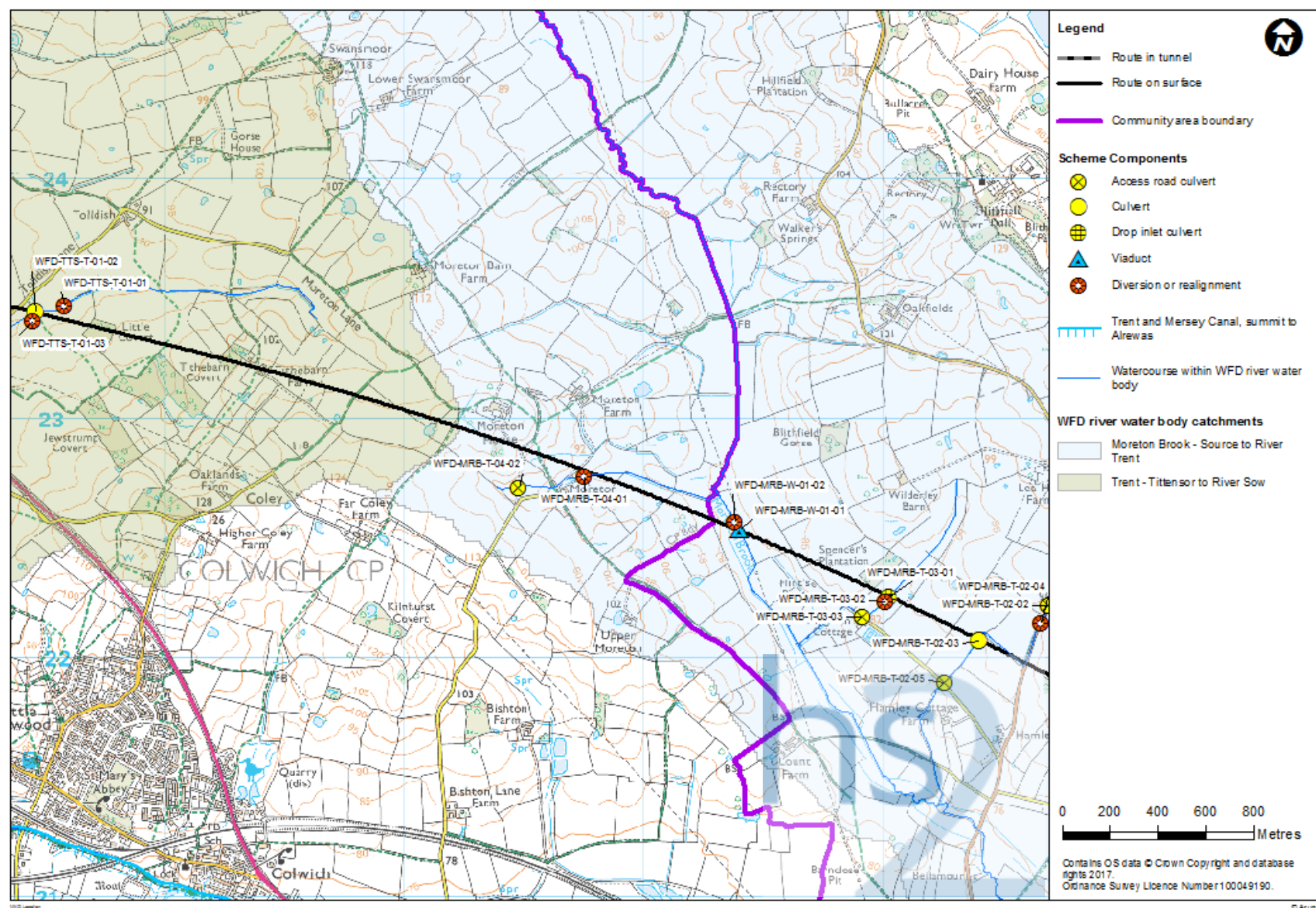


Figure 68: Proposed scheme components directly affecting WFD surface water bodies (Part 5)

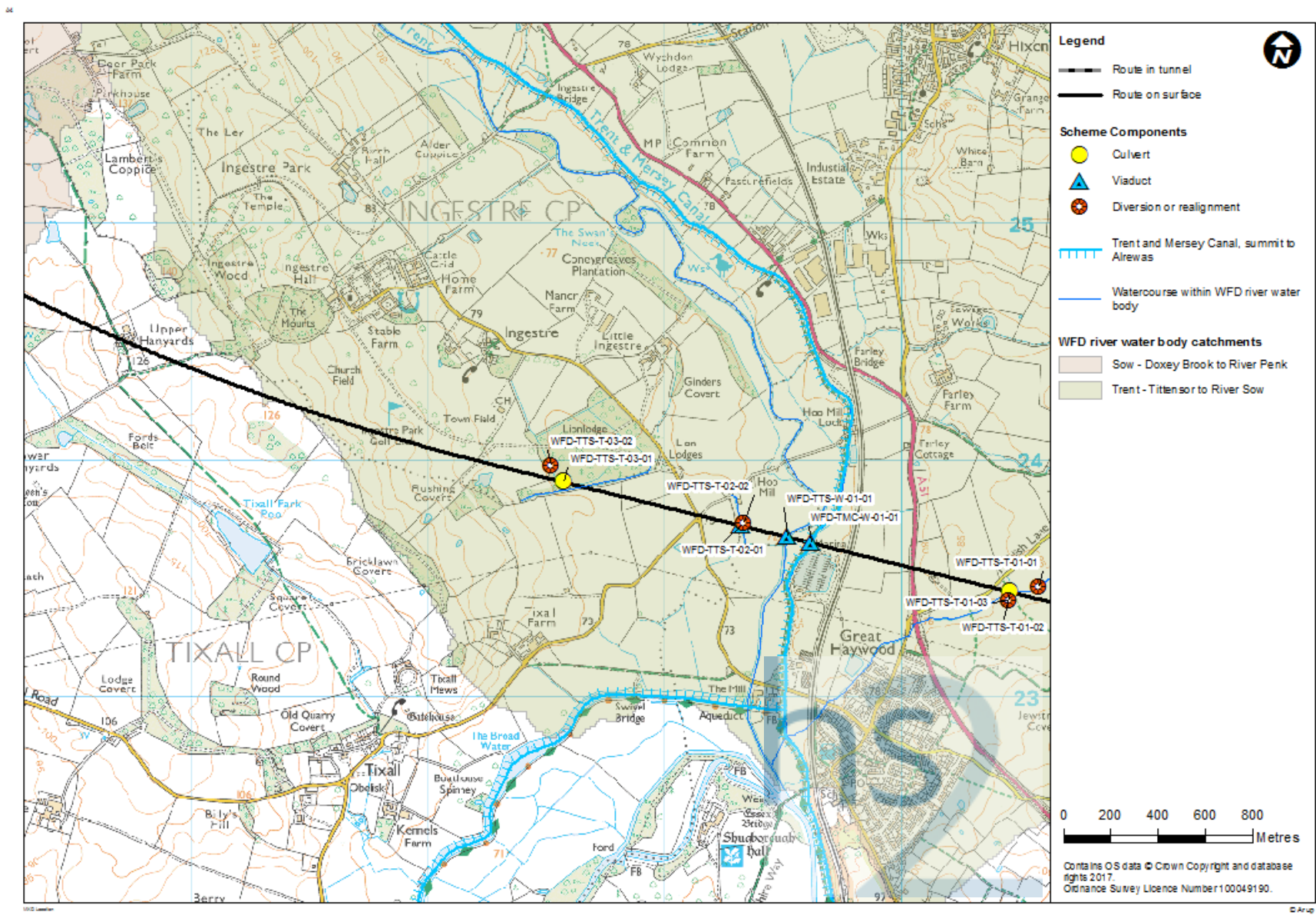


Figure 6g: Proposed scheme components directly affecting WFD surface water bodies (Part 6)

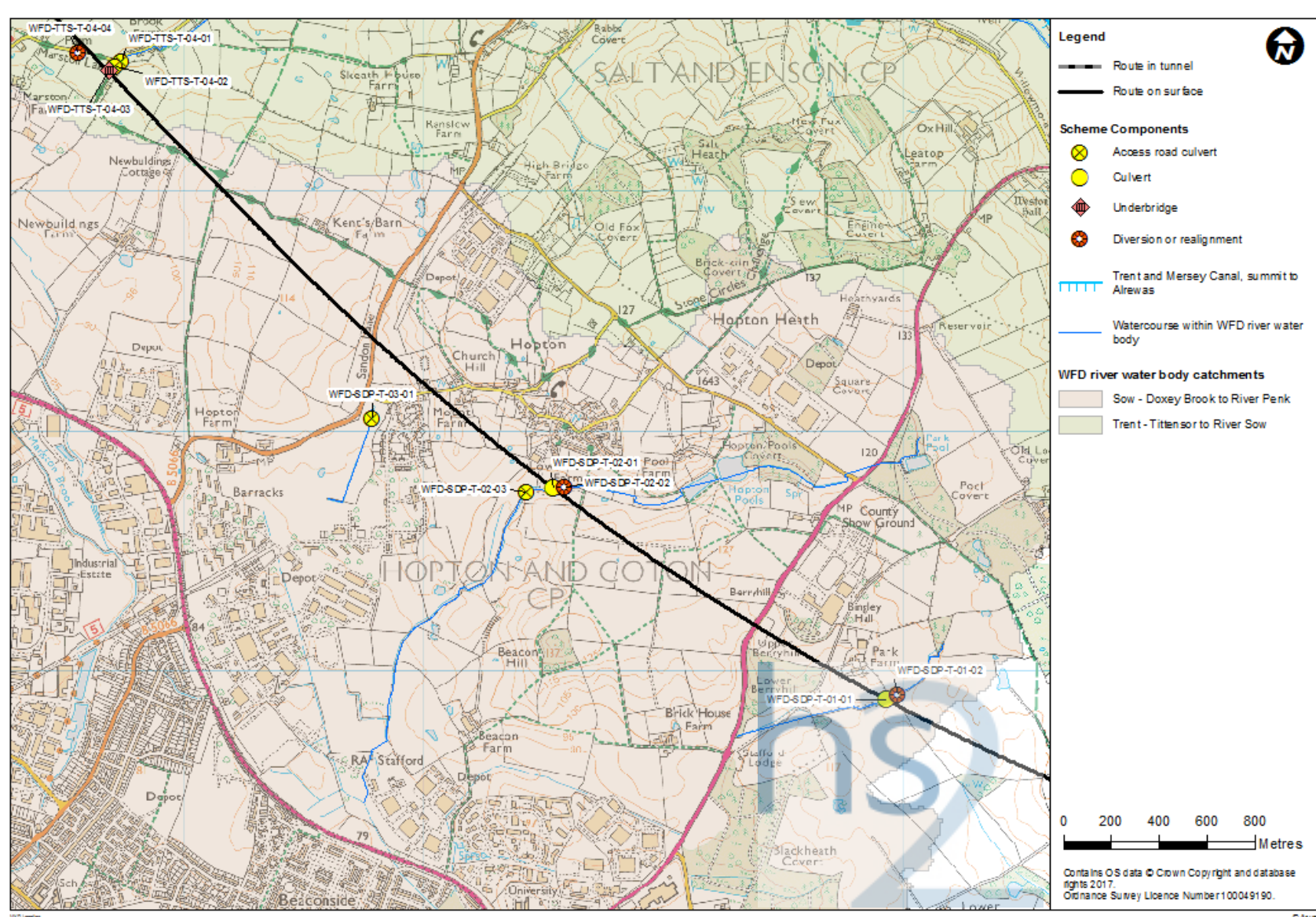


Figure 70: Proposed scheme components directly affecting WFD surface water bodies (Part 7)

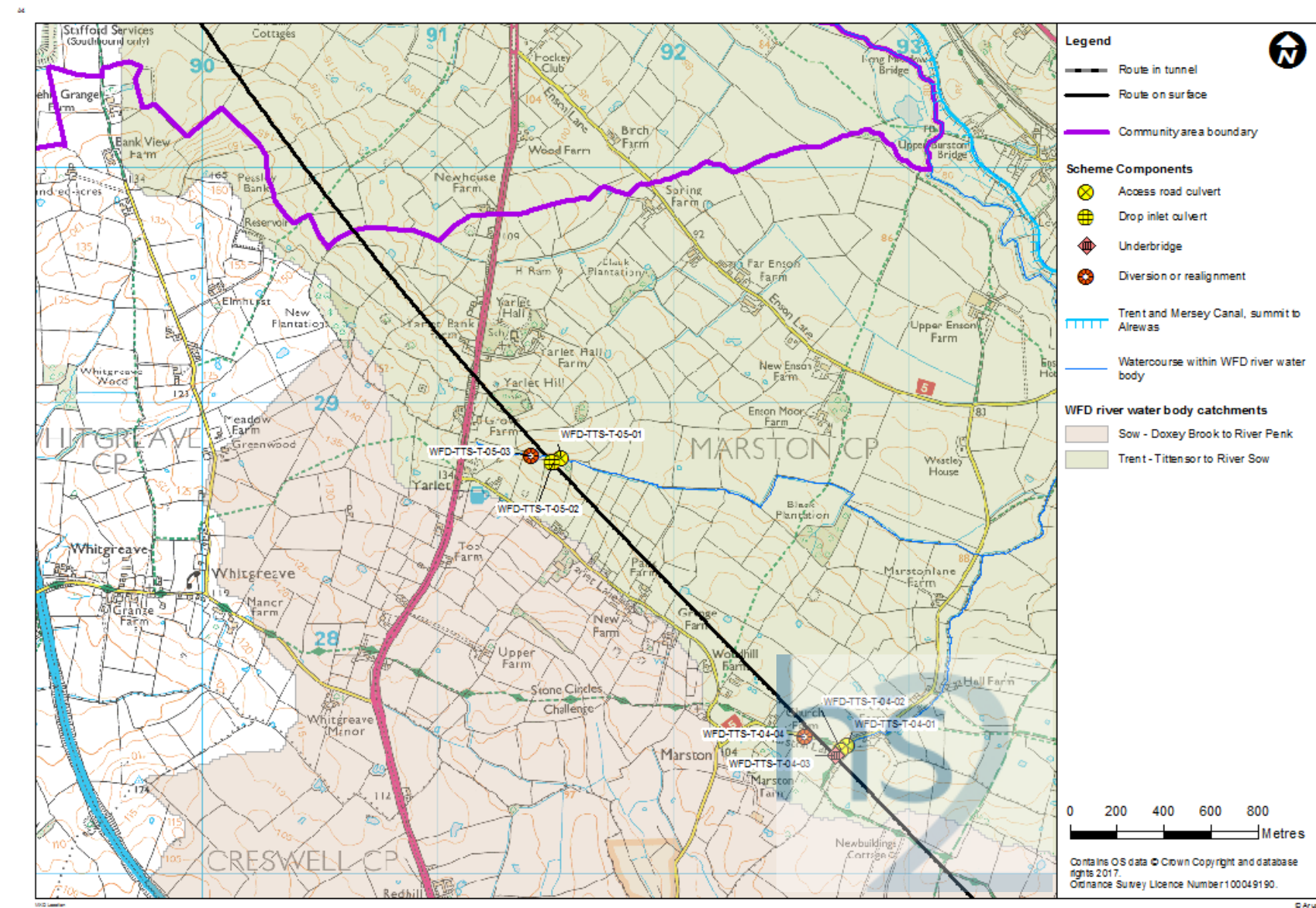


Figure 71: Proposed scheme components directly affecting WFD surface water bodies (Part 8)

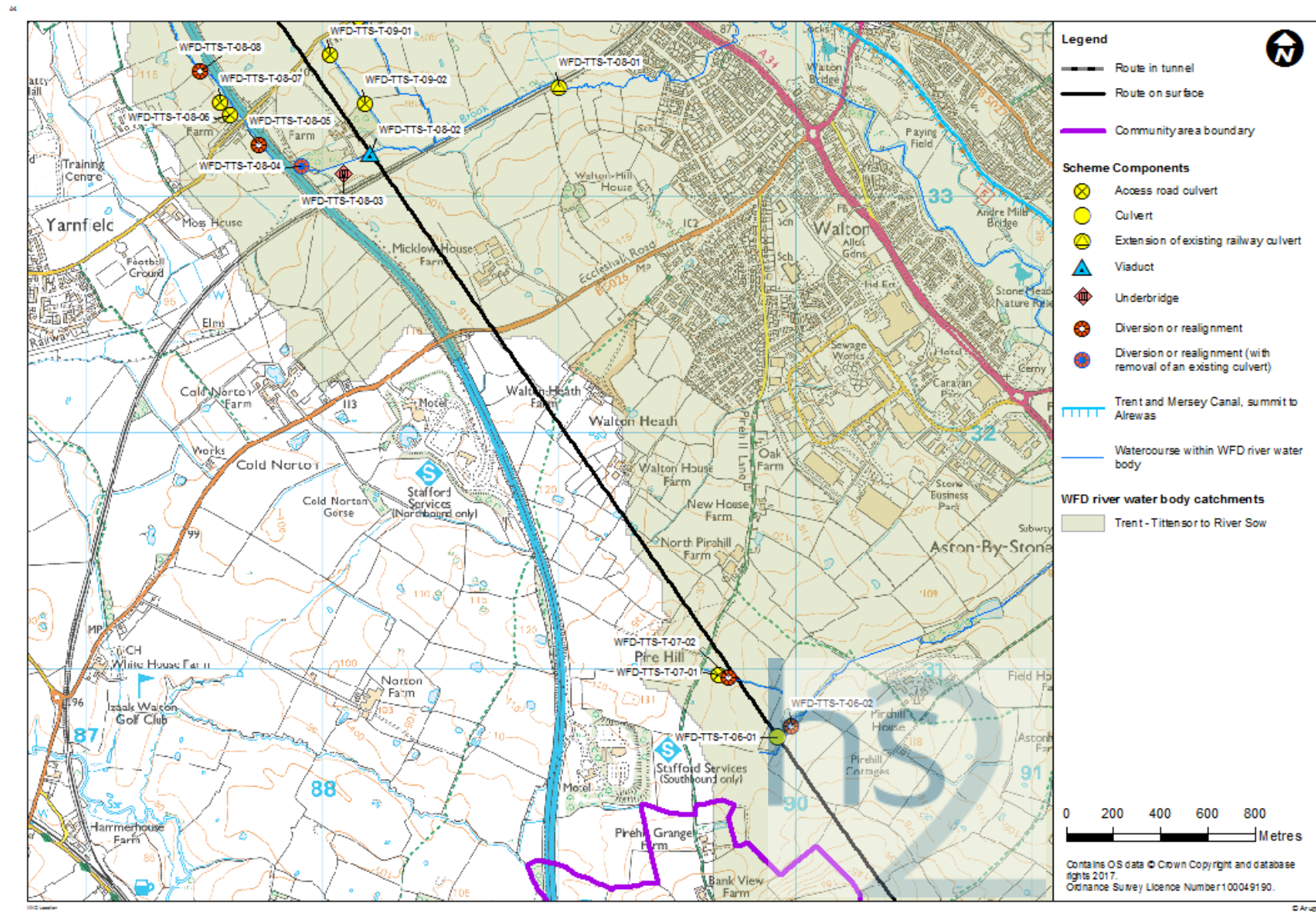


Figure 72: Proposed scheme components directly affecting WFD surface water bodies (Part 9)

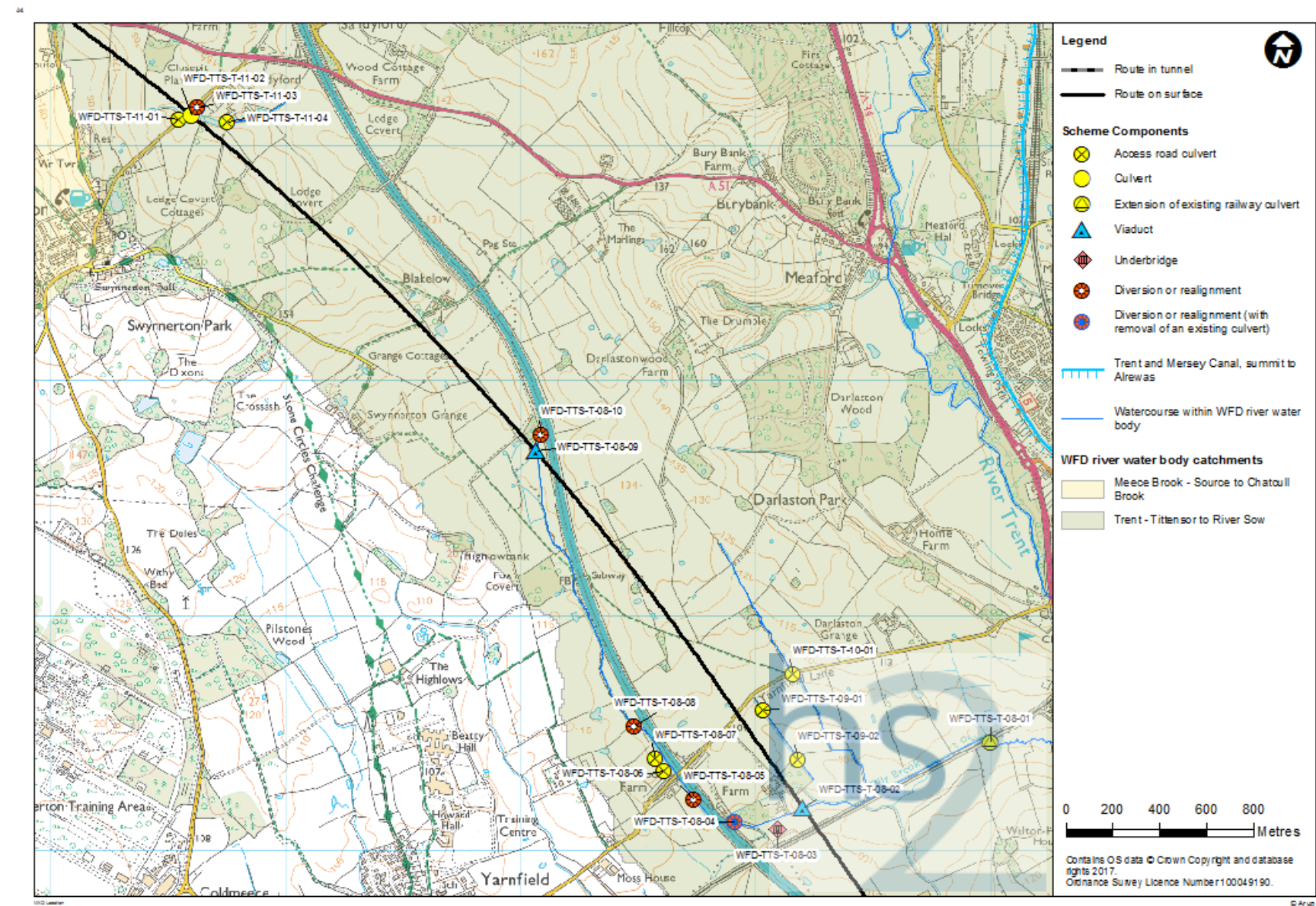




Figure 74: Proposed scheme components directly affecting WFD surface water bodies (Part 11)

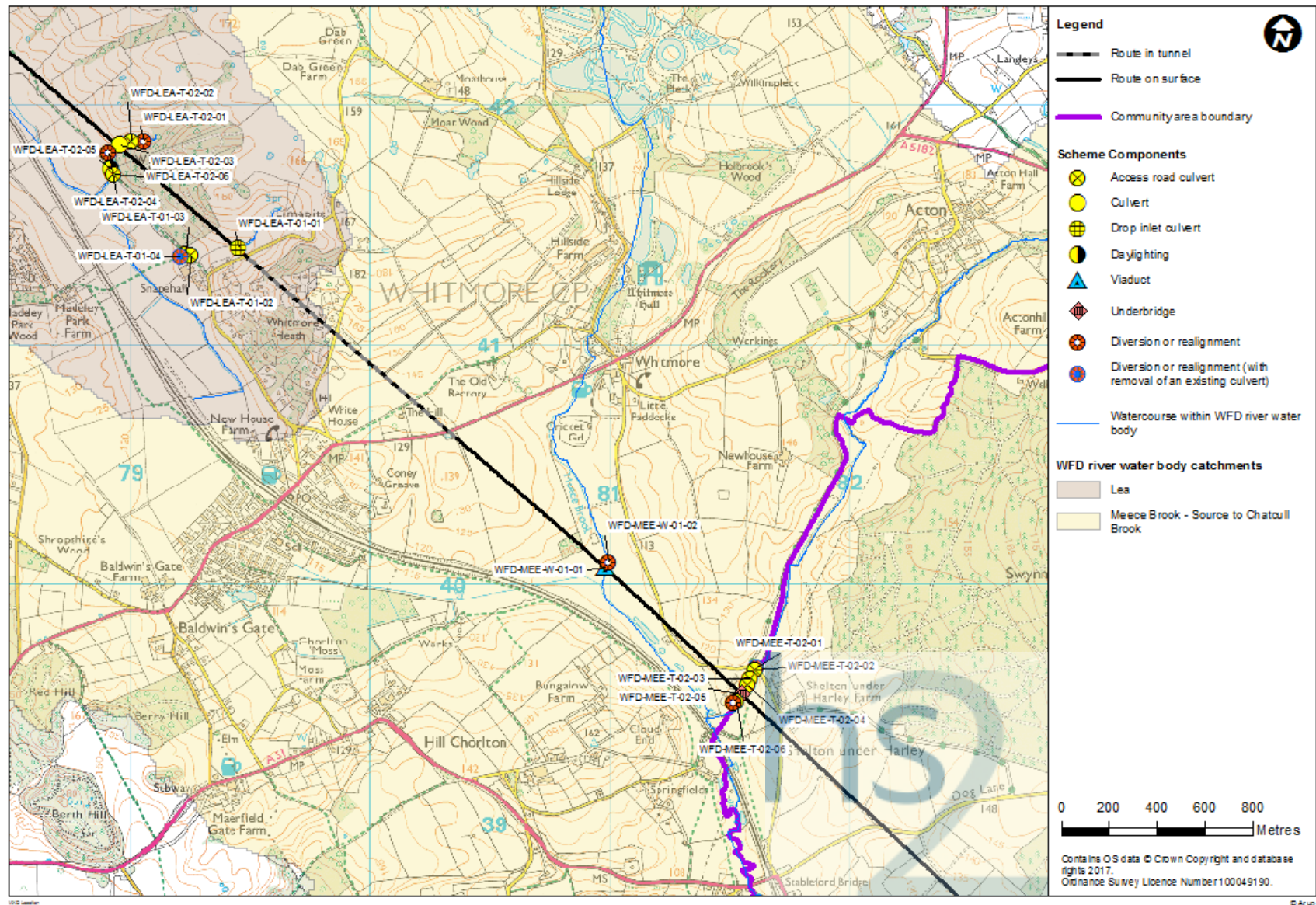


Figure 75: Proposed scheme components directly affecting WFD surface water bodies (Part 12)

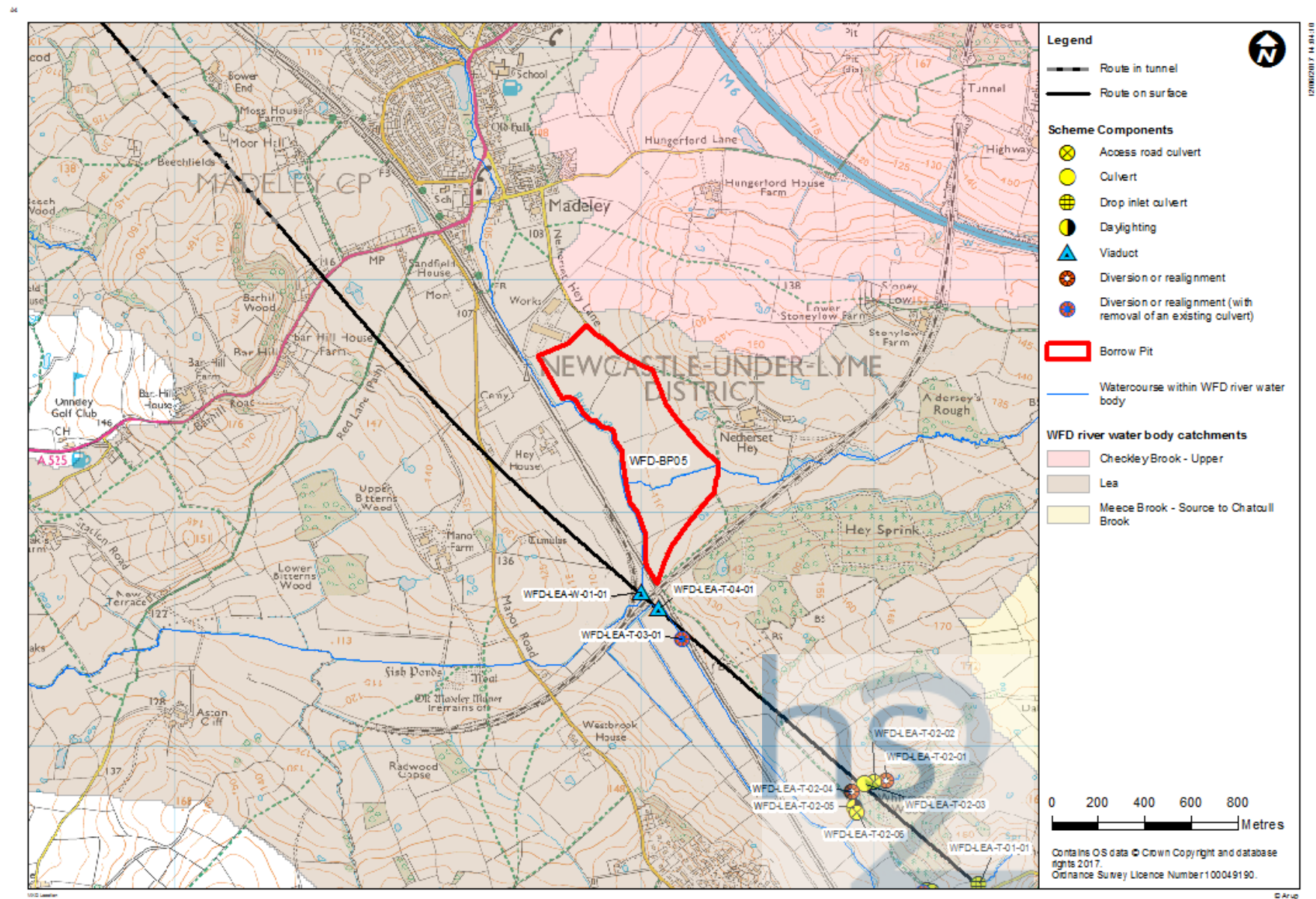


Figure 76: Proposed scheme components directly affecting WFD surface water bodies (Part 13)

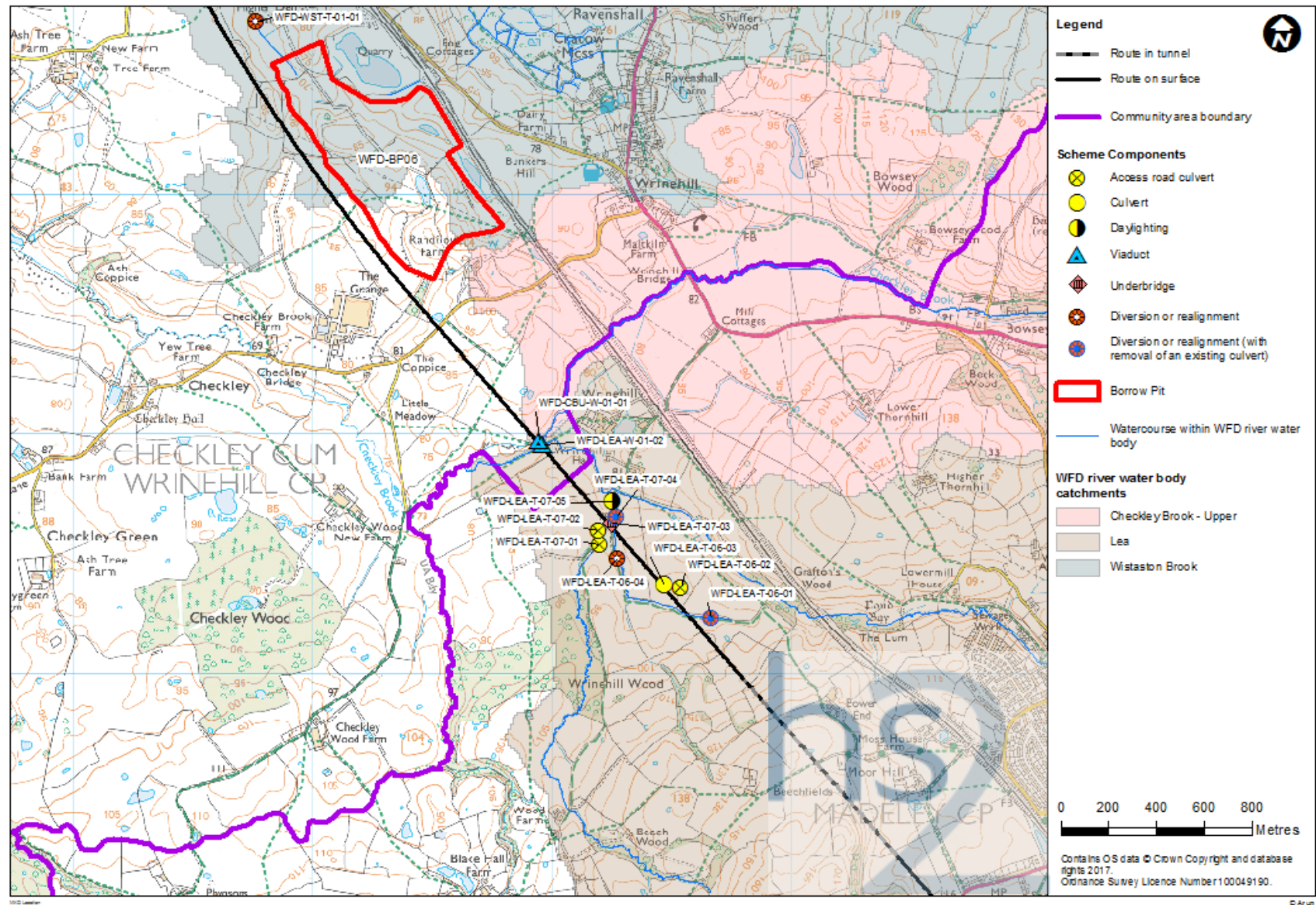


Figure 77: Proposed scheme components directly affecting WFD surface water bodies (Part 14)

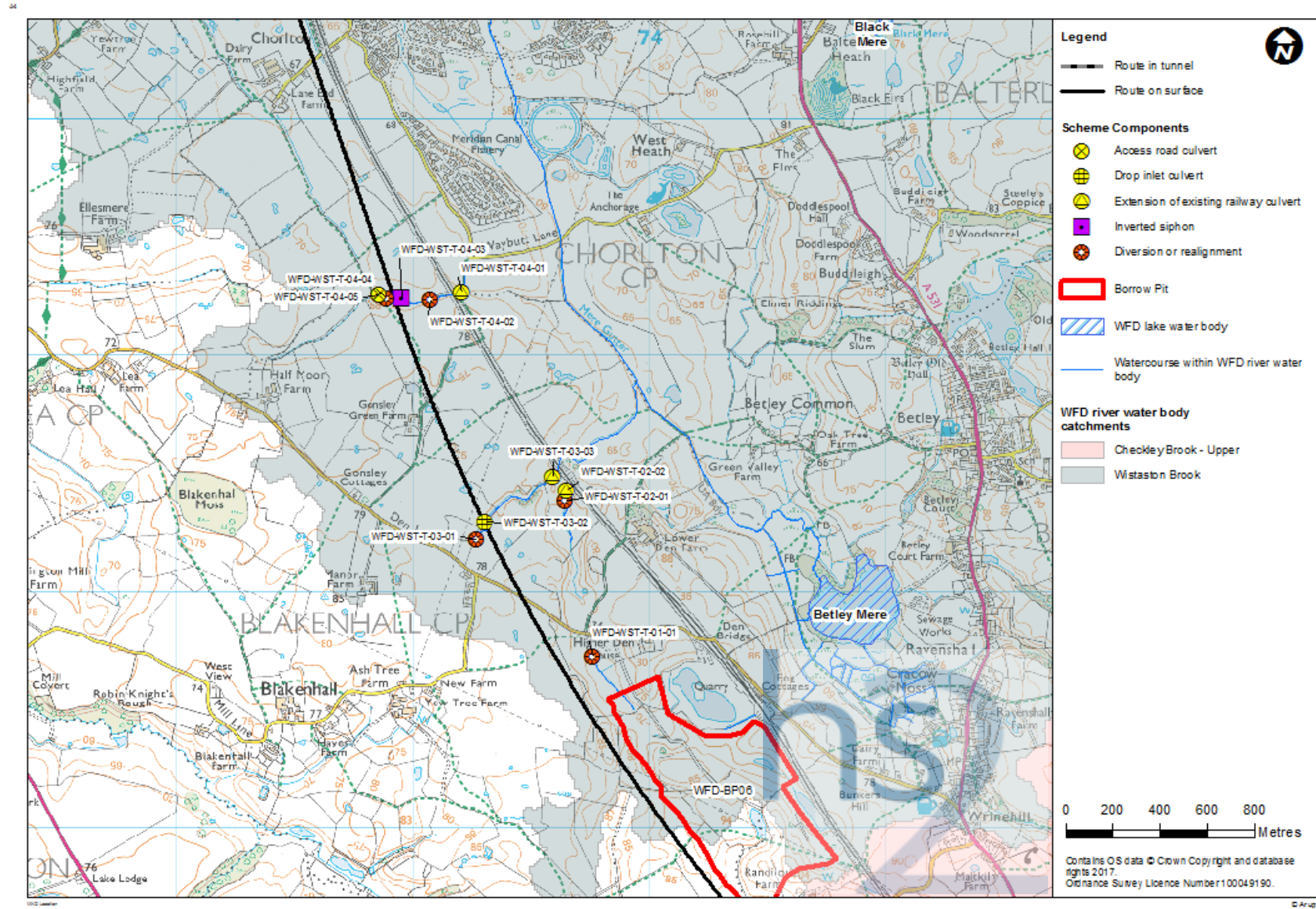
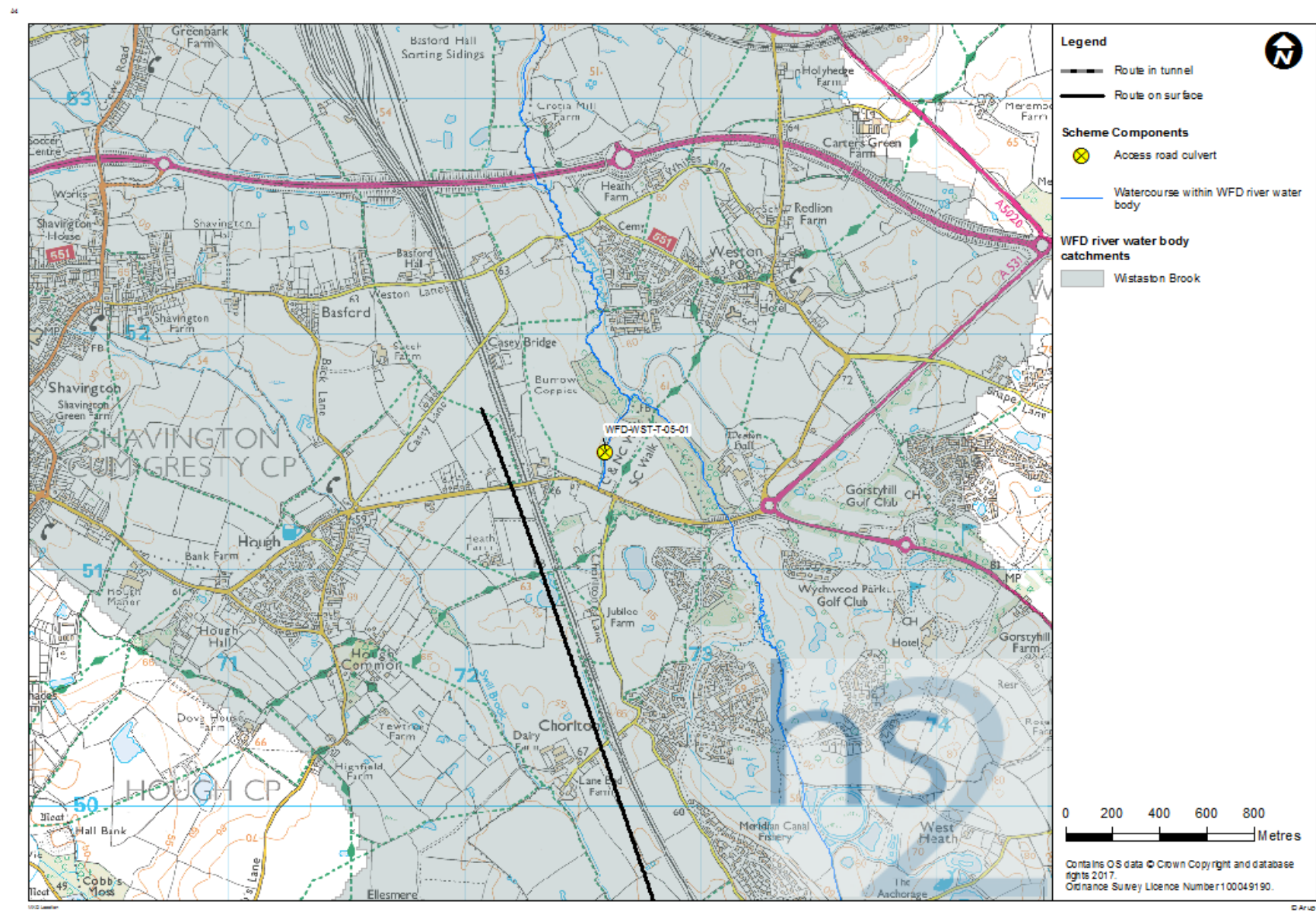


Figure 78: Proposed scheme components directly affecting WFD surface water bodies (Part 15)



1.2 **Groundwater**

- 1.2.1 All scheme components affecting groundwater bodies are summarised in Table 38, in relation to the relevant WFD groundwater body. The scheme component type and available design details are provided, and a unique reference code has been applied to each scheme component.

Table 38: Summary of proposed scheme components (with reference to relevant WFD groundwater water bodies)

WFD Groundwater Water Body (ID)	WFD Assessment Reference ID	Scheme Component	Scheme Component Name	Scheme Components Details	Design Drawing
Tame Anker Mease - Secondary Combined (GB40402G990800)	Permanent features of Proposed Scheme do not directly cross this WFD groundwater body.				
Staffordshire Trent Valley – Mercia Mudstone East & Coal Measures (GB40402G300300)	WFD-GW-MME-EM-01	Embankment	Pyford South embankment	Embankment Length: 305m; Maximum Height: 9m	CT-06-201
	WFD-GW-MME-VF-01	Viaduct	Pyford Brook viaduct	Approximate Length: 180m; Approximate Maximum Height: 10m	CT-06-201
	WFD-GW-MME-EM-02	Embankment	Pyford North embankment	Embankment Length: 1.8km; Maximum Height: 10m	CT-06-201
	WFD-GW-MME-VF-02	Viaduct	Kings Bromley viaduct	Approximate Length: 980m; Approximate Maximum Height: 16m	CT-06-202
	WFD-GW-MME-EM-03	Embankment	Bourne embankment	Embankment Length: 505m; Maximum Height: 16m	CT-06-203
	WFD-GW-MME-VF-03	Viaduct	River Trent viaduct	Approximate Length: 1.9km; Approximate Maximum Height: 15m	CT-06-203/204
	WFD-GW-MME-EM-04	Embankment	Pipe Ridware embankment	Embankment Length: 1.1km; Maximum Height: 9m	CT-06-204/205
	WFD-GW-MME-C-01	Cutting	Blithbury Central cutting	Cutting Length: 2.1km; Maximum Depth: 8m; Maximum Width at top of Cutting: 61m	CT-06-206/207
	WFD-GW-MME-OF-01	Overbridge	B5014 Uttoxeter Road overbridge	Approximate Height: 5.4 m; Approximate Height from existing Ground Level to top of Parapet: 7.2m	CT-06-206
	WFD-GW-MME-C-02	Cutting	Blithbury North cutting	Cutting Length: 895m; Maximum Depth: 12m; Maximum Width at top of Cutting: 87m	CT-06-207/208

WFD Groundwater Water Body (ID)	WFD Assessment Reference ID	Scheme Component	Scheme Component Name	Scheme Components Details	Design Drawing
	WFD-GW-MME-EM-05	Embankment	Stockwell Heath embankment	Embankment Length: 825m; Maximum Height: 12m	CT-06-208
	WFD-GW-MME-C-03	Cutting	Stockwell Heath cutting	Cutting Length: 555m; Maximum Depth: 8m; Maximum Width at top of Cutting: 59m	CT-06-208
	WFD-GW-MME-EM-06	Embankment	Moreton South embankment	Embankment Length: 1.2km; Maximum Height: 7m	CT-06-209
	WFD-GW-MME-VF-04	Viaduct	Moreton Brook viaduct	Approximate Length: 195m; Approximate Maximum Height: 9m	CT-06-209
	WFD-GW-MME-EM-07	Embankment	Moreton North embankment	Embankment Length: 695m; Maximum Height: 9m	CT-06-209/210
	WFD-GW-MME-C-04	Cutting	Moreton cutting	Cutting Length: 1.75km; Maximum Depth: 9m; Maximum Width at top of Cutting: 114.9m	CT-06-210/211
	WFD-GW-MME-RT-01	Retaining Wall	Moreton retaining wall	Approximate Dimensions: 208m x 10m (maximum height)	CT-06-210
	WFD-GW-MME-EM-08	Embankment	Trent South embankment	Embankment Length: 1.22km; Maximum Height: 15m	CT-06-211/212
	WFD-GW-MME-VF-05	Viaduct	Great Haywood viaduct	Approximate Length: 780m; Approximate Maximum Height: 16m	CT-06-212
	WFD-GW-MME-EM-09	Embankment	Trent North embankment	Embankment Length: 1.11km; Maximum Height: 11m	CT-06-212/213
	WFD-GW-MME-C-05	Cutting	Brancote South cutting	Cutting Length: 1.57km; Maximum Depth: 17m; Maximum Width at top of Cutting: 107.5m	CT-06-213

WFD Groundwater Water Body (ID)	WFD Assessment Reference ID	Scheme Component	Scheme Component Name	Scheme Components Details	Design Drawing
Staffordshire Trent Valley – PT Sandstone Staffordshire (GB40401G300500)	WFD-GW-SPT-C-01	Cutting	Blithbury South cutting	Cutting Length: 960m; Maximum Depth: 5m; Maximum Width at top of Cutting: 57m	CT-06-205/206
	WFD-GW-SPT-OF-01	Overbridge	B5014 Uttoxeter Road overbridge	Approximate Height: 5.4 m; Approximate Height from existing Ground Level to top of Parapet: 7.2m	CT-06-206
	WFD-GW-SPT-C-02	Cutting	Brancote South cutting	Cutting Length: 1.57km; Maximum Depth: 17m; Maximum Width at top of Cutting: 107.5m	CT-06-214
	WFD-GW-SPT-C-03	Cutting	Brancote North cutting	Cutting Length: 540m; Maximum Depth: 1m; Maximum Width at top of Cutting: 35m	CT-06-214
	WFD-GW-SPT-EM-01	Embankment	Hopton embankment	Embankment Length: 460m; Maximum Height: 8m	CT-06-215
	WFD-GW-SPT-C-04	Cutting	Hopton South cutting	Cutting Length: 1.48km; Maximum Depth: 15m; Maximum Width at top of Cutting: 91.3m	CT-06-215/216
	WFD-GW-SPT-OF-02	Overbridge	A518 Weston Road overbridge	Approximate Height: 9m; Approximate Height from existing Ground Level to top of Parapet: 10.6m	CT-06-215
	WFD-GW-SPT-RT-01	Retaining Wall	Hopton retaining wall	Approximate Dimensions: 299m x 4m (maximum height)	CT-06-216
	WFD-GW-SPT-C-05	Cutting	Hopton North cutting	Cutting Length: 2.08km; Maximum Depth: 17m; Maximum Width at top of Cutting: 103.8m	CT-06-216/217
	WFD-GW-SPT-EM-02	Embankment	Meaford North embankment	Embankment Length: 695m; Maximum Height: 9m	CT-06-224

WFD Groundwater Water Body (ID)	WFD Assessment Reference ID	Scheme Component	Scheme Component Name	Scheme Components Details	Design Drawing
	WFD-GW-SPT-C-06	Cutting	Swynnerton South cutting	Cutting Length: 2.08km; Maximum Depth: 17m; Maximum Width at top of Cutting: 103.8m	CT-06-224
	WFD-GW-SPT-EM-03	Embankment	Swynnerton embankment	Embankment Length: 1000m; Maximum Height: 7m	CT-06-224/225
	WFD-GW-SPT-C-07	Cutting	Swynnerton North cutting	Cutting Length: 1.97km; Maximum Depth: 19m; Maximum Width at top of Cutting: 117m	CT-06-225
	WFD-GW-SPT-OF-03	Overbridge	A519 Newcastle Road overbridge	Approximate Height: 10m; Approximate Height from existing Ground Level to top of Parapet: 4.4m	CT-06-226
	WFD-GW-SPT-EM-04	Embankment	Hatton embankment	Embankment Length: 980m; Maximum Height: 9m	CT-06-227
	WFD-GW-SPT-C-08	Cutting	Hatton South cutting	Cutting Length: 1.33km; Maximum Depth: 10m; Maximum Width at top of Cutting: 72m	CT-06-227/228
	WFD-GW-SPT-C-09	Cutting	Hatton North cutting	Cutting Length: 1.02km; Maximum Depth: 5m; Maximum Width at top of Cutting: 48m	CT-06-228
	WFD-GW-SPT-EM-05	Embankment	Stableford South embankment	Embankment Length: 165m; Maximum Height: 10m	CT-06-229
	WFD-GW-SPT-EM-06	Embankment	Stableford North embankment	Embankment Length: 565m; Maximum Height: 11m	CT-06-229
	WFD-GW-SPT-VF-01	Viaduct	Meece Brook viaduct	Approximate Length: 240m; Approximate Maximum Height: 12m	CT-06-229
	WFD-GW-SPT-EM-07	Embankment	Meece embankment	Embankment Length: 260m; Maximum Height: 10m	CT-06-229

WFD Groundwater Water Body (ID)	WFD Assessment Reference ID	Scheme Component	Scheme Component Name	Scheme Components Details	Design Drawing
	WFD-GW-SPT-C-10	Cutting	Whitmore South cutting	Cutting Length: 530m; Maximum Depth: 14m; Maximum Width at top of Cutting: 99m	CT-06-229
	WFD-GW-SPT-GT-01	Cut-and-cover tunnel	Porous portal	Approximate Length: 150m	CT-06-230
	WFD-GW-SPT-OF-04	Overbridge	A53 Newcastle Road overbridge	Approximate Height: 13m; Approximate Height from existing Ground Level to top of Parapet: 4.3m	CT-06-230
	WFD-GW-SPT-GT-02	Cut-and-cover tunnel	Whitmore Heath cut and cover tunnel	Approximate Length: 240m; Approximate Maximum Depth: 17m	CT-06-230
	WFD-GW-SPT-BT-01	Bore Tunnel	Whitmore Heath twin bore tunnel	Approximate Length: 690m; Approximate Maximum Depth: 50m	CT-06-230
Staffordshire Trent Valley – Mercia Mudstone West (GB40402G300400)	WFD-GW-MMW-C-01	Cutting	Hopton North cutting	Cutting Length: 2.08km; Maximum Depth: 17m; Maximum Width at top of Cutting: 103.8m	CT-06-216
	WFD-GW-MMW-OF-01	Overbridge	B5066 Sandon Road overbridge	Approximate Height: 10m; Approximate Height from existing Ground Level to top of Parapet: 11.9m	CT-06-216
	WFD-GW-MMW-EM-01	Embankment	Marston South embankment	Embankment Length: 1.08km; Maximum Height: 10m	CT-06-217
	WFD-GW-MMW-EM-02	Embankment	Marston North embankment	Embankment Length: 1.02km; Maximum Height: 4m	CT-06-218
	WFD-GW-MMW-C-02	Cutting	Yarlet South cutting	Cutting Length: 1.25km; Maximum Depth: 21m; Maximum Width at top of Cutting: 122.2m	CT-06-219
	WFD-GW-MMW-OF-02	Overbridge	A34 Stone Road overbridge	Approximate Height: 11m; Approximate Height from existing Ground Level to top of Parapet: 3.4m	CT-06-219

WFD Groundwater Water Body (ID)	WFD Assessment Reference ID	Scheme Component	Scheme Component Name	Scheme Components Details	Design Drawing
	WFD-GW-MMW-C-03	Cutting	Yarlet Central cutting	Cutting Length: 770m; Maximum Depth: 17m; Maximum Width at top of Cutting: 106m	CT-06-220
	WFD-GW-MMW-EM-03	Embankment	Yarlet embankment	Embankment Length: 940m; Maximum Height: 15m	CT-06-220
	WFD-GW-MMW-C-04	Cutting	Yarlet North cutting	Cutting Length: 2.02km; Maximum Depth: 17m; Maximum Width at top of Cutting: 138m	CT-06-221/222
	WFD-GW-MMW-EM-04	Embankment	Yarnfield South embankment	Embankment Length: 225m; Maximum Height: 6m	CT-06-222
	WFD-GW-MMW-OF-03	Overbridge	B5026 Eccleshall Road overbridge	Approximate Height: 10m; Approximate Height from existing Ground Level to top of Parapet: 4.2m	CT-06-222
	WFD-GW-MMW-VF-01	Viaduct	Filly Brook viaduct	Approximate Length: 449m; Approximate Maximum Height: 15m	CT-06-222
	WFD-GW-MMW-EM-05	Embankment	Yarnfield North embankment	Embankment Length: 761km; Maximum Height: 12m	CT-06-223
	WFD-GW-MMW-C-05	Cutting	Meaford cutting	Cutting Length: 380m; Maximum Depth: 3m; Maximum Width at top of Cutting: 54m	CT-06-223
	WFD-GW-MMW-EM-06	Embankment	Meaford South embankment	Embankment Length: 343m; Maximum Height: 9m	CT-06-223
	WFD-GW-MMW-VF-02	Viaduct	M6 Meaford viaduct	Approximate Length: 176m; Approximate Maximum Height: 14m	CT-06-223
	WFD-GW-MMW-EM-07	Embankment	Meaford North embankment	Embankment Length: 928m; Maximum Height: 19m	CT-06-224

WFD Groundwater Water Body (ID)	WFD Assessment Reference ID	Scheme Component	Scheme Component Name	Scheme Components Details	Design Drawing
	WFD-GW-MMW-EM-08	Embankment	Swynnerton embankment	Embankment Length: 1000m; Maximum Height: 7m	CT-06-224
Staffordshire Trent Valley - Coal Measures Stoke (GB40402G304600)	Permanent features of Proposed Scheme do not directly cross this WFD groundwater body.				
Manchester and East Cheshire Carboniferous Aquifers (GB41202G102900)	WFD-GW-MCA-BT-01	Bore Tunnel	Whitmore Heath twin bore tunnel	Approximate Length: 690m; Approximate Maximum Depth: 50m	CT-06-230
	WFD-GW-MCA-BT-02	Bore Tunnel	Porous portal	Approximate Length: 150m	CT-06-230
	WFD-GW-MCA-C-01	Cutting	Whitmore North cutting	Cutting Length: 600m; Maximum Depth: 13m; Maximum Width at top of Cutting: 43m	CT-06-231
	WFD-GW-MCA-EM-01	Embankment	Lea South embankment	Embankment Length: 845m; Maximum Height: 21m	CT-06-231
	WFD-GW-MCA-VF-01	Viaduct	River Lea viaduct	Approximate Length: 785m; Approximate Maximum Height: 21m	CT-06-232
	WFD-GW-MCA-EM-02	Embankment	Lea North embankment	Embankment Length: 860m; Maximum Height: 16m	CT-06-232
	WFD-GW-MCA-C-02	Cutting	Madeley cutting	Cutting Length: 1.02km; Maximum Depth: 17m; Maximum Width at top of Cutting: 133m	CT-06-232/233
	WFD-GW-MCA-RT-01	Retaining Wall	Whitmore Wood retaining wall	Approximate Dimensions: 577m x 20m (maximum height)	CT-06-233
	WFD-GW-MCA-OF-01	Overbridge	A525 Bar Hill Road overbridge	Approximate Height: 10m; Approximate Height from existing Ground Level to top of Parapet: 8m	CT-06-233

WFD Groundwater Water Body (ID)	WFD Assessment Reference ID	Scheme Component	Scheme Component Name	Scheme Components Details	Design Drawing
South Cheshire and North Staffordshire Permo-Triassic Sandstone Aquifers (GB41201G103400)	WFD-GW-CSPT-BT-01	Bore Tunnel	Porous portal	Approximate Length: 150m	CT-06-233
	WFD-GW-CSPT-BT-02	Bore Tunnel	Madeley twin bore tunnel	Approximate Length: 670m; Approximate Maximum Depth: 38m	CT-06-233
	WFD-GW-CSPT-BT-03	Bore Tunnel	Porous portal	Approximate Length: 150m	CT-06-234
	WFD-GW-CSPT-EM-01	Embankment	Checkley South embankment	Embankment Length: 1.18km; Maximum Height: 13m	CT-06-234
Weaver and Dane Quaternary Sand and Gravel Aquifers (GB41202G991700)	WFD-GW-WDQ-EM-01	Embankment	Checkley South embankment	Embankment Length: 1.18km; Maximum Height: 13m	CT-06-234
	WFD-GW-WDQ-VF-01	Viaduct	Checkley Brook viaduct	Approximate Length: 180m; Approximate Maximum Height: 15m	CT-06-235
	WFD-GW-WDQ-EM-02	Embankment	Checkley North embankment	Embankment Length: 400m; Maximum Height: 15m	CT-06-235
	WFD-GW-WDQ-C-01	Cutting	Crewe South cutting	Cutting Length: 5.5km; Maximum Depth: 6m; Maximum Width at top of Cutting: 60m	CT-06-235 to 239
	WFD-GW-WDQ-C-02	Cutting	Blakenhall Northbound spur cutting	Cutting Length: 1.8km; Maximum Depth: 5m; Maximum Width at top of Cutting: 49m	CT-06-236
	WFD-GW-WDQ-EM-03	Embankment	Blakenhall Northbound spur embankment	Embankment Length: 768m; Maximum Height: 14m	CT-06-236/237
	WFD-GW-WDQ-EM-04	Embankment	Blakenhall Southbound spur embankment	Embankment Length: 2.4km; Maximum Height: 8m	C861-ARP-CV-DPL-000-020036/7
	WFD-GW-WDQ-C-03	Cutting	Blakenhall cutting (WCML)	Cutting Length: 1.7km; Maximum Depth: 5m; Maximum Width at top of Cutting: 60m	
	WFD-GW-WDQ-VF-02	Viaduct	Den Lane east viaduct	Approximate Length: 67m; Approximate Maximum Height: 12m	CT-06-236

WFD Groundwater Water Body (ID)	WFD Assessment Reference ID	Scheme Component	Scheme Component Name	Scheme Components Details	Design Drawing
	WFD-GW-WDQ-VF-03	Viaduct	Den Lane west viaduct	Approximate Length: 67m; Approximate Maximum Height: 4m	CT-06-236
	WFD-GW-WDQ-VF-04	Viaduct	Blakenhall viaduct	Approximate Length: 291m; Approximate Maximum Height: 14m	CT-06-237
	WFD-GW-WDQ-EM-05	Embankment	Chorlton South embankment	Embankment Length: 935m; Maximum Height: 8m	CT-06-237
	WFD-GW-WDQ-RT-06	Retaining Wall	Chorlton retaining wall 4	Approximate Dimensions: 9m x 4m height	CT-06-238
	WFD-GW-WDQ-RT-07	Retaining Wall	Chorlton retaining wall 5	Approximate Dimensions: 9m x 4m height	CT-06-238
	WFD-GW-WDQ-RT-08	Retaining Wall	Chorlton retaining wall 6	Approximate Dimensions: 805m x 5m height	CT-06-238
	WFD-GW-WDQ-C-04	Cutting	Chorlton cutting (WCML)	Cutting Length: 2km; Maximum Depth: 4m; Maximum Width at top of Cutting: 90m	
	WFD-GW-WDQ-VF-05	Viaduct	Chorlton viaduct	Approximate Length: 340m; Approximate Maximum Height: 14m	CT-06-238
	WFD-GW-WDQ-EM-06	Embankment	Chorlton North embankment	Embankment Length: 1.5km; Maximum Height: 9m	CT-06-239
	WFD-GW-WDQ-BT-01	Cut-and-cover tunnel	Crewe south portal	Approximate Length: 524m; Approximate maximum Depth: 22m	CT-06-239
	WFD-GW-WDQ-OF-01	Overbridge	Newcastle Road overbridge	Approximate Height: 28m; Approximate Height from existing Ground Level to top of Parapet: 15.1m	CT-06-239
	WFD-GW-WDQ-C-05	Cutting	Basford cutting (WCML)	Cutting Length: 515m; Maximum Depth: 4m; Maximum Width at top of Cutting: 34m	
	WFD-GW-WDQ-BP-01	Borrow Pit	Borrow Pit north of Checkley Lane	Assumed extraction depth: 3.8m (0.8m topsoil); Maximum extraction depth: 12.8m (0.8m topsoil); Total footprint: 40ha	CT-06-235/236

WFD Groundwater Water Body (ID)	WFD Assessment Reference ID	Scheme Component	Scheme Component Name	Scheme Components Details	Design Drawing
	N/A	Bridge	Basford East bridge	Proposed bridge crossing at Basford East Development Site.	N/A

1.3 Identification of potential impacts

- 1.3.1 The generic impacts identified for scheme components affecting surface water bodies and groundwater bodies are summarised in Table 39 and Table 40, respectively.

Table 39: Generic potential impacts of scheme components on surface water bodies

Impact considered	Scheme Component							
	Viaduct	Culvert	Siphon	Diversion	Realignment	Underbridge	Daylighting / Removal of existing culvert	Borrow pit
Footprint	✓	✓	✓	✓	✓	✓	✓	✓
Changes in flow velocity and volume due to dewatering	X	X	X	X	X	X	X	✓
Noise and vibration during construction	✓	✓	✓	✓	✓	✓	✓	✓
Shading	✓	✓	X	X	X	✓	✓	X
Drainage	✓	✓	✓	X	X	✓	✓	✓
Changes to water body hydromorphology leading to changes in river processes and habitats upstream and downstream	✓	✓	✓	✓	✓	X	✓	✓
Changes in water quality due to discharge of groundwater to surface water body	X	X	X	X	X	X	X	✓
Creation of new habitats	X	X	X	✓	✓	X	✓	✓

Table 40: Generic potential impacts of scheme components on groundwater bodies

	Scheme Component								
Impact considered	Embankment	At grade	Cutting	Retaining walls	Bored tunnel	Cut-and-cover tunnel	Viaduct foundations	Overbridge foundations	Borrow pit
Lowering of groundwater levels and reduction in groundwater contributions to surface water bodies, GWDTE or groundwater abstractions by temporary dewatering/permanent groundwater control	X	X	✓	✓	✓	✓	X	X	✓
Disturbing or mobilising existing poor quality groundwater by temporary dewatering or depressurisation and permanent groundwater control	X	X	✓	✓	✓	✓	X	X	✓
'Damming' of groundwater flow and reduction in groundwater contributions	X	X	✓	✓	✓	✓	✓	✓	✓
Creating or altering of pathways along which existing poor quality groundwater can migrate	X	X	✓	✓	✓	✓	✓	✓	✓

Annex F: Preliminary assessment

1 Likely effects on current status

1.1 Surface water

- 1.1.1 The results of the preliminary screening assessment of the likely effects of the relevant scheme components on the WFD status elements of surface water bodies are summarised in Table 41.
- 1.1.2 The assessment has identified which WFD status elements are likely to be affected by each of the scheme components, in relation to the relevant watercourse and WFD surface water body catchment. Where likely effects are anticipated on a WFD status element, this status element has been carried forward for detailed impact and mitigation assessment.

Table 41: Preliminary assessment (screening) of the likely effects of the Proposed Scheme on the WFD status elements of surface water bodies

WFD Water Body (ID)	Watercourse	WFD Assessment Reference ID	Scheme Component	Biological Effects	Physicochemical Effects	Specific Pollutants Effects	Hydromorphological Effects
Pyford Brook Catchment (trib of Trent) (GB104028047250)	Pyford Brook	WFD-PYB-W-01-01	Viaduct	✓	✓	X	X
		WFD-PYB-W-01-02	Access Road Culvert	✓	✓	X	✓
	Unnamed tributary of Pyford Brook 1	WFD-PYB-T-01-01	Diversion	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
Bourne-Bilson Brook Catchment (trib of Trent) (GB104028047270)	Ashby Sitch	WFD-BRN-T-01-01	Culvert	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
		WFD-BRN-T-01-02	Realignment	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
		WFD-BP01	Borrow pit	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
	Bourne Brook	WFD-BRN-W-01-01	Viaduct	✓	✓	X	X
		WFD-BP02	Borrow pit	✓	✓	✓	✓
		WFD-BRN-W-01-02	Daylighting of existing highway culvert	✓	✓	✓	✓
		WFD-BRN-W-01-03	Highway realignment culvert	✓	✓	X	✓
	Crawley Brook	WFD-BRN-T-02-01	Highway realignment culvert	✓	✓	X	✓
		WFD-BRN-T-02-02	Viaduct	✓	✓	X	X
		WFD-BRN-T-02-03	Realignment	✓	✓	X	✓

WFD Water Body (ID)	Watercourse	WFD Assessment Reference ID	Scheme Component	Biological Effects	Physicochemical Effects	Specific Pollutants Effects	Hydromorphological Effects
		WFD-BP02	Borrow pit	✓	✓	✓	✓
		WFD-BP03	Borrow pit	✓	✓	✓	✓
		WFD-BRN-T-02-04	Highway realignment culvert	✓	✓	X	✓
Trent from Moreton Brook to River Tame (GB104028047290)	Unnamed tributary of River Trent (MB to RT) 1	WFD-TMT-T-01-01	Viaduct	✓	✓	X	X
		WFD-TMT-T-01-02	Diversion	✓	✓	X	✓
	Unnamed tributary of River Trent (MB to RT) 2	WFD-TMT-T-02-01	Viaduct	✓	✓	X	X
	Unnamed tributary of River Trent (MB to RT) 3	WFD-TMT-T-03-01	Viaduct	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
	River Trent	WFD-TMT-W-01-01	Viaduct	✓	✓	X	X
		WFD-BP04	Borrow pit	✓	✓	✓	✓
	Unnamed tributary of Bentley Brook 1	WFD-TMT-T-04-01	Drop inlet culvert	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
		WFD-TMT-T-04-02	Realignment (with removal of existing culvert)	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
	Unnamed tributary of Bentley Brook 2	WFD-TMT-T-05-01	Highway realignment culvert	✓	✓	X	✓
		WFD-TMT-T-05-02	Realignment (associated with removal of existing culvert; see WFD-	✓	✓	X	✓

WFD Water Body (ID)	Watercourse	WFD Assessment Reference ID	Scheme Component	Biological Effects	Physicochemical Effects	Specific Pollutants Effects	Hydromorphological Effects
			TMT-T-05-03)				
		WFD-TMT-T-05-03	Removal of existing highway culvert (associated with realignment; see WFD-TMT-T-05-02)	✓	✓	X	✓
		WFD-TMT-T-05-04	Daylighting of existing culvert	✓	✓	X	✓
		WFD-TMT-T-05-05	Highway realignment culvert (on daylighted channel; see WFD-TMT-T-05-04)	✓	✓	X	✓
		WFD-TMT-T-05-06	Access road culvert	✓	✓	X	✓
	Unnamed tributary of Bentley Brook 3	WFD-TMT-T-06-01	Access road culvert	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
		WFD-TMT-T-06-02	Highway realignment culvert	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
		WFD-TMT-T-06-03	Realignment (with removal of existing culvert)	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
		WFD-TMT-T-06-04	Drop inlet culvert	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
		WFD-TMT-T-06-05	Access road culvert	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
Blithe – Tad Bk to R Trent	Luth Burn	WFD-BTT-T-01-01	Viaduct	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			

WFD Water Body (ID)	Watercourse	WFD Assessment Reference ID	Scheme Component	Biological Effects	Physicochemical Effects	Specific Pollutants Effects	Hydromorphological Effects
(G104028046491)		WFD-BP04	Borrow pit	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment..			
Moreton Brook from Source to River Trent (GB104028047380)	Unnamed tributary of Moreton Brook 1	WFD-MRB-T-01-01	Culvert	✓	✓	X	✓
		WFD-MRB-T-01-02	Realignment	✓	✓	X	✓
		WFD-MRB-T-01-03	Highway realignment culvert	✓	✓	X	✓
		WFD-MRB-T-01-04	Access road culvert	✓	✓	X	✓
	Unnamed tributary of Moreton Brook 2	WFD-MRB-T-02-01	Realignment	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment..			
		WFD-MRB-T-02-02	Highway realignment culvert	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
		WFD-MRB-T-02-03	Culvert	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
		WFD-MRB-T-02-04	Realignment	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
		WFD-MRB-T-02-05	Access road culvert	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
	Unnamed tributary of Moreton Brook 3	WFD-MRB-T-03-01	Drop inlet culvert	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
		WFD-MRB-T-03-02	Realignment	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
		WFD-MRB-T-03-03	Access road culvert	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
	Moreton Brook	WFD-MRB-W-01-01	Viaduct	✓	✓	X	X

WFD Water Body (ID)	Watercourse	WFD Assessment Reference ID	Scheme Component	Biological Effects	Physicochemical Effects	Specific Pollutants Effects	Hydromorphological Effects
		WFD-MRB-W-01-02	Realignment	✓	✓	X	✓
	Unnamed tributary of Moreton Brook 4	WFD-MRB-T-04-01	Diversion	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
		WFD-MRB-T-04-02	Access road culvert	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
Trent from Tittensor to River Sow (GB104028053272)	Unnamed tributary of River Trent (T to RS) 1	WFD-TTS-T-01-01	Realignment	✓	✓	X	✓
		WFD-TTS-T-01-02	Culvert	✓	✓	X	✓
		WFD-TTS-T-01-03	Realignment	✓	✓	X	✓
	River Trent	WFD-TTS-W-01-01	Viaduct	✓	✓	X	X
	Unnamed tributary of River Trent (T to RS) 2	WFD-TTS-T-02-01	Viaduct	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment..			
		WFD-TTS-T-02-02	Realignment	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
	Unnamed tributary of River Trent (T to RS) 3	WFD-TTS-T-03-01	Culvert	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
		WFD-TTS-T-03-02	Realignment	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
	Unnamed tributary of River Trent (T to RS) 4	WFD-TTS-T-04-01	Access road culvert	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
		WFD-TTS-T-04-02	Access road culvert	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
		WFD-TTS-T-04-03	Underbridge	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			

WFD Water Body (ID)	Watercourse	WFD Assessment Reference ID	Scheme Component	Biological Effects	Physicochemical Effects	Specific Pollutants Effects	Hydromorphological Effects
		WFD-TTS-T-04-04	Realignment	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
	Unnamed tributary of River Trent (T to RS) 5	WFD-TTS-T-05-01	Access road culvert	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
		WFD-TTS-T-05-02	Drop inlet culvert	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
		WFD-TTS-T-05-03	Realignment	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
	Unnamed tributary of River Trent (T to RS) 6	WFD-TTS-T-06-01	Culvert	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
		WFD-TTS-T-06-02	Realignment	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
	Unnamed tributary of River Trent (T to RS) 7	WFD-TTS-T-07-01	Access road culvert	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
		WFD-TTS-T-07-02	Diversion	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
	Filly Brook	WFD-TTS-T-08-01	Extension of existing railway culvert	✓	✓	X	✓
		WFD-TTS-T-08-02	Viaduct	✓	✓	X	X
		WFD-TTS-T-08-03	Underbridge	✓	✓	X	X
		WFD-TTS-T-08-04	Realignment (with removal of existing culvert)	✓	✓	X	✓

WFD Water Body (ID)	Watercourse	WFD Assessment Reference ID	Scheme Component	Biological Effects	Physicochemical Effects	Specific Pollutants Effects	Hydromorphological Effects
		WFD-TTS-T-08-05	Realignment	✓	✓	X	✓
		WFD-TTS-T-08-06	Highway realignment culvert (replacement of existing highway culvert; on realigned channel)	✓	✓	X	✓
		WFD-TTS-T-08-07	Access road culvert (on realigned channel)	✓	✓	X	✓
		WFD-TTS-T-08-08	Realignment	✓	✓	X	✓
		WFD-TTS-T-08-09	Viaduct	✓	✓	X	X
		WFD-TTS-T-08-10	Realignment	✓	✓	X	✓
	Unnamed tributary of Filly Brook 1	WFD-TTS-T-09-01	Access road culvert	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
		WFD-TTS-T-09-02	Access road culvert	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
	Unnamed tributary of Filly Brook 2	WFD-TTS-T-10-01	Highway realignment culvert	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
	Unnamed tributary of River Trent (T to RS) 8	WFD-TTS-T-11-01	Access road culvert (on realigned channel)	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
		WFD-TTS-T-11-02	Culvert	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
		WFD-TTS-T-11-03	Realignment	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient.			

WFD Water Body (ID)	Watercourse	WFD Assessment Reference ID	Scheme Component	Biological Effects	Physicochemical Effects	Specific Pollutants Effects	Hydromorphological Effects
				Does not require further detailed WFD impact and mitigation assessment.			
		WFD-TTS-T-11-04	Access road culvert	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
Trent and Mersey Canal, summit to Alrewas (GB70410142)	Trent and Mersey Canal	WFD-TMT-W-01-01	Viaduct	✓	✓	X	X
Sow – Doxey Brook to River Penk (GB104028046790)	Unnamed tributary of Kingston Brook 1	WFD-SDP-T-01-01	Culvert	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
		WFD-SDP-T-01-02	Realignment	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
	Unnamed tributary of Kingston Brook 2	WFD-SDP-T-02-01	Culvert	✓	✓	X	✓
		WFD-SDP-T-02-02	Realignment	✓	✓	X	✓
		WFD-SDP-T-02-03	Access road culvert	✓	✓	X	✓
	Unnamed tributary of Kingston Brook 3	WFD-SDP-T-03-01	Access road culvert	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
Meece Brook from Source to Chatcull Brook	Unnamed tributary of Meece Brook 1	WFD-MEE-T-01-01	Diversion	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
		WFD-MEE-T-01-02	Culvert	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
		WFD-MEE-T-01-03	Diversion	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
		WFD-MEE-T-01-04	Access road culvert (on diverted channel)	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			

WFD Water Body (ID)	Watercourse	WFD Assessment Reference ID	Scheme Component	Biological Effects	Physicochemical Effects	Specific Pollutants Effects	Hydromorphological Effects
	Unnamed tributary of Meece Brook 2	WFD-MEE-T-02-01	Realignment (with removal of existing culvert)	✓	✓	X	✓
		WFD-MEE-T-02-02	Highway realignment culvert (on realigned channel; replacement of existing highway culvert; see WFD-MEE-T-02-01)	✓	✓	X	✓
		WFD-MEE-T-02-03	Access road culvert (on realigned channel)	✓	✓	X	✓
		WFD-MEE-T-02-04	Access road culvert (on realigned channel)	✓	✓	X	✓
		WFD-MEE-T-02-05	Underbridge	✓	✓	X	X
		WFD-MEE-T-02-06	Access road culvert (on realigned channel)	✓	✓	X	✓
		WFD-MEE-T-02-07	Realignment	✓	✓	X	✓
	Meece Brook	WFD-MEE-W-01-01	Viaduct	✓	✓	X	X
		WFD-MEE-W-01-02	Realignment	✓	✓	X	✓
Lea (GB112068055200)	Unnamed tributary of River Lea 1	WFD-LEA-T-01-01	Drop inlet culvert	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
		WFD-LEA-T-01-02	Access road culvert (on diverted	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient.			

WFD Water Body (ID)	Watercourse	WFD Assessment Reference ID	Scheme Component	Biological Effects	Physicochemical Effects	Specific Pollutants Effects	Hydromorphological Effects
			channel)	Does not require further detailed WFD impact and mitigation assessment.			
		WFD-LEA-T-01-03	Access road culvert (on diverted channel)	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
		WFD-LEA-T-01-04	Diversion (with removal of existing culvert)	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
	Unnamed tributary of River Lea 2	WFD-LEA-T-02-01	Realignment	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
		WFD-LEA-T-02-02	Access road culvert	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
		WFD-LEA-T-02-03	Culvert	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
		WFD-LEA-T-02-04	Realignment	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
		WFD-LEA-T-02-05	Daylighting	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
		WFD-LEA-T-02-06	Access road culvert	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
	Unnamed tributary of River Lea 3	WFD-LEA-T-03-01	Diversion (of partially culverted channel)	✓	✓	X	✓
	Unnamed tributary of River Lea 4	WFD-LEA-T-04-01	Viaduct	✓	✓	X	X
	River Lea	WFD-LEA-W-01-01	Viaduct	✓	✓	X	X

WFD Water Body (ID)	Watercourse	WFD Assessment Reference ID	Scheme Component	Biological Effects	Physicochemical Effects	Specific Pollutants Effects	Hydromorphological Effects
		WFD-BP05	Borrow pit	✓	✓	✓	✓
		WFD-LEA-W-01-02	Viaduct	✓	✓	X	X
	Unnamed tributary of River Lea 5	WFD-BP05	Borrow pit	✓	✓	✓	✓
	Unnamed tributary of River Lea 6	WFD-LEA-T-06-01	Diversion (with removal of existing culvert)	✓	✓	X	✓
		WFD-LEA-T-06-02	Access road culvert (on diverted channel)	✓	✓	X	✓
		WFD-LEA-T-06-03	Culvert (on diverted channel)	✓	✓	X	✓
		WFD-LEA-T-06-04	Diversion (with associated removal of existing culvert)	✓	✓	X	✓
	Unnamed tributary of River Lea 7	WFD-LEA-T-07-01	Access road culvert	✓	✓	X	✓
		WFD-LEA-T-07-02	Access road culvert	✓	✓	X	✓
		WFD-LEA-T-07-03	Underbridge	✓	✓	X	X
		WFD-LEA-T-07-04	Realignment (with removal of existing culvert)	✓	✓	X	✓
Checkley Brook – Upper (GB112068055230)	Checkley Brook	WFD-CBU-W-01-01	Viaduct	✓	✓	X	X
Wistaston Brook	Unnamed tributary of	WFD-BP06	Borrow pit	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient.			

WFD Water Body (ID)	Watercourse	WFD Assessment Reference ID	Scheme Component	Biological Effects	Physicochemical Effects	Specific Pollutants Effects	Hydromorphological Effects
(GB112068055280)	Mere Gutter 1			Does not require further detailed WFD impact and mitigation assessment.			
	Unnamed tributary of Mere Gutter 2	WFD-WST-T-01-01	Realignment	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
		WFD-BP06	Borrow pit	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
	Unnamed tributary of Mere Gutter 3	WFD-WST-T-02-01	Realignment	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
		WFD-WST-T-02-02	Extension of existing WCML railway culvert	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
	Unnamed tributary of Mere Gutter 4	WFD-WST-T-03-01	Realignment	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
		WFD-WST-T-03-02	Drop inlet culvert	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
		WFD-WST-T-03-03	Extension of existing WCML railway culvert	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
	Unnamed tributary of Mere Gutter 5	WFD-WST-T-04-01	Extension of existing WCML railway culvert	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
		WFD-WST-T-04-02	Realignment	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
		WFD-WST-T-04-03	Inverted siphon	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
		WFD-WST-T-04-04	Realignment	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			

WFD Water Body (ID)	Watercourse	WFD Assessment Reference ID	Scheme Component	Biological Effects	Physicochemical Effects	Specific Pollutants Effects	Hydromorphological Effects
		WFD-WST-T-04-05	Access road culvert	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
	Unnamed tributary of Mere Gutter 6	WFD-BPo6	Borrow pit	✓	✓	✓	✓
	Mere Gutter (Wistaston Brook)	WFD-BPo6	Borrow pit	✓	✓	✓	✓
		N/A	Bridge (Basford East)	✓	✓	X	X
	Unnamed tributary of Mere Gutter 7	WFD-WST-T-05-01	Highway realignment culvert	Watercourse site scoped out at baseline assessment stage. Embedded mitigation sufficient. Does not require further detailed WFD impact and mitigation assessment.			
Betley Mere (GB31234330)	N/a	WFD-BPo6	Borrow pit	✓	✓	✓	✓

1.2 **Groundwater**

- 1.2.1 The results of the preliminary screening assessment of the likely effects of relevant scheme components on the WFD status elements of groundwater bodies are summarised in Table 42. The assessment has identified which WFD status elements have potential to be affected by each of the scheme components, in relation to the relevant WFD groundwater body.
- 1.2.2 Where likely effects are anticipated on a WFD status element, this element has been carried forward for detailed impact and mitigation assessment.

Table 42: Preliminary assessment (screening) of the likely effects of the Proposed Scheme on the WFD status elements of groundwater bodies

WFD Groundwater Body (ID)	Scheme Components	Quantitative Status Effects		Chemical Status Effects		Screening outcome – taken forward for detailed impact assessment
		Lowering of groundwater levels and reduction in groundwater contributions to surface water bodies, GWDTE or groundwater abstractions by temporary dewatering/permanent groundwater control	'Damming' of groundwater flow and reduction in groundwater contributions	Disturbing or mobilising existing poor quality groundwater by temporary dewatering or depressurisation and permanent groundwater control	Creating or altering of pathways along which existing poor quality groundwater can migrate	
Tame Anker Mease - Secondary Combined (GB40402G990800)	WFD groundwater body not crossed by any permanent features of the Proposed Scheme.	N/A	N/A	N/A	N/A	X
Staffordshire Trent Valley – Mercia Mudstone East & Coal Measures (GB40402G300300)	Pyford South embankment	X	X	X	X	X
	Pyford Brook viaduct	X	✓	X	✓	✓
	Pyford North embankment	X	X	X	X	X
	Kings Bromley viaduct	X	✓	X	✓	✓
	Bourne embankment	X	X	X	X	X
	River Trent viaduct	X	✓	X	✓	✓
	Pipe Ridware embankment	X	X	X	X	X
	Blithbury Central cutting	✓	✓	✓	✓	✓
	B5014 Uttoxeter Road overbridge	X	✓	X	✓	✓
	Blithbury North cutting	✓	✓	✓	✓	✓
	Stockwell Heath embankment	X	X	X	X	X

WFD Groundwater Body (ID)	Scheme Components	Quantitative Status Effects		Chemical Status Effects		Screening outcome – taken forward for detailed impact assessment
		Lowering of groundwater levels and reduction in groundwater contributions to surface water bodies, GWDTE or groundwater abstractions by temporary dewatering/permanent groundwater control	'Damming' of groundwater flow and reduction in groundwater contributions	Disturbing or mobilising existing poor quality groundwater by temporary dewatering or depressurisation and permanent groundwater control	Creating or altering of pathways along which existing poor quality groundwater can migrate	
	Stockwell Heath cutting	✓	✓	✓	✓	✓
	Moreton South embankment	X	X	X	X	X
	Moreton Brook viaduct	X	✓	X	✓	✓
	Moreton North embankment	X	X	X	X	X
	Moreton cutting	✓	✓	✓	✓	✓
	Moreton retaining wall	✓	✓	✓	✓	✓
	Trent South embankment	X	X	X	X	X
	Great Haywood viaduct	X	✓	X	✓	✓
	Trent North embankment	X	X	X	X	X
	Brancote South cutting	✓	✓	✓	✓	✓
Staffordshire Trent Valley – PT Sandstone Staffordshire (GB40401G300500)	Blithbury South cutting	✓	✓	✓	✓	✓
	B5014 Uttoxeter Road overbridge	X	✓	X	✓	✓
	Brancote South cutting	✓	✓	✓	✓	✓
	Brancote North cutting	✓	✓	✓	✓	✓

WFD Groundwater Body (ID)	Scheme Components	Quantitative Status Effects		Chemical Status Effects		Screening outcome – taken forward for detailed impact assessment
		Lowering of groundwater levels and reduction in groundwater contributions to surface water bodies, GWDTE or groundwater abstractions by temporary dewatering/permanent groundwater control	'Damming' of groundwater flow and reduction in groundwater contributions	Disturbing or mobilising existing poor quality groundwater by temporary dewatering or depressurisation and permanent groundwater control	Creating or altering of pathways along which existing poor quality groundwater can migrate	
	Hopton embankment	X	X	X	X	X
	Hopton South cutting	✓	✓	✓	✓	✓
	A518 Weston Road overbridge	X	✓	X	✓	✓
	Hopton retaining wall	✓	✓	✓	✓	✓
	Hopton North cutting	✓	✓	✓	✓	✓
	Meaford North embankment	X	X	X	X	X
	Swynnerton South cutting	✓	✓	✓	✓	✓
	Swynnerton embankment	X	X	X	X	X
	Swynnerton North cutting	✓	✓	✓	✓	✓
	A519 Newcastle Road overbridge	X	✓	X	✓	✓
	Hatton embankment	X	X	X	X	X
	Hatton South cutting	✓	✓	✓	✓	✓
	Hatton North cutting	✓	✓	✓	✓	✓
	Stableford South embankment	X	X	X	X	X

WFD Groundwater Body (ID)	Scheme Components	Quantitative Status Effects		Chemical Status Effects		Screening outcome – taken forward for detailed impact assessment
		Lowering of groundwater levels and reduction in groundwater contributions to surface water bodies, GWDTE or groundwater abstractions by temporary dewatering/permanent groundwater control	'Damming' of groundwater flow and reduction in groundwater contributions	Disturbing or mobilising existing poor quality groundwater by temporary dewatering or depressurisation and permanent groundwater control	Creating or altering of pathways along which existing poor quality groundwater can migrate	
	Stableford North embankment	X	X	X	X	X
	Meece Brook viaduct	X	✓	X	✓	✓
	Meece embankment	X	X	X	X	X
	Whitmore South cutting	✓	✓	✓	✓	✓
	Porous portal	✓	✓	✓	✓	✓
	A53 Newcastle Road overbridge	X	✓	X	✓	✓
	Whitmore Heath cut and cover tunnel	✓	✓	✓	✓	✓
	Whitmore Heath twin bore tunnel	✓	✓	✓	✓	✓
Staffordshire Trent Valley – Mercia Mudstone West (GB40402G300400)	Hopton North cutting	✓	✓	✓	✓	✓
	B5066 Sandon Road overbridge	X	✓	X	✓	✓
	Marston South embankment	X	X	X	X	X
	Marston North embankment	X	X	X	X	X
	Yarlet South cutting	✓	✓	✓	✓	✓
	A34 Stone Road overbridge	X	✓	X	✓	✓

WFD Groundwater Body (ID)	Scheme Components	Quantitative Status Effects		Chemical Status Effects		Screening outcome – taken forward for detailed impact assessment
		Lowering of groundwater levels and reduction in groundwater contributions to surface water bodies, GWDTE or groundwater abstractions by temporary dewatering/permanent groundwater control	'Damming' of groundwater flow and reduction in groundwater contributions	Disturbing or mobilising existing poor quality groundwater by temporary dewatering or depressurisation and permanent groundwater control	Creating or altering of pathways along which existing poor quality groundwater can migrate	
	Yarlet Central cutting	✓	✓	✓	✓	✓
	Yarlet embankment	X	X	X	X	X
	Yarlet North cutting	✓	✓	✓	✓	✓
	Yarnfield South embankment	X	X	X	X	X
	B5026 Eccleshall Road overbridge	X	✓	X	✓	✓
	Filly Brook viaduct	X	✓	X	✓	✓
	Yarnfield North embankment	X	X	X	X	X
	Meaford cutting	✓	✓	✓	✓	✓
	Meaford South embankment	X	X	X	X	X
	M6 Meaford viaduct	X	✓	X	✓	✓
	Meaford North embankment	X	X	X	X	X
	Swynnerton embankment	X	X	X	X	X
Staffordshire Trent Valley - Coal Measures Stoke (GB40402G304600)	WFD groundwater body not crossed by any permanent features of the Proposed Scheme.	N/A	N/A	N/A	N/A	X

WFD Groundwater Body (ID)	Scheme Components	Quantitative Status Effects		Chemical Status Effects		Screening outcome – taken forward for detailed impact assessment
		Lowering of groundwater levels and reduction in groundwater contributions to surface water bodies, GWDTE or groundwater abstractions by temporary dewatering/permanent groundwater control	'Damming' of groundwater flow and reduction in groundwater contributions	Disturbing or mobilising existing poor quality groundwater by temporary dewatering or depressurisation and permanent groundwater control	Creating or altering of pathways along which existing poor quality groundwater can migrate	
Manchester and East Cheshire Carboniferous Aquifers (GB41202G102900)	Whitmore Heath twin bore tunnel	✓	✓	✓	✓	✓
	Porous portal	✓	✓	✓	✓	✓
	Whitmore North cutting	✓	✓	✓	✓	✓
	Lea South embankment	X	X	X	X	X
	River Lea viaduct	X	✓	X	✓	✓
	Lea North embankment	X	X	X	X	X
	Madeley cutting	✓	✓	✓	✓	✓
	Whitmore Wood retaining wall	✓	✓	✓	✓	✓
	A525 Bar Hill Road overbridge	X	✓	X	✓	✓
South Cheshire and North Staffordshire Permo-Triassic Sandstone Aquifers (GB41201G103400)	Porous portal	✓	✓	✓	✓	✓
	Madeley twin bore tunnel	✓	✓	✓	✓	✓
	Porous portal	✓	✓	✓	✓	✓
	Checkley South embankment	X	X	X	X	X

WFD Groundwater Body (ID)	Scheme Components	Quantitative Status Effects		Chemical Status Effects		Screening outcome – taken forward for detailed impact assessment
		Lowering of groundwater levels and reduction in groundwater contributions to surface water bodies, GWDTE or groundwater abstractions by temporary dewatering/permanent groundwater control	'Damming' of groundwater flow and reduction in groundwater contributions	Disturbing or mobilising existing poor quality groundwater by temporary dewatering or depressurisation and permanent groundwater control	Creating or altering of pathways along which existing poor quality groundwater can migrate	
Weaver and Dane Quaternary Sand and Gravel Aquifers (GB41202G991700)	Checkley South embankment	X	X	X	X	X
	Checkley Brook viaduct	X	✓	X	✓	✓
	Checkley North embankment	X	X	X	X	X
	Crewe South cutting	✓	✓	✓	✓	✓
	Blakenhall Northbound spur cutting	✓	✓	✓	✓	✓
	Blakenhall Northbound spur embankment	X	X	X	X	X
	Blakenhall Southbound spur embankment	X	X	X	X	X
	Blakenhall cutting	✓	✓	✓	✓	✓
	Den Lane east viaduct	X	✓	X	✓	✓
	Den Lane west viaduct	X	✓	X	✓	✓
	Blakenhall viaduct	X	✓	X	✓	✓
	Chorlton South embankment	X	X	X	X	X
	Chorlton retaining wall 4	✓	✓	✓	✓	✓

WFD Groundwater Body (ID)	Scheme Components	Quantitative Status Effects		Chemical Status Effects		Screening outcome – taken forward for detailed impact assessment
		Lowering of groundwater levels and reduction in groundwater contributions to surface water bodies, GWDTE or groundwater abstractions by temporary dewatering/permanent groundwater control	'Damming' of groundwater flow and reduction in groundwater contributions	Disturbing or mobilising existing poor quality groundwater by temporary dewatering or depressurisation and permanent groundwater control	Creating or altering of pathways along which existing poor quality groundwater can migrate	
	Chorlton retaining wall 5	✓	✓	✓	✓	✓
	Chorlton Retaining Wall 6 (<i>Retaining wall separate WCML from HS2 on its approach to Crewe South portal</i>)	✓	✓	✓	✓	✓
	Chorlton cutting	✓	✓	✓	✓	✓
	Chorlton viaduct	X	✓	X	✓	✓
	Chorlton North embankment	X	X	X	X	X
	Crewe south portal	✓	✓	✓	✓	✓
	Newcastle Road overbridge	X	✓	X	✓	✓
	Basford cutting	✓	✓	✓	✓	✓
	Borrow Pit north of Checkley Lane	✓	✓	✓	✓	✓
	Basford East bridge	X	✓	X	✓	✓

2 Likely effects on status objectives

2.1 Screening of reasons for not achieving good status

- 2.1.1 The 2015 RBMP RNAG for quality elements of surface water and groundwater bodies affected by the Proposed Scheme have been screened against the relevant scheme components proposed within the water body catchment area.
- 2.1.2 The RNAG for the surface water and groundwater bodies affected by the Proposed Scheme, together with the relevant scheme components and associated potential adverse and/or beneficial effects, are provided in Table 43 and Table 44, respectively.
- 2.1.3 A precautionary approach has then been taken, whereby any identification of a potential adverse effect (following consideration of embedded mitigation) is used to highlight the potential for the Proposed Scheme to prevent the status objective of the relevant quality element from being obtained.
- 2.1.4 Accordingly, those RNAG highlighted as potentially at risk from the Proposed Scheme have been taken forward for further assessment.

Table 43: Reasons for not achieving good status (RNAG) identified for WFD surface water bodies affected by Proposed Scheme (with reference to relevant scheme components)

WFD water body (ID)	RNAG ID	Element not achieving good status	Element status (2015)	Category (business sector)	SWMI	Activity	Pressure (tier)	Relevant to Proposed Scheme? (Y/N)	Relevant scheme component(s)	Likely effect of Proposed Scheme when considered against embedded mitigation
Pyford Brook catchment (trib of Trent) (GB104028047250)	508496	Ammonia (Phys-Chem)	Bad	Agriculture and rural land management	Diffuse source	Mixed agricultural		Y	Diversion	Minor, localised beneficial – diversions incorporate buffer strips to provide marginal / riparian improvements, which may in turn help to reduce agricultural diffuse pollution from surface water runoff and bank erosion.
	508508	Phosphate	Bad	Urban and transport	Diffuse source	Drainage – mixed		Y	Viaduct; Access road culvert	Negligible – drainage strategy incorporates suitable drainage systems (including balancing ponds) to intercept, attenuate and discharge runoff from the track and other proposed infrastructure in a manner that will not significant adversely impact upon water quality of receiving watercourse.
	508501	Dissolved oxygen	Bad	Agriculture and rural land management	Diffuse source	Mixed agricultural		Y	Diversion	Minor, localised beneficial – diversions incorporate buffer strips to provide marginal / riparian improvements, which may in turn help to reduce agricultural diffuse pollution from surface water runoff and bank erosion.

WFD water body (ID)	RNAG ID	Element not achieving good status	Element status (2015)	Category (business sector)	SWMI	Activity	Pressure (tier)	Relevant to Proposed Scheme? (Y/N)	Relevant scheme component(s)	Likely effect of Proposed Scheme when considered against embedded mitigation
	508890	Macrophytes and Phytobenthos Combined	Moderate	Urban and transport (urban)	Diffuse source	Drainage – mixed	Nutrients (tier 1); Phosphate (tier 2); Phosphate (tier 3)	Y	Viaduct; Access road culvert	Negligible – drainage strategy incorporates suitable drainage systems (including balancing ponds) to intercept, attenuate and discharge runoff from the track and other proposed infrastructure in a manner that will not significant adversely impact upon water quality of receiving watercourse.
	508510	Phosphate	Bad	Water Industry	Point source	Sewage discharge (continuous)		N	None	None anticipated
	508502	Dissolved oxygen	Bad	Water Industry	Point source	Sewage discharge (continuous)		N	None	None anticipated
	508498	Ammonia (Phys-Chem)	Bad	Water Industry	Point source	Sewage discharge (continuous)		N	None	None anticipated
	508499	Ammonia (Phys-Chem)	Bad	Water Industry	Point source	Sewage discharge (intermittent)		N	None	None anticipated
	508891	Macrophytes and Phytobenthos Combined	Moderate	Water Industry (Waste water treatment)	Point source	Sewage discharge (continuous)	Nutrients (tier 1); Phosphate (tier 2); Phosphate (tier 3)	N	None	None anticipated

WFD water body (ID)	RNAG ID	Element not achieving good status	Element status (2015)	Category (business sector)	SWMI	Activity	Pressure (tier)	Relevant to Proposed Scheme? (Y/N)	Relevant scheme component(s)	Likely effect of Proposed Scheme when considered against embedded mitigation
	508504	Dissolved oxygen	Bad	Water Industry	Point source	Sewage discharge (intermittent)			None	None anticipated
Bourne-Bilson Brook catchment (trib of Trent) (GB104028047270)	514001	Phosphate	Moderate	Water Industry	Point source	Sewage discharge (continuous)		N	None	None anticipated
	519735	Macrophytes and Phytobenthos Combined	Moderate	No sector responsible	Suspect data	Not applicable	Other (not in list) (tier 1)	N	None	None anticipated
	519733	Macrophytes and Phytobenthos Combined	Moderate	Agriculture and rural land management	Diffuse source	Mixed agricultural	Nutrients (tier 1); Phosphate (tier 2); Phosphate (tier 3)	Y	Realignment; Borrow pit	Minor, localised beneficial – realignments incorporate buffer strips to provide marginal / riparian improvements, which may in turn help to reduce agricultural diffuse pollution from surface water runoff and bank erosion. Negligible – borrow pits will involve a temporary reduction agricultural activity at the site during construction but borrow pits will be restored to their existing land use following construction.

WFD water body (ID)	RNAG ID	Element not achieving good status	Element status (2015)	Category (business sector)	SWMI	Activity	Pressure (tier)	Relevant to Proposed Scheme? (Y/N)	Relevant scheme component(s)	Likely effect of Proposed Scheme when considered against embedded mitigation
	514002	Phosphate	Moderate	Agriculture and rural land management	Diffuse source	Mixed agricultural		Y	Realignment; Borrow pit	Minor, localised beneficial – realignments incorporate buffer strips to provide marginal / riparian improvements, which may in turn help to reduce agricultural diffuse pollution from surface water runoff and bank erosion. Negligible – borrow pits will involve a temporary reduction agricultural activity at the site during construction but borrow pits will be restored to their existing land use following construction.
	514004	Phosphate	Moderate	Urban and transport	Diffuse source	Sewage discharge (diffuse)		N	None	None anticipated
Trent from Moreton Brook to River Tame (GB104028047290) (2015 data not available, 2014 data used)	491110	Phosphate	Moderate	Water industry	Point source	Sewage discharge (continuous)		N	None	None anticipated
	482177	Fish	Poor	Agriculture and rural land management	Physical modification	Land drainage	Morphology (tier 1); N/A (tier 2); physical modification (tier 3)	Y	Diversion; Realignment;	Minor, localised beneficial - realignments and diversions provide opportunity to improve local hydromorphological condition and fish habitat.
	490921	Macrophytes and	Moderate	Water industry	Point source	Sewage discharge	Nutrients (tier 1); Phosphate (tier 2);	N	None	None anticipated

WFD water body (ID)	RNAG ID	Element not achieving good status	Element status (2015)	Category (business sector)	SWMI	Activity	Pressure (tier)	Relevant to Proposed Scheme? (Y/N)	Relevant scheme component(s)	Likely effect of Proposed Scheme when considered against embedded mitigation
		phytobenthos				(continuous)	Phosphate (tier 3)			
	491980	Macrophytes and phytobenthos	Moderate	Agriculture and rural land management	Diffuse source	Dairy/beef field	Nutrients (tier 1); Phosphate (tier 2); Phosphate (tier 3)	Y	Diversion; Realignment; Borrow pit	Minor, localised beneficial – realignments incorporate buffer strips to provide marginal / riparian improvements, which may in turn help to reduce agricultural diffuse pollution from surface water runoff and bank erosion. Negligible – borrow pits will involve a temporary reduction agricultural activity at the site during construction but borrow pits will be restored to their existing land use following construction.
	490924	Macrophytes and phytobenthos	Moderate	Water industry	Point source	Sewage discharge (intermittent)	Nutrients (tier 1); Phosphate (tier 2); Phosphate (tier 3)	N	None	None anticipated
	490925	Fish	Poor	Urban and transport	Physical modification	Barriers to fish migration	Morphology (tier 1); N/A (tier 2); physical modification (tier 3)	Y	Drop inlet culvert (track); Highway realignment culvert; Access road culvert	At risk - construction of further physical modifications potentially causing adverse effect on fish passage. Take forward for detailed assessment.

WFD water body (ID)	RNAG ID	Element not achieving good status	Element status (2015)	Category (business sector)	SWMI	Activity	Pressure (tier)	Relevant to Proposed Scheme? (Y/N)	Relevant scheme component(s)	Likely effect of Proposed Scheme when considered against embedded mitigation
	492083	Macrophytes and phytobenthos	Moderate	Urban and transport	Diffuse source	Drainage – mixed	Nutrients (tier 1); Phosphate (tier 2); Phosphate (tier 3)	Y	Drop inlet culvert (track); Highway realignment culvert; Access road culvert	Negligible – drainage strategy incorporates suitable drainage systems (including balancing ponds) to intercept, attenuate and discharge runoff from the track and other proposed infrastructure in a manner that will not significant adversely impact upon water quality of receiving watercourse.
	490922	Macrophytes and phytobenthos	Moderate	Agriculture and rural land management	Diffuse source	Dairy/beef field	Nutrients (tier 1); Phosphate (tier 2); Phosphate (tier 3)	Y	Diversion; Realignment; Borrow pit	Minor, localised beneficial – realignments incorporate buffer strips to provide marginal / riparian improvements, which may in turn help to reduce agricultural diffuse pollution from surface water runoff and bank erosion. Negligible – borrow pits will involve a temporary reduction agricultural activity at the site during construction but borrow pits will be restored to their existing land use following construction.
	490923	Macrophytes and phytobenthos	Moderate	Water industry	Diffuse source	Sewage discharge (intermittent)	Nutrients (tier 1); Phosphate (tier 2); Phosphate (tier 3)	N	None	None anticipated

WFD water body (ID)	RNAG ID	Element not achieving good status	Element status (2015)	Category (business sector)	SWMI	Activity	Pressure (tier)	Relevant to Proposed Scheme? (Y/N)	Relevant scheme component(s)	Likely effect of Proposed Scheme when considered against embedded mitigation
	491828	Phosphate	Poor	Urban and transport	Diffuse source	Drainage - mixed	Phosphate (tier 3)	Y	Drop inlet culvert (track); Highway realignment culvert; Access road culvert	Negligible – drainage strategy incorporates suitable drainage systems (including balancing ponds) to intercept, attenuate and discharge runoff from the track and other proposed infrastructure in a manner that will not significant adversely impact upon water quality of receiving watercourse.
	492148	Macrophytes and phytobenthos	Moderate	Urban and transport	Diffuse source	Drainage - mixed	Nutrients (tier 1); Phosphate (tier 2); Phosphate (tier 3)	Y	Drop inlet culvert (track); Highway realignment culvert; Access road culvert	Negligible – drainage strategy incorporates suitable drainage systems (including balancing ponds) to intercept, attenuate and discharge runoff from the track and other proposed infrastructure in a manner that will not significant adversely impact upon water quality of receiving watercourse.
Blithe- Tad Bk to R Trent (GB104028046491)	514858	Macrophytes and Phytobenthos combined	Moderate	Agriculture and rural land management	Diffuse source	Mixed Agriculture	Agriculture and rural land management; n/a; Organic pollution	Y	Borrow pit	Negligible – borrow pits will involve a temporary reduction agricultural activity at the site during construction but borrow pits will be restored to their existing land use following construction.

WFD water body (ID)	RNAG ID	Element not achieving good status	Element status (2015)	Category (business sector)	SWMI	Activity	Pressure (tier)	Relevant to Proposed Scheme? (Y/N)	Relevant scheme component(s)	Likely effect of Proposed Scheme when considered against embedded mitigation
	513832	Phosphate	Poor	Agriculture and rural land management	Diffuse source	Mixed Agriculture	Agriculture and rural land management; N/a; Organic pollution	Y	Borrow pit	Negligible – borrow pits will involve a temporary reduction agricultural activity at the site during construction but borrow pits will be restored to their existing land use following construction.
	MMA_USE_o593	Mitigation Measures	Not assessed	Water industry (drinking water supply)	Physical modification	Other (not in list)		N	None	None anticipated
	MMA_USE_o593	Mitigation Measures	Not assessed	Water industry (water regulation)	Physical modification	Other (not in list)		N	None	None anticipated
Moreton Brook from Source to River Trent (GB104028047380)	513284	Phosphate	Moderate	Water Industry (Waste water treatment)	Point source	Sewage discharge (continuous)	Phosphate (tier 3)	N	None	None anticipated
	513280	Phosphate	Moderate	Agriculture and rural land management (livestock)	Diffuse source	Dairy/beef field	Phosphate (tier 3)	Y	Realignment; Diversion	Minor, localised beneficial – realignments and diversions incorporate buffer strips to provide marginal / riparian improvements, which may in turn help to reduce agricultural diffuse pollution from surface water runoff and bank erosion.

WFD water body (ID)	RNAG ID	Element not achieving good status	Element status (2015)	Category (business sector)	SWMI	Activity	Pressure (tier)	Relevant to Proposed Scheme? (Y/N)	Relevant scheme component(s)	Likely effect of Proposed Scheme when considered against embedded mitigation
Trent from Tittensor to River Sow (GB104028053272) (2015 data not available, 2014 data used)	483203	Invertebrates	Moderate	Agriculture and rural land management	Diffuse source	Mixed agricultural	Organic pollution (tier 1); N/A (tier 2); Organic pollution (tier 3)	Y	Realignment	Minor, localised beneficial – realignments incorporate buffer strips to provide marginal / riparian improvements, which may in turn help to reduce agricultural diffuse pollution from surface water runoff and bank erosion.
	491018	Phosphate	Poor	Agriculture and rural land management	Diffuse source	Dairy/beef field	Phosphate (tier 3)	Y	Realignment	Minor, localised beneficial – realignments incorporate buffer strips to provide marginal / riparian improvements, which may in turn help to reduce agricultural diffuse pollution from surface water runoff and bank erosion.
	491019	Fish	Poor	Sector under investigation	Physical modification	Barriers to fish migration	Morphology (tier 1); N/A (tier 2); Physical modification (tier 3)	Y	Culvert (track); Access Road Culvert; Highway realignment culvert	At risk - construction of further physical modifications potentially causing adverse effect on fish passage. Take forward for detailed assessment.
	491919	Fish	Poor	Agriculture and rural land management	Diffuse source	Mixed agricultural	Organic pollution (tier 1); N/A (tier 2); Organic pollution (tier 3)	Y	Realignment	Minor, localised beneficial – realignments incorporate buffer strips to provide marginal / riparian improvements, which may in turn help to reduce agricultural diffuse pollution from surface water runoff and bank erosion.

WFD water body (ID)	RNAG ID	Element not achieving good status	Element status (2015)	Category (business sector)	SWMI	Activity	Pressure (tier)	Relevant to Proposed Scheme? (Y/N)	Relevant scheme component(s)	Likely effect of Proposed Scheme when considered against embedded mitigation
	491020	Invertebrates	Moderate	Water Industry	Point source	Sewage discharge (continuous)	Ammonia (tier 1); N/A (tier 2); Ammonia (tier 3)	N	None	None anticipated
	491112	Phosphate	Poor	Water Industry	Point source	Sewage discharge (continuous)	Phosphate (tier 3)	N	None	None anticipated
	492085	Phosphate	Poor	Urban and transport	Diffuse source	Drainage - mixed	Phosphate (tier 3)	Y	Viaduct; Underbridge (track); Culvert (track); Drop inlet culvert (track); Highway realignment culvert; Access road culvert	Negligible – drainage strategy incorporates suitable drainage systems (including balancing ponds) to intercept, attenuate and discharge runoff from the track and other proposed infrastructure in a manner that will not significant adversely impact upon water quality of receiving watercourse.
	491918	Fish	Poor	Water Industry	Point source	Sewage discharge (continuous)	Organic pollution (tier 1); N/A (tier 2); Organic pollution (tier 3)	N	None	None anticipated

WFD water body (ID)	RNAG ID	Element not achieving good status	Element status (2015)	Category (business sector)	SWMI	Activity	Pressure (tier)	Relevant to Proposed Scheme? (Y/N)	Relevant scheme component(s)	Likely effect of Proposed Scheme when considered against embedded mitigation
Sow - Doxey Bk to R Penk (GB104028046790)	510120	Hydrological Regime	Does not support good	Water Industry	Flow	Groundwater abstraction	Abstraction and flow (tier 3)	Y	Cuttings (see ground water scheme components)	Negligible effect – groundwater abstractions within water body catchment anticipated to be unaffected by Proposed Scheme, with exception of Hanyards Farm. The alternative or replacement supply for Hanyards Farm is being developed with the Environment Agency and Seven Trent Ltd and will comprise either a replacement borehole (located to avoid impacts to river flows) or a mains water connection (with no impact).
	510117	Phosphate	Moderate	Agriculture and rural land management (livestock)	Diffuse source	Dairy/beef field	Phosphate (tier 3)	Y	Realignment	Minor, localised beneficial – realignments incorporate buffer strips to provide marginal / riparian improvements, which may in turn help to reduce agricultural diffuse pollution from surface water runoff and bank erosion.
	508736	Invertebrates	Good	Agriculture and rural land management	Diffuse source	Land use - arable	Organic pollution (tier 1); Pollution from rural areas (tier 3)	Y	Realignment	Minor, localised beneficial – realignments incorporate buffer strips to provide marginal / riparian improvements, which may in turn help to reduce agricultural diffuse pollution from surface water runoff

WFD water body (ID)	RNAG ID	Element not achieving good status	Element status (2015)	Category (business sector)	SWMI	Activity	Pressure (tier)	Relevant to Proposed Scheme? (Y/N)	Relevant scheme component(s)	Likely effect of Proposed Scheme when considered against embedded mitigation
										and bank erosion.
	514901	Macrophytes and Phytobenthos Combined	Moderate	Urban and transport (urban)	Diffuse source	Drainage - mixed	Nutrients (tier 1); Phosphate (tier 2); Pollution from towns, cities and transport (tier 3)	Y	Culvert (track); Access Road Culvert	Negligible – drainage strategy incorporates suitable drainage systems (including balancing ponds) to intercept, attenuate and discharge runoff from the track and other proposed infrastructure in a manner that will not significant adversely impact upon water quality of receiving watercourse.
	509648	Fish	Moderate	Industry	Physical modification	Barriers to fish migration	Morphology (tier 1); Physical modification (tier 3)	Y	Culvert (track); Access Road Culvert	At risk – construction of further physical modifications potentially causing adverse effect on fish passage. Take forward for detailed assessment.
	509649	Fish	Moderate	Local and Central Government (local authorities)	Physical modification	Flood protection - other operational management	Morphology (tier 1); Physical modification (tier 3)	N		None anticipated
	510119	Phosphate	Moderate	Water Industry (Waste water treatment)	Point source	Sewage discharge (continuous)	Phosphate (tier 3)	N	None	None anticipated
	514904	Macrophytes and Phytobenthos Combined	Moderate	Agriculture and rural land management	Diffuse source	Mixed agricultural	Nutrients (tier 1); Phosphate (tier 2); Pollution from rural	Y	Realignment	Minor, localised beneficial – realignments incorporate buffer strips to provide marginal / riparian improvements, which may in

WFD water body (ID)	RNAG ID	Element not achieving good status	Element status (2015)	Category (business sector)	SWMI	Activity	Pressure (tier)	Relevant to Proposed Scheme? (Y/N)	Relevant scheme component(s)	Likely effect of Proposed Scheme when considered against embedded mitigation
							areas (tier 3)			turn help to reduce agricultural diffuse pollution from surface water runoff and bank erosion.
	510118	Phosphate	Moderate	Urban and transport (urban)	Diffuse source	Drainage - mixed	Pollution from towns, cities and transport (tier 3)	Y	Culvert (track); Access Road Culvert	Negligible – drainage strategy incorporates suitable drainage systems (including balancing ponds) to intercept, attenuate and discharge runoff from the track and other proposed infrastructure in a manner that will not significant adversely impact upon water quality of receiving watercourse.
	508732	Invertebrates	Good	Agriculture and rural land management	Physical modification	Land use - arable	Morphology (tier 1); Physical modification (tier 3)	Y	Realignment	Minor, localised beneficial – realignments will aim to provide hydromorphological improvements where possible and will incorporate buffer strips to provide marginal / riparian improvements
	514899	Macrophytes and Phytobenthos Combined	Moderate	Water Industry (Waste water treatment)	Point source	Sewage discharge (continuous)	Nutrients (tier 1); Phosphate (tier 2); Pollution from waste water (tier 3)	N	None	None anticipated
	509650	Fish	Moderate	Industry	Point source	Unknown (pending	Other (not in list) (tier 1);	N	None	None anticipated

WFD water body (ID)	RNAG ID	Element not achieving good status	Element status (2015)	Category (business sector)	SWMI	Activity	Pressure (tier)	Relevant to Proposed Scheme? (Y/N)	Relevant scheme component(s)	Likely effect of Proposed Scheme when considered against embedded mitigation
						investigation)	Other (tier 3)			
	508735	Invertebrates	Good	Urban and transport	Physical modification	Urbanisation - transport	Morphology (tier 1); Physical modification (tier 3)	Y	Culvert (track); Access Road Culvert	Negligible – culvert lengths reduced as far as reasonably practicable. Invert of culverts to be buried 300mm below the existing bed level to maintain natural substrate. Hydromorphological improvements to be undertaken to river channel immediately upstream and downstream of the culvert to compensate for footprint loss.
	508737	Invertebrates	Good	Urban and transport	Diffuse source	Drainage - mixed	Organic pollution (tier 1); Organic pollution (tier 3);	Y	Culvert (track); Access Road Culvert	Negligible – drainage strategy incorporates suitable drainage systems (including balancing ponds) to intercept, attenuate and discharge runoff from the track and other proposed infrastructure in a manner that will not significant adversely impact upon water quality of receiving watercourse.
Meece Brook from Source to Chatcull Brook	508973	Invertebrates	Moderate	Sector under investigation	Unknown (pending investigation)	Unknown (pending investigation)	Other (not in list) (tier 1); Other (tier 3)	Unknown	Unknown	Unknown

WFD water body (ID)	RNAG ID	Element not achieving good status	Element status (2015)	Category (business sector)	SWMI	Activity	Pressure (tier)	Relevant to Proposed Scheme? (Y/N)	Relevant scheme component(s)	Likely effect of Proposed Scheme when considered against embedded mitigation
(GB104028053080)	513881	Macrophytes and Phytobenthos Combined	Moderate	Agriculture and rural land management	Diffuse source	Mixed agricultural	Nutrients (tier 1); Phosphate (tier 2); Pollution from rural areas (tier 3)	Y	Diversion; Realignment	Minor, localised beneficial – realignments incorporate buffer strips to provide marginal / riparian improvements, which may in turn help to reduce agricultural diffuse pollution from surface water runoff and bank erosion.
	514826	Dissolved oxygen	Good	Other	Diffuse source	Sewage discharge (diffuse)	Pollution from towns, cities and transport (tier 3)	Y	Viaduct; Culvert (track) Access Road Culvert; Highway realignment culvert	Negligible – drainage strategy incorporates suitable drainage systems (including balancing ponds) to intercept, attenuate and discharge runoff from the track and other proposed infrastructure in a manner that will not significant adversely impact upon water quality of receiving watercourse.
	514824	Dissolved oxygen	Good	Agriculture and rural land management (livestock)	Diffuse source	Mixed agricultural	Pollution from rural areas (tier 3)	Y	Diversion; Realignment	Minor, localised beneficial – realignments incorporate buffer strips to provide marginal / riparian improvements, which may in turn help to reduce agricultural diffuse pollution from surface water runoff and bank erosion.
Lea (GB112068055200)	517732	Invertebrates	Poor	Sector under investigation	Unknown (pending investigation)	Unknown (pending investigation)		Unknown	Unknown	Unknown

WFD water body (ID)	RNAG ID	Element not achieving good status	Element status (2015)	Category (business sector)	SWMI	Activity	Pressure (tier)	Relevant to Proposed Scheme? (Y/N)	Relevant scheme component(s)	Likely effect of Proposed Scheme when considered against embedded mitigation
	518435	Phosphate	Poor	Water Industry (Waste water treatment)	Point source	Sewage discharge (continuous)	Other (not in list) (tier 1); Phosphate (tier 3)	N	None	None anticipated
	516268	Phosphate	Poor	Sector under investigation	Unknown (pending investigation)	Unknown (pending investigation)	Other (not in list) (tier 1); Phosphate (tier 3)	Unknown	Unknown	Unknown
Wistaston Brook (GB112068055280)	514943	Fish	Bad	Urban and transport (railways)	Point source	Incidents	Other (not in list) (tier 1); Pollution from waste water (tier 3)	Y	Multiple	At risk - potential for increase in point source incidents from railway infrastructure. Take forward to detailed assessment.
Betley Mere (GB31234330) (2014 data)	483525	Total phosphorus	Bad	No sector responsible	Other pressures	Internal nutrient load (lakes only)	Phosphate (tier 3)	N	None	None anticipated
	483377	Phytoplankton	Poor	Agriculture and rural land management	Diffuse source	Mixed agricultural	Nutrients (tier 1); Phosphate (tier 2); Phosphate (tier 3)	Y	Borrow pit	Negligible – borrow pits will involve a temporary reduction agricultural activity at the site during construction but borrow pits will be restored to their existing land use following construction.

Table 44: Reasons for not achieving good status (RNAG) identified for WFD groundwater bodies affected by Proposed Scheme (with reference to relevant scheme components)

WFD Water body (ID)	RNAG ID	Element not achieving Good status	Element status (2015)	Category (business sector)	SWMI	Activity	Pressure (Tier)	Relevant to Proposed Scheme? (Y/N)	Relevant scheme component(s)	Likely effect of Proposed Scheme when considered against embedded mitigation
Staffordshire Trent Valley – PT Sandstone Staffordshire (GB40401G300500)	516027	Quantitative Dependent Surface Water Body Status	Poor	Sector under investigation	Flow	Unknown (pending investigation)	Abstraction and flow (tier 3)	Unknown	Unknown	Unknown
	492014	Quantitative Water Balance	Poor	Agriculture and rural land management (agriculture-arable)	Flow	Groundwater abstraction	Abstraction and flow (tier 3)	Y	Multiple	Localised beneficial – potential decommissioning of boreholes in the path of or close proximity the Proposed Scheme.
	492015	Quantitative Water Balance	Poor	Industry (other industry and manufacturing)	Flow	Groundwater abstraction	Abstraction and flow (tier 3)	N	None	None anticipated
	490993	Quantitative Water Balance	Poor	Water Industry (water supply)	Flow	Groundwater abstraction	Abstraction and flow (tier 3)	Y	Proposed Scheme within proximity to PWS abstraction near Whitmore	At risk – PWS abstraction near Whitmore to be taken out of supply during construction phase (to protect water quality). Alternative water source to be provided, with potential impact of water balance. Details of additional source and associated mitigation to be agreed with Severn Trent Water Ltd. Take forward to detailed assessment.

WFD Water body (ID)	RNAG ID	Element not achieving Good status	Element status (2015)	Category (business sector)	SWMI	Activity	Pressure (Tier)	Relevant to Proposed Scheme? (Y/N)	Relevant scheme component(s)	Likely effect of Proposed Scheme when considered against embedded mitigation
	490991	Chemical Dependent Surface Water Body Status	Poor	Mining and quarrying (coal mining)	Point source	Abandoned mine	Chemicals (tier 3)	N	None	None anticipated
	490992	Chemical Dependent Surface Water Body Status	Poor	Water industry (water supply)	Flow	Groundwater abstraction	Chemicals (tier 3)	N	None	None anticipated
	492016	Chemical Dependent Surface Water Body Status	Poor	Agriculture and rural land management (agriculture-arable)	Flow	Groundwater abstraction	Chemicals (tier 3)	N	None	None anticipated
	492017	Chemical Dependent Surface Water Body Status	Poor	Industry (other industry and manufacturing)	Flow	Groundwater abstraction	Chemicals (tier 3)	N	None	None anticipated
	490990	Chemical Drinking Water Protected Area	Poor	Agriculture and rural land management (agriculture-arable)	Diffuse source	Mixed agriculture	Chemicals (tier 3)	Y	Multiple	Negligible – some arable land converted to railway, with sustainable drainage. Positive impact negligible in the context of the groundwater body.
Staffordshire Trent Valley – Coal Measures Stoke (GB40402G304600)	491000	Chemical Dependent Surface Water Body Status	Poor	Mining and quarrying (coal mining)	Point source	Abandoned mine	Chemicals (tier 3)	N	None	None anticipated

WFD Water body (ID)	RNAG ID	Element not achieving Good status	Element status (2015)	Category (business sector)	SWMI	Activity	Pressure (Tier)	Relevant to Proposed Scheme? (Y/N)	Relevant scheme component(s)	Likely effect of Proposed Scheme when considered against embedded mitigation
	517816	Chemical Dependent Surface Water Body Status	Poor	Mining and quarrying (coal mining)	Point source	Abandoned mine	Chemicals (tier 3)	N	None	None anticipated
Manchester and East Cheshire Carboniferous Aquifers (GB41202G102900)	482939	Chemical Drinking Water Protected Area	Poor	Agriculture and rural land management (agriculture-arable)	Diffuse source	Mixed agricultural	Chemicals (tier 3)	Y	Multiple	Negligible – some arable land converted to railway, with sustainable drainage. Positive impact negligible in the context of the groundwater body.
	482940	Chemical Drinking Water Protected Area	Poor	Agriculture and rural land management (agriculture-livestock)	Diffuse source	Mixed agricultural	Chemicals (tier 3)	N	None	None anticipated
	482941	Chemical Drinking Water Protected Area	Poor	Domestic General Public	Point source	Unsewered domestic sewage	Chemicals (tier 3)	N	None	None anticipated
Weaver and Dane Quaternary Sand and Gravel Aquifers (GB41202G991700)	508540	Chemical Dependent Surface Water Body Status	Poor	Sector under investigation	Unknown (pending investigation)	Unknown (pending investigation)	Chemicals (tier 3)	Unknown	Unknown	Unknown
	508557	Chemical GWDTEs test	Poor	Sector under investigation	Unknown (pending investigation)	Unknown (pending investigation)	Chemicals (tier 3)	Unknown	Unknown	Unknown

WFD Water body (ID)	RNAG ID	Element not achieving Good status	Element status (2015)	Category (business sector)	SWMI	Activity	Pressure (Tier)	Relevant to Proposed Scheme? (Y/N)	Relevant scheme component(s)	Likely effect of Proposed Scheme when considered against embedded mitigation
	508582	General Chemical Test	Poor	Agriculture and rural land management (agriculture-arable)	Diffuse source	Arable field	Chemicals (tier 3)	Y	Multiple	Negligible – some arable land converted to railway, with sustainable drainage. Positive impact negligible in the context of the groundwater body.
	508583	General Chemical Test	Poor	Agriculture and rural land management (agriculture-livestock)	Diffuse source	Dairy/beef field	Chemicals (tier 3)	N	None	None anticipated

2.2 Screening of programme of measures

- 2.2.1 The 2015 RBMP PoM for the surface water affected by the Proposed Scheme are provided in Table 45. These have been screened against the Proposed Scheme in order to identify the potential for measures to be adversely effected.
- 2.2.2 No PoMs have as yet been derived for the groundwater bodies affected by the Proposed Scheme.

Table 45: RBMP Programme of measures identified for WFD surface water bodies affected by Proposed Scheme

WFD Water body (ID)	Measure Reference	Measure Category 1	Measure Category 2	Measure Category 3	Title	Estimated start date	Funding stream / Lead organisation	Status	Link to RNAG IDs	Measure relevant to Proposed Scheme?
Pyford Brook catchment (trib of Trent) (GB10402804 7250)	1.3.16	To control or manage point source inputs	Mitigate/ Remediate point source impacts on receptor	Alter/ change permits for sewage treatment works	Additional treatment to reduce concentrations of phosphate from Lichfield sewage treatment works	31/03/2020	Water company investment programme / Waste water treatment	Affordable	490918; 508510; 508502; 508498	No
Sow - Doxey Bk to R Penk (GB10402804 6790)	4.2	-	Appropriate management of releases	-	Adaptive management of compensation arrangements.	01/04/2015	Water company investment programme / Water supply	Affordable	510120	No (communication required to ensure that design considers potential future changes in flow regime)
Meece Brook from Source to Chatcull Brook (GB10402805 3080)	3.3.4	To control or manage abstraction	Control pattern/ timing of abstraction	Modify compensation release	Flow augmentation scheme	01/04/2015	Water company investment programme / Water supply	Affordable	491014	No (communication required to ensure that design considers potential future changes in flow regime)
	1.3.16	To control or manage point source inputs	Mitigate/ Remediate point source impacts on receptor	Alter/ change permits for sewage treatment works	Additional treatment to reduce concentrations of phosphate from Baldwin's Gate sewage treatment works	31/03/2020	Water company investment programme / Waste water treatment	Affordable	514770	No

Table 46: 2015 RBMP Programme of measures identified for WFD groundwater bodies affected by Proposed Scheme

WFD Water body (ID)	Measure Reference	Measure Category 1	Measure Category 2	Measure Category 3	Title	Estimated start date	Funding stream / Lead organisation	Status	Link to RNAG IDs	Measure relevant to Proposed Scheme?
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There are no measures currently in place for the WFD groundwater bodies affected by the Proposed Scheme.

2.3 Screening of HMWB mitigation measures

- 2.3.1 The 2015 RBMP HMWB mitigation measure assessments for the relevant HMWBs affected by the Proposed Scheme have been screened in order to identify the potential for the scheme to inhibit or prevent the successful implementation of measures.
- 2.3.2 The 2015 RBMP HMWB mitigation measures identified for the Sow – Doxey Bk to R Penk (GB104028047220) water body are provided in Table 47.
- 2.3.3 No 2015 RBMP HMWB mitigation measures have been derived for the Blithe - Tad Bk to R Trent (G104028046491) or Betley Mere (GB31234330) HMWBs as part of their 2015 Cycle 2 status classification.

Table 47: 2015 RBMP HMWB mitigation measures identified for WFD surface water bodies affected by Proposed Scheme

Water body (ID)	MMA measure reference	Measure description	Watercourse / Location	Measure relevant to Proposed Scheme? (Y/N)	Comments
Sow – Doxey Bk to R Penk (GB104028047220) *	A1	Aggrade channel by addition of gravels as channel has been over deepened in selected reaches	River Sow (various locations): - Stafford, south of Tixall Road - Stafford, west of Chell Road - Between M6 and Great Bridgeford (now part of GB104028047220)	N	Measure aimed at main river within urbanised area of Stafford and the westernmost part of water body catchment. Proposed Scheme passes through north east edge of water body catchment only and does not affect watercourse.
	B1	Divert channel away from houses and create wetland habitat	Pearl Brook – Stafford, north of Lammascote Road and west of Corporation Street	N	Measure aimed at principle tributary (Pearl Brook) within urbanised area of Stafford. Proposed Scheme passes through north east edge of water body catchment only and does not affect watercourse.
	B2	Rearrange existing car parking area and surrounding development to allow realignment of the Pearl Brook which is currently within a culvert.	Pearl Brook – Stafford, north of Lammascote Road	N	
	B3	Reorganise the operation of the Pearl Brook at weir O1157 so that the majority of the flow goes through the smaller channel to the south and channel used at the moment only takes high flows. This could ease flooding downstream. Would involve removal of weir O1157 and creation of an installation of a new weir across the channel which takes the majority of the flow at the moment.	Pearl Brook – Stafford, upstream of A518 (Weston Road), near Pennycrofts Court	N	
	C1	Realign channel around prison in order to allow the channel to be reopened.	Sandyford Brook / Marston Brook – HM Prison Stafford, south of Crooked Bridge Road	N	Measure aimed at principle tributaries (Sandyford Brook and Marston Brook) within urbanised area of Stafford. Proposed Scheme passes through north east edge of water body catchment only and does not affect these
	D1	Realign channel through play area to allow connection with reopened culvert recommended for downstream Reach. Small wetland habitat and	Sandyford Brook / Marston Brook – Stafford, upstream of Crooked	N	

		beach area could be formed	Bridge Road		watercourses.
E1	Educate landowners and users of the allotments for the need to stop tipping in the vicinity of the watercourse where it passes the allotments.	Marston Brook – Stafford, allotment gardens off Tenby Road	N	Measure aimed at principle tributaries (Marston Brook) within and north of urbanised area of Stafford. Proposed Scheme passes through north east edge of water body catchment only and does not affect watercourse.	
F1	Create wetland habitat in small open area adjacent to existing channel.	Marston Brook – Stafford, open area west of Tollgate Drive	N		
G1	Re-meander channel in open area of land downstream of existing flood storage area.	Marston Brook – north of Stafford, near A513 Beaconside	N		
H1	Create wetland habitat and a flood storage area in between Common Road and Brookmead Industrial Estates.	Marston Brook – between Common Road and Brookmead Industrial Estates	N		
I1	Re-meander channel where space allows along this reach.	Marston Brook – north of Stafford	N		
J1	Liaise with land owners to ensure adequate room is left between river and agricultural practices and to understand nature of effluent reaching river.	Marston Brook – rural area north of Stafford	N		
J2	The Sandyford Brook, which links into the Marston Brook downstream of this reach is culverted within and downstream of Stafford Common. The culverts in Stafford Common could be reopened and a wetland/flood storage area could be created.	Sandyford Brook – Stafford, at Stafford Common	N	Measure aimed at structure on principle tributary (Sandyford Brook) within urbanised area of Stafford. Proposed Scheme passes through north east edge of water body catchment only and does not affect watercourse.	
K1	Return river to a more natural form from its current heavily channelised state.	River Sow – Stafford, from Doxey Road to Queensway	N	Measure aimed at main river within and north-west of urbanised area of Stafford and the westernmost part of water body catchment. Proposed Scheme passes through north east edge of water body	
K2	Remove weirs	River Sow – Stafford, weirs at footbridge south of Tenterbanks	N		

	K3	Provide information to local communities and land owners why a change to the form of the river is beneficial.	River Sow – Stafford, from Doxey Road to Queensway	N	catchment only and does not affect watercourse.
	L1	Aggrade channel bed to allow reconnection of channel and flood plain and allow marshland habitat to continue. See Doxey Marsh 'Cause of Failure Assessment' (GB904001002253) for full details and costings conjunction with this assessment.	River Sow – vicinity of Doxey Marsh, north west of Stafford	N	
	L2	Introduce meanders and re-naturalise plan view of the River Sow. (Map Ref RS.MB.RP.R6.2)	River Sow – Stafford, west of Foregate Street / Eccleshall Road	N	
	N1	Investigate sedimentation problems on this watercourse. (Map Ref RS.MB.RP.R7.1)	River Sow – Stafford, west of Foregate Street / Eccleshall Road	N	

**Note: waterbody previously named 'River Sow Meece Brook to River Penk' under 2009 RBMP. Water body boundary has also been modified slightly since 2009 RBMP.*

Annex G: Detailed impact assessment

1 Overview

- 1.1.1 Following baseline and preliminary assessment, a detailed impact assessment has been undertaken for all water bodies and relevant scheme components where a potential for the Proposed Scheme to have an effect on the current status has been identified.
- 1.1.2 The assessment process for determining the potential for a deterioration of current status uses a traffic light rating system as agreed with the Environment Agency, in order to assign the magnitude of the effect on the specific quality elements of the affected watercourse (as described in Annex B5.2).
- 1.1.3 The outcome of the assessment identifies the overall effect of all of the relevant scheme components on each quality element at a water body scale. As part of this process, the assessment also considers the 'cumulative effects' on quality elements associated with the impacts of scheme components located within other, adjacent water bodies.
- 1.1.4 Where adverse effects on quality elements have been identified, the assessment has identified additional mitigation requirements and the resultant residual effect.

2 Surface water

- 2.1.1 The baseline assessment has identified 13 surface water bodies (and 54 watercourses) as being affected by the Proposed Scheme (see Section 4, main report and Annex C). Of these, a total of 25 watercourses have been scoped in for detailed assessment on the basis of their baseline hydromorphological and ecological condition. No watercourses have been scoped in within the Blithe - Tad Bk to R Trent (GB1040280046491) water body, which has consequently been scoped out of detailed assessment.
- 2.1.2 The preliminary assessment has then identified the relevant impacts of the various scheme components and the associated likely effects on the different WFD status elements of the surface water bodies affected by the Proposed Scheme (see Section 7.1, main report and Annex F1.1). This, in turn, has identified which quality elements are screened-in for detailed assessment for each watercourse.
- 2.1.3 The detailed impact assessment results for the surface water bodies affected by the Proposed Scheme are summarised in Part 2.

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