



# High Speed Two Phase 2a (West Midlands - Crewe)

## Background Information and Data

Ecology and biodiversity

Ecological baseline data - white clawed crayfish and  
other invertebrate (BID-EC-013-000)



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## 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

1.1.1 This report presents a summary of the baseline data relating to:

- terrestrial invertebrates;
- aquatic invertebrates; and
- white clawed crayfish.

1.1.2 Ecological baseline data has been collected for the assessment of High Speed Rail (West Midlands to Crewe). The Proposed Scheme will pass through the following community areas (CA):

- CA1: Fradley to Colton;
- CA2: Colwich to Yarlet;
- CA3: Stone and Swynnerton;
- CA4: Whitmore Heath to Madeley; and
- CA5: South Cheshire.

1.1.3 This report should be read in conjunction with Map Series EC-02, EC-03, EC-04, EC-10 and EC-11 in the Background Information and Data, Ecology Map Books.

1.1.4 The following baseline ecology reports can also be referred to:

- Ecological baseline data - phase 1 habitat survey (Background Information and Data: BID-EC-002-000);
- Ecological baseline data - protected and or notable flora (Background Information and Data: BID-EC-003-000);
- Ecological baseline data - national vegetation classification and ancient woodland (Background Information and Data: BID-EC-004-000);
- Ecological baseline data – hedgerows (Background Information and Data: BID-EC-005-000);
- Ecological baseline data - river habitat, river corridor, and ditch surveys, (Background Information and Data: BID-EC-006-000);
- Ecological baseline data - amphibian and pond surveys (Background Information and Data: BID-EC-007-000);
- Ecological baseline data – reptiles (Background Information and Data: BID-EC-008-000);
- Ecological baseline data - breeding and wintering birds (Background Information and Data: BID-EC-009-000);
- Ecological baseline data - otter and water vole (Background Information and Data: BID-EC-010-000);

- Ecological baseline data - hazel dormouse (Background Information and Data: BID-EC-011-000);
- Ecological baseline data – bats (Background Information and Data: BID-EC-012-000);
- Ecological baseline data - white clawed crayfish and other invertebrate (Background Information and Data: BID-EC-013-000); and
- Ecological baseline data – fish (Background Information and Data: BID-EC-014-000).

1.1.5 Note that baseline data for badger is not made publically available due to the historic persecution of this species.

1.1.6 The ecological assessment is detailed in the High Speed Rail (West Midlands to Crewe) Environmental Statement (ES)<sup>1</sup>:

- Volume 2 , Community area reports;
- Volume 3, Route-wide effects;
- Volume 4, Off-route effects; and
- Volume 5, Appendices.

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<sup>1</sup> HS2 Ltd (2007), *High Speed Rail (West Midlands – Crewe) Environmental Statement (ES)*, [www.gov.uk/hs2](http://www.gov.uk/hs2)

## 2 Terrestrial invertebrates

### 2.1 Methodology

- 2.1.1 Details of the standard methodology used for terrestrial invertebrate surveys are provided in Technical Note HS2 Ecological Surveys: Field Survey Methods and Standards (FSMS) included in the Scope and Methodology Report (SMR) Addendum (see ES Volume 5: Appendix CT-001-002). The methods employed were sweep netting, aerial netting and hand searching of suitable habitats. All surveys were undertaken between August and September 2016.
- 2.1.2 In addition to surveys of specific sites judged to be of high potential value for invertebrates, some survey work was also carried out within sites representative of the agricultural habitat within land required for construction of the Proposed Scheme.
- 2.1.3 Following the approach outlined in the FSMS, the requirement for detailed invertebrate surveys has been based on:
- the results of a desk study;
  - interpretation of aerial photography and Phase 1 surveys to identify habitats that may be suitable for breeding or that may be important for maintenance of at least one part of an invertebrate's life cycle (e.g. foraging habitat, overwintering habitat for eggs/larvae etc.); and
  - screening of sites using expert opinion.
- 2.1.4 Desk study records relating to terrestrial invertebrates for the land required for the construction of the Proposed Scheme were obtained from the Staffordshire Ecological Record<sup>2</sup>, Staffordshire Wildlife Trust<sup>3</sup>, Cheshire Wildlife Trust<sup>4</sup> and rECOrd (the Local Biological Records Centre serving Cheshire, Halton, Warrington and Wirral - 'the Cheshire Region')<sup>5</sup>.
- 2.1.5 Along much of the route corridor the data search has been analysed to within 100m of land required for the construction of the Proposed Scheme, although a greater distance is considered where appropriate (up to 2km).
- 2.1.6 The status of species of conservation concern was taken from the Joint Nature Conservation Committee database of species designations<sup>6</sup>.
- 2.1.7 Notable species, i.e. those of conservation concern, are defined as follows:
- nationally notable - species known or likely to be present within 16- 100 10-km squares of the Ordnance Survey National Grid in the UK. For some invertebratespecies this is further refined as Notable-A (Na) for species thought to occur in 30 or fewer 10-km squares and Notable-B (Nb) for those thought to occur in 31-100 10-km squares of the National Grid;

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<sup>2</sup> Staffordshire Ecological Record, *the Ecological Database for Staffordshire*, [http://www.staffs-ecology.org.uk/html2015/index.php?title=Main\\_Page](http://www.staffs-ecology.org.uk/html2015/index.php?title=Main_Page)

<sup>3</sup> Staffordshire Biodiversity Action Plan Steering Group (2001), *Staffordshire Biodiversity Action Plan*, Staffordshire Wildlife Trust

<sup>4</sup> Cheshire Wildlife Trust (2007), *Cheshire region Biodiversity Action Plan*, <https://www.cheshirewildlifetrust.org.uk/biodiversity>

<sup>5</sup> rECOrd, *Local Biological Records Centre serving Cheshire*, <http://www.record-lrc.co.uk>

<sup>6</sup> Joint Nature Conservation Committee, <http://jncc.defra.gov.uk/page-3408>



- nationally scarce – a term now largely superseding nationally notable and defined as species in 16-100 10-km squares of the National Grid. Nationally scarce is abbreviated to NS;
- nationally rare – defined as species that occur in 15 or fewer 10-km squares of the National Grid in Britain and is used in Site of Special Scientific Interest (SSSI) designation and common standards monitoring;
- Red Data Book species – species occurring in fewer than 16 10-km squares of the National Grid, divided as:
  - endangered (Red Data Book 1), for species known from a single population or in continuous recent decline and now known from five or fewer 10-km squares;
  - vulnerable (Red Data Book 2), likely to become endangered (Red Data Book 1) if causal factors continue;
  - rare (Red Data Book 3), species at risk but not qualifying as vulnerable; and
  - Red Data Book K, species insufficiently known but likely to qualify at least as rare;

these are respectively abbreviated as RDB<sub>1</sub>, RDB<sub>2</sub>, RDB<sub>3</sub> and RDB K; and
- species of principal importance as listed in Section 41 of the National Environment and Rural Communities Act, 2006. These are abbreviated as NERC-S<sub>41</sub>.

2.1.8 Survey work was undertaken primarily in August and September 2016. These surveys concluded that additional survey work in the spring and early summer periods was justified for some sites. The sampling methods for each habitat followed those proposed by Drake et al. (2007)<sup>7</sup> largely based on sweep netting and hand searching. Each site was subject to a visual appraisal with one or more stations selected for direct survey. The number of stations was decided according to the size of the site, variety of habitats, and the likely species present and their importance. At each station, sampling was undertaken for 50 minutes comprising 30 minutes of hand searching and 20 minutes netting, although this was modified according to the professional judgement of the surveyor. The range of species surveyed largely comprised the target taxa listed by Drake et al. (2007)<sup>7</sup>.

2.1.9 The site inventories are not considered to be comprehensive enough for a full assessment of site condition using the Invertebrate Species-habitat Information System (ISIS) of Natural England. However, ISIS is used to allocate species to assemblage types and to allow a standardised comparison of the habitats of importance at sites. Thus, where species are listed within ISIS then their broad assemblage type and, for the more specialist species, any specific assemblage type is given. For species not included in ISIS the habitat requirements were taken from authoritative field guides or other literature.

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<sup>7</sup> Drake, C.M., Lott, D.A., Alexander, K.N.A. & Webb, J. (2007), *Surveying Terrestrial and Freshwater Invertebrates for Conservation Evaluation*, Natural England, Sheffield

2.1.10 Table 1 summarises those locations where surveys for terrestrial invertebrates were undertaken. This information is cross referenced to the accompanying Map Series EC-11.

Table 1: Summary of terrestrial invertebrate field surveys undertaken

Ecology survey code	Survey site name	Location	Centroid OS grid reference	Habitat types included in survey	Survey date(s)	CA	Approximate distance from the land required for the construction of the Proposed Scheme (m) and orientation
000-IT-188001	Cranberry Wood	North-west of Cranberry	SK131139	Planted broadleaved woodland	16 September 2016	CA1	Within
000-IT-191001	Shawlane Farm	South-east of Shaw Lane	SK114160	A garden and managed hedgerows with a linear strip of oak woodland along the eastern side of a lane	13 September 2016	CA1	Within
000-IT-193001	Trentside Meadows LWS	South-west of River Trent	SK101172	Grassland with wetland features, scrub and managed hedgerows.	15 August 2016	CA1	Within
000-IT-197001	Hurstwood Pit and woodland north	South-east of Newlands Lane	SK066207	Agricultural sown crop fields with two small areas of broadleaved wood/scrub copse.	09 August 2016	CA1	Within
000-IT-201001	Spencer's Plantation	North-east of Moreton Brook	SK041224	Agricultural sown crop fields with small areas of broadleaved wood copse, hedgerows and farm ponds	08 August 2016	CA1	Within
000-IT-203001	Tithebarn Covert, Jewstrump Covert and woodland south	South-east of Tithebarn Covert	SK009231	Agricultural fields with small blocks (coverts) of broadleaved, mixed and coniferous woodland.	24 August 2016	CA2	Within
000-IT-206001	Fields south of Hoomill Cottages	South-east of Hoomill Lane	SJ993236	Agricultural fields	03 September 2016	CA2	Within
000-IT-207001	Woodland strip on south-west side of Ingestre Park Golf Club	North-west of Ingestre Wood	SJ975241	Strip of mixed woodland with young to semi-mature native trees and mature conifers, and a small improved field	07 September 2016	CA2	Within
000-IT-207002	Town Field Plantation	North-east of Town Field Plantation	SJ978242	Manicured golf course	15 September 2016	CA2	Within

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Ecology survey code	Survey site name	Location	Centroid OS grid reference	Habitat types included in survey	Survey date(s)	CA	Approximate distance from the land required for the construction of the Proposed Scheme (m) and orientation
000-IT-208003	Fields near Upper Hanyards	North-east of Ingestre Wood	SJ964244	Grazed improved grass fields with few hedgerows	24 August 2016	CA2	Within
000-IT-208001	Ingestre Wood (The Mounts)	North-east of Ingestre Wood	SJ972247	Coniferous plantation and broadleaved woodland	30 August 2016	CA2	Within
000-IT-208002	Ingestre Wood (The Mounts)	North-east of Ingestre Wood	SJ969247	Coniferous plantation and broadleaved woodland	30 August 2016	CA2	Within
000-IT-217001	Field near Pirehill House	South-east of Pirehill Lane	SJ898310	Agricultural grass improved fields, hedgerow boundaries and overgrown pond areas	09 August 2016	CA3	Within
000-IT-219001	Walton Heath Farm	South-east of Eccleshall Road	SJ889320	Agricultural grazed improved grass fields, managed hedgerows and ponds with limited edge vegetation	08 August 2016	CA3	Within
000-IT-222001	Highlow Meadows Local Wildlife Site (LWS)	South-west of M6	SJ871341	Agricultural grazed improved grassland, young dense trees (heavy shading)	08 August 2016	CA3	Within
000-IT-222002	Highlow Meadows LWS	South-west of Birchwood	SJ868345	Occasionally grazed grassland with flowering plants, wet ditches, pools and scrub fringe	16 August 2016	CA3	Within
000-IT-221001	Pool House Wood LWS	South-east of Yarnfield Lane	SJ883335	Agricultural improved grass and species-rich hedgerow, small mature woodland area (oak, willow, alder), some fallen dead wood, overgrown wet field ditches and grazed farm ponds	09 August 2016	CA3	Within
000-IT-224001	Lodge Covert Site of Biological Importance (SBI)	North-east of Hall Lane	SJ860355	Woodland (grazed periodically) of mostly oak	16 September 2016	CA3	Within

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Ecology survey code	Survey site name	Location	Centroid OS grid reference	Habitat types included in survey	Survey date(s)	CA	Approximate distance from the land required for the construction of the Proposed Scheme (m) and orientation
000-IT-225001	Stabhill Plantation	South-west of A51	SJ850365	Planted young to semi-mature beech wood, with occasional sycamore and young oak, heavily shaded with limited ground vegetation of mostly nettle and ivy. Two small mostly dry, heavily shaded ponds	18 August 2016	CA3	Within
000-IT-225002	Stabhill Plantation	South-west of A51	SJ849365	Planted young to semi-mature beech wood, with occasional sycamore and young oak, heavily shaded with limited ground vegetation of mostly nettle and ivy. One mostly dry, heavily shaded pond	18 August 2016	CA3	Within
000-IT-226001	Cash's Pit	North-east of A51	SJ846368	Mature heavily shaded broadleaved woodland, limited ground vegetation. No older or ancient trees present	18 August 2016	CA3	Within
000-IT-227001	Plantation wood north of Clifford's Wood	North-west of Clifford Wood	SJ835376	Young planted mixed woodland (spruce, ash, pedunculate oak, sweet chestnut, birch, hawthorn, guelder rose, hazel)	07 September 2016	CA3	Within
000-IT-227002	Field north of Clifford's Wood	South-east of Clifford Wood	SJ835376	Improved grazed grass, some grassland/scrub field edges bordering adjoining woodland. Small cultivated areas (maize, small young planted conifers, and two small ponds overgrown with trees)	07 September 2016	CA3	Within
000-IT-226002	Clifford's Wood LWS	South-east of Clifford Wood	SJ837372	Large mature mixed woodland (larch plantation). Some scattered very large mature beech and lime, oak, Scot's pine, birch, elder. Understory is heavily shaded. Some larger fallen trees/dead logs. Small damp ditches along track	07 September 2016	CA3	Within
000-IT-228001	Hatton Common LWS	North-east of A51	SJ826381	Mature mixed woodland, with mostly mature oak and birch	18 August 2016	CA3	Within
000-IT-230001	Field around Meece Brook near	North-west of Bent Lane	SJ806403	Open lightly grazed tall grass and tall flowering herb, pond edge, stream herb edge	01 September	CA4	Within

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Ecology survey code	Survey site name	Location	Centroid OS grid reference	Habitat types included in survey	Survey date(s)	CA	Approximate distance from the land required for the construction of the Proposed Scheme (m) and orientation
	Shelton under Harley Farm						
000-IT-232001	Coney Greave	North-east of Coneygreave Lane	SJ799404	Grazed improved grass field with boundary hedgerow	13 September 2016	CA4	Within
000-IT-232002	Field east of Whitmore Heath and Heath Road	South-east of Heath Road	SJ802411	Grazed farmland field area of poor biodiversity value due to dominant seed rye-grass with boundary hedgerows	13 September 2016	CA4	Within
000-IT-233001	Whitmore Heath south of Snape Hall Road	South-east of Snape Hall Road	SJ796413	Grazed improved grassland farmland fields with hedgerow boundaries and broadleaved woodland area	01 September 2016	CA4	Within
000-IT-234001	Land north of Whitmore Wood	North-east of Whitmore Wood	SJ790419	Managed farmland with hedgerows, tree-lines and wood copse and grazed ponds in field	01 September 2016	CA4	Within
000-IT-233002	Whitmore Wood LWS	North-east of Whitmore Wood	SJ792417	Coniferous plantation and broadleaved woodland. The ground flora is mixed with areas of bracken in the coniferous areas but more typical woodland ground flora and understory in the broadleaved woodland areas	13 September 2016	CA4	Within
000-IT-236001	Bar Hill Top Cottage	North-west of Red Lane	SJ766437	Managed farmland with improved grassland and boundary hedgerows, small wood copses (mature oak, birch, rowan) and grazed farm ponds	01 September 2016	CA4	Within
000-IT-236002	Barhill Wood	North-west of Barhill Wood	SJ765439	Managed grazed field and hedgerow, and small area of mature broadleaved woodland with no trees of older or ancient age and limited dead wood	01 September 2016	CA4	Within
000-IT-237001	Fields around Barhill Wood	North-east of Barhill Wood	SJ763443	Eastern side of the site is a typical managed grazed improved field and hedgerow farmland and a drier western hill side of scattered trees, scrub and more acidic grassland	13 September 2016	CA4	Within

Ecology survey code	Survey site name	Location	Centroid OS grid reference	Habitat types included in survey	Survey date(s)	CA	Approximate distance from the land required for the construction of the Proposed Scheme (m) and orientation
000-IT-245001	Fields south of Chorlton Bank Farm	North-west of Chorlton Lane	SJ724510	Arable ploughed farmland fields, uncut boundary hedgerows and small areas of tree-lines/woodland (mostly hawthorn, ash, grey poplar, willow, oak)	13 September 2016	CA5	Within
000-IT-245002	Woodland south of Chorlton Bank Farm	North-west of Chorlton Lane	SJ724511	Small un-grazed and unmanaged mature native broadleaved woodland site	03 August 2016	CA5	Within
000-IT-192001	Trentside Meadows LWS	South-west of King's Bromley Lane	SK103167	Amenity planted young woodland	27 September 2016	CA1	1m south-west
000-IT-244001	Wychwood Park Golf Club	North-east of Chorlton Lane	SJ727508	A well-maintained golf course with amenity grassland, scrub areas and broadleaved plantation trees	13 August 2016 2016	CA5	2m north-east
000-IT-232005	Allotments south of Bar Hill Road near Sandfield House	South-east of Birch Tree Lane	SJ794411	Actively managed allotments with typical vegetable and flower growing plots	13 September 2016	CA4	37m south-west

## 2.2 Deviations, constraints and limitations

- 2.2.1 As set out in the FSMS, standard survey methodology was followed and as far as possible surveys were carried out on sunny, clear days with light wind. Only a few surveys were undertaken in sub-optimal conditions; nevertheless it is considered that this data still provides a good representation of the species present, and allows for an objective measure of site value sufficient for the purposes of this assessment.
- 2.2.2 Access constraints were the main limitations to the field surveys. Additionally, delays in access for Phase 1 scoping surveys resulted in the late notification of potential invertebrate sites and therefore only late season visits were possible.
- 2.2.3 In addition to Habitats of Principal Importance (HoPI), semi-natural broadleaved woodland, ancient woodland or standalone veteran trees and areas of unmanaged grassland with diverse flowering plant assemblages near water bodies were also selected for further surveying.
- 2.2.4 Whilst every effort was made to establish an inventory that was as complete as possible for each site, it is accepted that more species could be recorded with additional visits and at other times of year. Nevertheless, it is considered that the surveys are robust for the purposes of impact assessment.

2.2.5 Surveys undertaken were limited to locations where landowner permission had been obtained. Delays in granting access resulted in a restricted field season and it was not possible to undertake spring invertebrate surveys. For some sites this will have resulted in reduced species lists.

## 2.3 Baseline

2.3.1 Table 2 provides a summary of those sites that were subject to initial scoping surveys, and were found not to warrant further detailed survey.

Table 2: Sites scoped out of requirement for further terrestrial invertebrate survey

Ecology survey code	Survey site name/ location	OS grid reference	Description of proposed site and rationale for scoping out requirement for further survey	Survey date(s)	CA
000-IT-188001	Cranberry Wood	SK131139	Grazed improved grassland farmland with young to semi-mature trees and boundary hedgerow habitats of low biodiversity value for invertebrates	13 September 2016	CA1
000-IT-191001	Shawlane Farm	SK114160	A garden and managed hedgerows with a linear strip of oak woodland along the eastern side of a lane	13 September 2016	CA1
000-IT-192001	Trentside Meadows LWS	SK103167	Amenity planted young woodland with a mixture of widespread young to semi-mature trees and habitats of low biodiversity value	27 September 2016	CA1
000-IT-192003	Trentside Meadows LWS	SK102169	Young woodland with a few older trees and low flora diversity. Very dense woodland with heavy shading which inhibits invertebrate diversity	13 September 2016	CA1
000-IT-197001	Hurst Wood Farm	SK066207	Managed farmland with a mixture of widespread habitats of low biodiversity value	09 August 2016	CA1
000-IT-201001	Spencer's Plantation	SK041224	Managed farmland with a mixture of widespread habitats of low biodiversity value	08 August 2016	CA1
000-IT-206001	Fields south of Hoomill Cottages	SJ993236	Improved grassland field series and hedgerows which have been heavily grazed by cattle and therefore lacks structure and diversity of flowers. The associated invertebrates are common and ubiquitous	03 August 2016	CA2
000-IT-207001	Woodland on west side of Ingestre Park Golf Club	SJ975241	Mixed planted woodland with young to semi-mature native trees and mature conifers, and a small improved field	07 September 2016	CA2
000-IT-208003	Fields near Upper Hanyards	SJ964244	Agricultural farmland with improved grass fields, hedges and grazed ponds. Low potential for scarce species with a typical range of common invertebrates present	24 August 2016	CA2
000-IT-217001	Field near Pirehill House	SJ898310	Farmland with a mixture of widespread habitats of mostly low biodiversity value	09 August 2016	CA3

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Ecology survey code	Survey site name/ location	OS grid reference	Description of proposed site and rationale for scoping out requirement for further survey	Survey date(s)	CA
000-IT-219001	Walton Heath Farm	SJ889320	Farmland with a limited mixture of widespread habitats of mostly low biodiversity value	08 August 2016	CA3
000-IT-222001	Highlow Meadows LWS	SJ871341	Heavily grazed by cattle with managed hedgerows that offer little to scarce or high fidelity invertebrates	16 August 2016	CA3
000-IT-221001	Pool House Wood LWS	SJ883335	Farmland with a mixture of widespread habitats. The small area of mature broadleaved woodland has moderate biodiversity value with some mature trees. The uncut hedgerows are relatively species-rich although the field ponds are grazed. As such, the site has low to moderate potential for a typical range of mostly common and widespread invertebrate species	09 August 2016	CA3
000-IT-224001	Lodge Covert	SJ860355	A linear woodland, subject to heavy external influences as reflected in the poor invertebrate diversity and lack of many woodland species, and no species of value	16 September 2016	CA3
000-IT-225001	Stabhill Plantation	SJ850365	Beech tree planting with occasional sycamore and oak, the trees are not of suitable older age to host much invertebrate interest	18 August 2016	CA3
000-IT-225002	Stabhill Plantation	SJ849365	Beech tree planting with occasional sycamore and oak, the trees are not of suitable older age to host much invertebrate interest	18 August 2016	CA3
000-IT-226001	Cash's Pit	SJ846368	Mature woodland, no older trees and no larger fallen large logs or noteworthy dead wood. The trees therefore are not of a suitable older age to host much invertebrate interest	18 August 2016	CA3
000-IT-227001	Plantation wood north of Clifford's Wood	SJ835376	Young woodland with a mix of native and non-native trees, with no trees of any mature age. Overall low potential for scarce species of invertebrate with a typical range of common and local widespread species recorded	07 September 2016	CA3
000-IT-227002	Field north of Clifford's Wood	SJ835376	Managed farmland area with a mixture of typical widespread farm habitats of low biodiversity value	07 September 2016	CA3
000-IT-232001	Coney Greave	SJ799404	Managed farmland field with semi-mature wood with no larger trees of suitable age for scarce invertebrates, and limited fallen wood	13 September 2016	CA4
000-IT-232002	Field east of Whitmore Heath and Heath Road	SJ802411	Managed grazed farmland field area of poor biodiversity value due to dominant seed rye-grass	13 September 2016	CA4
000-IT-232005	Allotments south of Bar Hill Road near Sandfield	SJ794411	Area of actively managed allotments with typical vegetable and flower	13 September	CA4



Ecology survey code	Survey site name/ location	OS grid reference	Description of proposed site and rationale for scoping out requirement for further survey	Survey date(s)	CA
	House		growing plots. As such, the site has low potential for scarce breeding invertebrates to be present	2016	
000-IT-233001	Whitmore Heath south of Snape Hall Road	SJ796413	Improved grassland farmland fields with boundary hedgerow habitats of low biodiversity value for invertebrates	01 September 2016	CA4
000-IT-234001	Land north of Whitmore Wood	SJ790419	Managed farmland with a mixture of widespread terrestrial habitats of low biodiversity value	01 September 2016	CA4
000-IT-236001	Bar Hill Top Cottage	SJ766437	Managed farmland with a mixture of widespread terrestrial habitats of low biodiversity value	01 September 2016	CA4
000-IT-236002	Barhill Wood	SJ765439	Grazed field and hedgerow, and small area of mature broadleaved woodland with no trees of older or ancient age and limited dead wood - all widespread habitats of low to moderate biodiversity value for invertebrates	01 September 2016	CA4
000-IT-244001	Wychwood Park Golf Club	SJ727508	Typical managed well-maintained golf course. The fairways and greens are too well managed and sandy bunkers well raked for any invertebrate interest	13 September 2016	CA5
000-IT-245001	Fields south of Chorlton Bank Farm	SJ724510	Managed farmland area with boundary hedgerows and narrow wood/tree-lines. The tree-lines/wood areas contain mostly young to semi-mature trees with few older trees, so holding low interest for invertebrates	13 September 2016	CA5

2.3.2 Table 3 provides a summary of invertebrate species of conservation significance identified within CA1 to CA5 inclusive.

Table 3: Protected and/or notable invertebrate species identified during terrestrial invertebrate survey in CA1 to CA5

Ecology survey code	Latin name	Status	Survey site name/ location	Habitat	Survey date(s)	CA
000-IT-245002	<i>Agelastica alni</i>	RDBK	Woodland south of Chorlton Bank Farm	Ground flora of mature native broadleaved woodland	3rd August 2016	CA5

### Fradley to Colton (CA1)

#### *Notable / protected species recorded*

2.3.3 No notable or protected species of greater than local value were recorded within the Fradley to Colton area.

#### *Summary*

2.3.4 Field surveys within the Fradley to Colton area recorded three species of local importance *Rhaphium antennatum*, *Syntormon aulicum* and *Xanthochlorus ornatus*. All

three species were recorded near Spencer's Plantation, a semi-natural broadleaved woodland.

- 2.3.5 Trentside Meadows Local Wildlife Site (LWS) and coastal and floodplain grazing marsh (HoPI), which lies within the land required for the Proposed Scheme, recorded 104 terrestrial invertebrate species, all of which were common and widespread, and typical of the habitat types present within the surveyed areas. Trentside Meadows grassland area was the only site in CA1 that requires further surveying following the initial invertebrate survey visit. This is largely due to the site's wetland features, such as tall grassland and ruderal vegetation along ditches and boundaries which present the greatest likelihood of finding species of higher conservation value. No notable or protected species were recorded during the survey; however given the habitat quality and incomplete survey information the possibility of notable or protected species being present cannot be excluded.
- 2.3.6 The closest desk record within the Fradley to Colton area is a Staffordshire Biodiversity Action Plan (BAP) species, the red-tailed bumblebee (*Bombus lapidarius*), recorded 478 m north east of the Proposed Scheme. Within 2km of the Proposed Scheme, there are four NERC S41, one Nationally Notable B and one Wildlife and Countryside Act Schedule 5 / International Union for Conservation of Nature (IUCN) Global Red List Endangered species recorded.

### Colwich to Yarlet (CA2)

#### *Notable / protected species recorded*

- 2.3.7 No notable or protected species of greater than local value were recorded within the Colwich to Yarlet area.

#### *Summary*

- 2.3.8 The sites surveyed for terrestrial invertebrates within the Colwich to Yarlet area were all within the land required for the Proposed Scheme and consisted of mostly managed agricultural farmland with areas of improved grassland and broadleaved woodland. The assemblages recorded reflected the characteristics of the habitats present in that they were not of a type, extent or quality capable of supporting a significant community of specialist species with specific habitat requirements.
- 2.3.9 At Tithebarn Covert, a site that will be added to the national Ancient Woodland Inventory (AWI) as agreed by Natural England following the heritage review undertaken by HS2 Ltd, 49 invertebrate species were recorded. One species recorded within the broadleaved woodland near a pond is considered locally scarce (*Achyrolimonia decemmaculata*). The species recorded were typical of the woodland and water edge habitats present on the site, with damp conditions provided by the stream within Tithebarn Covert.
- 2.3.10 A survey conducted at a mixed deciduous woodland and National Forest Inventory site to the west of Upper Hanyards recorded a total of 28 invertebrate species. One of the species recorded was a local but widespread species, a rove beetle (*Bisnius subuliformis*), most likely associated with the larger mature trees such as oak and copper beech present on site.

- 2.3.11 Another species of localised distribution importance, the net-winged beetle (*Platycis minutus*), was recorded in Ingestre Wood. This species was widespread at the site, recorded within the broadleaved woodland and coniferous plantation woodland areas, along with 38 other terrestrial invertebrate species.
- 2.3.12 Town Field Plantation at Ingestre Park Golf Course, an AWI site, was visited but not surveyed during the 2016 period. This site consisted of mostly low value habitat for terrestrial invertebrates; however, there are a few veteran trees, specifically two very large (greater than 5-6m circumference) senescent oak trees noted during the walk-over visit. Given the habitat quality and incomplete survey information, the possibility of notable or protected species being present cannot be excluded. Additionally, the complimentary ruderal areas and copses further elevate the potential of these trees.
- 2.3.13 The desk study provided details of one notable species (NERC-S41) within the land required for the construction of the Proposed Scheme within the Colwich to Yarlet area. The white-letter hairstreak (*Satyrrium w-album*) is a butterfly associated with Elm trees (*Ulmus glabra*), typically near hedgerows or on the edge of deciduous woodland. Habitats that support this species can be found within the Proposed Scheme in the Colwich to Yarlet area. Within 2km of the Proposed Scheme, 24 Notable species were recorded, including: three Nationally Notable, three Nationally Scarce, one IUCN Near Threatened, one IUCN Endangered (and WCA Schedule 5), one IUCN Vulnerable species and 17 NERC S41 species.

### Stone and Swynnerton (CA3)

#### *Notable / protected species recorded*

- 2.3.14 No notable or protected species of greater than local value were recorded within the Stone and Swynnerton area.

#### *Summary*

- 2.3.15 The majority of the sites visited within the Stone and Swynnerton area were within the land required for the Proposed Scheme and consisted of managed agricultural farmland with areas of mature broadleaved woodland and a few young plantation woodlands. Two HoPI grassland areas designated for good quality semi-improved grassland and purple moor grass and rush pastures were also visited.
- 2.3.16 Four species of local importance were recorded within the Stone and Swynnerton area, which indicate that the habitats on the site had some features which were capable of supporting specialist species that are not commonly distributed within the wider countryside:
- field surveys at Pool House Wood LWS recorded mostly common and widespread species, typical of the woodland habitats. One species of local importance was recorded, *Geomyza hackman*, near a wet ditch within the woodland; however, this species is considered widespread in UK, the larvae of which feed in common grasses;
  - a survey conducted within young plantation woodland with a mix of native and non-native trees north of Clifford's Wood recorded 14 common and

widespread species. Of these species, *Xanthochlorus tenellus*, a marsh fly of local importance but widespread was recorded;

- Hatton Common LWS recorded 45 terrestrial invertebrate species, of which one was a fly species of local importance, *Clusiodes gentilis*. This species is associated with dead rotten wood that is present within the site. There is potential for scarcer woodland species to occur. Given the habitat quality and incomplete survey information the possibility of notable or protected species being present cannot be excluded; and
- Cash's Pit, a deciduous woodland directly adjacent to the land required for the construction of the Proposed Scheme, recorded one species of local importance, *Platypalpus interstinctus*, a dance fly.

- 2.3.17 Two surveys were conducted at sites within the Highlow Meadows LWS. This site is a HoPI with good quality semi-improved grassland and purple moor grass and rush pastures. The purple moor grass and rush pastures area lies within the land required for the Proposed Scheme and included a range of niches and features (i.e. scrub fringe, rich flower resource and wetland elements) that may be of some value to the local invertebrate species. The semi-improved grassland, which lies 20m north-west of the land required for the Proposed Scheme, was mostly heavily grazed by cattle. Only common and widespread species were recorded at these sites during the 2016 survey period.
- 2.3.18 Clifford's Wood LWS and AWI site did not record any notable species; however the presence of scattered very large mature trees such as common lime (*Tilia x europaea*), beech (*Fagus sylvatica*) and oak (*Quercus robur*), along with larger fallen dead trees and branches results in a high potential for scarcer woodland invertebrates to occur. Given the habitat quality and incomplete survey information the possibility of notable or protected species being present cannot be excluded.
- 2.3.19 The desk study provided details of two NERC S41 species within the Stone and Swynnerton area. The white-letter hairstreak (*Satyrium w-album*) was recorded within the land required for the Proposed Scheme near Walton Heath Farm and Whitemoor Farm. The white ermine (*Spilosoma lubricipeda*) moth was recorded 40 m south west of the Proposed Scheme near Stone Golf Course and is typically associated with rural and urban habitats including gardens, hedgerows and grassland. Habitats that support these species can be found within the Proposed Scheme in the Stone and Swynnerton area. Within 2km of the Proposed Scheme, 26 Notable species were recorded, including two IUCN Vulnerable, one IUCN Near Threatened, one IUCN Endangered (and WCA Schedule 5) and 22 NERC S41 / UK Biodiversity Action Plan (UK BAP) species.
- 2.3.20 The closest desk record within the Fradley to Colton area is a Staffordshire BAP species, the red-tailed bumblebee (*Bombus lapidarius*), recorded 478 m north east of the Proposed Scheme. Within 2km of the Proposed Scheme, there are four NERC S41, one Nationally Notable B and one Wildlife and Countryside Act Schedule 5 / IUCN Global Red List Endangered species recorded.

## Whitmore Heath to Madeley (CA4)

### *Notable / protected species recorded*

- 2.3.21 No notable or protected species of greater than local value were recorded within the Whitmore Heath to Madeley area.

### *Summary*

- 2.3.22 The majority of the sites recorded within the Whitmore Heath to Madeley area lie within the land required for the construction of the Proposed Scheme and consisted of grazed improved grassland fields and managed farmland hedgerows with areas of mature broadleaved woodland. There are also sites of open lightly grazed tall grass and tall flowering herb with suitable vegetation around pond and stream edges that have the potential to support an assemblage of mostly common and widespread species associated with wetland habitats.
- 2.3.23 Field surveys conducted at Bar Hill House Farm, an agricultural field with a small woodland, recorded 42 terrestrial invertebrate species, one of which was a dance fly species (*Rhamphomyia (Amydroneura) gibba*) of local importance but widespread.
- 2.3.24 Whitmore Wood, an ancient woodland, provides a mixture of suitable habitat for terrestrial invertebrates. There are a number of streams throughout the woodland that have potential for an interesting fly fauna. Although notable species were not recorded at this site, the presence of *Sphegina siberica* (a saproxylic hoverfly) suggests that other niche species could be present, particularly around these streams. Given the habitat quality and incomplete survey information the possibility of notable or protected species being present cannot be excluded.
- 2.3.25 The western hill of Barhill Wood, an AWI site, is marked by scattered trees, scrub and acidic grassland which provides potential for terrestrial invertebrates, particularly nesting Aculeates (bees and wasps), a Staffordshire BAP invertebrate group, of which several more common species were recorded during the site visit.
- 2.3.26 The closest desk records were found within the Madeley area, 586m from the Proposed Scheme and included 20 moth and butterfly species, of which one is an IUCN Vulnerable, one Nationally Notable B, and 11 are NERC S41 species. A number of Notable species were recorded within 2km of the Proposed Scheme, including the IUCN Endangered and WCA Schedule 5 species, the white-letter hairstreak.

## South Cheshire (CA5)

### *Notable / protected species recorded*

- 2.3.27 One notable species, Red Data Book (RDB K) species (*Agelastica alni*), was recorded in the South Cheshire area in a woodland directly adjacent to Wychwood Park Golf Club. This species is typically associated with wet woodlands (HoPI).

### *Summary*

- 2.3.28 The sites surveyed in the South Cheshire area of the Proposed Scheme consisted of predominately typical managed farmland and managed improved grassland with some areas of mature broadleaved woodland.

- 2.3.29 The deciduous woodland directly adjacent to Wychwood Park Golf Club, which lies within the land required for the Proposed Scheme, is small unmanaged mature native broadleaved woodland with good woodland tree diversity, age and structure but low diversity of flowering plants due to dense shade. Overall, the site has good potential for a range of typical uncommon and common woodland invertebrates.
- 2.3.30 The desk study provided details of five NERC S<sub>41</sub> species within the Cheshire area. Records for white-letter hairstreak (*Satyrrium w-album*), Ringlet (*Aphantopus hyperantus*), Small Heath (*Coenonympha pamphilus*), Dingy Skipper (*Erynnis tages*) and the Wall moth (*Lasiommata megera*) were recorded within the land required for the proposed scheme near Madeley. Habitats that support these species can be found within the Proposed Scheme in the South Cheshire area. Within 2km of the Proposed Scheme, an additional 25 NERC S<sub>41</sub> and five Nationally Scarce species were recorded.

## 3 Aquatic invertebrates

### 3.1 Methodology

- 3.1.1 Details of the standard methodologies used for aquatic invertebrate survey are provided in the FSMS.
- 3.1.2 Desk study records relating to aquatic invertebrates for the land required for the construction of the Proposed Scheme were obtained from the Environment Agency records, the Staffordshire Ecological Record<sup>8</sup>, Staffordshire Wildlife Trust<sup>9</sup>, Cheshire Wildlife Trust<sup>10</sup> and rECOrd (the Local Biological Records Centre)<sup>11</sup>. The field surveys included river macroinvertebrate surveys and invertebrate surveys of aquatic invertebrates sampled as part of pond, canal and ditch assessments.
- 3.1.3 Macroinvertebrate samples were identified to standard mixed-taxon level. The results were then used to calculate pressure-specific biotic indices for each site:
- Biological Monitoring Working Party (BMWP) score– used as an indicator of organic pollution/ general degradation for flowing and still waters;
  - Average Score Per taxon (ASPT) – used as an indicator of organic pollution and more reliable than BMWP in cases of low taxon richness for flowing and still waters;
  - Proportion of Sediment-sensitive Invertebrates (PSI) – used to indicate the level of sedimentation at a site (flowing water only);
  - Lotic Invertebrate index for Flow Evaluation (LIFE) – used to evaluate the flow regime at a site (flowing water only); and
  - Community Conservation Index (CCI) – used to indicate the conservation value of macroinvertebrates at a site (flowing and still water).
- 3.1.4 Table 4 summarises the biotic indices calculated for the aquatic invertebrate survey locations for CA1 to CA5 inclusive.

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<sup>8</sup> Staffordshire Ecological Record, *The Ecological Database for Staffordshire*, [http://www.staffs-ecology.org.uk/html2015/index.php?title=Main\\_Page](http://www.staffs-ecology.org.uk/html2015/index.php?title=Main_Page)

<sup>9</sup> Staffordshire Biodiversity Action Plan Steering Group (2001), *Staffordshire Biodiversity Action Plan*, Staffordshire Wildlife Trust

<sup>10</sup> Cheshire Wildlife Trust (2007), *Cheshire region Biodiversity Action Plan*, <https://www.cheshirewildlifetrust.org.uk/biodiversity>

<sup>11</sup> rECOrd, *Local Biological Records Centre serving Cheshire*, <http://www.record-lrc.co.uk>

Table 4: Summary of biotic indices calculated for aquatic invertebrate survey locations for CA1 to CA5

Ecology survey code	Watercourse/ waterbody	CA	Total number of taxa in sample	Total abundance in sample	BMWP score* <sup>1</sup>	ASPT* <sup>2</sup>	N-Taxa* <sup>3</sup>	LIFE score (family)	CCI score* <sup>4</sup>	PSI	PSI interpretation	Notable taxa
000-IA-235003	Pond	CA4	10	25	39	4.33	9	-	1.33	-	-	No notable taxa present
000-IA-235001	Pond	CA4	11	64	49	4.45	11	-	1.33	-	-	No notable taxa present
000-IA-235002	Pond	CA4	16	350	62	4.13	15	-	1.4	-	-	No notable taxa present
000-IA-236001	Boggy area near River Lea	CA4	This site has the River Lea running through it and map evidence of standing water. On investigation the standing water was found to be slightly boggy ground which may well dry out									
000-IA-236002	Fairfield House	CA4	4	-	13	3.25	4	-	9	-	-	No notable taxa present
000-IA-239001	Wrinehill Mill	CA4	26	269	68	4.25	16	-	11.81	-	-	One species of 'Notable' conservation interest (the water beetle <i>Hydaticus seminiger</i> )
000-IA-244002	Pond near Highfield Farm	CA5	13	276	30	3.75	8	-	7.78	-	-	One species of 'Local' conservation interest (the lesser diving beetle <i>Acilius sulcatus</i> )
000-IA-244005	Pond near Highfield Farm	CA5	24	398	77	4.53	17	-	4	-	-	No notable taxa present

\*<sup>1</sup> Biological Monitoring Working Party

\*<sup>2</sup> Average Score Per Taxon

\*<sup>3</sup> Number of Taxa contributing to the assessment

\*<sup>4</sup> Community Conservation Index



Ecology survey code	Watercourse/ waterbody	CA	Total number of taxa in sample	Total abundance in sample	BMWP score* <sup>1</sup>	ASPT* <sup>2</sup>	N-Taxa* <sup>3</sup>	LIFE score (family)	CCI score* <sup>4</sup>	PSI	PSI interpretation	Notable taxa
000-IA-244003	Pond near Highfield Farm	CA5	17	128	54	4.5	12	-	4.71	-	-	No notable taxa present
000-IA-244004	Pond near Highfield Farm	CA5	22	248	59	4.21	14	-	13.56	-	-	One species of 'Notable' conservation interest (the water beetle <i>Hydaticus seminiger</i> )
000-IA-244006	Pond near Highfield Farm	CA5	12	96	32	4	8	-	5.63	-	-	No notable taxa present
000-IA-244007	Pond near Highfield Farm	CA5	6	72	12	3	4	-	1	-	-	No notable taxa present
000-IA-245001	Pond near Wychwood Park Golf Club	CA5	32	311	94	4.95	19	-	9.52	4.26	Heavily sedimented	One species of 'Local' conservation interest (the water bug <i>Aphelocheirus aestivalis</i> )
000-IA-244008	Pond near Wychwood Park Golf Club	CA5	8	only exploratory samples								No notable taxa present
000-IA-245002	Pond near Wychwood Park Golf Club	CA5	5	only exploratory samples								No notable taxa present
000-IA-246001	Oak Farm	CA5	9	only exploratory samples								No notable taxa present
000-IA-246002	Oak Farm	CA5	10	only exploratory samples								No notable taxa present
000-IA-201001	Moreton Brook	CA1	32	616	124	5.17	24	7.37	8.16	52.08	Moderately sedimented	No notable taxa present

Ecology survey code	Watercourse/ waterbody	CA	Total number of taxa in sample	Total abundance in sample	BMWP score* <sup>1</sup>	ASPT* <sup>2</sup>	N-Taxa* <sup>3</sup>	LIFE score (family)	CCI score* <sup>4</sup>	PSI	PSI interpretation	Notable taxa
000-IA-190001	Bourne Brook	CA1	24	486	113	5.95	19	8.32	8.93	78.38	Minimally sedimented/unsedimented	No notable taxa present
000-IA-191001	Crawley Brook	CA1	16	338	41	4.56	9	6.1	10	25	Sedimented	No notable taxa present
000-IA-238001	Lea tributary	CA4	18	548	69	5.31	13	7.33	4.13	51.85	Moderately sedimented	No notable taxa present
000-IA-243001	Mere Gutter	CA5	19	1277	68	4.86	14	6.93	4.09	29.63	Sedimented	No notable taxa present
000-IA-244001	Swill Brook	CA5	24	1155	63	4.5	14	7.19	13.3	44.44	Moderately sedimented	Presence of one genus of Notable (but not RDB) status, the dance fly (Chelifera)

3.1.5 A summary of locations at which aquatic invertebrate surveys were undertaken within the section of the Proposed Scheme that will pass through CA1 to CA5 inclusive, is provided in Table 5, and shown in Map Series EC-12.

Table 5: Summary of aquatic invertebrate field surveys undertaken

Ecology survey code	Survey site name	Feature type	Survey date(s)	CA	Approximate distance from the land required for the construction of the Proposed Scheme (m) and orientation
000-IA-190001	Bourne Brook	Watercourse	28 November 2016	CA1	224m north-west
000-IA-191001	Crawley Brook	Watercourse	28 November 2016	CA1	Within
000-IA-201001	Moreton Brook	Watercourse	28 November 2016	CA1	Within
000-IA-235001	Pond east of Manor Farm	Pond	16 September 2016	CA4	Within
000-IA-235002	Pond east of Manor Farm	Pond	16 September 2016	CA4	Within
000-IA-235003	Pond east of Manor Farm	Pond	16 September 2016	CA4	Within
000-IA-236001	Between River Lea and Netherset Hey Lane	Boggy area of field	16 September 2016	CA4	16m south-west
000-IA-236002	Fairfield House	Pair of ponds	16 September 2016	CA4	19m south-west
000-IA-238001	River Lea tributary	Watercourse	21 November 2016	CA4	Within
000-IA-239001	Wrinehill Mill	Pond	14 September 2016	CA4	77m north-east
000-IA-243001	Mere Gutter	Watercourse	21 November 2016	CA5	108m north-west
000-IA-244001	Swill Brook	Watercourse	28 November 2016	CA5	Within
000-IA-244002	Highfield Farm	Pond	11 August 2016	CA5	619m north-west
000-IA-244005	Highfield Farm	Pond	11 August 2016	CA5	419m south-west
000-IA-244003	Highfield Farm	Pond	11 August 2016	CA5	285m south-west
000-IA-244004	Highfield Farm	Pond	11 August 2016	CA5	441m south-west
000-IA-244006	Highfield Farm	Pond	11 August 2016	CA5	353m south-west

Ecology survey code	Survey site name	Feature type	Survey date(s)	CA	Approximate distance from the land required for the construction of the Proposed Scheme (m) and orientation
000-IA-244007	Highfield Farm	Marsh area/ muddy pool of varying size	11 August 2016	CA5	619m south-west
000-IA-245001	Wychwood Park Golf Club	Small lake/ large pond	14 September 2016	CA5	145m south-east
000-IA-244008	Wychwood Park Golf Club	Ditch	14 September 2016	CA5	182m south-east
000-IA-245002	Wychwood Park Golf Club	Pool and marsh	14 September 2016	CA5	106m south-east
000-IA-246001	Oak Farm, Basford	Pond	14 September 2016	CA5	29m south-east
000-IA-246002	Oak Farm, Basford	Pond	14 September 2016	CA5	28m south-east

## 3.2 Deviations, constraints and limitations

- 3.2.1 Aquatic invertebrate surveys were primarily scheduled based on the results of an initial desk scoping exercise and scoping surveys undertaken as part of Phase 1 habitat and river corridor/ Water Framework Directive (WFD) walkover surveys. For those sites surveyed, only one survey per site was completed during the 2016 survey period due to access constraints.
- 3.2.2 Macroinvertebrate summaries are based on one season autumn data, no comparison can be made between observed and expected scores without two-season RICT/RIVPACS analysis. Seasonal variation in the macro-invertebrate community cannot be assessed.
- 3.2.3 Details of sites where access was not available are listed in Table 6.

Table 6: Summary of locations where requirements for aquatic invertebrates survey was identified but no access was available

Survey site name/ location	OS grid reference	Description of proposed survey location	CA	Approximate distance from the land required for the construction of the Proposed Scheme (m) and orientation
North of Randilow Farmhouse	SJ746470	Small copse and pond. Appears to have complex scrub and woodland area suitable for mud snail. Cheshire Wild Habitats	CA5	Within
Gonsley Green Farm	SJ732486	Series of ponds surrounded by arable fields and some areas of semi-improved grassland between where route crosses Den Lane to Gonsley Green farm	CA5	Within
Heath Farm	SJ723509	Series of ponds surrounded by marshy and semi-improved grassland	CA5	Within
Tributary of Mere	SJ729492	Slow flowing field boundary drain with	CA5	Within

Survey site name/ location	OS grid reference	Description of proposed survey location	CA	Approximate distance from the land required for the construction of the Proposed Scheme (m) and orientation
Gutter		abundant aquatic vegetation		
Basford Brook	SJ731512	The area in which Basford Brook crosses through semi-improved grassland area and a semi-natural mixed and broadleaved woodland	CA5	53m north-east

### 3.3 Baseline

3.3.1 Baseline data for watercourses and water bodies containing habitat capable of supporting a range of aquatic invertebrates is presented in the sections below.

#### Fradley to Colton (CA1)

##### *Moreton Brook*

3.3.2 At the stretch surveyed, Moreton Brook is a 3–4m wide, 0.3–0.8m deep, meandering field brook with varied habitat of glides and riffles and a mosaic of substrate up to large pebble size with woody debris, tree roots and fallen boughs in-stream.

3.3.3 The autumn 2016 field survey of Moreton Brook recorded 32 taxa from 27 families. Overall the CCI score indicates 'Moderate' conservation value of the invertebrate assemblage. The PSI score indicates that the river bed ecology is affected by 'Moderate' levels of sedimentation.

3.3.4 BMWP scores are high and indicate 'Excellent' biological water quality while the ASPT score indicates 'Good' water quality. A broad variety of taxa are present including water beetles, mayfly larvae, alderfly larvae, caddisfly larvae, stonefly larvae, true flies, leeches, worms, shrimps and molluscs. The LIFE score for the Moreton Brook sample indicates slow to moderate (7.37) flow.

3.3.5 Autumn 2013 Environment Agency data for Moreton Brook (before the River Trent confluence some 3 km downstream of the land required for the construction of the Proposed Scheme) show BMWP and ASPT scores which indicate 'Excellent' and 'Good' biological water quality respectively, in keeping with the results of the 2016 survey.

##### *Bourne Brook*

3.3.6 At the stretch surveyed, Bourne Brook is a wide (2–2.5 m), shallow (0.3–0.5m), clear brook along a field boundary with a substrate composed predominantly of clean pebbles with some in-stream vegetation. The sampling point was a straight section along a field boundary with good flow and clarity.

3.3.7 The autumn 2016 field survey of Bourne Brook recorded 24 taxa from 21 families. Overall the watercourse has a CCI score which indicates 'Moderate conservation value, and species found include a 'Regionally Notable' species of conservation interest, the caddisfly *Brachycentrus subnubilis*. Regionally notable species are those which occur in more than 100 10km squares but are uncommon in some regions. The PSI score indicates minimal impact from sedimentation on the river bed ecology.

- 3.3.8 There is a moderate diversity of macroinvertebrate taxa present in Bourne Brook, with representative populations of water beetles, mayfly larvae, alderfly larvae, caddisfly larvae, stonefly larvae, damselfly larvae, true flies, leeches, shrimps and molluscs. BMWP and ASPT scores indicate 'Excellent' and 'Good' water quality respectively. The CCI score recorded for Bourne Brook indicates 'Moderate' conservation value of the invertebrate assemblage and the LIFE score indicates a moderate to fast flowing watercourse.
- 3.3.9 Environment Agency data for Bourne Brook was collected at a point near Lupin Farm, approximately 2.5km downstream of the Proposed Scheme. Autumn 2011 data give BMWP and ASPT scores which indicate 'Excellent' and 'Good' water quality respectively, in keeping with the results of the 2016 survey.

### *Crawley Brook*

- 3.3.10 At the stretch surveyed, Crawley Brook is a steep-banked field boundary brook that is heavily shaded with a substrate covered by a thick layer of leaf litter. The brook is 1.5–2m wide, 0.2–0.4m deep with one flowing section along a very flat and slow moving part of the brook.
- 3.3.11 The autumn 2016 field survey of Crawley Brook west of Shaw Lane shows 'Moderate' conservation value as indicated by the CCI score. Whilst only 16 taxa were recorded, one is considered to be of 'Regionally Notable' conservation interest, this being the flatworm *Planaria torva*. The PSI score indicates that the river bed condition is 'Sedimented', which is affecting the river bed ecology at this site.
- 3.3.12 There is a moderate diversity of macroinvertebrate taxa present. BMWP and ASPT scores indicate 'Poor' and 'Fair' water quality respectively. Taxa recorded include water beetles, caddisfly larvae, true flies, leeches, flatworms, water mites, shrimps and crustaceans. The LIFE score calculated for Crawley Brook indicates a slow moving watercourse.
- 3.3.13 No Environment Agency or other desk study data were available for Crawley Brook.

### *Pyford Brook*

- 3.3.14 Pyford Brook was scoped out for consideration of aquatic invertebrates due to the consistently below average BMWP score for this watercourse.

### *Trent and Mersey Canal*

- 3.3.15 The Trent and Mersey Canal in CA1 was scoped out for consideration of aquatic invertebrates as this watercourse will not be directly affected by the Proposed Scheme.

### *River Trent*

- 3.3.16 The River Trent in CA1 was scoped out for consideration of aquatic invertebrates as this watercourse will be spanned by a viaduct.

## Colwich to Yarlet (CA2)

### *River Trent*

- 3.3.17 The River Trent in CA2 was scoped out for consideration of aquatic invertebrates as this watercourse will be spanned by a viaduct.

## Stone and Swynnerton (CA3)

### *Meece Brook*

- 3.3.18 Meece Brook was scoped out for consideration of aquatic invertebrates as this watercourse will be spanned by a viaduct.

## Whitmore Heath to Madeley (CA4)

### *River Lea tributary*

- 3.3.19 A tributary of the River Lea was surveyed at Wrinehill Wood in 2016, approximately 200m upstream of the Proposed Scheme, as habitat at the crossing point itself was heavily silted and unsuitable for aquatic invertebrates. Suitable habitat for aquatic invertebrates was found within the woodland portion of the stream.
- 3.3.20 The stretch of the River Lea tributary that was sampled arises in a small steep woodland and the tributary passes underground for some distance. The watercourse was sampled at the edge of a field boundary within a stretch that had good flow and some riffles. The watercourse was 1–2m wide, 0.2–0.4m deep, shaded by trees on right bank and open to the field on the left bank.
- 3.3.21 The PSI score in the River Lea tributary indicates that the river bed ecology is affected by 'Moderate' levels of sedimentation and the CCI score indicates 'Low' conservation value.
- 3.3.22 There is a moderate diversity of macroinvertebrate taxa present. BMWP and ASPT scores indicate 'Fair' to 'Good' water quality respectively. Eighteen taxa are present including water beetles, mayfly larvae, caddisfly larvae, amphipods and molluscs. The LIFE score indicates a slow to moderate flow.
- 3.3.23 No Environment Agency or other desk study data were available for the River Lea tributary.

### *Water bodies*

- 3.3.24 Five ponds within the Whitmore Heath and Madeley area were surveyed for aquatic invertebrates in September 2016, three within the land required for the construction of the Proposed Scheme at Manor Farm, a pair of ponds near Fairfield House 19m south west and a pond at Wrinehill Mill 77m north-east.
- 3.3.25 The three ponds just east of Manor Road near Manor Farm are within the land required for the construction of the Proposed Scheme and presented suitable habitat for aquatic invertebrates. However, these sites only recorded species of 'Very Common' and 'Common' conservation interest during the site survey in 2016. ASPT reveal 'Poor' to 'Fair' water quality in the ponds.

- 3.3.26 One nationally notable species, a Nationally Scarce water beetle *Hydaticus seminiger*, was recorded in a large millpond with varied surrounding and emergent vegetation near Wrinehill Mill. The millpond therefore had a 'Fairly High' CCI score and recorded aquatic invertebrates from 26 taxa, including up to seven species of water beetle. The BMWP scores of the pond are considered to have 'Good' biological water quality and ASPT scores indicate 'Fair' water quality.
- 3.3.27 No Environment Agency or other desk study data were available for the water bodies within the Whitmore Heath to Madeley area.

## South Cheshire (CA5)

### *Checkley Brook*

- 3.3.28 Checkley Brook was scoped out for consideration of aquatic invertebrates as this watercourse will be spanned by a viaduct.

### *River Lea*

- 3.3.29 The River Lea was scoped out for consideration of aquatic invertebrates as this watercourse will be spanned by a viaduct.

### *Mere Gutter*

- 3.3.30 Mere Gutter was sampled at a section downstream of Waybutt Lane where it passes from a small weir under the bridge through ploughed agricultural land. The sample was collected at a straight section (1–2m wide, 0.4–0.6 m deep) with vegetated steep sided banks. The watercourse flows contain a large quantity of silt.
- 3.3.31 The sample site on Mere Gutter contained 19 taxa with 'Low' conservation value, as reflected by the low CCI score. The PSI score indicates that the river bed condition is 'Sedimented', affecting the ecology of the river bed.
- 3.3.32 There is a moderate diversity of macroinvertebrate taxa present, with representative populations of water beetles, mayfly larvae, alderfly larvae, caddisfly larvae, stonefly larvae, damselfly larvae, true flies, leeches, shrimps and molluscs. BMWP and ASPT scores indicate 'Fair' water quality. The LIFE score for Mere Gutter indicates slow/sluggish flow.
- 3.3.33 No Environment Agency or other desk study data for the invertebrate assemblage were available for Mere Gutter, though records of white-clawed crayfish are known from this watercourse (see Section 4).

### *Swill Brook*

- 3.3.34 Swill Brook was sampled at the edge of pasture land, upstream of the village of Chorlton. The point of the watercourse sampled was 0.5–1m wide, 0.2–0.3m deep and had some flow above and below a bridge carrying a field track along a fairly flat section. Accumulations of silt were observed in some areas with in-stream vegetation recorded and shaded by trees on its left bank.



- 3.3.35 The autumn 2016 field survey at Swill Brook revealed CCI score indicative of 'Fairly High' conservation value, with 24 scoring taxa recorded. One genus recorded, which is considered to be of 'Notable'<sup>12</sup> conservation interest in the UK, was a dance fly (genus *Chelifera*, family Empididae). All *Chelifera* species likely to be found in the area of the Proposed Scheme are 'Notable'.
- 3.3.36 The PSI score for Swill Brook indicates that the river bed ecology is affected by 'Moderate' levels of sedimentation.
- 3.3.37 There is a moderate diversity of macroinvertebrate taxa present in Swill Brook. BMWP/ASPT scores indicate 'Fair' water quality. Sixteen families were represented, with taxa including water beetles, caddisfly larvae, leeches, true flies, flatworms, segmented worms, shrimps and molluscs. The LIFE score for Swill Brook indicated slow to moderate flow.
- 3.3.38 No Environment Agency or other desk study data were available for Swill Brook.

### *Basford Brook*

- 3.3.39 Environment Agency data for Basford Brook has been collected for a site at Weston Lane approximately 350m downstream of the land required for the construction of the Proposed Scheme. Autumn 2013 data for BMWP and ASPT indicate 'Good' and 'Fair' biological water quality respectively and LIFE scores indicate slow to moderate flow. The 17 taxa recorded include crustaceans, molluscs, true flies, mayfly larvae, caddisfly larvae water beetles and segmented worms. Basford Brook and Mere Gutter Local Wildlife site is known to support white-clawed crayfish (see Section 4).

### *Water bodies*

- 3.3.40 Eleven ponds within the South Cheshire area were surveyed for aquatic invertebrates, some of which lie within the land required for the construction of the Proposed Scheme.
- 3.3.41 The two water bodies at Oak Farm are the closest to the land required for the construction of the Proposed Scheme (>30m) but only recorded species of 'Very Common' and 'Common' conservation interest during the site survey in 2016. ASPT reveal 'Poor' water quality in the ponds.
- 3.3.42 Another species of 'Local' conservation interest, the water bug *Aphelocheirus aestivalis*, was recorded in a pond just over 250m from the land required for the Proposed Scheme near the Wychwood Golf Course. This site was a small lake with varied surrounding emergent vegetation and recorded 32 taxa. The site had a BWMP score that indicated 'Excellent' water quality and ASPT score indicated 'Good' water quality, indicating good site condition. The moderate CCI score is due to taxa being dominated by 'Very Common' and 'Common' species and the single species of 'Local' conservation interest, *A. aestivalis*.
- 3.3.43 One Notable species, a water beetle *Hydaticus seminiger*, and one of 'Local' importance, the lesser diving beetle *Acilius sulcatus*, were recorded in the ponds

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<sup>12</sup> Taxa that do not fall within RDB categories 1–3 but which are nonetheless scarce in Great Britain and thought to occur in fewer than 100 10km squares of the National Grid

interspersed throughout Highfield Farm. All six of the ponds visited on this site lie more than 250m from the land required for the Proposed Scheme.

- 3.3.44 No Environment Agency or other desk study data were available for the water bodies within the South Cheshire area.

## 4 White-clawed crayfish

### 4.1 Methodology

- 4.1.1 Details of the standard methodology utilised for white-clawed crayfish surveys are provided in the FSMS.
- 4.1.2 Following this approach, the requirement for detailed white-clawed crayfish surveys has been based on consideration of:
- desk study records relating to white-clawed crayfish obtained from the relevant Environment Agency offices (West Midlands Area, Greater Manchester, Merseyside and Cheshire Area);
  - Staffordshire Ecological Record<sup>13</sup>;
  - rECOrd (the local biological records centre for the Cheshire Region)<sup>14</sup>;
  - stakeholder consultation responses relating to white-clawed crayfish (National Trust, Cheshire East Council);
  - Environment Agency records of signal crayfish which would preclude the presence of white-clawed crayfish;
  - scoping surveys undertaken as part of Phase 1 habitat and river corridor/ Water Framework Directive (WFD) walkover surveys; and
  - the potential for significant effects to white-clawed crayfish to occur.
- 4.1.3 Survey work was undertaken between August and November 2016.
- 4.1.4 Table 7 summarises those locations where surveys for white-clawed crayfish were undertaken. This information is cross referenced to the accompanying Map Series EC- 11.

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<sup>13</sup> Staffordshire Ecological Record, *The Ecological Database for Staffordshire*, [http://www.staffs-ecology.org.uk/html2015/index.php?title=Main\\_Page](http://www.staffs-ecology.org.uk/html2015/index.php?title=Main_Page)

<sup>14</sup> rECOrd, *Local Biological Records Centre serving Cheshire*, <http://www.record-lrc.co.uk>

Table 7: Summary of white-clawed crayfish field surveys undertaken

Ecology survey code	Watercourse/ waterbody	Location	Survey methods and survey dates			CA	Approximate distance from the land required for the construction of the Proposed Scheme (m) and orientation
			Habitat assessment	Manual search	Trapping		
000-WC1-190001	Bourne Brook	SJ113148	10 October 2016	11 October 2016	N/A	CA1	4m south-east
000-WC1-205001	River Trent	SJ996237	21 October 2016	21 October 2016	N/A	CA2	6m south-west
000-WC1-236001	River Lea	SJ773441	13 September 2016	13 September 2016	N/A	CA4	44m north-east
000-WC1-238001	Unnamed tributary of River Lea	SJ751453	17 October 2016	17 October 2016	N/A	CA4	96m south-west
000-WC1-239001	River Lea	SJ748459	06 January 2016	06 January 2016	N/A	CA5	14m north-east
000-WC1-239003	Checkley Brook	SJ750463	18 October 2016	18 October 2016	N/A	CA5	10m south-east
000-WC1-244001	Mere Gutter	SJ733503	25 August 2016	N/A	N/A	CA5	491m south-east
000-WC1-245001	Basford Brook	SJ72520	25 August 2016	25 August 2016	N/A	CA5	186m south-east
000-WC1-246001	Basford Brook	SJ724524	26 August 2016	26 August 2016	N/A	CA5	173m north-east
000-WC1-246002	Basford Brook	SJ723525	10 October 2016	N/A	N/A	CA5	216m north-east
000-WC1-248002	Unnamed tributary of Gresty Brook	SJ712534	15 September 2016	N/A	N/A	CA5	280m south-west
000-WC1-248001	Gresty Brook	SJ707536	10 October 2016	10 October 2016	N/A	CA5	487m south-west

## 4.2 Deviations, constraints and limitations

- 4.2.1 Surveys undertaken were limited to locations where landowner permission had been obtained within the period surveyed (August to November 2016). Surveys conducted in October and November were outside the optimal survey window and can only be considered conclusive where white-clawed crayfish were recorded as present.
- 4.2.2 Scoping surveys would have been conducted at the locations shown in Table 8 but access was not granted within the survey window. Further description of these locations is provided in the sections below.

Table 8: Locations where surveys would have been carried out had access been granted

<b>Watercourse</b>	<b>Location</b>	<b>OS grid reference</b>	<b>CA</b>	<b>Approximate distance from the land required for the construction of the Proposed Scheme (m) and orientation</b>
Unnamed tributary of Bentley Brook	Staffordshire, North of Rugley	SK076199	CA1	Within
Moreton Brook	Staffordshire, Upper Moreton	SK034223	CA1	Within
Unnamed tributary of Moreton Brook	Staffordshire, Lea Hall Farm	SK040222	CA1	Within
Unnamed tributary of River Trent	Staffordshire, Manor Park	SK108166	CA1	Within
Unnamed tributary of River Trent	Staffordshire, Manor Park Sailing Club	SK107167	CA1	Within
Unnamed tributary of River Trent	Staffordshire, Kings Bromley Lane	SK103172	CA1	Within
River Trent	Staffordshire, Pipe Ridware	SK 100174	CA1	Within
Trent and Mersey Canal	Staffordshire, West of Great Haywood	SJ996237	CA2	Within
Unnamed tributary of River Trent	Staffordshire, Lionlodge Covert	SJ986239	CA2	Within
Kingston Brook	Staffordshire, Lower House Farm, Hopton	SJ945257	CA2	Within
Meece Brook	Staffordshire, West of Bent Lane	SJ809401	CA3	Within
Unnamed drain	Staffordshire, Lodge Covert	SJ861356	CA3	Within
Unnamed tributary of River Lea	Staffordshire, East of Manor Road	SJ780426	CA4	Within
Unnamed tributary of River Lea	Staffordshire, North of Wrinehill Wood	SJ752455	CA4	Within
Unnamed tributary of River Lea	Staffordshire, East of Wrinehill Wood	SJ756452	CA4	Within
Mere Gutter	Cheshire, South of Waybutt Lane near West Heath	SJ736493	CA5	Within
Unnamed tributary of Mere Gutter	Cheshire, West of Waybutt Lane	SJ729492	CA5	Within
Unnamed tributary of Mere Gutter	Cheshire, North of Den Lane	SJ733483	CA5	Within

Watercourse	Location	OS grid reference	CA	Approximate distance from the land required for the construction of the Proposed Scheme (m) and orientation
Basford Brook within and upstream of the land required for the construction of the Proposed Scheme	Cheshire, Crotia Mill Farm	SJ722527	CA5	Within

## 4.3 Baseline

4.3.1 Baseline data for watercourses and water bodies containing habitat capable of supporting white-clawed crayfish is presented in the sections below.

### Fradley to Colton (CA1)

4.3.2 There are no desk study records for white-clawed crayfish or signal crayfish in tributaries of Bentley Brook and thus scoping surveys would have been undertaken if access had been granted within the survey window. Historically white-clawed crayfish have been recorded in Rising Brook and Sher Brook (as indicated through desk study data and consultation with the National Trust), part of the Cannock Chase area shared with the Bentley Brook. It was considered possible crayfish occur in Bentley Brook and tributary upstream, however scoping surveys on another unnamed tributary of Bentley Brook indicate no suitable crayfish habitat. It is therefore considered unlikely that those tributaries that were not accessed contain crayfish.

4.3.3 There are no desk study records for white-clawed crayfish or signal crayfish in Moreton Brook or its tributaries and thus scoping surveys would have been undertaken if access had been granted within the survey window. Scoping surveys of other unnamed tributaries of Moreton Brook indicate these are small ditches/drains with no suitable crayfish habitat. It is therefore considered unlikely that those tributaries that were not accessed contain crayfish. Moreton Brook itself, however, does contain suitable habitat for crayfish.

4.3.4 There are no desk study records for white-clawed crayfish or signal crayfish in the tributaries of the River Trent in the vicinity of Manor Park and scoping surveys would have been undertaken if access had been granted within the survey window.

4.3.5 Historic desk study data indicate white-clawed crayfish records in the River Trent and Trent and Mersey Canal, though there are no recent records of the species and records of signal crayfish exist for both watercourses, the latest being from 2015. This is considered to preclude the continued presence of white-clawed crayfish in the river and canal and the need for survey has been scoped out.

### Colwich to Yarlet (CA2)

4.3.6 There are no desk study records for white-clawed crayfish or signal crayfish in the tributary of the Trent at Lionlodge Covert or Kingston Brook and thus scoping surveys would have been undertaken if access had been granted within the survey window. However, maps and aerial imagery suggest that the tributary at Lionlodge Covert is a simple woodland drain and that the section of Kingston Brook to be crossed by the

Proposed Scheme is a field drain which may be prone to drying out. It is therefore considered unlikely that white-clawed crayfish would be found at these locations.

### Stone and Swynnerton (CA3)

- 4.3.7 Meece Brook has historic records of white-clawed crayfish some 13km downstream of the land required for the construction of the proposed scheme. However, the most recent of these dates from 1997; and records of signal crayfish on the watercourse were made in 2014 and 2015. This is considered to preclude the continued presence of white-clawed crayfish in Meece Brook and the need for survey has been scoped out. An isolated drain at Lodge Covert would also have been subject to a scoping survey had access been granted within the survey window, however mapping and aerial imagery suggest this small vegetated drain is likely to be unsuitable for crayfish.

### Whitmore Heath to Madeley (CA4)

- 4.3.8 There are no desk study records for white-clawed crayfish or signal crayfish in tributaries of the River Lea in the vicinity of the Proposed Scheme and scoping surveys would have been undertaken if access had been granted within the survey window. One River Lea tributary east of Manor Road which was accessed for river corridor survey had suitable habitat for crayfish.
- 4.3.9 One River Lea tributary downstream of Wrinehill Wood was surveyed but no suitable habitat was found within the stretch potentially affected by the Proposed Scheme. However, another tributary which runs to the north and east of Wrinehill Wood was accessed for macroinvertebrate survey during which suitable crayfish habitat was found.

### South Cheshire (CA5)

- 4.3.10 There are desk study records of white-clawed crayfish in Mere Gutter and it is also possible that the species occurs within the tributaries which feed it. Desk study data also shows recent records of white-clawed crayfish in Basford Brook within and immediately upstream of the land required for construction of the Proposed Scheme. In the absence of survey it is assumed white-clawed crayfish is present.
- 4.3.11 Watercourses and water bodies which were not included in the scope of further surveys are listed in Table 9 with reasons for the exclusions in each case.

Table 9: Rationale for scoping out requirement for further crayfish survey of watercourses/water bodies in CA1 to CA5

Watercourse	Location	OS grid reference	Rationale for scoping watercourse out of requirement for further survey	CA	Approximate distance from the land required for the construction of the Proposed Scheme (m) and orientation
Pyford Brook	Staffordshire, East of Woodend Common Barn	SK130140	Bad overall WFD status and ecological status	CA1	Within
Unnamed tributary of Pyford Brook	Staffordshire, East of Woodend Common Barn	SK130140	Scoping visit showed habitat at site to be unsuitable	CA1	Within
Ashby Stitch	Staffordshire, East of Common Farm	SK124148	Scoping visit showed habitat at site to be unsuitable	CA1	Within

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<b>Watercourse</b>	<b>Location</b>	<b>OS grid reference</b>	<b>Rationale for scoping watercourse out of requirement for further survey</b>	<b>CA</b>	<b>Approximate distance from the land required for the construction of the Proposed Scheme (m) and orientation</b>
Unnamed tributary of Bentley Brook	Staffordshire, North of Rugley	SK003223	Scoping visit showed habitat at site to be unsuitable	CA1	Within
Crawley Brook	Staffordshire, Shaw Lane	SK113160	Scoping visit showed habitat at site to be unsuitable	CA1	Within
Luth Burn	Staffordshire, Pipe Wood Lane	SK096178	Scoping visit showed habitat at site to be unsuitable	CA1	Within
Unnamed tributary of Bentley Brook	Staffordshire, South of Blithbury	SK081195	Scoping visit showed habitat at site to be unsuitable	CA1	Within
Unnamed tributary of Moreton Brook	Staffordshire, Stockwell Heath	SK056214	Scoping visit showed habitat at site to be unsuitable	CA1	Within
Unnamed tributary of Moreton Brook	Staffordshire, Lea Hall Farm	SK044220	Scoping visit showed habitat at site to be unsuitable	CA1	Within
Unnamed tributary of Moreton Brook	Staffordshire, Moreton Grange	SK027227	Scoping visit showed habitat at site to be unsuitable	CA2	Within
Unnamed tributary of Moreton Brook	Staffordshire, Upper Moreton	SK031225	Scoping visit showed habitat at site to be unsuitable	CA2	Within
Unnamed tributary of River Trent	Staffordshire, Downstream Tithebarn Covert	SK009233	Scoping visit showed habitat at site to be unsuitable	CA2	Within
Unnamed tributary of River Trent	Staffordshire, South of Tolldish Lane	SK002234	Scoping visit showed habitat at site to be unsuitable	CA2	Within
Unnamed tributary of River Trent	Staffordshire, South of Tolldish Lane	SK003233	Scoping visit showed habitat at site to be unsuitable	CA2	Within
Unnamed tributary of Kingston Brook	Staffordshire, Downstream of Weetman's Plantation	SJ959249	Scoping visit showed habitat at site to be unsuitable	CA2	Within
Unnamed tributary of River Trent	Staffordshire, South of Hollytree Farm	SJ925275	Scoping visit showed habitat at site to be unsuitable	CA2	Within
Unnamed tributary of River Trent	Staffordshire, Marston Lane	SJ930275	Scoping visit showed habitat at site to be unsuitable	CA2	Adjacent
Unnamed tributary of River Trent	Staffordshire, Yarlet Wood	SJ914287	Scoping visit showed habitat at site to be unsuitable	CA2	Within



<b>Watercourse</b>	<b>Location</b>	<b>OS grid reference</b>	<b>Rationale for scoping watercourse out of requirement for further survey</b>	<b>CA</b>	<b>Approximate distance from the land required for the construction of the Proposed Scheme (m) and orientation</b>
Unnamed tributary of River Trent	Staffordshire, East of Pirehill Lane	SJ899306	Scoping visit showed habitat at site to be unsuitable	CA3	Within
Unnamed tributary of Meece Brook	Staffordshire, Shelton under Harley Farm	SJ815395	Scoping visit showed habitat at site to be unsuitable	CA3	Within
Unnamed drain	Staffordshire, Walton Heath Farm	SJ888323	Scoping visit showed habitat at site to be unsuitable	CA3	Within
Filly Brook Millstream	Staffordshire, Pool House Farm	SJ881332	Scoping visit showed habitat at site to be unsuitable	CA3	Within
Unnamed tributary of Filly Brook	Staffordshire, Northeast of Pool House Farm	SJ883335	Scoping visit showed habitat at site to be unsuitable	CA3	Within
Unnamed tributary of Filly Brook	Staffordshire, Upstream of Fox Covert	SJ870347	Scoping visit showed habitat at site to be unsuitable	CA3	Within
Unnamed tributary of Filly Brook	Staffordshire, Upstream of Fox Covert	SJ870347	Scoping visit showed habitat at site to be unsuitable	CA3	Within
Unnamed tributary of Filly Brook	Staffordshire, Upstream of Fox Covert	SJ870347	Scoping visit showed habitat at site to be unsuitable	CA3	Within
Unnamed tributary of River Trent	Staffordshire, West of Sandyford Farm	SJ856361	Scoping visit showed habitat at site to be unsuitable	CA3	Within
Unnamed Drain	Staffordshire, Whitmore Wood	SJ791416	Scoping visit showed habitat at site to be unsuitable	CA4	Within
Unnamed Drain	Staffordshire, Whitmore Wood	SJ789418	Scoping visit showed habitat at site to be unsuitable	CA4	Within
Unnamed tributary of River Lea	Staffordshire, West of Hey Sprink	SJ781425	Scoping visit showed habitat at site to be unsuitable	CA4	Within
Unnamed tributary of River Lea	Staffordshire, Snape Hall Road	SJ794414	Scoping visit showed habitat at site to be unsuitable	CA4	Within

4.3.12 Table 10 provides data for sites where white-clawed crayfish were recorded.

Table 10: Summary of crayfish records from surveys undertaken in CA1 to CA5

Ecology survey code	Location and watercourse	OS grid reference	Species recorded and number	Survey method yielding record	CA	Approximate distance from the land required for the construction of the Proposed Scheme (m) and orientation
000-WC1-245001	Basford Brook	SJ725520	White-clawed crayfish (5)	Manual search	CA5	Immediately downstream
000-WC1-246001	Basford Brook	SJ724524	White-clawed crayfish (2)	Manual search	CA5	Approximately 350m downstream

## 4.4 Discussion of survey results by community area

### *Fradley to Colton (CA1)*

#### *Bourne Brook*

- 4.4.1 Crayfish surveys of Bourne Brook at Rileyhill, upstream of the land required for the construction of the Proposed Scheme, revealed limited habitat suitability due to high silt levels and no crayfish were found during manual searching. White-clawed crayfish have not been recorded previously in Bourne Brook, and despite the survey having been conducted outside the optimal survey season and the finding of more suitable habitat downstream of the land required for the construction of the Proposed Scheme, the known proliferation of signal crayfish in the Trent system means that white-clawed crayfish are assumed absent from Bourne Brook.

### *Colwich to Yarlet (CA2)*

#### *River Trent*

- 4.4.2 The River Trent was surveyed at a number of stretches near Hoomill Lane. Suitable habitat for crayfish was present. None were found during manual searching. However, survey confidence using this technique in this area was low. Desk study data show the last records of white-clawed crayfish in this area of the River Trent to be from 1998 and 1997, adjacent to and downstream of the Proposed Scheme respectively, however records of signal crayfish both upstream and downstream of these locations from 1999 and 2015 suggest that white-clawed crayfish are no longer likely to be found there.

### *Stone and Swynnerton (CA3)*

- 4.4.3 No crayfish surveys were undertaken in CA3.

### *Whitmore Heath to Madeley (CA4)*

#### *River Lea*

- 4.4.4 The River Lea was surveyed at Madeley, approximately 100m downstream of the land required for the construction of the Proposed Scheme and approximately 1.5 km downstream of the River Lea crossing point in CA4. Suitable habitat was present and

conditions were suitable for manual searching, however no crayfish were found. Desk study data revealed no white-clawed crayfish or signal crayfish records for the River Lea in the vicinity of the Proposed Scheme. Given the presence of suitable habitat on the River Lea, on a precautionary basis the presence of white-clawed crayfish cannot be ruled out.

### *Tributaries of the River Lea*

- 4.4.5 A tributary of the River Lea was surveyed at Wrinehill Wood in 2015, approximately 200 m upstream of the Proposed Scheme and 300 m upstream of a crossing point on that tributary, as habitat at the crossing point itself was heavily silted and unsuitable for crayfish. Suitable habitat for crayfish was found within the woodland portion of the stream, however no crayfish were found. As the survey was conducted just outside the optimal survey season, on a precautionary basis, the presence of white-clawed crayfish cannot be ruled out at the tributary. However, the only suitable habitat found was upstream of the area to be affected by the Proposed Scheme.

### *South Cheshire (CA5)*

#### *River Lea*

- 4.4.6 The River Lea was surveyed near Wrinehill Hall, within the land required for the construction of the Proposed Scheme. Habitat suitability for crayfish was limited and none were found during the manual search. Desk study data revealed no white-clawed crayfish or signal crayfish records for the River Lea or its tributaries in the vicinity of the Proposed Scheme. White-clawed crayfish are presumed absent. .

#### *Checkley Brook*

- 4.4.7 Checkley Brook was surveyed near Wrinehill Hall, within the land required for the construction of the Proposed Scheme. Abundant suitable habitat for crayfish was present, however none were found during the manual search. Desk study data shows records of white-clawed crayfish on Checkley Brook just upstream of the reach surveyed, however these are from 1999. Desk study data revealed no signal crayfish records for Checkley Brook. Given the presence of suitable habitat at Checkley Brook, and the historic records of white-clawed crayfish at this location, on a precautionary basis their presence cannot be ruled out.

#### *Mere Gutter and tributaries*

- 4.4.8 Mere Gutter was visited for crayfish survey, however habitat conditions meant that it was largely inaccessible for manual search. Desk study data show records of white-clawed crayfish and no records of signal crayfish in Mere Gutter, therefore it is also possible that the species exists in the tributaries which feed this watercourse where suitable habitat is present.

#### *Basford Brook*

- 4.4.9 A short section of Basford Brook and Mere Gutter LWS lies within the land required for the construction of the Proposed Scheme. Desk study data show recent records of white-clawed crayfish and no records of signal crayfish in Basford Brook. Surveys of Basford Brook were undertaken within and downstream of the land required for the construction of the Proposed Scheme. Suitable habitat was present and white-clawed

crayfish were recorded south of Weston Lane in the surveyed reaches, downstream of the land required for the construction of the Proposed Scheme.


### *Gresty Brook and tributaries*

4.4.10

Data searches returned no white-clawed crayfish or signal crayfish records for Gresty Brook, therefore a scoping survey was undertaken and suitable habitat found in the brook itself. An unnamed tributary of Gresty Brook was surveyed at Basford Hall Sorting Sidings. The habitat assessment found the tributary to be a heavily vegetated ditch with little water and not suitable for crayfish, therefore no further survey was conducted in this tributary. Approximately 350 m further downstream, Gresty Brook itself was surveyed. Despite silt build up in places, some suitable habitat was present. A manual search and netting was undertaken, though sufficient patches suitable for survey could not be found in the accessible area. Given the presence of suitable habitat at Gresty Brook, and that some of these areas were inaccessible for survey, the presence of white-clawed crayfish, on a precautionary basis, cannot be excluded.

## 5 References

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