A38 Derby Junctions

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6.3 Environmental Statement Appendices

Appendix 8.3(b): Extended Phase 1 Habitat Survey in 2017

Regulation 5(2)(a)

Planning Act 2008

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

April 2019

Infrastructure Planning

Planning Act 2008

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

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6.3 Environmental Statement Appendices
Appendix 8.3(b): Extended Phase 1 Habitat Survey in 2017

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A38 Derby Junctions

Extended Phase 1 Habitat Survey 2017 Report

Report Number: HE514503-ACM-EBD-A38_SW_PR_ZZ-RP-EG-004 P02 S4
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1 INTRODUCTION

1.1 Background and Scope

1.1.1 AECOM Infrastructure & Environment UK Limited (AECOM) has been commissioned by Highways England to provide design services with regards to the A38 Derby Junctions scheme (referred to as the proposed scheme herein).

1.1.2 The proposed scheme concerns the grade separation of three junctions on the A38 in Derby, namely:

- A38/ A61 Little Eaton junction;
- A38/ A52 Markeaton junction;
- A38/ A5111 Kingsway junction.

1.1.3 These three junctions are located along an approximate 5.5km length of the A38 national trunk road, to the west and north of Derby. A plan showing the location of the proposed scheme is presented in Figure 1, Appendix A.

1.1.4 In order to assist with the assessment of the proposed scheme's potential environmental effects, a range of environmental surveys have been undertaken since 2015 to define prevailing baseline conditions. As the proposed scheme's preparation progresses, a number of updates have occurred and the design boundary has been refined several times.

1.1.5 Plans showing the different areas added and surveyed since 2015 are presented in Figures 2 and 3 Appendix A.

1.1.6 The 2017 Extended Phase 1 Habitat survey across the proposed scheme comprised the following:

- **Resurvey of the habitats previously surveyed in 2015** to confirm the nature and extent of habitats, as well as the potential to support protected or notable species (i.e. within the 2015 proposed scheme boundary as shown on Figure 2 and 3, Appendix A). The 2015 Phase 1 Habitat survey results were approaching two years old and therefore required updating.
- **Resurvey of the habitats previously surveyed in 2016** to confirm the nature and extent of habitats, as well as the potential to support protected or notable species (as shown in various arbitrary colours on Figures 2 and 3, Appendix A). This was to ensure the date of the Extended Phase 1 Habitat baseline survey data across the proposed scheme was consistent should there be any requirement for future updates.
- **A survey of nine new areas identified in 2017 as a result of proposed scheme boundary changes** which had not been surveyed previously in 2015 or 2016 (i.e. Areas A to F; and Sites 22 to 24 shown on Figures 2 and 3, Appendix A).

1.1.7 The Extended Phase 1 Habitat survey documented in this report was undertaken across several days between February and June 2017.

1.1.8 Results of the 2017 Extended Phase 1 Habitat survey are documented herein, together with desktop data. Recommendations for further surveys are made as appropriate based upon the following:

- Any new or significant changes in the nature and extent of habitats present and their potential to support protected or notable species.
- The date of existing baseline survey data (generally valid for two years).

1.1.9 Note: At the time of writing this report (July 2018), some of the recommended further surveys have now been completed - this is stated where applicable.

1.2 Study Site

1.2.1 The proposed scheme comprises Kingsway and Markeaton junctions, west of the City of Derby (SK 32801 36103) and Little Eaton junction to the north of Derby (SK 36402 39990). In accordance with best practice, the ecological study area as referred to herein extends up to 50m beyond the proposed scheme boundary.

1.2.2 The A38 is an existing and busy arterial 'A' road carrying traffic around the west and north of the City of Derby. South of Kingsway junction, the road enters a cutting and is bordered by semi-improved grassland and scrub-covered verges. The central reservation south of Kingsway junction and the junction island in this location support a mix of habitat types, including semi-improved neutral grassland and native broadleaved woodland. Bramble Brook flows from the west of the proposed scheme in this location, through culverts located under the north-bound carriageway and the central reservation before connecting with further culverts located between the junction islands. North of Kingsway junction there is an area of mixed plantation represented by semi-mature trees on an embankment.

Markeaton junction is bordered to the east by residential properties and to the west by parkland with veteran trees. The outfall from Markeaton Lake and Markeaton Brook flows through culverts beneath the existing A38, which is located at the northern extent of proposed scheme at Markeaton junction.

1.2.3 The proposed scheme at Little Eaton junction borders the road bridge over the River Derwent. The existing A38 is on embankment in this location, with the embankments themselves represented by areas of scrub and immature broadleaved plantation. A variety of grassland habitats exist at the base of the embankments in this location.

1.3 Relevant Legislation and Biodiversity Strategies

1.3.1 The Extended Phase 1 Habitat survey sought to identify the presence of protected or notable habitats and species, which in this case are covered under one or more of the following pieces of legislation:

- The Natural Environment and Rural Communities (NERC) Act 2006;
- The Wildlife and Countryside Act (1981) (as amended) (WCA);
- The EC Birds Directive (Directive 79/409/ECC) as translated into UK law by The Habitats and Species Regulations 2010 (as amended);
- The EC Habitats Directive (Directive 92/43/ECC) as translated into UK law by The Habitats and Species Regulations 2010 (as amended);
- The Protection of Badgers Act (1992); and
- The Hedgerow Regulations 1997.

1.3.2 Relevant protected species legislation as well as Planning Policy Guidance is presented in Appendix B.

1.3.3 Highways England, through the national Road Investment Strategy (RIS), has set an aspiration that the operation, maintenance, and enhancement of the Strategic Road Network (SRN) should move to a position that delivers no net loss of biodiversity by 2020; and, in the long term, Highways England should deliver a net gain in biodiversity across its broader range of works by 2040. Highways England published a Biodiversity Plan in 2015 (Highways England, 2015) to show how it will work with service providers to halt overall biodiversity loss, and maintain and enhance habitats and ecological networks. The Government requires Highways England to demonstrate progress against the 2015 Biodiversity Plan, to secure an ongoing annual reduction in the loss of net biodiversity due to its activities. The 2015 Biodiversity Plan provides a general plan to protect and increase biodiversity. The 2015 Biodiversity Plan supersedes the preceding 2002 Highways Agency (now Highways England) Biodiversity Action Plan (Highways BAP, 2002), which still however carries some relevance as it lists specific habitats and species of conservation concern.

2 METHODOLOGY

2.1 Desk-Based Study

2.1.1 The desk study included an updated search for European Sites (e.g. Special Areas of Conservation (SACs) and Special Protection Areas (SPAs)) up to 30km from the proposed scheme to identify those sites where bats are a primary reason for designation, or where potential impact pathways are present with regard to birds. This was in order to reaffirm the findings from the Assessment of Implications on European Sites (AIES) Report produced in 2016 based on the most recent proposed scheme boundary (AECOM(a), 47071319-URS-05-RP-EN-019, 2016). The desk study also identified national and local statutory and non-statutory nature conservation designations within 2km of the proposed scheme boundary, and protected or notable species up to 1km from the proposed scheme boundary. Findings are summarised in this report, with further details provided in Appendix C and illustrated on Figure 4 and 5, Appendix A.

2.1.2 Online resources reviewed as part of the desk-study included the Multi-Agency Geographic Information Centre (MAGIC) for statutory sites within 5km. A data search to identify any local designated non-statutory sites or sites of local interest within 2km of the proposed scheme, and notable or protected species records within 1km of the proposed scheme boundary was requested from the Derbyshire Wildlife Trust (DWT). Further data searches relating to notable or protected species records within 1km of the proposed scheme boundary were also requested from Derbyshire Mammal Group (DMG), Mid-Derbyshire Badger Group (MDBG), Derbyshire and Nottinghamshire Entomological Society (DaNES) and the Derbyshire Bat Conservation Group (DBCG).

2.1.3 The Highways England Environmental Information System (EnvIS) was also searched for any nature conservation and ecology records.

2.1.4 The data sources used to carry out the desk study are shown in Table 1, which also shows the search distances used for each subject.

Table 1: Desk Study Data Source

Data Type	Data Source	Date Obtained and Comments
International/ European designated sites up to 30km of the proposed scheme boundary	MAGIC	Last accessed October 2017
National and Local statutory designated sites up to 2km of the proposed scheme boundary	MAGIC	Last accessed October 2017
Non-statutory designated sites within 2km of the proposed scheme boundary	DWT	October 2016
Other sites within 2km of the proposed scheme boundary	MAGIC DWT website DWT	MAGIC last accessed October 2017 DWT Nature Reserves map and site details October 2016

Data Type	Data Source	Date Obtained and Comments
Habitat connections and green corridors within 2km of the proposed scheme boundary	Aerial photographs Google Earth	Aerial photographs last accessed October 2017 Map date 2017.
Local Biodiversity Action Plan Species and Habitats within 1km of the proposed scheme boundary	Lowland Derbyshire BAP 2011	Accessed BAP for hedgerows after preliminary appraisal of Site from aerial photographs
Protected and notable Species Data within 1km of the proposed scheme boundary	DWT	October 2016 Records for past 10 years.
Protected and notable Species Data within the vicinity of the proposed scheme boundary	A-One+	March 2015
Bat records within 1km of the proposed scheme boundary	DBCT	September 2017
Mammal records within 1km of the proposed scheme boundary	DMG	March 2015 DMG re-contacted for record update in January 2017 – no response.
Badger records within 1km of the proposed scheme boundary	MDBG	March 2016 MDBG re-contacted for record update on 6th March 2017 – no response.
Entomological records within 1km of the proposed scheme boundary	DaNES	30 March 2015
Protected and notable Species Data within the vicinity of the proposed scheme boundary	EnvIS	February 2016 Highways England re-contacted for record update on September 2017 – awaiting response.

2.1.5 Sections of the proposed scheme extent have been subject to a range of ecological surveys since 2015. A summary of the surveys for protected/ notable fauna undertaken by AECOM are presented in Table 2. Figures 2 and 3 in Appendix A show the boundaries of all the areas noted in the table (i.e. Area reference).

Table 2: Summary of Previous Surveys Undertaken by AECOM for the Proposed Scheme

Document Title	Survey Type	Area Reference	Survey Date	Method Used	Report Reference
A38 Derby Junctions Phase 1 Habitat Survey Report	Extended Phase 1 Habitat Survey	Kingsway & Markeaton junctions - Site boundary_2015 and Little Eaton junction - Site boundary_2015	January 2015	Extended Phase 1 Habitat Survey (JNCC, 2015)	47071319-URS-05-RP-EN-003 March 2016 (AECOM(b))
A38 Derby Junctions Additional Sites: Ecology Report	Extended Phase 1 Habitat Survey	Sites 1, 2, 3, 4, 5, 7a, 7b, 8, 9, 10, 12, 15, 16, 19a, 19b, 19c	September 2016	Extended Phase 1 Habitat Survey (JNCC, 2015)	Technical Note 47071319-URS-05-TN-EN-023 (AECOM(c))
A38 Derby Junctions Reptile Survey Report	Reptile survey	Kingsway & Markeaton junctions - Site boundary_2015 and Little Eaton junction - Site boundary_2015	Spring 2015	Froglife Advice sheet 10 (1999) & Herpetofauna Workers' Manual (1998)	47071319-URS-05-RP-EN-010 March 2016 (AECOM(d))
A38 Derby Junctions Badger Survey Report (Confidential)	Badger survey	Kingsway & Markeaton junctions - Site boundary_2015 and Little Eaton junction - Site boundary_2015	2015	Standard methodology (Harris, Creswell & Jefferies, 1989)	47071319-URS-05-RP-EN-012 March 2016 (AECOM(e))
A38 Derby Junctions River Corridor Survey and River Habitat Survey Report	River Habitat and River Corridor survey	Kingsway & Markeaton junctions - Site boundary_2015 and Little Eaton junction - Site boundary_2015	2015	National Rivers Authority (NRA) River Corridor Assessment guidelines (NRA, 1992), River Habitat Survey in Britain and Ireland. Field Survey Guidance Manual (Environment Agency, 2003)	47071319-URS-05-RP-EN-015 March 2016 (AECOM(f))
A38 Derby Junctions Otter and Water Vole Survey Report	Otter and Water vole survey	Kingsway & Markeaton junctions - Site boundary_2015 and Little Eaton junction - Site boundary_2015	2015	New Rivers and Wildlife Handbook (RSPB, NRA & RSNC, 1994), Environment Agency's Fifth Otter Survey of England 2009-2010 (Environment Agency, 2010), Monitoring the Otter (Chanin, 2003), The Water Vole Conservation Handbook (Third Edition).(Strachan et al. 2011)	47071319-URS-05-RP-EN-014 March 2016 (AECOM(g))
A38 Derby Junctions Great Crested Newt Survey Report	Great crested newt survey	Kingsway & Markeaton junctions - Site boundary_2015 and Little Eaton junction - Site boundary_2015	Spring 2015	Habitat Suitability Index (HSI) (Oldham et al., 2000), Standard methodology (Langton *et al.* 2001); Gent & Gibson, 1998)	47071319-URS-05-RP-EN-009 March 2016 (AECOM(h))
A38 Derby Junctions Vegetation and Hedgerow Survey Report	Botanical survey	Kingsway & Markeaton junctions - Site boundary_2015 and Little Eaton junction - Site boundary_2015	Summer 2015	Hedgerow Survey Handbook (DEFRA 2007) LBAP Selection Criteria (LBAP 2011)	47071319-URS-05-RP-EN-011 March 2016 (AECOM(i))
A38 Derby Junctions Breeding Bird Survey Report	Breeding bird survey	Kingsway & Markeaton junctions - Site boundary_2015 and Little Eaton junction - Site boundary_2015	2015	Bird Census Techniques (Bibby *et* al, 1992) Common Birds Census Instructions (Marchant 1983) LBAP Species-Birds (2015)	47071319-URS-05-RP-EN-008 March 2016 (AECOM(j))
A38 Derby Junctions Terrestrial Invertebrate Survey report	Terrestrial invertebrate survey	Kingsway & Markeaton junctions - Site boundary_2015 and Little Eaton junction - Site boundary_2015	2015	NERR005 (Drake *et al*, 2007)	47071319-URS-05-RP-EN-013 March 2016 (AECOM(k))
A38 Derby Junctions Wintering Bird Survey Report	Wintering bird survey	Kingsway & Markeaton junctions - Site boundary_2015 and Little Eaton junction - Site boundary_2015	Winter 2015-2016	Bird Monitoring Methods (Gilbert et al. 1998)	47071319-URS-05-RP-EN-022 June 2016 (AECOM(l))
A38 Derby Junctions White-Clawed Crayfish Survey Report	White-clawed crayfish survey	Kingsway & Markeaton junctions - Site boundary_2015 and Little Eaton junction - Site boundary_2015	Summer 2015	Standardised Survey and Monitoring Protocol for White-Clawed Crayfish *Austropotamobius pallipes'* (Peay, 2002), 'Monitoring the White-Clawed Crayfish *Austropotamobius pallipes'* (Peay, 2003)	47071319-URS-05-RP-EN-017 May 2016 (AECOM(m))

Document Title	Survey Type	Area Reference	Survey Date	Method Used	Report Reference
A38 Derby Junctions Aquatic Macroinvertebrate Survey Report	Aquatic invertebrate survey	Kingsway & Markeaton junctions - Site boundary_2015 and Little Eaton junction - Site boundary_2015	2015	Freshwater macro-invertebrate analysis of riverine samples (Environment Agency, 2014), The conservation of freshwater macroinvertebrate populations: a community based classification scheme (Chadd, R. & Extence, C., 2004)	47071319-URS-05-RP-EN-018 May 2016 (AECOM(n))
A38 Derby Junctions Bat Survey Report	Bat activity surveys Bat roost surveys of structures and trees with moderate or higher roost potential.	Kingsway & Markeaton junctions - Site boundary_2015 and Little Eaton junction - Site boundary_2015	Summer 2015	Bat Surveys – Good Practice Guidelines. (Hundt, 2012)	47071319-URS-05-RP-EN-020 March 2016 (AECOM(o))

2.2 Extended Phase 1 Habitat Survey

2.2.1 The Extended Phase 1 Habitat survey was undertaken between February and June 2017 by AECOM ecologists. Most of the proposed scheme extent had already been surveyed in 2015 and 2016 and the purpose of this survey was to ensure that the ecological baseline was still relevant or updated when changes were noted. In addition, nine areas were surveyed for the first time between February and June 2017 - these are marked as A, B, C, D, E, F, Site 22, Site 23 and Site 24 on Figures 2 and 3 in Appendix A.

2.2.2 The Extended Phase 1 Habitat survey was undertaken according to the published guidelines (Joint Nature Conservation Committee, 2016). Summaries of the habitat types recorded are presented as Phase 1 Habitat maps (refer to Figures 8, 9 and 10, Appendix A). Target Notes (TN) detailed on the Phase 1 Habitat maps are described and referred to throughout the text herein, with further details provided in Appendix D, E and F.

2.2.3 Additional notes relating to the field assessment undertaken are as follows:

- The Extended Phase 1 Habitat survey included assessments of the potential for protected species and/ or habitats or species groups of nature conservation importance to occur within the proposed scheme boundary, or within the study area, which extends up to 500m beyond the proposed scheme boundary.
- Waterbodies and wetland habitats of potential suitability to amphibians, particularly great crested newt *Triturus cristatus* (GCN) were identified and recorded.
- The presence of trees and structures of potential suitability to roosting bats were recorded.
- Signs of badger *Meles meles* activity (for example setts, latrines, paths, feeding remains and footprints) were recorded.
- Habitats of potential suitability to support reptiles were recorded.
- Habitats of potential suitability to support breeding birds and over-wintering birds were recorded.
- Habitats with potential to support threatened/ scarce plant species or botanical species of conservation importance were noted.
- The extent and locations of stands of invasive, non-native plant species were recorded.
- Watercourses of potential suitability to otter *Lutra lutra*, water vole *Arvicola amphibious*, white-clawed crayfish *Austropotamobius pallipes* or aquatic invertebrates were identified and noted.
- Habitats with potential to support diverse assemblages of terrestrial invertebrates were identified and noted.

2.2.4 Survey effort was focused on those habitats within 50m of the proposed scheme boundary. However, where justified by habitat connectivity, and in line with the details provided above, consideration was given to habitats and the potential presence of protected or notable species up to 500m beyond the proposed scheme boundary.

2.2.5 The results of the Extended Phase 1 Habitat survey have been used to inform the potential presence of protected or notable species within or around the proposed scheme as well as the requirement for further surveys.

2.3 Survey Limitations

2.3.1 An Extended Phase 1 Habitat survey can be carried out at any time of the year, although the optimal time is between April and September. Areas were surveyed in February and therefore outside of the optimal survey season. However, owing to the availability of data previously collected (the result of Phase 1 Habitat surveys undertaken in 2015 and 2016), as well as the managed nature of the habitats present, this is not considered to represent a significant constraint.

2.3.2 The survey was, however, constrained by access restrictions associated with the assessment of Area B.

2.3.3 The results of the Extended Phase 1 Habitat survey are not definitive and it is not intended that they negate the need for further survey work.

3 RESULTS

3.1 Overview

3.1.1 The results of the desk study and 2017 Extended Phase 1 Habitat survey are provided below.

3.2 Desk-Based Study

Designated and Notable Sites

3.2.1 There are no European designated sites with bats as a qualifying feature within 30km of the proposed scheme boundary; and no effective pathway exists with regards to flight paths or feeding areas of birds from the proposed scheme to an SPA or Ramsar within 30km.

3.2.2 The list of all the statutory and non-statutory sites located within 2km of the proposed scheme is available in Appendix C. A summary is provided below focusing on those sites within or directly adjacent to the proposed scheme (see Figures 4 and 5 in Appendix A).

3.2.3 There are no international, national or local statutory designated sites located within or directly adjacent to the proposed scheme.

3.2.4 There are seven non-statutory designated sites i.e. Local Wildlife Sites (LWS) located within or directly adjacent to the proposed scheme boundary as follows:

- A38 Roundabout LWS (DE010) – semi-improved neutral grassland - within the proposed scheme boundary at Kingsway junction.
- Mickleover Railway Cutting LWS (DE004) - Habitat mosaic - within the proposed scheme boundary continuing up to 0.8km west of the proposed scheme boundary near Kingsway junction.
- Markeaton Brook System LWS (DE003) - Invertebrate assemblage (including white-clawed crayfish) within the proposed scheme boundary and continuing up to 0.8km south-east of the proposed scheme boundary and 1.2km north of the proposed scheme boundary near the Markeaton junction.
- Bramble Brook and Margins LWS (DE014) - secondary broad-leaved woodland - within the proposed scheme boundary at Kingsway junction.
- Markeaton Park LWS (DE074) - wood pasture and parks including veteran trees – within the proposed scheme boundary at Markeaton junction.
- Alfreton Road Rough Grassland LWS (ER002) – floodplain grassland semi-improved - within the proposed scheme boundary at Little Eaton junction.
- River Derwent LWS (DE007) - flowing water, river and associated streams – adjacent to the proposed scheme boundary at Little Eaton junction.

3.2.5 There are six non-designated Potential Local Wildlife Sites (PLWS) or sites of interest reported by DWT located within or directly adjacent to the proposed scheme boundary as follows:

- A38 Scrub (DE050/3);
- Ford Lane Field PLWS;
- Des Lane Brook Course (DE/3);

- Boosemoor Brook (EER018/3);
- Plantation (ER017/3);
- Old Canal Derby (ER003/3).

3.2.6 Appendix C details the Local Biodiversity Action Plan (LBAP) habitats recorded within 2km of the proposed scheme. There are two LBAP habitats within or adjacent to the proposed scheme as follows:

- Wood pasture – at Markeaton Park LWS;
- Lakes and ponds – in association with Markeaton Park LWS, Markeaton Brook System LWS and other ponds.

Protected and/or Notable Species

3.2.7 Relevant records of protected and notable species for a 1km search area from the proposed scheme boundary provided by the DWT, DBCT, A-One+, DMG, DBG, DaNES and EnvIS and AECOM were collated and summarised in Table 3 (see Figures 6 and 7 in Appendix A for record locations and Figures 6 and 7 for site locations).

Table 3: Protected and Notable Species Records

Common Name	Scientific Name	Number of Records	Notes	Date of nearest record/ date of survey	Legal status & conservation aims*	Data source
Amphibians						
Great crested newt	*Triturus cristatus*	5	Approx. 0.9km west of the proposed scheme boundary.	2013	HabRegs[a], W&CA[b], NERC S41[c], LBAP[d]	DWT
Great crested newt	*Triturus cristatus*	0	GCN surveys conducted in 2015 across the proposed scheme (Site boundary_2015) were all negative for GCN.	2015	HabRegs, W&CA, NERC S41, LBAP	AECOM(h)
Common toad	*Bufo bufo*	Toad crossing	Toad crossing proposed scheme on the A38 between Markeaton Park and Mill ponds.	2017	NERC S41, LBAP	DWT
Common toad	*Bufo bufo*	Large populations	The AECOM 2015 surveys recorded large populations of common toad in both Mill Ponds 1 and 2 and Markeaton lake.	2015	NERC S41, LBAP	AECOM(h)
Birds						
House Sparrow	*Passer domesticus*	1	Approx. 0.9km east of Kingsway & Markeaton junctions.	2006	NERC S41, BoCC Red list[e]	DWT
Song Thrush	*Turdus philomelos*	1	Approx. 1km north of Kingsway & Markeaton junctions.	2006	NERC S41, BoCC Red list	DWT
Birds		Several	Presence of several bird populations of conservation concern identified within and adjacent to the 2015_Site boundary. Barn owls *Tyto alba* and little ringed plover *Charadrius dubius* were also recorded within the 2015_proposed scheme boundary.	2015	W&CA sch1, BoCC, NERC S41, LBAP	AECOM(j)
Wintering birds		13 target bird species	13 target bird species (including lapwing *Vanellus vanellus* and teal *Anas crecca* identified within and/ or adjacent to Little Eaton junction 2015_Site boundary in flooded field (located south-west of Little Eaton junction).	September 2015 - March 2016	Lapwing: NERC S41, BoCC Red list, LBAP Teal: BoCC Amber list	AECOM(l)
Mammals						
Water vole	*Arvicola amphibius*	1	Approx. 500m south of Little Eaton junction.	2010	W&CA, NERC S41, LBAP	DWT
Water vole	*Arvicola amphibius*	1	Of the 10 waterbodies/ watercourses surveyed within the 2015_Site boundary, water vole field signs were solely recorded for Watermeadows ditch.	2015	W&CA, NERC S41, LBAP	AECOM(g)
Otter	*Lutra lutra*	Several	Several records of otter presence exist for the River Derwent and Duffield. Their grid references are not accurate enough to be included on Figure 5.	2014	HabRegs, W&CA, NERC S41, LBAP	DWT
Otter	*Lutra lutra*	Several	Of the 10 waterbodies/ watercourses surveyed within the 2015_Site boundary, otter field signs were recorded at 9. Two potential otter holts were also recorded for within the proposed scheme boundary.	2015	HabRegs, W&CA, NERC S41, LBAP	AECOM(g)
Badger	*Meles meles*	Several	Several badger sett records present within the proposed scheme boundary.	2007 - 2015	Protection of Badgers Act 1992	DWT
Badger	*Meles meles*	Several	Several badger setts were identified within the proposed scheme boundary.	2015, 2016	Protection of Badgers Act 1992	AECOM(b), AECOM(c), AECOM(e)
Bats Brown long- eared Unidentified pipistrelles	*Plecotus auritus* *Pipistrelle sp.*	3	A brown long- eared *Plecotus auritus* roost and Pipistrelle species roosts were recorded in the Markeaton Park area.	2012 - 2016	HabRegs, W&CA, NERC S41, LBAP	DWT

Common Name	Scientific Name	Number of Records	Notes	Date of nearest record/ date of survey	Legal status & conservation aims*	Data source
Bats		4 roosts	Mill ponds area and the bridge over the River Derwent were identified as bat activity hot spots. A confirmed common pipistrelle *Pipistrelle pipistrellus* tree roost was identified in the Markeaton Park area. Daubenton's bats *Myotis daubentonii* and common pipistrelle 'night roosts' were confirmed in the bridge above the River Derwent. A confirmed brown long-eared bat roost was recorded under another A38 bridge by Little Eaton junction. A Daubenton's bat roost was recorded in a drainage pipe under during the Phase 1 Habitat survey of Site 7b.	2015 - 2016	HabRegs, W&CA, NERC S41, LBAP	AECOM(o), AECOM(c)
Hedgehog	*Erinaceus europaeus*	1	Approx. 600m north east of Little Eaton junction.		NERC S41, LBAP	DWT
Flora						
Sand spurrey	*Spergularia rubra*	2	Possibly within the proposed scheme boundary near Kingsway roundabout and near Site 21 (record accuracy not precise enough to determine exact location).	2011	DRDB[f] Category 5 Locally scarce or declining	DWT
Brown sedge	*Carex disticha*	1	Possibly within the proposed scheme boundary near Site 3 (record accuracy not precise enough to determine exact location).		DRDB Category 5 Locally scarce or declining	DWT
Horned pond weed	*Zannichellia palustris*	1	In pond Pa2 (see Figure 9, Appendix A).	2011	DRDB Category 5 Locally scarce or declining	DWT
Veteran trees		Several	Numerous records of veteran trees were provided by DWT particularly for Markeaton Park and Site 10.	20	NERC S41, LBAP	DWT
Species-rich Grasslands		2	Botanical surveys conducted in 2015 across the proposed scheme (Site boundary_2015) concluded that out of the 17 grassland areas surveyed, all the grasslands were all largely species-poor, apart from two areas (north of Little Eaton roundabout, and within the A38 roundabout LWS), which were considered to be species-rich.	2015		AECOM(i)
Reptiles						
Grass snake	*Natrix natrix*	2	Approx. 200m north of Site 23. Approx. 1km south east of Kingsway roundabout.	2014	W&CA, NERC S41, LBAP	DWT
Slow worm	*Anguis fragilis*	11	Approx. 600m north east of Site 7b.	2010	W&CA, NERC S41, LBAP	DWT
Reptiles		0	Reptile surveys conducted in 2015 across the proposed scheme (Site boundary_2015) were all negative for reptiles.	2015	W&CA, NERC S41, LBAP	AECOM(d)
Invertebrates						
White-clawed crayfish	*Austropotamobius pallipes'*	Several	White-clawed crayfish have historically been recorded from Markeaton Brook and its tributaries, which feed into the River Derwent in Derby. Female white-clawed crayfish found within a section of Dam Brook.	>10 years ago 2014	HabRegs, W&CA, NERC S41, LBAP	DWT A-One+
White-clawed crayfish	*Austropotamobius pallipes'*	1	White-clawed crayfish surveys conducted in 2015 across the proposed scheme (Site boundary_2015) suggested that white-clawed crayfish populations were absent from all but one of the study sites; the exception being the slow flowing section of the Dam Brook where a single adult male was recorded.	2015	HabRegs, W&CA, NERC S41, LBAP	AECOM(m)
American Signal crayfish	*Pacifastacus leniusculus*	Well-establish population	White-clawed crayfish surveys conducted in 2015 across the proposed scheme (Site boundary_2015) recorded American signal crayfish in Markeaton Lake, indicating a well-established population. Crayfish plague is readily carried by signal crayfish populations and is responsible for losses of white-clawed crayfish populations in many catchments in England and Wales. Markeaton Lake is well connected to downstream watercourses, including the Middle Brook and Markeaton Brook suggesting signal crayfish or crayfish and/ or crayfish plague may be present in these watercourses.	2015	W&CA sch9	AECOM(m)

Common Name	Scientific Name	Number of Records	Notes	Date of nearest record/ date of survey	Legal status & conservation aims*	Data source
Other aquatic invertebrates		Several	Aquatic invertebrates surveys conducted in 2015 across the proposed scheme (Site boundary_2015) recorded 98 taxa. Most diverse groups included caddisfly larvae, mayfly larvae and snails. Most of the species recorded across the survey areas were very common. However, the following, "Regionally Notable" species were recorded: *Potampohylax rotundipennis* (a caddisfly), *Brachycentrus subnubilus* (a caddisfly), and *Lasiocephala basalis* (a caddisfly) were recorded. Results of analysing the sample data demonstrated that: • The River Derwent LWS and Markeaton Brook LWS were of very good biological quality in the stretch sampled, and of "Moderate" to "Fairly High" conservation value; they both supported communities likely to be very sensitive to changes in water quality. • Dam Brook was of good biological quality in the area surveyed and of "Low" to "Moderate" conservation value; it supported communities likely be sensitive to changes in water quality. • Bramble Brook was of moderate biological quality and of "Low" conservation value and supported communities likely to be relatively tolerant to pollution.	2015	DRDB Category 5 Regionally Notable	AECOM(n)
Latticed Heath	*Chiasmia clathrata*	1	Approx. 500m south east of Site 23.	2006	LBAP	DWT
Terrestrial invertebrates		Several	Terrestrial invertebrates surveys conducted in 2015 across 7 sampling sites within the proposed scheme (Site boundary_2015) recorded 106 species representing 10 Orders. The grassland at Kingsway Hospital (Sites 4 and 5) was by far the most species diverse, with a peak count of 70 species.	Summer 2015	Some LBAP	AECOM(k)
Invasive non-native plant species						
Himalayan balsam	*Impatiens glandulifera*	Several	The Phase 1 Habitat survey conducted in 2015 recorded Himalayan balsam along the entire watercourse within the proposed scheme (Site boundary_2015).	2015	W&CA sch9	AECOM(b)
Japanese knotweed and Giant knotweed	*Fallopia japonica* *Fallopia sachalinensis*	Several	The Phase 1 Habitat survey conducted in 2015 within the proposed scheme (Site boundary_2015) recorded Japanese and giant knotweed near Kingsway roundabout, along the river Derwent and either of the railway line by the A38. Several pockets of Japanese knotweed were also recorded on Site 8 in November 2016.	2015 2016	W&CA sch9	AECOM(b) AECOM(c)
New Zealand pigmy weed	*Crassula helmsii*	1	The Phase 1 Habitat survey conducted in 2015 within the proposed scheme (Site boundary_2015) recorded new Zealand pigmy weed in Site 21.	2015	W&CA sch9	AECOM(b)

[a] The Conservation of Habitats and Species Regulations 2017

[b] Wildlife and Countryside Act 1981 (as amended)

[c] The Natural Environment and Rural Communities (NERC) Section 41. Habitats and Species of Principal Importance for the conservation of biodiversity in England

[d] Lowland Derbyshire Biodiversity Action Plan

[e] Birds of Conservation Concern 4: the Red List for Birds

[f] Red Data List of Derbyshire's Vascular Plants (Moyes & Willmot 2009)

3.3 Extended Phase 1 Survey

Habitats

3.3.1 The following habitats were recorded during the Extended Phase 1 Habitat survey undertaken in 2017 (see Figures 8, 9 and 10 in Appendix A):

- Semi-natural broad-leaved woodland and scattered broad-leaved trees;
- Broadleaved plantation woodland;
- Coniferous plantation woodland;
- Mixed plantation woodland;
- Dense and scattered scrub;
- Semi-improved neutral grassland;
- Poor semi-improved grassland;
- Marshy grassland;
- Improved grassland and arable;
- Tall ruderal;
- Standing water and associated inundation vegetation;
- Running water;
- Amenity grassland;
- Hard standing and bare ground; and
- Buildings.

Hedgerows

3.3.2 The complete and updated habitat descriptions for the proposed scheme are provided below, with further details in Appendix D, associated Target Notes in Appendix E and watercourse photos in Appendix F.

Semi-natural Broad-leaved Woodland and Scattered Broad-leaved Trees

3.3.3 Semi-natural broadleaved woodland was present within Kingsway junction (TN26) and the A38 central reservation to the south of Kingsway junction (TN11). This habitat was dominated by willow *Salix spp*., with alder *Alnus glutinosa*, hazel *Corylus avellana*, ash *Fraxinus excelsior* and holly *Ilex aquifolium*. Notable ground flora included hart's tongue fern *Asplenium scolopendrium*, lords and ladies *Arum maculatum*, wood anemone *Anemone nemorosa* and dog's mercury *Mercurialis perennis*. Bramble brook flowed through the woodland and there were extensive stands of Himalayan balsam *Impatiens glandulifera* (TN2 and TN26). Pockets of this habitat were also recorded at TN16, TN17 and TN28. A wide fringe of broad-leaved woodland was also recorded in Markeaton Park. This included a range of native and non-native tree species, with pedunculate oak *Quercus robur*, ash, beech *Fagus sylvatica*, yew *Taxus baccata* and horse chestnut *Aesculus hippocastanum* widely recorded. Norway maple *Acer platanoides* and Scots pine *Pinus sylvestris* were recorded less frequently. The trees varied in age structure, but many mature trees were present, including some veteran trees as well as others, which had been

recently planted (TN31). Trees also fringed Markeaton Lake and Mill Pond, and these included common lime *Tilia x europaea*, sycamore *Acer pseudoplatanus*, alder, crack-willow *Salix fragilis*, grey willow *Salix cinerea*, yew, weeping willow *Salix fragilis ssp. babylonica*, ash and horse chestnut. This area supported an understory of hawthorn *Crataegus monogyna*, elder scrub *Sambucus nigra* and dogwood *Cornus sanguinea*.

3.3.4 At Little Eaton junction three parcels of broad-leaved woodland dominated by ash and hawthorn were situated at TN34; which comprises the A38 Scrub (DE050/3) pLWS. Pockets of this habitat were also recorded at TN41, TN63, TN64, TN67, and along Alfreton Road, adjacent to Pond Pb8.

3.3.5 Scattered trees occurred in various locations within the extent of the proposed scheme. Species present comprised native species including veteran pedunculate oak, recorded along the eastern edge of Markeaton Park, along with mature examples of sycamore, London plane *Platanus x hispanica*, ash, willows, cherry *Prunus domesticus*, lime *Tilia spp*. and horse chestnut. Site 12 was bordered with two lines of mature lime trees.

3.3.6 Several veteran trees locations within or near the proposed scheme boundarythe proposed scheme boundary were reported by DWT (see Figures 4 and 5). These were principally located within Markeaton Park and within Site 10. Species included pedunculate oak, turkey oak *Quercus cerris*, willow, horse chestnut, lime and beech.

Broad-leaved Plantation Woodland

3.3.7 Two lines of mature horse chestnut were recorded at TN12.

3.3.8 Broad-leaved plantation was present in Mackworth Park at TN10, TN13, TN19 and TN27.

3.3.9 Broad-leaved plantation was present at TN58. This woodland is known to have been planted in 2000 and was dominated with hazel, cleavers *Galium aparine*, hogweed *Heracleum sphondylium*, rough meadow-grass *Poa trivialis*, hedge woundwort *Stachys sylvatica* and common nettle *Urtica dioica*. Other species recorded were: Ash, rowan *Sorbus aucuparia*, oak *Quercus* sp., field maple *Acer campestre*, yew, and blackthorn *Prunus spinosa*.

3.3.10 Broad-leaved plantation was present on the approach of Little Eaton junction on both sides of the carriageway, south-west of the River Derwent (from TN33). This habitat was dominated by ash with frequent hawthorn and blackthorn and occasional alder. Then the broad-leaved plantation extended along both sides of the carriageway at TN40 and TN51 as the A38 heads north from Little Eaton junction.

3.3.11 A wide strip of broad-leaved plantation was recorded along the railway line, but no access was possible along this corridor and therefore no detailed survey was undertaken there.

Mixed Plantation Woodland

3.3.12 The central reservation separating the carriageways north of Kingsway junction (leading to Markeaton junction) comprised a very dense mixed plantation woodland, with native broad-leaved species including semi-mature and self-set saplings of ash, silver birch *Betula pendula*, cherry *Prunus spp*., sycamore, hawthorn, hazel, dogwood and alder, along with frequent Scots pine with a poor understorey species

diversity.

3.3.13 Mixed woodland plantation woodland was located to the west of the A38 near to the entrance to Markeaton Park. Species present there were dominated by Scots pine and yew. The habitats beneath these trees were maintained as part of the Markeaton Park public space and as such did not support any notable ground flora, being dominated by perennial rye-grass *Lolium perenne* with scattered scrub.

Dense and Scattered Scrub

3.3.14 Scattered scrub and dense scrub occurred in areas throughout the extent of the proposed scheme and were interspersed within grassland habitats. Typical scrub species represented within the extent of the proposed scheme included bramble *Rubus fruticosus* agg., alder, blackthorn, hawthorn, silver birch and also various willow species including grey willow, goat willow *Salix caprea* and *Salix x spp*,. Willows and alders in particular occurred in proximity to the streams and areas of standing water, which were present across the Site. TN6, TN9, TN15, TN35, TN49 and TN62 present a description selection of this habitat.

Semi-improved Neutral Grassland

3.3.15 Semi-improved grasslands dominated by Yorkshire-fog *Holcus lanatus* and false oat-grass *Arrhenatherum elatius* were recorded east of the carriageway at the southern extent of Kingsway and Markeaton junctions (see TN6, TN7, TN8 and TN20). At TN4, a strip of mown semi-improved grassland surrounded a balancing pond. Species present there included common bent *Agrostis capillaris*, rough meadow grass *Poa trivialis* and creeping buttercup *Ranunculus repens*.

3.3.16 The A38 Roundabout LWS comprised two areas of semi-improved grassland, one within the roundabout itself (TN25) and one within the central reservation further south (TN18). The grassland at TN25 was managed and dominated by false oat-grass, whereas the grassland at TN18 was unmanaged and suffered from extensive scrub encroachment due to lack of management.

3.3.17 TN29 was managed grassland within the grounds of the Territorial Army Site. It was largely dominated by red fescue *Festuca rubra*, with herbs such as common knapweed *Centaurea nigra*, cleavers, selfheal *Prunella vulgaris*, meadow vetchling *Lathyrus pratensis*, fox-and-cubs *Pilosella aurantiaca* and creeping cinquefoil *Potentilla reptans* making up a much smaller proportion of the sward.

3.3.18 TN52 was a horse grazed and species-poor neutral grassland located by the River Derwent, with a large component of perennial rye-grass, along with grasses such as cock's-foot *Dactylis glomerata*, red fescue, smooth meadow-grass *Poa pratensis*, meadow foxtail *Alopecurus pratensis* and false oat-grass.

3.3.19 Alfreton Road Rough Grassland LWS at TN55 was a horse-grazed field by the A38 with local stands of perennial weeds such as common nettle, creeping thistle *Cirsium arvense* and spear thistle *Cirsium vulgare*. Creeping bent and red fescue dominated the grasses, with lesser amounts of marsh foxtail *Alopecurus geniculatus*, Yorkshire-fog, cock's-foot and smooth meadow-grass, perennial rye-grass. The effects of heavy horse-grazing were manifested in the frequent occurrence of daisy, silverweed *Potentilla anserina*, common ragwort *Senecio jacobaea* and creeping buttercup. In 2015, AECOM recorded three grassland indicator species (Derbyshire Wildlife Trust;

2003, revised 2011) in this area (AECOM(i), 47071319-URS-05-RP-EN-011, 2016): water forget-me-not *Myosotis scorpioides*, meadowsweet *Filipendula ulmaria* and meadow crane's bill *Geranium pratense*. Meadow buttercup *Ranunculus acris*, ribwort plantain *Plantago lanceolata*, red clover *Trifolium pratense* were also noted, along with small amounts of more diminutive herbs, such as common mouse-ear *Cerastium fontanum*, cut-leaved crane's-bill *Geranium dissectum* and dove's-foot crane's-bill *Geranium molle*. The field was variously inundated through the seasons and the invasive New-Zealand pigmyweed *Crassula helmsii* was locally dominant. There was an area of open water with a draw down zone at the southern end of the field (see Pb9 in Table 4).

3.3.20 TN59 was a wetter grassland with dominated by soft rush *Juncus effusus*, meadow foxtail, tufted hair-grass *Deschampsia cespitosa* and Yorkshire-fog with floating sweet-grass *Glyceria fluitans* dominating the wetter hollows. Common spotted-orchid *Dactylorhiza fuchsii* was also recorded rarely.

Poor Semi-improved Grassland

3.3.21 TN47, TN69 and TN70 were three areas heavily grazed by sheep and cattle. Vegetation included abundant broad-leaved dock *Rumex obtusifolius*, with crested dog's-tail *Cynosurus cristatus*, annual meadow-grass *Poa annua*, rough meadow-grass, perennial rye-grass and creeping buttercup.

3.3.22 TN60 and TN62 comprised un-managed, poor semi-improved grassland, with some more species rich short areas. The area was heavily disturbed by vehicles and suffered from extensive scrub encroachment.

Marshy grassland

3.3.23 TN43 comprised an area of marshy grassland choked by reedmace *Typha sp*., meadowsweet and ornamental non-native reed sweet grasses *Glyceria spp*. No open water was recorded.

Improved Grassland and Arable

3.3.24 The improved grasslands recorded at TN37, TN57, TN61 and TN72 comprised Yorkshire-fog, perennial rye-grass and cock's foot.

3.3.25 TN73 was an area utilised as a turf farm with scrub and poor ruderal vegetation recorded along the field margins.

Tall Ruderal

3.3.26 This category comprised stands of tall perennial or biennial dicotyledons, usually more than 25cm high, of species such as cow parsley *Anthriscus sylvestris*, rosebay willowherb *Chamerion angustifolium* and nettle. This habitat was commonly found along footpaths and along field margins as well as at TN14, TN38, TN39, TN45, TN46 and TN56. Numerous stands of Japanese knotweed, giant knotweed and Himalayan balsam were also recorded; their locations and descriptions are detailed in the following paragraph.

3.3.27 No significant changes noted from 2015.

Standing Water and Associated Inundation Vegetation

3.3.28 Twenty-three ponds were identified within 50m of the proposed scheme boundary. These are described in Appendix D, Table D1.

3.3.29 Other ponds located within 500m of the proposed scheme are described in relation to their GCN breeding potential in Section 3.3.46.

Running Water

3.3.30 Eight streams were identified within 50m of the proposed scheme boundary:

- Bramble Brook;
- Markeaton Brook;
- Middle Brook;
- Watermeadows Ditch;
- Dam Brook;
- Boosemoor Brook;
- River Derwent; and
- Bottle Brook.

3.3.31 These watercourses are described in Appendix D, Table D2. Photographs are available in Appendix F.

Amenity Grassland

3.3.32 Most of the small gardens (including the gardens along Queensway) and mown verges associated with residential properties within the boundary of the proposed scheme were included in this habitat category.

3.3.33 Amenity grassland was also recorded in Mackworth Park at TN5 and TN21. This area is used frequently by members of the public for exercise and dog walking.

3.3.34 TN30 was an area of mown amenity grassland at Derby University. It was species-poor and dominated by perennial rye-grass with lesser amounts of grasses such as cock's-foot, Yorkshire-fog and smooth meadow-grass. Herbs noted include black medick *Medicago lupulina*, hogweed *Heracleum sphondylium*, creeping cinquefoil, meadow buttercup, creeping buttercup, dandelion *Taraxacum officinale agg*. and red clover.

3.3.35 The grasslands at Markeaton Park at TN32 comprised improved/ amenity grassland and the majority of these habitats were regularly mown. Species present included perennial rye-grass, daisy *Bellis perennis,* dandelion, and nettles.

3.3.36 A small area of amenity grassland and scrub was located east of Kingsway roundabout within land owned by Sainsbury's Plc. Species present included cowslip *Primula veris*, daisy, Yorkshire-fog, perennial rye-grass, ribwort plantain , creeping cinquefoil, dandelion, red clover, white clover *Trifolium repens*, and tufted vetch *Vicia cracca*.

TN48 was a private garden with closely mown amenity grassland with shrubs and trees. Riverside tree species recorded were sycamore, alder and grey willow. The riverbank flora consisted of common nettle and great willow herb *Epilobium hirsutum*.

Hardstanding and bare ground

3.3.37 Hardstanding was recorded principally associated with the carriageways of the A38 as well as public footpaths and residential and commercial properties surrounding the proposed scheme.

3.3.38 TN50 was a large area of bare ground by Talbot Turf Farm topsoil works area.

Buildings

3.3.39 Thirteen buildings or man-made structures were recorded during the Extended Phase 1 Habitat survey. These were located either within the boundary of the proposed scheme, or otherwise within 50m. These are shown in Figures 13 and 14, Appendix A and detailed in Appendix D, Table D3.

Hedgerows

3.3.40 A total of 38 hedgerows were identified during the Extended Phase 1 Habitat survey. These were located either within the boundary of the proposed scheme, or otherwise within 50m. The majority of these hedgerows were dominated by hawthorn, with occasional elder and blackthorn. No notable ground flora was recorded at the time of survey. The hedgerows detailed in Appendix D, Table D4.

3.3.41 Hedgerow H1 to H7 were surveyed in 2015 (AECOM(i), 47071319-URS-05-RP-EN-011, 2016) and were recorded as species-poor and 'not important' under the nature conservation criterion of the Hedgerow Regulations 1997. This was reaffirmed in 2017. Hedgerows H9 to H38 were also recorded as species-poor and 'not important' in 2017. Hedgerow H8 was graded as species-rich and included dominant hawthorn, with ash, holly, dog-rose *Rosa canina* agg., bramble, elder and English elm *Ulmus procera* also present.

3.3.42 Hedgerows are a priority habitat for England (Section 41 NERC Act, 2006) where they comprise a minimum 80% of at least one native species. Apart from the laurel and leylandii hedges, all the other hedgerows recorded within the proposed scheme boundary or within 50m therefore qualify.

Invasive Non-Native Plant Species

3.3.43 Schedule 9 of the Wildlife and Countryside Act 1981 (as amended) covers the control of invasive plants and animals. Invasive plant species recorded within or adjacent to the proposed scheme boundary include:

- Japanese knotweed;
- Giant knotweed;
- Himalayan balsam;
- Variegated yellow archangel;
- New Zealand pigmyweed; and
- Cherry laurel and snowberry (although not listed on Schedule 9 species, these species are listed on the Great Britain Invasive Non-Native Species Secretariat).

3.3.44 Details of the invasive plants recorded during the surveys are provided in Appendix D, Table D5. The unique reference number of each stand can be found in Figures 11 and 12, Appendix A.

Fauna

Great Crested Newts and Common Toad

3.3.45 The desk study identified the presence of 40 waterbodies within 500m of the proposed scheme boundary. Twenty six of these ponds were surveyed in 2015 (AECOM(h), 47071319-URS-05-RP-EN-009, 2016), whilst 14 were new ponds identified and not previously surveyed. The 40 ponds were subject to Habitat Suitability Index (HSI) assessments in 2017. The HSI methodology and full results are provided in Appendix G and the 2017 GCN Survey Report. In summary, nine of the waterbodies had HSI values of excellent or good potential to support breeding GCN populations, with the remaining ponds all having average, below average or poor potential to support breeding GCN populations.

Bats – Roosting

3.3.46 Fourteen structures, 100 trees and one group of trees with potential bat roost features (PRF) were recorded within the extent of the proposed scheme plus 50m, as shown in Figures 13 and 14, Appendix A. Seven of these structures and 35 of these trees were surveyed in 2015 (AECOM(o), 47071319-URS-05-RP-EN-020, 2016) and reassessed in 2017; whilst seven structures and 65 trees were new features not previously surveyed and subject to assessment in 2017.

3.3.47 Details of all the PRF identified in 2017 within the proposed scheme boundary plus 50m are provided in Appendix H and the Bat Roost Survey Report (AECOM, 2017) – refer to Table 4.

Table 4: Summary of Bat Roost Suitability Assessment

	Confirmed / Possible Roosts	**High**	**Moderate**	**Low**	**Negligible**	**Unknown**
Buildings and Structures	B2, B3, B11	B1,	B6, B7	B4, B5		B8, B9, B10, B12, B13, B14
Trees / Group of trees	M1	M12, M36,	M2 - M4, M6 – M11, M14, M15, M17, M20, M23, M24, M28, M29, M32-M34, M37, M38, M46, M51, M53, T1*, T2*, T5*, T12*, T16a, T31, T71	M13, M16, M18, M19, M21, M22, M25, M27, M30, M31, M35, M39-M42, M44, M45, M47 – M50, M52, T3*, T4*, T6*, T7*, T14a, T15, T16, T23, T25, T30, T56, T65, T72, T74	M26, M43, T13, T14, T17-T20, T24, T26, T27, T44, T57, T60, T61, T73, T75, T76	T21, T22, T28, T29, T66, T67, T70,G1
* Assessment from the AECOM 2015 survey (AECOM(o), 47071319-URS-05-RP-EN-020, 2016).						

Bats – Foraging and Commuting

3.3.48 The habitat suitability for foraging and commuting bats at Kingsway, Markeaton and Little Eaton was reassessed in 2017 based upon the habitats present, survey data gathered from 2015 and also upon updated BCT Survey Guidance (Collins, 2016). Results are summarised below:

- Low Value – Kingsway;
- Moderate to High Value – Markeaton; and
- Moderate Value – Little Eaton.

3.3.49 Refer to Bat Activity Survey Report (AECOM, 2017) for further details.

Birds

3.3.50 The proposed scheme provides a wide range of habitats that are potentially suitable for both nesting and foraging birds.

3.3.51 Alfreton Road Rough Grassland LWS and Talbot Turf Farm (Site 21 and large extent to the south) are of importance for wintering birds. Additional habitats that were potentially suitable for wintering bird, particularly wintering wildfowl and waders were found in Sites 7a, 7b, 10, 19a, 19b and 19c.

Terrestrial Invertebrates

3.3.52 The proposed scheme provides a range of habitats including species rich grasslands, veteran trees, and native species broad leaved woodland that are potentially suitable for supporting diverse or notable terrestrial invertebrates; particularly Markeaton Park and Mickleover Railway Cutting LWS.

3.3.53 Alfreton Road Rough Grassland LWS was observed to be heavily grazed and poached by horses, and has also become dominated by invasive species including Himalayan balsam and New Zealand pigmyweed. This area was therefore considered sub-optimal habitat for supporting a diverse terrestrial invertebrate assemblage.

3.3.54 Site 8 had a mosaic of disturbed ground suitable for protected or notable terrestrial invertebrates including areas of unmanaged poor semi-improved grassland with some more species-rich areas of rabbit grazed shorter grassland. Several wetter pockets with species typical of wetland community were also recorded.

White-clawed Crayfish

3.3.55 Eight watercourses (i.e. Bramble Brook, Markeaton Brook, Middle Brook, Watermeadows Ditch, Dam Brook, Boosemor Brook, River Derwent and Bottle Brook) were recorded within the extent of the proposed scheme plus 50m, as shown in Figures 9 and 10, Appendix A.

3.3.56 Bramble Brook, Markeaton Brook and Middle Brook were considered unsuitable to support white-clawed crayfish due to lack of available habitat in the Bramble Brook and the known presence of signal crayfish upstream of the proposed scheme in Markeaton Lake.

3.3.57 The Watermeadows Ditch, Dam Brook, Boosemoor Brook, River Derwent and Bottle Brook were all considered suitable to support white-clawed crayfish due to the

available habitat and known presence of a single white-clawed crayfish recorded on the Dam Brook in 2015.

3.3.58 Details of all the watercourses assessed for white-clawed crayfish in 2017 within the proposed scheme boundary plus 50m are provided in Appendix I and the White-Clawed Crayfish Survey Report (AECOM, 2017).

Aquatic Macroinvertebrates

3.3.59 The following five watercourses, which may be crossed or directly impacted by the proposed scheme, were considered suitable to support protected or notable aquatic macroinvertebrates:

- River Derwent;
- Markeaton Brook;
- Bramble Brook;
- Dam Brook; and
- Bottle Brook.

Reptiles

3.3.60 The habitat suitability for reptiles was assessed against the proposed scheme boundary. 17 areas were identified as suitable. Refer to Appendix J and the Reptile Survey Report (AECOM, 2017) for details.

Otter and Water Vole

3.3.61 The following watercourses were assessed for their suitability to support otter and water vole:

- Bramble Brook;
- Markeaton Brook;
- Middle Brook;
- Mill Ponds;
- Watermeadows ditch;
- Dam Brook;
- Boosemoor Brook;
- River Derwent;
- Bottle Brook; and
- Pb1.

3.3.62 Refer to Appendix K and Water Vole and Otter Survey Report (AECOM, 2017) for details. In summary, Markeaton Brook, Mill Ponds and the River Derwent were considered suitable for otter with potential holt sites, resting places and foraging opportunities available. Watermeadows Ditch was found to provide potentially suitable resting places and foraging sites for otter, but with limited potential holt sites. Bramble Brook, Middle Brook, Dam Brook, Boosemor Brook, Bottle Brook and Pb1 were assessed to have potentially suitable resting places and potential holt sites for otter, with limited foraging opportunity.

3.3.63 Bramble Brook, Markeaton Brook, Middle Brook, Mill Ponds, Boosemor Brook and Bottle Brook were assessed as sub-optimal for water vole due to the shaded nature of the channels and lack of bankside and emergent vegetation providing little or no foraging opportunities. However, Watermeadows Ditch, Dam Brook, River Derwent and Pb1 provided suitable habitat for water vole.

Badgers

3.3.64 Badgers are discussed in a separate confidential report.

4 RECOMMENDATIONS

4.1.1 Refer to Table 5 for recommendations for further ecological survey and justification (where appropriate) for 2017.

4.1.2 Note: at the time of producing this report (July 2018), some of the recommended further baseline surveys have now been completed and are reported separately or have not been completed and recommended for completion within 2018. Please refer to separate baseline reports for further details where applicable/ referenced in Table 5.

Table 5: Recommendations for Further Ecological Survey and Justification (where appropriate) for 2017

Designated / Non-Designated Site / Habitat / Species	Ecological Feature	Survey Conducted in 2015 (based on 2015 Proposed Scheme Boundary)	Survey Recommended in 2017 (based on Proposed Scheme Boundary)	Rationale for 2017 Survey	2017 Survey Completed	2017 Baseline Survey Report
Local Wildlife Sites and Sites of interest	A38 Roundabout LWS, Alfreton Road Rough Grassland LWS	Vegetation survey	Updated vegetation survey	The LWSs within the proposed scheme boundary were noted to have potential to support notable botanical species and assemblages. Although these areas were surveyed in 2015, it was recommended to resurvey these sites to see if there were any significant habitat changes given the data was approaching 2 years old.	Yes	Vegetation Report
	A38 Scrub Site of interest	None	Vegetation survey	New designated site identified in 2017 due to site boundary changes.	Yes	Vegetation Report
	Other LWSs	Vegetation survey	None	No significant habitat changes noted.	N/A	N/A
Habitat	Semi-improved grassland	Vegetation survey	Updated vegetation survey of species-rich areas and seven new grassland areas.	Updated surveys required of those areas surveyed in 2015 to ensure that the survey information to support the EIA was up to date. New grassland areas require further survey at appropriate time of year.	Yes	Vegetation Report
	Hedgerows	Hedgerow assessment (H1 to H7)	Hedgerow survey of H8.	One hedgerow H8 species-rich identified for further survey. All other hedgerows within and adjacent to the proposed scheme boundary were assessed as species-poor.	Yes	Vegetation Report
	Woodland (excl. A38 Roundabout LWS)	Vegetation survey	Vegetation survey	One new woodland area identified in 2017 due to site boundary changes (noted as a Site of Interest – A38 Scrub Site; see above). Woodland areas previously surveyed had no significant change in habitats from 2015/2016 were noted; therefore no requirement for further surveys.	N/A	N/A
	Watercourses	River Habitat and River Corridor Survey of: Markeaton Brook, Bramble Brook, River Derwent and Dam Brook.	Selective updated surveys were recommended on those watercourses surveyed in 2015. River Habitat and River Corridor Survey of Bottle Brook.	Updated surveys required of those areas surveyed in 2015 to ensure that the survey information to support the EIA, was up to date. Bottle Brook was a new watercourse identified as a result of site boundary changes.	No – recommended for 2018	N/A
	Other habitats	None	None	Habitats common and widespread.	N/A	N/A
Amphibians	GCN	Presence/ absence, eDNA (environmental DNA assay) and population class assessments (where appropriate) of all ponds within 500m of proposed scheme.	Presence/ absence, eDNA (environmental DNA assay) and population class assessments (where appropriate) of all ponds within 500m of proposed scheme.	New ponds identified which were not previously surveyed. Additionally, although a negative result in 2015, age of data was approaching three breeding seasons old and recommended to be updated.	Yes	GCN Report
	Toads	None	None	A population of toads was found at Markeaton in 2015. These three ponds were scoped out for the 2017 amphibian surveys due to the presence of fish. However, it is considered that this population of toads is still present in this area and will be considered within the next stage of assessment.	N/A	N/A

Designated / Non-Designated Site / Habitat / Species	Ecological Feature	Survey Conducted in 2015 (based on 2015 Proposed Scheme Boundary)	Survey Recommended in 2017 (based on Proposed Scheme Boundary)	Rationale for 2017 Survey	2017 Survey Completed	2017 Baseline Survey Report
Mammals	Bats – Roosting	Each built structure and tree within the proposed scheme boundary was assessed by an experienced and licensed bat worker in-line with then current guidance from the Bat Conservation Trust (BCT) (Hundt, 2012). Between May and September 2015 dusk emergence and/or dawn re-entry surveys and/or thermal imaging surveys were undertaken at those built structures identified by the preceding bat roost potential survey as having potential to support roosting.	External and internal survey assessments for the 17 residential properties at the Markeaton junction section of the proposed scheme, and subsequent dusk emergence and dawn re-entry surveys (where required). Bat roost presence / absence surveys for confirmed roost sites at buildings and structures identified from the 2015 and 2016.Further studies also required on tree roosting species that may be impacted at Markeaton junction using bat trapping and radio tracking. Dusk emergence / dawn return surveys recommended for the new potential roost features identified during the 2017 PRF assessment with potential to be impacted by the proposed scheme, and not previously surveyed in 2015,	To determine the presence / likely absence of roosting bats. To gain up to date and more detailed survey information to further characterise the roosts, to support the ecological impact assessment of the proposed scheme and feed into any potential draft licence applications. To determine the presence / likely absence of roosting bats.	Partially completed	Bat Roost Survey Report Bat Trapping and Radio-tracking Report
	Bats – Foraging and Commuting	Activity surveys within and in the immediate vicinity of the proposed scheme were based on Hundt 2012 guidance. May, June and July transects.	Activity surveys within and in the immediate vicinity of the proposed scheme were recommended based on Collins 2016 guidance. Bat trapping and radio- tracking at Markeaton were also recommended to assist with determining population dynamics given high habitat valuation for bats.	Significant change in habitat suitability for bats recorded in 2017; in comparison to 2015. This was based on the bat survey results from 2015, desk study data records, and updated survey guidance. • Kingsway – Low (requiring spring, summer and autumn transects). • Markeaton – Moderate to High (recommended for bat trapping and radio tracking and transects alongside the Kingsway surveys). • Little Eaton – Moderate value (requiring monthly transect surveys April to October).	Yes	Bat Activity Survey Report Bat Trapping and Radio-tracking Report
	Otter	Presence/ absence surveys for sections of Markeaton Brook, Markeaton Lake, Mill Pond 1, Mill Pond 2, Mackworth Brook, Bramble Brook, Dam Brook, Watermeadows Ditch, River Derwent and Boosemoor Brook.	Presence/ absence surveys were recommended for Bramble Brook, Markeaton Brook, Middle Brook, Mill ponds, Watermeadows Ditch, Dam Brook, Boosemoor Brook, River Derwent, Bottle Brook and Pb1.	Otter are a highly mobile species and an assessment of the usage of the watercourses by otter was recommended to advise any mitigation measures that may be necessary. As the 2015 otter survey results were approaching 2 years old, it was recommended that these waterbodies are re-surveyed. Lower reaches of Bramble Brook, upper and lower reaches of the River Derwent, lower reaches of Watermeadows Ditch, Bottle Brook and Pb1 were new watercourses/ stretches of watercourse identified for survey as a result of site boundary changes.	Partially completed – further surveys recommended in 2018	Otter and Water vole Survey Report

Designated / Non-Designated Site / Habitat / Species	Ecological Feature	Survey Conducted in 2015 (based on 2015 Proposed Scheme Boundary)	Survey Recommended in 2017 (based on Proposed Scheme Boundary)	Rationale for 2017 Survey	2017 Survey Completed	2017 Baseline Survey Report
	Water vole	Presence/ absence surveys for sections of Markeaton Brook, Markeaton Lake, Mill Pond 1, Mill Pond 2, Mackworth Brook, Bramble Brook, Dam Brook, Watermeadows Ditch, River Derwent and Boosemoor Brook.	Presence/ absence surveys were recommended for Bramble Brook, Markeaton Brook, Middle Brook, Mill ponds, Watermeadows Ditch, Dam Brook, Boosemoor Brook, River Derwent, Bottle Brook and Pb1.	Records of water vole exist within 1km of the proposed scheme as well as from numerous watercourses that flow through or adjacent to the proposed scheme from within the last 10 years. In 2015 AECOM recorded a water vole latrine on Watermeadows Ditch. As the 2015 water voles survey results were approaching 2 years old, it was recommended that these waterbodies are re-surveyed. Lower reaches of Bramble Brook, upper and lower reaches of the River Derwent, lower reaches of Watermeadows Ditch, Bottle Brook and Pb1 were new watercourses/ stretches of watercourse identified for survey as a result of site boundary changes.	Partially completed – further surveys recommended in 2018	Otter and Water vole Survey Report
	Badgers			See rationale in confidential badger report		
Invertebrates	Terrestrial invertebrates	Terrestrial invertebrate survey conducted across all semi-improved grassland areas.	Detailed evaluation of habitat suitability Site 8 for terrestrial invertebrates, to assess impacts and provide recommendations for survey (if required) and mitigation, compensation and enhancement.	No significant change in habitats from 2015; therefore, no requirement for further terrestrial invertebrate surveys in those areas of habitat already surveyed. The mosaic of habitats with varied sward height grassland, scrub, and bare ground present within Site 8 has the potential to support a diverse assemblage of terrestrial invertebrates, which may include notable species. Site 8 was recommended for further terrestrial invertebrate assessment.	No – recommended for 2018.	N/A
	White-clawed crayfish	Presence/ absence surveys and population size assessment were conducted for: River Derwent at the A38 overbridge, Boosemoor Brook, Dam Brook, Watermeadows Ditch, Markeaton Lake, Mil Pond 1, Mill Pond 2, Middle Brook.	Presence/ absence surveys and population size assessment were recommended for Little Eaton junction only: Bottle Brook, River Derwent at the A38 overbridge, Boosemoor Brook, Dam Brook, Watermeadows Ditch. No surveys recommended at Markeaton or Kingsway junction.	In 2015 AECOM recorded white-clawed crayfish on the Dam Brook. Potential exists for this species to be present within other watercourses and waterbodies which exist within or adjacent to the proposed scheme. Data approaching 2 years old therefore updated survey recommended. Bottle Brook was a new watercourse not previously surveyed in 2015.	Partially completed – further surveys recommended in 2018	WCC Survey Report
	Aquatic Invertebrates	Aquatic macroinvertebrate sampling undertaken at the River Derwent, Markeaton Brook, Bramble Brook and Dam Brook.	Aquatic Invertebrate survey recommended for Bottle Brook.	Bottle Brook was a new watercourse identified as a result of site boundary changes. No further surveys were recommended in 2017 with regards to the watercourses previously surveyed in 2015 as no significant habitat changes were recorded across the proposed scheme.	Yes	Aquatic Invertebrate Survey Report
Birds	Breeding birds	Breeding bird surveys were conducted across the proposed scheme to assess the conservation importance of the local bird assemblage and to identify habitat	Selective updates recommended across the proposed scheme. Full suite of breeding bird surveys recommended at Sites 7a, 7b, 22, 10a (part of site 10), 19a and 19c.	Desk study records identified numerous bird species listed under Section 41 of the NERC Act (2006). Schedule 1 species were also recorded by AECOM in 2015 (AECOM(j), 47071319-URS-05-RP-EN-008, 2016). As the 2015 breeding bird survey results were approaching 2 years old, it was recommended that the highest potential areas for breeding birds were resurveyed in 2017. Sites 7a, 7b, 22, 10a (part of site 10), 19a and 19c were new areas identified as a result of site boundary changes and recommended for breeding bird survey.	Yes	Breeding Bird Survey Report

Designated / Non-Designated Site / Habitat / Species	Ecological Feature	Survey Conducted in 2015 (based on 2015 Proposed Scheme Boundary)	Survey Recommended in 2017 (based on Proposed Scheme Boundary)	Rationale for 2017 Survey	2017 Survey Completed	2017 Baseline Survey Report
		of importance to members of this species group.				
	Wintering bird	Winter Bird survey conducted at Alfreton Road grassland LWS and Talbot Turf to the south west of Little Eaton junction.	Wintering bird survey of Sites 7a, 7b, 10, 21, 19a, 19b and 19c.	The wintering bird survey undertaken by AECOM in 2015-2016 (AECOM(l), 47071319-URS-05-RP-EN-022, 2016) at Alfreton Road Rough Grassland LWS and Talbot turf Farm (Site 21 and large extent to the south) identified lapwing, teal and black-headed gull and these areas were considered to be of Local importance for wintering birds. Habitats that are potentially suitable for wintering bird, particularly wintering wildfowl and waders were found in Sites 7a, 7b, 10, 19a, 19b and 19c and wintering bird surveys were recommended for these areas from September /October 2016 to March 2017.	Yes	Wintering Bird Survey Report
Reptiles	Reptiles	Presence / absence surveys of 14 areas within and in the immediate vicinity of the proposed scheme.	Presence/ absence surveys at Sites 8,10 and 19.	No significant habitat changes across the proposed scheme with regards to those areas of habitat previously surveyed in 2015. Given negative result in 2015; no further surveys were recommended in 2017 on those areas previously surveyed. The new grassland habitats within Sites 8, 10 and 19 have potential to support reptile populations. Desk study records of reptiles were recorded within 1km of the proposed scheme.	Partially completed – further surveys recommended in 2018	Reptile Survey Report

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AECOM(b) (2016) A38 Derby Junctions Phase 1 Habitat Survey Report Ref. No. 47071319-URS-05-RP-EN-003.

AECOM(c) (2016) A38 Derby Junctions Additional Sites Individual Technical notes Ref. Nos. 47071319-URS-05-TN-EN-01 (to 023).

AECOM(d) (2016) A38 Derby Junctions Reptile Survey Report Ref. No. 47071319-URS-05-RP-EN-010.

AECOM(e) (2016) A38 Derby Junctions Badger Survey Report (Confidential) Ref. No. 47071319-URS-05-RP-EN-012.

AECOM(f) (2016) A38 Derby Junctions River Corridor Survey and River Habitat Survey Report Ref. No. 47071319-URS-05-RP-EN-015.

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AECOM(h) (2016) A38 Derby Junctions Great Crested Newt Survey Report Ref. No. 47071319-URS-05-RP-EN-009.

AECOM(i) (2016) A38 Derby Junctions Vegetation and Hedgerow Survey Report Ref. No. 47071319-URS-05-RP-EN-011.

AECOM(j) (2016) A38 Derby Junctions Breeding Bird Survey Report Ref. No. 47071319-URS-05-RP-EN-008.

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AECOM(n) (2016) A38 Derby Junctions Aquatic Macroinvertebrate Survey Report Ref. No. 47071319-URS-05-RP-EN-018.

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Appendix A Figures

Figure 1: A38 Derby Junction Scheme Location Plan

Figure 2: Markeaton and Kingsway Junctions – Phase 1 Habitat Survey area

Figure 3: Little Eaton Junction - Phase 1 Habitat Survey area

Figure 4: Markeaton and Kingsway Junctions – Desk Study: Designated Sites

Figure 5: Little Eaton Junction - Desk Study: Designated Sites

Figure 6: Markeaton and Kingsway Junctions - Desk Study: Protected and Notable Species Records

Figure 7: Little Eaton Junction - Desk Study: Protected and Notable Species Records

Figure 8: Phase 1 Habitat Survey – Map Legend

Figure 9: Markeaton and Kingsway Junctions – Phase 1 Habitat Survey

Figure 10: Little Eaton Junction - Phase 1 Habitat Survey

Figure 11: Markeaton and Kingsway Junctions - Invasive Non-Native Species

Figure 12: Little Eaton Junction - Invasive Non-Native Species

Figure 13: Markeaton and Kingsway Junctions – Potential Bat Roost Features

Figure 14: Little Eaton Junction – Potential Bat Roost Features

N

M1 JUNCTION 28

A38/A61 LITTLE EATON JUNCTION

A38/A6 PALM COURT JUNCTION

A38/A52 MARKEATON JUNCTION

A38/A5111 KINGSWAY JUNCTION

A50/A38 JUNCTION

2 0 2 4 6 8 Kilometres

Project Title/Drawing Title

A38 DERBY JUNCTIONS SCHEME LOCATION PLAN

AECOM Internal Project Number
47071319

Drawn	Checked	Approved
GB	SW	SW
Date	Scale @ A3	Purpose of issue
04/02/2016	1:100,000	FINAL
Drawing Number		Rev
Figure 1		2F

A38 Derby Junctions Project
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File Name:\\ch-wip-001\CH_Roads\A38 Derby Jcns - PO1339\12 CAD\12.1 WIP\FIGURE 1.1 - LOCATION PLAN F1.mxd

Legend

- Scheme boundary - indicative
- 50m buffer
- Areas scoped in for Extended Phase 1 Habitat Survey in 2017 (with alphabetical reference)

Areas previously surveyed

- Site surveyed in Autumn 2016 (with numerical reference)
- Various arbitrary colour - Site surveyed in Autumn 2016 + 50 m buffer
- Site boundary 2015 + 50 m buffer _ surveyed in 2015
- No access in 2015

N

200 0 200 400 600 800 1000 Metres

Project Title/Drawing Title A38 DERBY JUNCTIONS KINGSWAY MARKEATON PHASE1 HABITAT SURVEY 2017 LOCATIONS OF AREAS PREVIOUSLY SURVEYED AND ADDITIONAL AREAS SURVEYED IN 2017	AECOM Internal Project Number 60533462	A38 Derby Junctions Project Highways England, Floor 5 2 Colmore Square 38 Colmore Circus Birmingham B4 6BN
	Drawn: GSB; Checked: HP; Approved: PB	
	Date: 31/10/2017; Scale @ A3: 1:10,000; Purpose of issue: FINAL	AECOM Royal Court Basil Close, Chesterfield Derbyshire. S41 7SL +44 (0) 1246 209221 +44 (0) 1246 209229 www.aecom.com
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N

Legend

- Scheme boundary - indicative
- 50m buffer
- Areas scoped in for Extended Phase 1 Habitat Survey in 2017 (with alphabetical reference)

Areas previously surveyed

- Site surveyed in Autumn 2016 (with numerical reference)
- Various arbitrary colours - Site surveyed in Autumn 2016 + 50m buffer
- Site boundary 2015 + 50m buffer _ surveyed in 2015

Site boundary 2015

100 0 100 200 300 400 500 Metres

File Name:X:\Highways Agency\47071390 A38 Derby Jcns - Environment\Technical\Ecology\GIS_A38_2017\project_files\Updated Phase 1\A38_Phase1_survey area_LE_20170904.mxd

Project Title/Drawing Title A38 DERBY JUNCTIONS LITTLE EATON PHASE1 HABITAT SURVEY 2017 LOCATIONS OF AREAS PREVIOUSLY SURVEYED AND ADDITIONAL AREAS SURVEYED IN 2017	AECOM Internal Project Number 60533462	A38 Derby Junctions Project Highways England, Floor 5 2 Colmore Square 38 Colmore Circus Birmingham B4 6BN
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	Drawing Number: Figure 3 / Rev: .	

N

Allestree Park LNR and LWS

Woodlands School Hedges LWS

AV017/3 Markeaton Brook

Kedleston Park SSSI

DE088/3 St Edmunds Churchyard

AV013/3 Lower Vicarwood Pond

AV010/3 Lower Vicarwood Pond 2

Darley and Nutwood LNR and LWS

Markeaton Lane Meadow LWS

Kedleston Road Marsh LWS

Kedleston Road Hedge LWS

Markeaton Park LWS

Beech Wood LWS

Osierbed and Gravelpit Woods LWS

AV007/3 Brun Lane Pond

Mackworth Brook LWS

AV015/3 All Saints Churchyard

Markeaton Park LWS

DE056/3 Broadway Stream

Darley Park LWS

Bowbridge Wood LWS

AV009/3 Gold Lane

Markeaton Park LWS

River Derwent LWS

Mickleover Meadows LNR

Radbourne Lane Hedge LWS

Markeaton Brook System LWS

Mickleover - Etwall Trail (Derby) LWS

Mickleover Railway Cutting LWS

Friargate Station LWS

DE072/3 King Street

Land off Kingsway PLWS

DE071/3 Hackwood Farm Pond

DE081/3 Old Cemetery

A38 Roundabout LWS

DE073/3 Littleover Brook

Mickleover School Meadow LWS

DE087/3 Rykneld Recreation Ground

Inglewood Avenue Meadow LWS

Bramble Brook and margins LWS

DE082/3 Old Hall Wood

Bunkers Wood LWS

Bunkers Grassland - Derby PLWS

Hell Brook & Hell Brook Copse PLWS

Richmond Close POS PLWS

500 0 500 1000 1500 2000 Metres

Legend

- Scheme boundary - indicative
- 2km buffer

Designated sites

- SSSI
- LNR
- LWS
- Ancient woodland

Notable habitats

- BAP - Wood pasture
- BAP - Lakes, ponds
- BAP - Lowland fen
- BAP - Open mosaic
- BAP - Traditional orchard
- Other site of interest
- Potential LWS

File Name:X:\Highways Agency\47071390 A38 Derby Jcns - Environment\Technical\Ecology\GIS_A38_2017\project_files\Desk Study_2017\A38_DeskStudy_Designated Sites_KM_2017.mxd

Project Title/Drawing Title

A38 DERBY JUNCTIONS KINGSWAY - MARKEATON DESK STUDY DESIGNATED AND NOTABLE SITES - 2017

AECOM Internal Project Number 60533462		
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Date 13/11/2017	Scale @ A3 1:20,000	Purpose of issue FINAL
Drawing Number Figure 4		Rev .

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Legend

- Scheme boundary - indicative
- 2km buffer

Designated Sites

- SSSI
- LNR
- LWS
- Ancient woodland

Notable Habitats

- BAP - Wood pasture
- BAP - Lakes and ponds
- BAP - Lowland heathland
- BAP - Lowland fen
- BAP - Traditional orchard
- Other site of interest
- Potential LWS

Eatonpark Wood LWS
Great Farley's Wood LWS
AV030/3 Daypark Quarry
Whittaker Lane Woodland LWS
Duffield Millennium Meadows LNR and LWS
ER015/3 Home Farm Pond
Outwoods PLWS
AV 122/3 R. Derwent, Duffield Bridge
Horsley Carr LWS
Botany Stream Margin Complex LWS
Peckwash Mills LWS
Hatherings Wood, Little Eaton LWS
Moor Plantation & Drum Hill LWS
Rigga Quarry PLWS
Breadsall Moor Grasslands PLWS
Burley Wood LWS
AV 120/3 Waste Land, Duffield
Little Eaton Acid Grassland PLWS
Burley Hill Farm Scrub and Grassland LWS
ER125/3 Embankment
Drum Hill Fields, Breadsall Moor LWS
Breadsall Priory Golf Course LWS
Camp Wood, Little Eaton LWS
River Derwent LWS
A6 Bank PLWS
ER017/3 Plantation
Allestree Park LNR and LWS
Moor Road Fields LWS
Broomfield College grasslands PLWS
DE/3 stream
Woodlands School Hedges LWS
Ferriby Brook & Dam Brook LWS
ER018/3 Boosemoor Brook
DE050/3 A38 Scrub
Broomfield Hedge PLWS
DE088/3 St Edmunds Churchyard
Alfreton Rd Rough Grassland LWS
Mill Plantation PLWS
ER003/3 Old Derby Canal
Holme Nook Ponds PLWS
Ferriby Brook PLWS
Manor farm pasture PLWS
ER007/3 The Slip
River Derwent LWS
Marsh Area, Breadsall PLWS
Croft Wood PLWS
Chaddesden Wood LNR and LWS
ER187/3 Garage Pond
Darley and Nutwood LNR and LWS
Porter's Lane Pond LWS
Breadsall Railway Cutting LWS
Markeaton Lane Meadow LWS
Porter's Lane hedge LWS
Kedleston Road Marsh LWS
Nooney's Pond LWS
Kedleston Road Hedge LWS
Holme Nook Ponds PLWS
Markeaton Park LWS
Beech Wood LWS
Watermeadows Ditch LWS
High View South Community School Nature Reserve LWS
Markeaton Park LWS
DE056/3 Broadway Stream
Haslams
Haslams Lane Brook Course
*No data
Darley Park LWS
Markeaton Brook System LWS
Breadsall Railway Cutting SSSI, LNR and LWS

500 0 500 1000 1500 2000 Metres

N

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Project Title/Drawing Title

A38 DERBY JUNCTIONS
LITTLE EATON
DESK STUDY
DESIGNATED AND NOTABLE SITES - 2017

AECOM Internal Project Number
60533462

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13/11/2017	1:20,000	FINAL
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Figure 5		.

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Legend

- Scheme boundary - indicative (20170426)
- 1 km buffer (20170426)

Derbyshire Wildlife Trust records Nov. 2016

- Great crested newt
- Grass Snake
- White-clawed crayfish
- Bat roost
- Bat sighting
- Song thrush
- Derbyshire Red Data Book plant
- Toad crossing
- Veteran tree

AECOM data - 2015 and 2016

- Otter signs
- Bat roost
- No bat roost recorded
- American Signal crayfish
- No great crested newts recorded
- No reptiles recorded
- No Water Vole recorded
- Grassland area of interest

Records not shown but available in 2016 species specific baseline reports for: Breeding birds, wintering birds, terrestrial and aquatic invertebrates, otter holts and badgers.

N

500 0 500 1000 1500 2000 Metres

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Project Title/Drawing Title

A38 DERBY JUNCTIONS
KINGSWAY MARKEATON
DESK STUDY 2017
PROTECTED AND NOTABLE SPECIES RECORDS

AECOM Internal Project Number
60533462

Drawn	Checked	Approved
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13/11/2017	1:15,000	FINAL
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Figure 6		.

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Legend

- Scheme boundary - indicative (20170426)
- 1 km buffer (20170426)

Derbyshire Wildlife Trust records Nov. 2016

- Great crested newt
- White-clawed crayfish
- Bat roost
- Bat sighting
- House sparrow, song thrush
- Cinnabar, Latticed heath
- Hedgehog
- Otter
- Grass Snake
- Slow-worm
- Water vole
- Derbyshire Red Data Book plant
- Veteran tree

AECOM data - 2015 and 2016

- Water vole signs
- No Water Vole recorded
- Otter signs
- No GCN recorded
- Bat roost
- No bat roost recorded
- 1 ♂ White-clawed crayfish
- No reptiles recorded
- Grassland area of interest

Records not shown but available in 2016 species specific baselinbe reports for: Breeding and overwintering birds; terrestrial and aquatic invertebrates; and badgers.

500 0 500 1000 1500 2000 Metres

N

File Name:X:\Highways Agency\47071390 A38 Derby Jcns - Environment\Technical\Ecology\GIS_A38_2017\project_files\Desk Study_2017\A38_DeskStudy_Protected species_LE_2017.mxd

Project Title/Drawing Title

A38 DERBY JUNCTIONS
LITTLE EATON
DESK STUDY - 2017
PROTECTED AND NOTABLE SPECIES RECORDS

AECOM Internal Project Number 60533462		
Drawn GSB	Checked HP	Approved OB
Date 13/11/2017	Scale @ A3 1:15,000	Purpose of issue FINAL
Drawing Number Figure 7		Rev .

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Legend

Scheme boundary - indicative

50m buffer

Habitats

Semi-natural Broad-leaved Woodland

Broad-leaved Plantation Woodland

Coniferous Plantation Woodland

Mixed Plantation Woodland

Dense Scrub

Scattered Scrub

Scattered Broad-leaved Trees

Mixed Scattered Trees

Semi-Improved Neutral Grassland

Marshy grassland

Improved Grassland

Poor Semi-Improved Grassland

Tall Ruderal

Inundation Vegetation

Standing Water

Water Body - Dry

Rocks

Arable

Amenity Grassland

Introduced Shrub

Building

Bare Ground

Hard Standing

Invasive Non-Native Species

Other Habitat

No access

Private Gardens - Not surveyed

Broad-Leaved Tree Line

Running Water

Species-Poor Hedge

Species-poor Defunct Hedge

Species-Poor Hedge With Trees

Fence

Wall

Dry Ditch

Invasive Non-Native Species

Target Note

File Name:X:\Highways Agency\47071390 A38 Derby Jcns - Environment\Technical\Ecology\GIS_A38_2017\project_files\Updated Phase 1\A38_Phase1_Phase1_Legend_20170111.mxd

Project Title/Drawing Title

A38 DERBY JUNCTIONS
PHASE 1 HABITAT SURVEY
MAP LEGEND

AECOM Internal Project Number
60533462

Drawn	Checked	Approved
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Date	Scale @ A3	Purpose of issue
18/01/2018	1:8,000	FINAL
Drawing Number		Rev
Figure 8		.

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N

Markeaton Brook
Markeaton Park
Markeaton Lake: Pa8
Middle Brook
Queensway
Mill Pond 1: Pa7
Markeaton Roundabout
Mill Pond 2: Pa6
Pa12
Pc59
Pc61
Pc62
Pa5
Pc60
(Pa11)
A38
Ashbourne Road
Pa4
Mackworth Park
Kingsway Roundabout
Pa3
Bramble Brook
Pa2
Pa9

100 0 100 200 300 400 500 Metres

File Name:X:\Highways Agency\47071390 A38 Derby Jcns - Environment\Technical\Ecology\GIS_A38_2017\project_files\Updated Phase 1\A38_Phase1_20170609.mxd

Project Title/Drawing Title

A38 DERBY JUNCTIONS KINGSWAY MARKEATON PHASE 1 HABITAT SURVEY 2017

AECOM Internal Project Number
60533462

Drawn	Checked	Approved
GSB	JS	PB
Date	**Scale @ A3**	**Purpose of issue**
13/11/2017	1:8,000	FINAL
Drawing Number		**Rev**
Figure 9		.

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N

Railway

Bottle Brook

River Derwent

Alfreton Road

A38

Little Eaton Roundabout

Boosemoor Brook

Pc58

Pc54

Dam Brook

Dam Brook

A38

Watermeadows Ditch

A61

100 0 100 200 300 400 500 Metres

File Name:X:\Highways Agency\47071390 A38 Derby Jcns - Environment\Technical\Ecology\GIS_A38_2017\project_files\Updated Phase 1\A38_Phase1_LE_20170609.mxd

Project Title/Drawing Title

A38 DERBY JUNCTIONS
LITTLE EATON
PHASE 1 HABITAT SURVEY
2017

AECOM Internal Project Number
60533462

Drawn	Checked	Approved
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Date	Scale @ A3	Purpose of issue
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Drawing Number		Rev
Figure 10		.

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N

Markeaton Brook
JK11
JK12
HB21
Markeaton Park
JK13
Markeaton Lake: Pa8
HB20
Middle Brook
JK4
Mill Pond 1
Markeaton Roundabout
Mill Pond 2
HB5
JK10
A38
Ashbourne Road
Mackworth Park
JK8
JK9
JK5
Kingsway Roundabout
HB1
JK7
JK6
JK2
JK3
CL3
HB2
CL2
CL1
JK1
HB3
Bramble Brook
HB4

Legend

- Scheme boundary - indicative
- 50m buffer

Invasive Non-native Species (with reference):

- Cherry Laurel (CL)
- Himalayan Balsam* (HB)
- Japanese Knotweed* (JK)

* Schedule 9 species

100 0 100 200 300 400 500 Metres

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Project Title/Drawing Title

A38 DERBY JUNCTIONS KINGSWAY MARKEATON INVASIVE NON-NATIVE SPECIES 2017

AECOM Internal Project Number
60533462

Drawn	Checked	Approved
GSB	JS	PB
Date	**Scale @ A3**	**Purpose of issue**
01/11/2017	1:8,000	FINAL
Drawing Number		**Rev**
Figure 11		.

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Legend

- Scheme boundary - indicative
- 50 m buffer

Invasive Non-native Species (with reference):

- Himalayn Balsam (HB) *
- Japanese and Giant Knotweed (JK and GK) *
- Montbretia (CR) *
- New Zealand Pygmy weed (NZP) *
- Snowberry (SN)
- Varigated yellow archangel (VA) *

* Schedule 9 species

Railway
HB17
Bottle Brook
River Derwent
HB18
HB19
Alfreton Road
HB16
JK14
JK20
JK21
A38
Little Eaton Roundabout
HB15
HB14
HB13
JK15
HB8
HB6
JK16
VA1
Boosemoor Brook
GK2
HB12
JK17
GK1
JK18
GK3
JK19
HB22
HB7
HB9
NZP1
Dam Brook
HB11
Dam Brook
HB10
A38
Watermeadows Ditch
A61
CR1
VA2
SN1

100 0 100 200 300 400 500 Metres

File Name:X:\Highways Agency\47071390 A38 Derby Jons - Environment\Technical\Ecology\GIS_A38_2017\project_files\Updated Phase 1\A38_INNS_P1HS_LE_20171016.mxd

Project Title/Drawing Title

A38 DERBY JUNCTIONS
LITTLE EATON
INVASIVE NON-NATIVE SPECIES
2017

AECOM Internal Project Number
60533462

Drawn	Checked	Approved
GSB	JS	PB
Date	**Scale @ A3**	**Purpose of issue**
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Drawing Number		**Rev**
Figure 12		.

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M54 M48 M53 M44 M52 M46 M49 M47 M50 M43 M51 M39 M45 M6 M36 M40 M41 M42 M3 M23 M1 M38 M2 M4 T8 M37

M32 M14 M16 T10 M55 M31 M25 M24 T57 M17 M35 M15 M23 T76 T56 M10 M20 M22 M30 M13 M21 M12 M19 M11 M18 M26 M34 T11 M8 M27 M33 M9 M7 T12 M28 B8 M29

T44 T13 B7

T7 B5 B4 T6 B6 T5 T4 T3 T2 T14a T14 T15

200 0 200 400 600 800 1000 Metres

Legend

- Scheme boundary - indicative
- 50 m buffer
- Potential Ecology Enhancement Area: No impact on bats or habitat anticipated.

Potential Roosting Features (PRF)

- Building
- Tree

AECOM 2015 bat survey data

- Roost or possible roost
- High BRP
- Moderate BRP
- Low BRP

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Project Title/Drawing Title

A38 DERBY JUNCTIONS KINGSWAY - MARKEATON POTENTIAL ROOSTING FEATURES

AECOM Internal Project Number
60533462

Drawn	Checked	Approved
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Date	**Scale @ A3**	**Purpose of issue**
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Drawing Number		**Rev**
Figure 13		.

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N

Legend

- Scheme boundary - indicative
- 50 m buffer

Potential Roosting Features (PRF)

- Building
- Tree

AECOM 2015-2016 bat survey data

- Roost or possible roost
- High Bat Roost Potential (BRP)
- Moderate BRP

B15 B13 B12 T16 T16a T19 T18 T17 T24 T23 T25 T26 T60 T61 B14 T65 T66 T67 T71 B9 T20 T27 B2 B1 B3 T68 T1 T30 T28 T69 T29 T70 T31 T21 T22 T73 T74 T72 T75

100 0 100 200 300 400 500 Metres

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Project Title/Drawing Title

A38 DERBY JUNCTIONS
LITTLE EATON
POTENTIAL ROOSTING FEATURES

AECOM Internal Project Number 60533462		
Drawn: GSB	Checked: HP	Approved: PB
Date: 13/11/2017	Scale @ A3: 1:8,000	Purpose of issue: FINAL
Drawing Number: Figure 14		Rev: .

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Appendix B Relevant Legislation for Protected Species and Planning Policy Guidance

Legislation Relating to Breeding Birds

All birds, their nests and eggs are protected by the Wildlife and Countryside Act (WCA) 1981 (as amended) and it is an offence, with certain exceptions, to:

- intentionally kill, injure or take any wild bird
- intentionally take, damage or destroy the nest of any wild bird while it is in use or being built
- intentionally take or destroy the egg of any wild bird

Schedule 1 of the WCA 1981 provides further protection for selected species (for example peregrine falcon *Falco peregrinus*, barn owl *Tyto alba*, little ringed plover *Charadrius dubius* and black redstart *Phoenicurus ochruros* during the breeding season. If any person intentionally or recklessly disturbs any wild bird included in Schedule 1 while it is building a nest or is in, on or near a nest containing eggs or young; or disturb dependent young of such a bird. That person shall be guilty of an offence. For the purpose of this offence 'Any wild bird' means any bird included in Schedule 1.

Natural Environment and Rural Communities (NERC) Act 2006. Section 41 of the NERC Act identifies species and habitats of Principal Importance in England. Section 40 of the same Act places a duty of care on the competent authority to consider biodiversity as a material consideration whilst undertaking its normal functions. Section 41 includes numerous bird species.

Legislation Relating to Great Crested Newts

Great crested newts (GCN) are strictly protected by the WCA 1981 (as amended) and by the EC Habitats Directive, (transposed into domestic law through the Conservation (Natural Habitats &c) Regulations 1994 (as amended) (the Habitats Regulations) and Section 41 of the NERC Act as a species of Principal Importance in England. Under the Habitats Regulations GCN are classed as a European protected species and therefore given the highest level of protection.

The deliberate capturing, disturbing, injuring or killing of a GCN is prohibited, as is damaging or destroying a breeding Site or resting place.

Legislation Relating to Invasive Species

Schedule 9 of the 1981 WCA (as amended) provides a list of species for which it is illegal to facilitate spread or release into the wild.

Section 34 of the Environment Protection Act 1990 places as duty of care on any person who imports, produces, carries, keeps, treats or disposes of controlled waste. INNS propagules may be considered controlled waste where their disposal could result in environmental hazard. Crime and Policing Act 2014. Community Protection Notices can be issued where INNS are causing a nuisance to neighbours, with fines up to £20,000 where there is a failure to act.

Legislation Relating to Plants

All wild plants are protected against unauthorised removal or uprooting under Section 13 of the WCA 1981 (as amended). Plants listed on Schedule 8 of the Act are afforded additional protection against picking, uprooting, destruction and sale.

Legislation Relating to Hedgerows

Under the Hedgerows Regulations 1997 it is against the law to remove or destroy certain hedgerows without permission from the local planning authority. The local planning authority is the enforcement body for offences created by the Regulations

Local planning authority permission is normally required before removing hedges that are at least 20 metres (66 feet) in length, more than 30 years old and contain certain plant species. The authority will assess the importance of the hedgerow using criteria set out in the regulations.

The Hedgerow regulations provide provision for hedgerow retention when hedges are considered to be “important” based on criteria set out in the regulations.

Legislation Relating to Otter

Otters are strictly protected by the WCA 1981 (as amended) and by the EC Habitats Directive, (transposed into domestic law through the Conservation (Natural Habitats &c) Regulations 1994 (as amended) (the Habitats Regulations) and Section 41 of the NERC Act as a species of Principal Importance in England. Under the Habitats Regulations otters are classed as a European protected species and therefore given the highest level of protection.

The deliberate capturing, disturbing, injuring or killing of an otter is prohibited, as is damaging or destroying a breeding Site or resting place (for example an otter holt).

Legislation Relating to Water Vole

The water vole is fully protected under Schedule 5, Section 9 of the WCA 1981 (as amended), which makes it illegal to:

- Intentionally kill, injure or take (capture) a water vole;
- Possess or control a live or dead water vole, or any part of a water vole;
- Intentionally or recklessly damage, destroy or obstruct access to any structure or place which water voles use for shelter or protection or disturb water voles while they are using such a place; and
- Sell, offer for sale or advertise for live or dead water voles.

Legislation Relating to White-clawed Crayfish

White-clawed crayfish are partially protected under the WCA 1981 (as amended). This legislation makes it illegal to:

- Intentionally take white-clawed crayfish
- Sell, barter or exchange white-clawed crayfish

They are also listed on Annex II of the EC Habitats and Species Directive and are classed as “endangered” by IUCN.

Planning Policy

In December 2010, the Minister for Decentralisation and Planning, Greg Clark MP, announced a review of national planning policy, designed to consolidate all the existing Planning Policy Statements, Planning Policy Guidance's and various circulars into a single consolidated document aimed to make the planning system less complex, more accessible and to promote sustainable growth. Known as the National Planning Policy Framework (NPPF), it was published in final form in March 2012.

The publication of the NPPF supersedes the majority of the previous national Planning Policy Statement and Planning Policy Guidance. Thus, it now forms the principal national planning policy for development. It sets out the Government's key economic, social and environmental objectives and the planning policies needed to deliver them.

Appendix C Desk-Based Study – Designated and Notable Sites

Kingsway and Markeaton Junctions

Table C1: Statutory Designated Sites within 2km of Kingsway and Markeaton Junctions (see Figure 4 and 5, Appendix A)

Site Name	Designation(s) (with DWT reference number when available)	Reason for Designation	Relationship to Scheme (approx.)
.	Local Nature Reserve (LNR) (DE076)	Diverse habitat mosaic.	0.7km west of the proposed scheme boundarythe proposed scheme boundary (Kingsway junction)
Kedleston Park	Site of Special Scientific Interest (SSSI)	Rich and diverse deadwood invertebrate fauna which is primarily dependent upon the large number of mature and over-mature beech and pedunculate oak trees.	Approx. 1.9km north-west of the proposed scheme boundarythe proposed scheme boundary (Markeaton junction)
Darley and Nutwood	LNR	Habitats include grassland being invaded by scrub and woodland which includes an area of ancient woodland.	2km north-east of the proposed scheme boundarythe proposed scheme boundary (Markeaton junction)

Table C2: Non-statutory Designated Sites within 2km of Kingsway and Markeaton Junctions (see Figure 4 in Appendix A for the location of those sites primarily on and/ or within 1km of Kingsway and Markeaton junctions)

Site Name	Designation(s) (with DWT reference number when available)	Reason for Designation	Relationship to Scheme
A38 Roundabout	Local Wildlife Site (LWS) (DE010)	Semi-improved neutral grassland	Within the proposed scheme boundarythe proposed scheme boundary
Mickleover Railway Cutting	LWS (DE004)	Habitat mosaic	Within the proposed scheme boundarythe proposed scheme boundary continuing up to 0.8km west of the proposed scheme boundarythe proposed scheme boundary

Site Name	Designation(s) (with DWT reference number when available)	Reason for Designation	Relationship to Scheme
Markeaton Brook System	LWS (DE003)	Invertebrate assemblage (including white-clawed crayfish)	Within the proposed scheme boundarythe proposed scheme boundary continuing up to 0.8km south-east of the proposed scheme boundarythe proposed scheme boundary and 1.2 km north of the proposed scheme boundarythe proposed scheme boundary
Bramble Brook and Margins	LWS (DE014)	Secondary broad-leaved woodland	Adjacent to and within the proposed scheme boundarythe proposed scheme boundary
Markeaton Park	LWS (DE074)	Wood pasture and Parks including veteran trees (BAP habitat – Wood pasture)	Directly adjacent to the north and west of the proposed scheme boundarythe proposed scheme boundary
Osierbed and Gravelpit Woods	LWS (AV019)	Secondary broad-leaf wet woodland	Approx. 0.3km k m north west of the proposed scheme boundary
Markeaton Lane Meadow	LWS	No information	Approx. 0.4km north of the proposed scheme boundary
Kedleston Road Marsh	LWS	No information	Approx. 0.8km north of the proposed scheme boundary
Friargate Station	LWS (DE006)	Presence of Red data book (RDB) species (BAP habitat – Open mosaic)	Approx. 0.8km east of the proposed scheme boundary
Kedleston Road Hedge	LWS	No information	Approx. 0.8km north of the proposed scheme boundary
Beech Wood	LWS	No information	Approx. 0.9km east of the proposed scheme boundary
River Derwent	LWS	No information	Approx. 1.1km east of the proposed scheme boundary
Mickleover – Etwall Trail (Derby)	LWS	No information	Approx. 1.3km west of the proposed scheme boundary
Mackworth Brook	LWS	No information	Approx. 1.4km west of the proposed scheme boundary
Inglewood Avenue Meadow	LWS	No information	Approx. 1.5km west of the proposed scheme boundary

Site Name	Designation(s) (with DWT reference number when available)	Reason for Designation	Relationship to Scheme
Radbourne Lane Hedge	LWS	No information	Approx. 1.5km west of the proposed scheme boundary
Bunkers Wood	LWS	No information	Approx. 1.5km south of the proposed scheme boundary
Woodlands School Hedges	LWS	No information	Approx. 1.8km north of the proposed scheme boundary
Darley and Nutwood	LWS	No information	Approx. 2km north-east of the proposed scheme boundary

(LWS: Local Wildlife Site with designation numbers)

Table C3: Non-Designated Sites of Interest within 2km of Kingsway and Markeaton Junctions (see Figure 4 in Appendix A for the location of those sites primarily on and/ or within 1km of Kingsway and Markeaton junctions)

Site Name	Category (with DWT reference number when available)	Reason for Designation	Relationship to Scheme
Land off Kingsway	Potential Local Wildlife Site (PLWS) (DE115 and (R6541)	Running water and small pond	Approx. 0.2km east of the proposed scheme boundary
King Street	PLWS	No information	Approx. 0.9km east of the proposed scheme boundary
Old Cemetery	DE081/3	Not assessed	Approx. 1.0km east of the proposed scheme boundary
All Saints Churchyard	AV015/3	Not assessed	Approx. 1.3km west of the proposed scheme boundary
Littleover Brook	DE073/3	Not assessed	Approx. 1.3km south east of the proposed scheme boundary
Rykneld Recreation Ground	DE087/3	Not assessed	Approx. 1.4km south east of the proposed scheme boundary
Bunkers Grassland - Derby	PLWS	No information	Approx. 1.4km south of the proposed scheme boundary
Hackwood Farm Pond	DE071/3	No information	Approx. 1.6km west of the proposed scheme boundary
Markeaton Brook	AV017/3	No information	Approx. 1.8km south of the proposed scheme boundary

Site Name	Category (with DWT reference number when available)	Reason for Designation	Relationship to Scheme
Old Hall Wood	DE082/3	Not assessed	Approx. 1.8km south of the proposed scheme boundary
Gold Lane	AV009/3	No information (BAP habitat adjacent – Traditional Orchard)	Approx. 1.8km west of the proposed scheme boundary
Richmond Close	PLWS	No information	Approx. 1.8km south of the proposed scheme boundary
Lower Vicarwood Pond 2	AV010/3	No information	Approx. 1.9km north west of the proposed scheme boundary
Hell Brook & Hell Brook Copse	PLWS	No information	Approx. 1.9km south of the proposed scheme boundary
Lower Vicarwood Pond	AV013/3	No information	Approx. 2.0km north west of the proposed scheme boundary

Little Eaton Junction

Table C4: Statutory Designated Sites within 2km of Little Eaton Junction (see Figure 5 in Appendix A for the location of those sites primarily on and/or within 1km of Little Eaton junction)

Site Name	Designation(s) (with DWT reference number when available)	Reason for Designation	Relationship to Scheme
Allestree Park	LNR (DE011)	Parkland, veteran trees, secondary woodland and open water	Approx. 0.2km west of the proposed scheme boundary
Darley Abbey and Nutwood	LNR (DE005)	Neutral grassland and ancient woodland	Approx. 0.3km m south of the proposed scheme boundary
Breadsall Railway Cutting	LNR, SSSI	Unimproved grassland. Calcareous, neutral and acidic grassland. Diverse butterfly population.	Approx. 1.5km south east of the proposed scheme boundary
Chaddesden Wood and Lime Lane Wood	LNR (DE001)	Ancient semi-natural oak woodland	Approx. 1.6km east of the proposed scheme boundary
Duffield Millennium Meadows	LNR	Part of the Lowland Derbyshire Biodiversity Action Plan and includes flood plain grazing marsh, standing open water with	Approx. 1.6km north of the proposed scheme boundary

Site Name	Designation(s) (with DWT reference number when available)	Reason for Designation	Relationship to Scheme
		associated vegetation, rivers, stream and hedgerows. The Site is bounded by the Derwent and Ecclesbourne Rivers.	

Table C57: Non-statutory Designated Sites within 2km of Little Eaton Junction (see Figure 5 in Appendix A for the location of those Sites primarily on and/ or within 1km of Little Eaton junction)

Site Name	Designation(s) (with DWT reference number when available)	Reason for Designation	Relationship to Scheme
Alfreton Road Rough Grassland	LWS (ER002)	Floodplain grassland semi-improved	Within the Little Eaton junction Site boundary
River Derwent	LWS (DE007)	Flowing water, river and associated streams	Within the Little Eaton junction Site boundary
Allestree Park	LWS (DE011)	Unimproved neutral grassland (BAP habitat – Wood pasture)	Approx. 0.2km west of the Little Eaton junction Site boundary
Darley and Nutwood	LWS	Neutral grassland and ancient woodland	Approx. 0.3km south of the Little Eaton junction Site boundary.
Burley Hill Farm Scrub and Grassland	LWS (AV119)	Unimproved acid grassland	Approx. 0.3km west of the Little Eaton junction Site boundary
Breadsall Disused Railway	LWS (ER005)	Unimproved neutral grassland	Approx. 0.3km south east of the Little Eaton junction Site boundary
Hatherings Wood, Little Eaton	LWS	Secondary broadleaved woodland	Approx. 0.3km north of the Little Eaton junction Site boundary
Camp Wood, Little Eaton	LWS (ER019)	Secondary broad-leaved woodland	Approx. 0.3km east of the Little Eaton junction Site boundary
Watermeadows ditch	LWS (DE047)	Standing open water	Approx. 0.4km south of the Little Eaton junction Site boundary

Site Name	Designation(s) (with DWT reference number when available)	Reason for Designation	Relationship to Scheme
Peckwash Mills	LWS	Secondary broadleaved woodland	Approx. 0.6km north of the Little Eaton junction Site boundary.
Nooney's Pond	LWS (DE033)	Standing open water	Approx. 0.7km south of the Little Eaton junction Site boundary
Darley Park	LWS (DE064)	Wood Pasture and Parkland (BAP habitat – Wood pasture)	Approx. 0.7km south of the Little Eaton junction Site boundary
Beech Wood	LWS	No information	Approx.1.0km south-west of the Little Eaton junction Site boundary.
Drum Hill Fields, Breadsall Moor	LWS	Unimproved acid grassland (BAP habitat – Lowland heathland)	Approx. 1.1km north-east of the Little Eaton junction Site boundary.
Ferriby Brook and Dam Brook	LWS (ER209) (Includes PLWS (ER R6599 and ER009/3)	Secondary broad-leaved woodland	Approx. 1.2km east of the Little Eaton junction Site boundary
Moor Road fields	LWS (ER023)	Semi-improved neutral grassland	Approx. 1.2km east of the Little Eaton junction Site boundary
Porter's Lane Hedge	LWS (DE095)	Hedgerow	Approx. 1.2km south east of the Little Eaton junction Site boundary
Woodlands School Hedges	LWS	Hedgerow	Approx. 1.2km west of the Little Eaton junction Site boundary.
Breadsall Priory Golf Course	LWS (ER024)	Wood-pasture and parks	Approx. 1.3km north east of the Little Eaton junction Site boundary
Breadsall Priory Golf Course	LWS	Wood-pasture and parks	Approx. 1.3km east of the Little Eaton junction Site boundary.
Botany Stream Margin Complex	LWS	Secondary broadleaved wet woodland	Approx. 1.3km north-west of the Little Eaton junction Site boundary.
Porter's Lane Pond	LWS (DE098)	Standing open water	Approx. 1.4km south east of the Little Eaton junction Site boundary

Site Name	Designation(s) (with DWT reference number when available)	Reason for Designation	Relationship to Scheme
Horsley Carr	LWS	Ancient woodland plantation-mixed	Approx. 1.4km north-east of the Little Eaton junction Site boundary.
Moor plantation & Drum Hill	LWS	Secondary broadleaved woodland	Approx. 1.4km north-east of the Little Eaton junction Site boundary.
Eatonpark Wood	LWS	Secondary broadleaved woodland (BAP habitat – Wood pasture)	Approx. 1.4km north of the Little Eaton junction Site boundary.
Burley Wood	LWS	Ancient-woodland plantation-broadleaved	Approx. 1.5km west of the Little Eaton junction Site boundary.
High View South Community School Nature Reserve	LWS (DE023)	Unimproved neutral grassland	Approx. 1.5km south east of the Little Eaton junction Site boundary
Whittaker Lane Woodland	LWS	Secondary broadleaved woodland	Approx. 1.5km north of the Little Eaton junction Site boundary.
Breadsall Railway Cutting	LWS (DE015)	Unimproved neutral grassland	Approx. 1.6km m south of the Little Eaton junction Site boundary
Duffield Millennium Meadows	LWS	Standing open water	Approx. 1.6km north of the Little Eaton junction Site boundary
Chaddesden Wood and Lime Lane Wood	LWS	Ancient semi-natural oak woodland (BAP habitat – Traditional orchard)	Approx. 1.6km east of the proposed scheme boundary
Kedleston Road Hedge	LWS	No information	Approx.1.7km south-west of the Little Eaton junction Site boundary.
Markeaton Park	LWS	No information	Approx.1.8km south-west of the Little Eaton junction Site boundary.
Markeaton Lane Meadow	LWS	No information	Approx.1.8km south-west of the Little Eaton junction Site boundary.
Kedleston Road Marsh	LWS	No information	Approx.1.8km south-west of the Little Eaton junction Site boundary.

Site Name	Designation(s) (with DWT reference number when available)	Reason for Designation	Relationship to Scheme
Great Farley's Wood	LWS	Ancient semi-natural woodland-mixed (BAP habitat – Traditional orchard)	Approx. 1.9km north of the Little Eaton junction Site boundary.
Markeaton Brook System	LWS	No information	Approx.2.0km south-west of the Little Eaton junction Site boundary.

Table C58: Non-designated Sites of Interest within 2km of Little Eaton Junction (see Figure 6 in Appendix A for the location of those sites primarily on and/ or within 1km of Little Eaton junction)

Site Name	Category (with DWT reference number when available)	Reason for Consideration	Relationship to Scheme
A38 Scrub	DE050/3	Not assessed	Within the Little Eaton junction scheme section
Ford Lane Field	Site recorded as a PLWS in 2015 by DWT but not in 2016. AV Grassland (no designation number)	Semi-improved acid grassland, needs survey	Within Little Eaton junction scheme section
Des Lane Brook Course	DE/3	Not assessed	Partly within and to the west of Little Eaton junction scheme section
Boosemoor Brook	ER018/3	Not assessed	Adjacent to the eastern Little Eaton junction scheme section
Plantation	ER017/3	Not assessed	Adjacent to the Little Eaton junction scheme section
Old Derby Canal	ER003/3	Not assessed	Adjacent to the southern Little Eaton junction scheme section
Croft Wood	PLWS ER004	Secondary woodland	Approx. 0.1km south of Little Eaton junction scheme section
Marsh area, Breadsall	PLWS ER001	Swamp	Approx. 0.2km south of Little Eaton junction scheme section

Site Name	Category (with DWT reference number when available)	Reason for Consideration	Relationship to Scheme
Rectory Lane Grassland	Site recorded as a PLWS in 2015 by DWT but not in 2016. AV Grassland	Semi-improved acid grassland, needs survey	Approx. 0.2km east of Little Eaton junction scheme section
The Slip	ER007/3	Not assessed	Approx. 0.3km east of Little Eaton junction scheme section
A6 Bank	PLWS DE R6335	SI grassland	Approx. 0.3km west of Little Eaton junction scheme section
Holme Nook Ponds	PLWS DE R6440	Open water	Approx. within 0.5km south of Little Eaton junction scheme section
Rigga Quarry	PLWS	No information	Approx. 0.3km north of the Little Eaton junction scheme section
Croft wood Pasture	PLWS ER R6496	Acid grassland	Approx. within 0.4km south east of Little Eaton junction scheme section
Waste Land, Duffield	AV120/3	No information	Approx. 0.4km north west of the Little Eaton junction scheme section
St Edmunds Churchyard	DE088/3	Not assessed	Approx. 0.5km west of the Little Eaton junction scheme section
Garage Pond	ER187/3	Not assessed	Approx. 0.6km south east of Little Eaton junction scheme section
Mill Plantation	PLWS ER008	Secondary woodland	Approx. within 0.7km east of Little Eaton junction scheme section
Outwoods	PLWS	No information	Approx. 0.8km south of the Little Eaton junction scheme section
Little Eaton Fields	PLWS AV Grassland	Semi-improved acid grassland, needs survey	Approx. 0.9km north of Little Eaton junction scheme section
Embankment, Little Eaton	ER125/3	Not assessed	Approx. 0.9km north east of Little Eaton junction scheme section

Site Name	Category (with DWT reference number when available)	Reason for Consideration	Relationship to Scheme
Little Eaton Acid Grassland	PLWS	No information	Approx. 0.9km north east of the Little Eaton junction scheme section.
Ferriby Brook	PLWS	No information	Approx. 1.1km east of the Little Eaton junction scheme section
Home Farm Pond	ER015/3	No information	Approx. 1.1km south of the Little Eaton junction scheme section
Breadsall Moor Grassland	PLWS	No information	Approx. 1.2km north east of the Little Eaton junction scheme section
River Derwent, Duffield Bridge	AV122/3	No information	Approx. 1.2km north of the Little Eaton junction scheme section
Broomfield Hedge	PLWS ER R6600	Ancient hedge	Approx. 1.5km east of the Little Eaton junction scheme section
Broadway Stream	DE056/3	No information	Approx. 1.6km south west of the Little Eaton junction scheme section
Broomfield College grasslands	PLWS	No information	Approx. 1.8km east of the Little Eaton junction scheme section
Daypark Quarry	AV030/3	No information	Approx. 1.8km south of the Little Eaton junction scheme section

Appendix D Habitat Descriptions

Table D1: Standing Water Features Recorded Within 50m of the proposed scheme boundary

Water body number	Description
Pa2	Pa2 was a large (approximately 1,500m^2) balancing pond south of the Kingsway junction, and to the east of the carriageway. It is understood that this pond was installed to accept run-off from the Derby Royal Hospital overflow car park. The pond is divided by a large strip of common reed *Phragmites australis*. The western bank of the pond was bare and sloped gently towards the water. The eastern bank was covered by scrub and immature trees. The pond was surrounded by semi-improved grassland.
Pa3	Pa3 was a shallow medium sized pond created in 2013 to receive water from drainage channels dug across the Mackworth allotments. This pond was located within disturbed ground with minimal marginal vegetation. Submerged macrophytes include Canadian waterweed *Elodea canadensis* and the surface was dominated by duckweed *Lemna spp*. The surrounding habitats consisted of scrub and semi-improved grassland.
Pa4	Pa4 was a small, recently dug, wildlife pond within the grounds of Brackensdale Junior School at SK 32870 36498 near the Kingsway junction. This pond was located within amenity grassland and was considered to have limited connectivity with surrounding habitats. Macrophytes present included reedmace, common reed, Canadian pondweed and broad leaved pondweed *Potamogeton natans*.
Pa5	Pa5 was a balancing pond for the University of Derby Arts building. The northern bank was steep and maintained with gabions. The southern side sloped gently within amenity grassland towards the water. Two large stands of common reed were located within the water.
Pa6 and Pa7	Mill Ponds 1 and 2 (Pa7 and Pa6) were located north of the Markeaton junction. It was a long waterbody, stocked with fish, with Pa6 linked to Pa7 via culvert. The banks of the ponds were tree lined with steep margins and the bed was heavily silted with dead leaves overlain. Aquatic species recorded included rigid hornwort *Ceratophyllum demersum*, common duckweed *Lemna minor*, least duckweed *Lemna minuta*, water-lily N*ymphaeae spp*., blanket weed algae *Cladophora glomeratus* and horned pondweed *Zannichellia palustris*.
Pa8	Markeaton Park lake (Pa8) was located to the north of the Markeaton junction. The lake drained through a culvert to a connected waterbody, Mill Pond 1 and 2, east of the existing A38 carriageway, now controlled by the Earl of Harrington fishing club. Mill Ponds in-turn drained to Markeaton Brook further to the east of the proposed scheme. The open water areas included the main lake with wooded islands and an amenity play pool with little diversity in aquatic habitat. The main lake banks were vertical across much of the shore, with small bays that were heavily poached by the high numbers of waterfowl present. Lake banks also had sparse to dense tree cover, were undercut in places with stretches of bank being artificial and were largely devoid of vegetation. Patchy marginal vegetation was present and largely concentrated at the southern end of the lake; however, no submerged macrophytes were noted. The surrounding habitats consisted of managed improved grassland.

Water body number	Description
Pa9	Pa9 was a new pond located within the Bramble Brook and Margins Local Wildlife Site, south of the Kingsway junction, and east of the carriageway. The pond coverer an area of approximately 200m^2 and was located within dense woodland. Due to the surrounding habitat the pond was shaded with no marginal or aquatic vegetation recorded.
Pa11	Pa11 was destroyed in 2016 and did not exist anymore. It used to be located within the Mill Dam allotment, plot 14 and was lined and covered by a protective mesh. No aquatic or marginal vegetation had been recorded.
Pa12	Pa12 was located within Mill Dam allotment and was a narrow and shallow ditch running east-west and then north-south. Dense aquatic or marginal vegetation was recorded.
Pb1	Pb1 was a shallow ditch of with width varying from 1.5m to 3m The channel was densely vegetated with willow scrub, bramble and tall ruderals throughout length with some open areas. This ditch is surrounded the eastern and southern edges of the Severn Trent Water ponds (Pb2, Pb3).
Pb2a, Pb3a and Pb3b	Pb2a, Pb3a and Pb3b were three ponds located to the north of Little Eaton junction centred on SK 36188 40616. They were associated with the Severn Trent Water (STW) Treatment works. These three ponds were used as ferric sulphate settling lagoons for waste sludge from the Severn Trent Water potable treatment works.
Pb5	Pb5 was a small shallow pond receiving run-off from road gullies on the Little Eaton junction. The pond was heavily silted with dense reed sweet grass *Glyceria maxima* and duckweed.
Pb7	Pb7 was a long shallow ditch approximately 4m wide, following the course of the historic Derby Canal located between the A38, north of Little Eaton junction and Alfreton Road. This ditch was fed by surface water run-off from the Little Eaton Garden Centre car park located at the north end of the ditch.
Pb8	Pb8 was a long slow flowing ditch which runs from Little Eaton alongside the Alfreton Road to the Little Eaton junction at SK 36422 40173.
Pb9	Pb9 is located within Alfreton Road Rough Grassland LWS. It comprised a large shallow water body with a wide muddy drawdown zone. There was much bare mud and based on old fluctuation shores and the lack of aquatic open water macrophyte species, it was evident that the water levels fluctuate widely. Eight drawdown indicator species were recorded in 2015 within the drawdown zone (AECOM(i), 47071319-URS-05-RP-EN-011, 2016): toad rush *Juncus bufonius* creeping bent, common water forget-me-not, amphibious bistort *Persicaria amphibium,* celery leaved buttercup *Ranunculus scleratus*, silverweed, water chickweed *Myosoton aquaticum* and marsh foxtail; satisfying the criterion (minimum 5 indicator species) for consideration as a Local Wildlife Site. It does, however, also include the highly invasive non-native species New Zealand pigmyweed.
Pc58	Pc58 was dry, totally encroached by willow and very dense ground flora, including abundant nettles.
Pc59	Pc59 was a very small garden pond, lined and protected with a metal mesh. No aquatic vegetation was recorded.

Water body number	Description
Pb61	Pc61 was a very small garden pond, lined and elevated with dense Canadian pondweed and leaf litter.
Pc60 and Pc62	Pc60 and Pc62 were 2 small ornamental garden fish ponds well stocked with fish and non-native Canadian pondweed.

Table D2: Watercourses Recorded Within 50m of the proposed scheme boundary

Running water feature name	Description
Bramble Brook	The Bramble Brook is a small brook course which rises in Mickleover and flows eastwards towards the City of Derby, where it runs in culverts for much of its length before discharging into the Markeaton Brook. The Bramble Brook has 2 main tributary watercourses, the north of which runs dry during the summer months. The Bramble Brook was modified across much of its length by extensive lengths of culvert, bank reinforcement and weirs. The channel had a wetted width of approximately 1m, a bank full width of approximately 1.5m, an average water depth of <0.2m and a bank height of approximately 2m. Flows were moderate to slow, with a variety of flow types present, including riffles and glides with channel substrate comprising of sand and gravels with silt present in the deeper slow flowing sections. In open sections the channel was wooded, heavily shaded and unmanaged, with fallen trees and scrub found periodically along the channel length. Himalayan balsam was also present throughout the open sections of channel.
Markeaton Brook	The Markeaton Brook, a tributary of the River Derwent, flows in a south easterly direction towards the City of Derby. The Markeaton Brook had a wetted width of approximately 2m, a bank full width of approximately 10m and had a water depth of approximately 0.3m. The channel bed supported numerous features including boulders, cobbles and exposed gravel beds which cause a riffled flow type that was dominant throughout. The Brook has been straightened and was modified with weirs, bank reinforcement and road culverts. These modifications encouraged less diverse flow conditions with slower flows noted within impounded sections and through the road culverts. The channel was heavily shaded by bankside and riparian vegetation, including broad-leaved plantation woodland, scrub, areas of tall ruderal vegetation and Himalayan balsam. An active management regime is also in place and consequently deadwood and fallen trees were not noted and are likely to have been removed from the channel in order to reduce flood risk to adjacent properties.
Middle Brook	The Middle Brook is a small watercourse which runs through playing fields and discharges to the Markeaton Brook. The watercourse had a wetted width of approximately 1.5m, a bank full width of approximately 4m and had an average water depth of <0.2m. Flow conditions were varied with riffles, glides and pools being present throughout the length of the watercourse. Flow conditions were affected by coarse sediments including gravels and larger cobbles and the presence of tree routes, which formed natural weirs and weir pools. The channel was heavily shaded by bankside and riparian vegetation, including broad-leaved plantation woodland, scrub and areas of tall ruderal vegetation. Woody material was also noted and the channel appeared to be unmanaged.
Watermeadows Ditch	The Watermeadows Ditch starts immediately downstream of the A61 Road bridge and flows in a south westerly direction to its confluence with the River Derwent. The Watermeadows Ditch had an approximate wetted width of between 2.5m and 3m and a bank full width of approximately 5m, with shallow vertical banks present throughout.

Running water feature name	Description
	Flows were slow with limited variation. Variation in bed substrate was also limited with sand and silt being dominant throughout. Downstream of the railway line the channel was more open with grassland and tall ruderal vegetation being present on the banks. In the more open sections significant amounts of in-channel vegetation were present. Sections of the Ditch downstream of the railway line had recently been cleared of vegetation and bare banks were noted.
Dam Brook	The Dam Brook begins downstream of the A608 road bridge but rises at the Ferriby Brook downstream of Lime Lane near Oakwood. The Dam Brook flows in a westerly direction towards the A61 road bridge where it becomes the Watermeadows Ditch, a tributary of the River Derwent. The Dam Brook was trapezoidal through the Site and had wetted width of <1 m, a bank full width of 2m, an average water depth of <0.5m and a bank height of 1.5m. At SK 36517 40047, the banks of the brook were engineered using concrete rip-rap and flowed southwards alongside the A61 carriageway. The brook then flowed over a weir and into a culvert under the east side of the Little Eaton junction. The brook emerged at SK 36462 39977 to flow through a channel engineered using natural materials. In this location the brook lacked any notable in-channel features. Bed substrate varied across the area of survey, with coarse sediment, such as cobbles and gravels, present upstream of the Boosemoor Brook confluence and finer sediments, including sand and silt, present downstream of this section. The channel bordered semi-improved grassland, dense scrub and scattered broad-leaved trees on the left bank. On the right bank were occasional stands of willow, hawthorn, alder and white poplar. Both banks had been re-sectioned throughout. Dam Brook continued to flow southwards from this location to SK 36412 39700 where the channel was again heavily engineered using concrete rip-rap. It then flowed west into a culvert under the A61 carriageway to join Watermeadows Ditch.
Boosemoor Brook	The Boosemor Brook rises from a lake outlet near Moor Road and flows in a south westerly direction until it meets the Dam Brook downstream of Breadsall. The Boosemoor Brook ha an approximate wetted width of 2m, a bank full width of approximately 4m and a water depth of <0.3m. The channel appeared to have been straightened historically, with the banks re-profiled and the channel deepened to form a trapezoidal channel over a slack gradient. There was limited flow variation as a result of the slack gradient with glides and slack flows being dominant throughout the area of survey. The bed substrate was dominated by fine sediments such as sand and silt, likely as a result of the slow flows encouraging sediment deposition; however some coarse sediment including gravels were present. The banks of the Brook were steep and heavily shaded by scrub which encroaches on open water habitat.
River Derwent	Near to the Little Eaton junction, north of the A38 road bridge, the River Derwent had moderate flow and passed through semi-improved and improved grassland in a shallow valley. River dimensions comprised: approximately 15m width; bank full width approximately 20m; approximately 0.6m water depth; bank heights of between 1.8m and approximately 2m. The banks of the river in this location supported scattered mature trees on the left bank, and occasion clumps of trees on the right bank which provided some channel shading. North of the A38 road bridge in this location both banks had been re-sectioned and the channel is likely to have been realigned. The right bank was generally steep whilst the left bank was generally vertical, ranging from 0.2m to 1.5m from the water surface, with little emergent bankside vegetation. Small, discrete stands of common reed and yellow-flag iris *Iris pseudacorus* were present on both banks along the surveyed section. The channel lacked major features and exhibited a glide habitat with predominant rippled and smooth flow. A gravel bar was present and supported a large bed of water

Running water feature name	Description
	crowfoot *Ranunculus spp*. Beyond this gravel bar, the river deepened into a pool habitat that was too deep to survey further from within the channel. Where the river was accessible for survey, the substrate comprised boulders, cobbles, gravel and sand. Leafy debris and large amounts of anthropogenic debris directly beneath the road bridge was also present. On the east bank at SK 35949 40069 and SK 35911 40010 discrete approximate 40m stands of giant knotweed were recorded overhanging the river channel. Himalayan balsam was also recorded associated with the banks of the river and adjoining habitats throughout the area of survey.
Bottle Brook	The Bottle Brook rises at Greenhill Locks and flows in a south westerly direction until it meets the River Derwent at Little Eaton. The Bottle Brook through the area of survey had an approximate wetted width of 3m, a bank full width of approximately 5m and an approximate average water depth of <0.5m. The channel through the area of survey appeared to have been straightened historically, with the banks reinforced with concrete and rip-rap stone. The bed of the channel was predominantly comprised of coarse substrate including large boulders, cobbles, gravels and anthropogenic debris. The coarse substrate and flow velocities increase flow variation with riffles, runs and glides present along the survey reach. Tall ruderal vegetation was present above the bank reinforcement on the west bank with scrub and mature trees present on the east bank.

Table D3: Building and Man-Made Structures' Descriptions

Building reference	Description
B1	B1 was a large railway over-bridge for the A38 carriageway west of the Little Eaton junction.
B2	B2 was a farm access track bridge supporting the A38 carriageway, west of the Little Eaton junction. The bridge spanned a concrete underpass providing farm vehicle access between the north and south sides of the carriageway.
B3	B3 was a large road bridge supporting the A38 carriageway west of Little Eaton junction which spans the River Derwent.
B4 and B5	B4 and B5 were two parallel road bridges carrying the A38 carriageways over Brackensdale Avenue. This structure supported heavy traffic and bright lighting.
B6	B6 was a disused, old railway viaduct bridge, which lied in the vicinity of Kingsway junction.
B7	B7 was an electricity substation on the north side of the Markeaton junction, west of the entrance to Markeaton Park. A brick building with a well maintained tiled roof, and a ventilated ridge tile. This structure is located in the vicinity of good foraging habitat.
B8	B8 was a row of fifteen detached residential properties on Queensway and two semi-detached properties on the A52 Ashbourne Road, located within the Site boundary.
B9	B9 was a 2-storey building with pitched roof tiled and flat-roofed extension.
B12	B12 was a tunnel mapped on Ordnance Survey map. However, it was not found on Site.

Building reference	Description
B13	B12 was a tunnel mapped on Ordnance Survey map. However, it was not found on Site.
B14	B14 was a tunnel under the railway.
B15	B15 was a drainage pipe.

Table D4: Species-Poor Hedgerow Descriptions

Hedgerow number	Description	Length (approx.)
H1	Hawthorn dominated, 2 – 3 m high, 1 - 2 m wide. Two standard oak trees. Dry ditch, no end connections.	103m
H2	Hawthorn dominated. 1 - 2 m wide, 1 - 2 m high. One semi-mature standard ash. One end connection.	48m
H3	Hawthorn dominated hedgerow with locally dominant ivy. No notable ground flora. 2 - 3 m high, 1 - 2 m wide. No end connections, adjacent to track/road.	125m
H4	Hawthorn dominated hedgerow and elder. One mature lime standard and two semi-mature ash standards. No notable ground flora, two end connections.	128m
H5	Species noted in hedge are crack willow, blackthorn, grey willow, common hawthorn and elder. Two end connections, adjacent to track with brook flowing below (from Pond Pb4).	155m
H6	Dominated with ash, elder, oak, and blackthorn. Two standard mature ash trees. 2 – 3 m high, 2 – 3 m wide, adjacent to track, two end connections. Dam Brook flows beneath hedge. 15m gap.	124m
H7	Hawthorn dominated hedgerow with occasional elder. Two end connections.	79m
H8	A hedgerow with maturing trees over 5m in height. Ground flora and understorey heavily browsed by livestock to 1.5m from ground. Species present included dominant hawthorn, with ash, holly, dog-rose, blackberry, elder and English elm also present.	143m
H9	Hawthorn dominated hedge 2-4 m high, 2-3 m wide. Limited ground flora, unmanaged with heavy bramble and cleavers.	160m
H10	Garden hedge dominated by hawthorn with occasional non-native species.	52m
H11	Hawthorn hedge along the roadside - no trees.	60m
H12	Overgrown hedge – line of trees. Hawthorn dominant with occasional elder and rare occurrences of dog rose *Rosa canina*. Hedge is >4m high with scrub below. Other species include bramble which dominates the area with abundant common nettle and frequent cleavers *Galium aparine*. Himalayan balsam abundant throughout.	135m
H13	Hedgerow north of Ford Lane. Well managed hedge, dominated by hawthorn	157m

Hedgerow number	Description	Length (approx.)
	with occasional elder. Bramble and Himalayan balsam also present.	
H14	Leylandii hedge.	51m
H15	Leylandii hedge.	64m
H16	Leylandii hedge.	185m
H17	Overgrown hedge not managed and dominated by hawthorn.	70m
H18	Overgrown hedge dominated by hawthorn.	48m
H19	Overgrown hedge dominated by hawthorn with occasional ash and elder.	131m
H20	Overgrown hedge dominated by hawthorn with hazel, ash and elder also present.	140m
H21	Hedge dominated by hawthorn with rare occurrences of elder.	145m
H22	Hedge dominated by hawthorn.	40m
H23	Hedge dominated by hawthorn with rare occurrences of elder.	967m
H24	A hedgerow with maturing trees over 5m in height. Ground flora and understorey heavily browsed by livestock to 1.5m from ground. Species present included hawthorn with occasional ash and pedunculate oak.	53m
H25	Hedge dominated by hawthorn.	48m
H26	Remnant old hawthorn hedge with numerous gaps with large trees over 5m in height. Ground flora and understorey heavily browsed by livestock to 1.5m from ground.	106m
H27	Goat willow and ash overtopping ornamental planting.	177m
H28	Defunct hedge. Line of oak and ash trees over bramble scrub.	44m
H29	Defunct hedge. Line of unmanaged hawthorn and blackthorn trees with occasional oak and ash. Heavily browsed by livestock.	123m
H30	Remnant old hawthorn hedge with numerous gaps with large trees over 5m in height. Ground flora and understorey heavily browsed by livestock to 1.5m from ground.	126m
H31	Managed laurel hedge, 1.2 m high.	40m
H32	Beech hedge newly planted.	48m
H33	Unmanaged hedge dominated by hawthorn, 2.5m x 2m wide. Encroached with bramble and raspberry.	160m

Hedgerow number	Description	Length (approx.)
H34	Laurel hedge 1.2m high.	55m
H35	Unmanaged hedge dominated by hawthorn with hazel also present.	112m
H36	Hedge - Scrub no trees includes ornamental species Species recorded included hawthorn, ivy *Hedera helix*, honeysuckle *Lonicera periclymenum.*	13m
H37	Hedge - with trees Unmanaged hedge with maturing trees over10m tall with extensive growth of self-set saplings expanding into the grasslands to the east and west. Dominated by hawthorn and blackthorn with occasional ash, ivy, apple *Malus domestica*, with understory of dog's mercury, blackberry, elder, common nettle.	148m
H38	Tall hedgerow with trees intact but species poor hawthorn dominant with some elderberry.	202m

Table D5: Invasive Plant Species Locations

Species	Code	Grid reference	Notes
Japanese knotweed	JK1	SK 32574 35765	Large stand, approx. 2,000m^2 in area. Very mature. Within 50m of the proposed scheme boundary.
Japanese knotweed	JK2	SK 32979 36127	Small stand, approximately 50m^2 in area, Within the proposed scheme boundary.
Japanese knotweed	JK3	SK 33033 36005	Small stand, approximately 30m^2 in area. Within 50 m of scheme boundary.
Japanese knotweed	JK4	SK 33752 37336	Stand on bank of Markeaton Lake. Within 50m of scheme boundary, high risk of dispersal due to proximity to watercourse.
Japanese knotweed	JK5	SK 33037 36151	Small immature stand, approximately 10m^2 in area, within scheme boundary.
Japanese knotweed	JK6	SK 32920 36104	Small stand, 3 single stems possibly propagated spring 2015. Likely to have spread.
Japanese knotweed	JK7	SK 32839 36076	Small stand, approximately 50m^2 in area. Within the proposed scheme boundary.
Japanese knotweed	JK8	SK 32943 36208	Small stand, approximately 30m^2 in area. Within 50 m of the proposed scheme boundary.
Japanese knotweed	JK9	SK 32931 36162	Small stand, approximately 50m^2 in area. Within the proposed scheme boundary.

Species	Code	Grid reference	Notes
Japanese knotweed	JK10	SK 34057 36890	Stand on bank of Mill Dam. Within 50m of the proposed scheme boundary, high risk of dispersal due to proximity to watercourse.
Japanese knotweed	JK11	SK 33489 37761	Stand on bank of Markeaton Brook. Within 50m of the proposed scheme boundary, high risk of dispersal due to proximity to watercourse.
Japanese knotweed	JK12	SK 33354 37738	Stand on bank of Mackworth Brook. Within the proposed scheme boundary, high risk of dispersal due to proximity to watercourse.
Japanese knotweed	JK13	SK 33702 37462	Stand on bank of Markeaton Lake. Within 50m of the proposed scheme boundary, high risk of dispersal due to proximity to watercourse.
Japanese knotweed	JK14	SK 36356 40557	Large stand, approx. 1,500m^2 in area. Very mature. Within the proposed scheme boundary.
Japanese knotweed	JK15	SK 36368 40177	Small stand, approximately 10m^2 in area, within the proposed scheme boundary,
Japanese knotweed	JK16	SK 36188 40143	Large stand, approx. 700m^2 in area. Very mature. Within the proposed scheme boundary, likely to spread.
Japanese knotweed	JK17	SK 36168 40011	Small stand, approximately 20m^2 in area, Within 50m of the proposed scheme boundary, on Network Rail land.
Japanese knotweed	JK18	SK 36199 40011	Small stand, approximately 10m^2 in area, within the proposed scheme boundary, on Network Rail land.
Japanese knotweed	JK19	SK 36439 39972	Small immature stand on footpath – regrowth in area previously cleared for pinch point scheme.
Japanese knotweed	JK20	SK 36132 40504	Large stand, approx. 700m^2 in area. Very mature. Within the proposed scheme boundary.
Japanese knotweed	JK21	SK 36236 40482	Small stand, approximately 20m^2 in area, within 50m of the proposed scheme boundary, likely to spread.
Giant knotweed	GK1	SK 35920 40025	Mature stand on bank of River Derwent. Within the proposed scheme boundary, high risk of dispersal due to proximity to watercourse.

Species	Code	Grid reference	Notes
Giant knotweed	GK2	SK 35946 40066	Mature stand on bank of River Derwent. Within the proposed scheme boundary, high risk of dispersal due to proximity to watercourse.
Giant knotweed	GK3	SK 36159 39946	Small stand, approximately 10m^2 in area. Immature stand, within 50m of the proposed scheme boundary. On Talbot Turf Farm land.
Himalayan balsam	HB1	SK 32807 36117 (approx.)	Dense growth present throughout the banks of the watercourses within the A38 Kingsway junction island. Within the proposed scheme boundary.
Himalayan balsam	HB2	SK 32699 35989 (approx.)	Dense growth present throughout the banks of the watercourses within the A38 central reservation south of the Kingsway junction. Within the proposed scheme boundary.
Himalayan balsam	HB3	SK 32589 35721	Dense growth present along the banks of Bramble Brook, within the proposed scheme boundary.
Himalayan balsam	HB4	SK 32301 35564	Dense growth present along the banks of Bramble Brook, within the proposed scheme boundary.
Himalayan balsam	HB5	SK 33956 36982	Sporadic growth along Mill Dam banks. Now under management by Earl of Harrington SAC. Within the proposed scheme boundary.
Himalayan balsam	HB6	SK 35884 40090	Extensive growth present throughout along the banks of the River Derwent. Within the proposed scheme boundary.
Himalayan balsam	HB7	SK 35888 39936	Extensive growth present along the banks of the River Derwent. Within the proposed scheme boundary.
Himalayan balsam	HB8	SK 36133 40121	Sporadic growth adjacent to rail line boundary fence, within the proposed scheme boundary.
Himalayan balsam	HB9	SK 36182 39847	Extensive growth along rail line in wetted area. Within 50m of the proposed scheme boundary.
Himalayan balsam	HB10	SK 36334 39668	Extensive growth present along the banks of Watermeadows Ditch, within 50m of the proposed scheme boundary (this area is downstream of the proposed scheme boundary and is unlikely to pose any constraint to the proposed scheme).
Himalayan balsam	HB11	SK 36412 39834	Extensive growth present along the banks of Dam Brook and extending into field to east, within the proposed scheme boundary.

Species	Code	Grid reference	Notes
Himalayan balsam	HB12	SK 36520 40025	Extensive growth present along the banks of Boosemoor/ Dam Brook and extending into field to south, within the proposed scheme boundary.
Himalayan balsam	HB13	SK 36631 40186	Extensive growth present along the channel of heavily schemed un-named brook and extending into fields to north, within the proposed scheme boundary.
Himalayan balsam	HB14	SK 36487 40225	Extensive growth present along the channel of a remnant section of Derby Canal, canal now derelict. Within 50m of the proposed scheme boundary.
Himalayan balsam	HB15	SK 36419 40254	Extensive growth present along the channel of heavily silted un-named brook and extending into fields to west, within 50m of the proposed scheme boundary.
Himalayan balsam	HB16	SK 36229 40549	Extensive growth present along the channel of ditch Pb1 and Severn Trent settling lagoons, within 50m of the proposed scheme boundary.
Himalayan balsam	HB17	SK 35605 41457	Extensive growth present along the banks of the River Derwent. Within 50m of the proposed scheme boundary.
Himalayan balsam	HB18	SK 36118 40844	Extensive growth present along the channel of heavily silted un-named brook and extending into fields to south, within the proposed scheme boundary.
Himalayan balsam	HB19	SK 35963 40801	Extensive growth present along the banks of the River Derwent and surrounding Severn Trent abstraction intake. Within the proposed scheme boundary.
Himalayan balsam	HB20	SK 33750 37390	Extensive growth present throughout along the banks of Markeaton Lake. Within the proposed scheme boundary.
Himalayan balsam	HB21	SK 33681 37683	Extensive growth present throughout along the banks of Markeaton Brook. Within 50m of the proposed scheme boundary.
Himalayan balsam	HB22	SK 36290 39956	Extensive growth throughout field margins. Within the proposed scheme boundary.
Variegated Yellow Archangel *Lamiastrum galeobdolon subsp. argentum*	VA1	SK 36448 40059	Dense growth, within the proposed scheme boundary.
Variegated yellow archangel	VA2	SK 35047 39190	Small stand, within 50m of the proposed scheme boundary. Likely garden escape.

Species	Code	Grid reference	Notes
New Zealand pigmyweed	NZP1	SK 36291 39893	Extensive area dominating the open ground flora in this field within the proposed scheme boundary.
Cherry laurel* *Prunus laurocerasus*	CL1	SK 32978 35970	Planted extensively along Kingsway Hospital access road, within 50m of the proposed scheme.
Cherry Laurel*	CL2	SK 32896 36001	Dense growth along Kingsway Road verges, within 50m of the proposed scheme.
Cherry Laurel*	CL3	SK 32639 35997	Present within the proposed scheme, at Kingsway South island.
Montbretia *Crocosmia x crocosmiiflora*	CR1	SK 35031 39176	Small stand, within 50m of scheme boundary. Likely garden escape.
Snowberry* *Symphoricarpos album*	SN1	SK 34988 39146	Small stand, within 50m of scheme boundary. Likely garden escape.

* Not Schedule 9 species, however this species is listed on the Great Britain Invasive Non-Native Species Secretariat

Appendix E Target Notes

N	Grid reference	Description	Photograph
1	SK 32170 35371	No access but flyover visible from underneath via the carriageway. Structure with tight seals. No PRF for bats recorded.	No photo available
2	SK 32234 35527	Broadleaved Woodland. Species present were dominated by ash and ivy with occasional hazel (old coppice stools), hawthorn *Crataegus monogyna* and bramble. Stands of Himalayan balsam were also recorded.	
3	SK 32260 35567	Soil mound and bare soil around – likely due to disturbance caused as a result of high levels of access by public (dog walkers etc.)	

N	Grid reference	Description	Photograph
4	SK 32418 35576	Managed and mown semi-improved grassland surrounding balancing pond. Species present are typical of semi-improved grassland and include common bent, rough meadow grass, creeping buttercup.	
5	SK 32306 35650	Unmanaged species-poor semi-improved grassland areas within a much wider area of amenity grassland. Planted dogwood was also present.	
6	SK 32484 35600	Yorkshire fog and false oat grass with approximately 15% encroaching scrub, comprising mainly hawthorn. Approximately 50% of the area also comprised tall herb dominated by great willowherb, rosebay willowherb and ragwort *Senecio jacobaea*.	

N	Grid reference	Description	Photograph
7	SK 32443 35649	In this approximate 1.1 ha area Yorkshire-fog dominates with lesser amounts of false oat grass and frequent meadow foxtail and great willowherb. Some hawthorn scrub is present. Tufted vetch, smooth tare and field horsetail *Equisetum arvense* are locally frequent, along with couch grass *Elytrigia repens*, and smooth meadow-grass. A range of species occurs in lesser amounts, including sweet vernal-grass *Anthoxanthum odoratum*, cock's-foot and common vetch. The presence of wild angelica *Angelica sylvestris*, common sedge *Carex nigra*, tufted hair-grass and hard rush *Juncus inflexus* indicates damp conditions.	
8	SK 32552 35657	Yorkshire fog and false oat grass with approximately 30% encroaching scrub, comprising mainly hawthorn and bramble. The habitat includes approximately 50% tall herbs, with species present including great willowherb, rosebay willowherb, and ragwort.	
9	SK 32381 35734	Mature cherry *Prunus* sp. and blackthorn in scrub thicket with semi-improved grassland.	

N	Grid reference	Description	Photograph
10	SK 32307 35749	Young tree and shrub plantation and unmanaged grassland within amenity grassland Creeping bent *Agrostis stolonifera* was recorded in high abundance in this area. Pedunculate oak, elder and blackthorn *Prunus spinosa* in planting.	
11	SK 32530 35821	This is an area of semi-mature, semi-natural woodland with a densely shaded, species- poor understorey. The species recorded include dogwood hawthorn, ash, ivy *Hedera helix*, Himalayan balsam, poplar species *Populus spp*, pedunculate oak bramble, crack-willow, elder and common nettle.	
12	SK 32637 35823	Field layer under horse chestnut *Aesculus hippocastanum* trees: herb Bennett *Geum urbanum*, saplings field maple, hawthorn, holly and ash and bare ground.	

N	Grid reference	Description	Photograph
13	SK 32481 35865	Broadleaved woodland plantation: Species included beech, ash, pedunculate oak, bramble, blackthorn and horse chestnut.	
14	SK 32476 35891	Tall herbs along dry drain, species present included false-brome *Brachypodium sylvaticum*, rosebay willowherb, great willow herb, bramble, raspberry *Rubus idaeus* and nettle with occasional *Salix sp.* scrub.	
15	SK 32153 35894	Dense tall scrub Species recorded included Occasional: hawthorn, ash. Dominant: blackthorn, goat willow. Broadleaved woodland beyond to the west.	No photo available
16	SK 32173 35913	Broad-leaved woodland with mature white poplar *Populus alba* present, along with Norway maple, ash, ivy, *Prunus sp*., blackthorn and pedunculate oak.	

N	Grid reference	Description	Photograph
17	SK 32189 35930	Broadleaved woodland semi-natural. Species included Occasional: hazel, ash, blackthorn, willow sp., and wych elm *Ulmus glabra*, with ground habitat of common nettle, field woundwort *Stachys arvensis*, ivy and raspberry.	
18	SK 32630 35924	This area forms part of the A38 Roundabout Local Wildlife Site. This physically isolated, approximate 0.40ha area lying between the A38 carriageways. It is neutral grassland that is suffering from extensive scrub encroachment due to lack of management. The grassland is drier at the eastern edge, where open herb-rich patches occur and this is replaced in the western half by a damper sward which is typically dominated by species such as meadowsweet, with other damp indicators such as soft-rush and wild angelica. Red fescue is dominant in much of the open sward, with lesser amounts of creeping bent, false oat-grass, cock's-foot, Yorkshire-fog and smooth meadow-grass. Herbs recorded include black knapweed *Centaurea nigra*, meadow vetchling, zigzag clover, oxeye daisy, spotted-orchid *Dactylorhiza fuchsii*, ribwort plantain, meadow buttercup, perforate St john's wort *Hypericum perforatum.*	

N	Grid reference	Description	Photograph
19	SK 32507 35937	Broad-leaved Woodland Plantation Dominant: ivy, Occasional: horse-chestnut, dogwood, hogweed, poplar species *Populus* spp., cherry *Prunus* sp., raspberry, black pine *Pinus nigra*.	
20	SK 32774 35936	This is an approximate 0.40 ha area of tall, unmanaged, neutral grassland that is dominated by Yorkshire-fog with locally dominant rosebay willowherb. Locally frequent species include false oat-grass red fescue and meadow buttercup. Occasional common bent, creeping bent meadow foxtail, cow parsley, cock's-foot hogweed perennial rye-grass, ribwort plantain smooth meadow-grass *Poa pratensis* occur. Smaller herbs are rarer, due to the tall coarse sward and include common mouse-ear, meadow crane's-bill, goat's-beard, selfheal and red clover.	
21	SK 32528 35973	Amenity grassland with scattered immature trees and scrub.	

N	Grid reference	Description	Photograph
22	SK 32383 35976	Amenity grassland with scattered immature trees and scrub.	
23	SK 32594 36021	Large pile of deadwood and standing deadwood. Invertebrate interest for saproxylic species.	
24	SK 32558 36038	Dismantled railway; bed is wet, with a slow flowing very shallow stream. This stream is highly influenced by rainfall and dries up during extended dry periods.	
25	SK 32826 36036	This tall unmanaged grassland occurs by the Kingsway roundabout and covers approximate 0.32 ha in area. The area forms part of the A38 Roundabout LWS. It is dominated by false oat-grass, with abundant red clover and frequent cow parsley, red fescue, hogweed and Yorkshire-fog, with lesser amounts of common mouse-ear, creeping thistle, cock's-foot, ribwort plantain and smooth meadow-grass. It supports a herb component typical of neutral grassland, including meadow buttercup, creeping buttercup, goat's-beard, yarrow, common knapweed, oxeye daisy and tufted vetch.	

N	Grid reference	Description	Photograph
26	SK 32816 36068	This is an area of dense semi-mature broad-leaved woodland with poor species diversity in the understory. This woodland has a range of native and non-native tree and shrub species, including field maple, Norway maple, sycamore *Acer pseudoplatanus*, alder *Alnus glutinosa*, hawthorn, ash, poplar species, *Prunus* species, pedunculate oak, osier *Salix viminalis*, dog-rose *Rosa canina*, and bramble, overtopping a tall. species-poor ground-flora dominated by Himalayan balsam, common nettle and great willowherb.	
27	SK 32680 36107	Broad-leaved Woodland Plantation Species include Occasional: field maple, hawthorn, bramble, elder, and common nettle.	
28	SK 32968 36424	Semi mature silver birch *Betula pendula*, willow and cherry forming an area of semi-natural woodland on a south facing slope.	No photo available
29	SK 33364 36834	This is an approximate 1.04 ha area of managed grassland within the grounds of the Territorial Army Site. It is largely grass–dominated, with herbs making up a much smaller proportion of the sward. There was a lot of grass thatch on the ground from mowing on Site. Red fescue is prominent in the sward with lesser amounts of common bent, false oat-grass, creeping thistle, meadow foxtail, cock's-foot, perennial rye-grass, couch grass and creeping bent. Herbs recorded include common knapweed, cleavers, selfheal, meadow vetchling local stands of fox-and-cubs and creeping cinquefoil.	

N	Grid reference	Description	Photograph
30	SK 33841 37293	Herbs noted include black medick, hogweed, creeping cinquefoil, meadow buttercup, creeping buttercup, dandelion *Taraxacum officinale* agg., and red clover. This is an area of approximately 2.03 ha of mown amenity grassland at Derby University. It is not species-rich and is dominated by perennial rye-grass, with lesser amounts of grasses such as cock's-foot, Yorkshire-fog and smooth meadow-grass.	
31	SK 33544 37448	Markeaton Park included a wide range of native and non-native tree species with pedunculate oak, ash, beech, yew and horse chestnut widely recorded, and less common records for Norway maple and Scots pine. The trees varied in age structure, but many mature trees were present, including some veteran trees as well as others, which had been recently planted. Trees also fringed the lakes and included common lime, sycamore, alder, crack-willow, grey willow, yew, weeping willow, ash and horse chestnut, with an understorey of hawthorn, elder scrub and dogwood.	No photo available
32	SK 33703 37552	Amenity grassland is the dominant habitat type within Markeaton Park with the sward dominated by perennial rye-grass with occasional creeping bent and cock's-foot. Typical herbaceous species included common daisy, ribwort plantain, greater plantain *Plantago major*, dandelion, creeping buttercup, common field speedwell *Veronica persica*, white clover, cleavers and common mouse-ear.	

N	Grid reference	Description	Photograph
33	SK 35049 39216	Broad leaved plantation dominated by sycamore, silver birch, hawthorn, hazel, cherry, elder. Understorey dominated by ivy with male fern *Dryopteris felis-mas*, bramble, cleavers, and wood avens *Geum urbanum*. A small patch of Canadian goldenrod *Solidago canadensis*, dog rose, hedge woundwort and raspberry is also present.	
34	SK 35823 39869	Broadleaved woodland dominated by ash and hawthorn. The understorey and ground flora are heavily browsed by livestock.	
35	SK 35980 39887	Line of semi-mature trees with alder, Himalayan balsam, crack-willow, osier, common nettle. Dead trees with high potential bat roost features are present.	

N	Grid reference	Description	Photograph
36	SK 35779 39893	H11 - Hawthorn hedge along the roadside - no trees.	
37	SK 35925 39891	Area sown since 2015. Improved grassland west of alder and willow treeline (ref. TN 35).	
38	SK 35843 39918	Tall ruderals and scrub with bramble, common nettle and Himalayan balsam.	
39	SK 35833 39951	Riverside scrub and tall ruderals.	

N	Grid reference	Description	Photograph
40	SK 36059 39961	Broadleaved woodland plantation by road dominated by ash and hawthorn.	
41	SK 35842 39998	Willow dominated woodland near to A38, very dense ground flora with nettle abundant.	
42	SK 35853 40079	Rabbit activity, several holes. Collapsed and active holes present.	
43	SK 35847 40144	Marshy grassland choked by reedmace, meadowsweet *Filipendula ulmaria* and ornamental non-native reed sweet grasses *Glyceria spp*. No open water present.	

N	Grid reference	Description	Photograph
44	SK 35836 40183	Bordered by domestic gardens with native and ornamental trees; ash, willow, Norway spruce *Picea abies* and sycamore. Himalayan balsam present in high abundance throughout.	
45	SK 35877 40177	Tall ruderal dominated area. Species included common nettle, great willowherb, bramble, comfrey *Symphytum officinale*, and creeping bent.	
46	SK 35938 40156	Tall ruderals with occasional scrub. Species include dominant nettle, with occasional hawthorn, Himalayan balsam, elder and Russian comfrey *Symphytum × uplandicum*.	
47	SK 35874 40264	Poor semi-improved grassland. Individual trees along bankside dominated by alder and willow.	

N	Grid reference	Description	Photograph
48	SK 35988 40159	House and gardens. Closely mown amenity grassland with shrubs and trees. Riverside tree species, sycamore, alder and willow. Riverbank consists of common nettle and great willow herb.	
49	SK 36062 40123	Dense scrub along roadside. Species include hawthorn, sycamore, butterfly bush *Buddleia davidii* with common nettle.	
50	SK 36073 40063	Talbot Turf Farm topsoil works area.	
51	SK 36023 40054	Broadleaved Woodland Plantation. Species include dominant ash, hawthorn with abundant elder. Understorey of semi improved grassland.	

N	Grid reference	Description	Photograph
52	SK 35975 40055	This is a horse grazed and species-poor neutral grassland of approximately 0.31 ha in area located by the River Derwent, with a large component of perennial rye-grass, along with grasses such as cock's-foot, red fescue, smooth meadow-grass, meadow foxtail, and false oat-grass. Stands of common nettle have developed in response to horse-grazing. Other herbs recorded include frequent white clover yarrow, ground-elder *Aegopodium podagraria*, common mouse-ear, hogweed and meadow buttercup. The invasive species Giant knotweed *Fallopia sachalinensis* borders the grassland fence along the river edge.	
53	SK 35269 40194	Amenity grassland and mix of native and non-native woody species on small road junction	
54	SK 36309 40011	Semi-improved grassland dominated by young herbs with small amounts of grass cover. It includes early colonisers such as tall rocket *Sisymbrium altissimus*, groundsel *Senecio vulgaris* and field madder *Sherardia arvensis*. Herb species recorded include oxeye daisy, common knapweed, common mouse-ear, creeping thistle, dove's-foot crane's-bill *Geranium molle*, meadow buttercup, ribwort plantain, creeping buttercup, wild mignonette *Reseda lutea* and, common vetch. Grasses recorded included cock's-foot, red fescue, Yorkshire-fog, smooth and annual meadow-grass. Vigorous perennial weeds such as broad-leaved dock *Rumex obtusifolius* and common nettle.	

N	Grid reference	Description	Photograph
55	SK 36311 39898	This is a horse-grazed field with perennial weeds, such as common nettle, creeping thistle and spear thistle. The field is variously inundated through the seasons and the invasive New-Zealand pigmyweed is locally dominant and spreading. There is an area of open water with a draw down zone at the southern end of the field. Creeping bent and red fescue dominate the grasses, with lesser amounts of marsh foxtail Yorkshire-fog, cock's-foot and smooth meadow-grass, perennial rye-grass, daisy, silverweed, common ragwort, creeping buttercup, meadow buttercup, ribwort plantain, meadowsweet, meadow crane's-bill and red clover.	
56	SK 36432 39938	The area around and the A38 ditch banks are vegetated by a tall herb community with dominant common nettle, locally abundant false oat-grass and a range of occasional species including hemlock *Conium maculatum,* cleavers, Yorkshire-fog, rough meadow-grass, water figwort, red campion *Silene dioica* and hogweed. A small stand of Japanese knotweed *Fallopia japonica* is present in this area.	
57	SK 36516 39902	Grassland largely dominated by Yorkshire-fog, with lesser amounts of other robust grass species. Herbs are a very minor component of the sward. Along the margins, common bent is locally dominant with abundant false oat-grass and frequent meadow foxtail, smooth meadow-grass, cock's-foot and perennial rye-grass. Herbs recorded included cleavers, hogweed, oxeye daisy, meadow buttercup, common vetch and bush vetch *Vicia sepium*.	

N	Grid reference	Description	Photograph
58	SK 36646 40079	Broadleaf plantation woodland planted in 2000, dominated with hazel, cleavers, hogweed, rough meadow-grass, hedge woundwort and common nettles. Other species recorded were: Ash, rowan *Sorbus aucuparia*, oak, field maple, yew and blackthorn.	
59	SK 36588 40215	The main sward components are soft rush *Juncus effusus*, meadow foxtail, tufted hair-grass, Yorkshire-fog and creeping buttercup, common couch. Creeping bent and smooth meadow-grass are also widespread and floating sweet-grass *Glyceria fluitans* dominates in the wetter hollows. Meadow fescue *Schedonorus pratensis* is occasional. The herb component is quite varied and includes a range of species associated with damper areas such as common marsh bedstraw *Galium palustre*, wild angelica, purple-loosestrife *Lythrum salicaria*, water figwort and bog stitchwort *Stellaria alsine*. Common spotted-orchid was recorded rarely and other herb records made included meadow buttercup, wavy bitter-cress *Cardamine flexuosa*, common mouse-ear, field horsetail and clustered dock *Rumex comglomeratus.*	
60	SK 36311 40306	Mosaic of disturbed ground which has established on a restored landfill site. Some areas were open, short rabbit grazed herb-dominated and other areas were taller and grass dominated. There were stands of scrub included bramble, rose, and willow; as well as large stands of ruderals such as rosebay willow herb, stinging nettle and wild teasel. The invasive non-native Japanese knotweed was growing along the western part of the area and Himalayan balsam was also	

N	Grid reference	Description	Photograph
		recorded.	
61	SK 36058 40343	Perennial rye-grass field.	No photo available
62	SK 36212 40381	Unmanaged, poor semi-improved grassland with some more species-rich areas of short rabbit-grazed grassland. Much vehicle disturbance. Extensive scrub encroachment.	
63	SK 36257 40553	Broad-leaved woodland dominated by crack willow over wet ditch.	
64	SK 35981 40714	Area of broad-leaved woodland dominated by ash, silver birch and hazel with a narrow, single lane, approximately 3-m wide, providing access to the STW buildings, with a metal gate blocking access to a concrete bridge going over the Bottle Brook.	

N	Grid reference	Description	Photograph
65	SK 36646 40675	This unmanaged, species-rich grassland sward covering approximately 0.24 ha occurs on a steep slope near a sewage works on the A38. There is extensive scrub and tree encroachment from species including ash and common hawthorn. It is dominated by tall grasses, but also supports a good range of indicator grassland herb species and few weed species. False oat-grass dominates, with frequent Yorkshire-fog. Other grass records include cock's-foot, red fescue, smooth meadow-grass, common bent and the less widely recorded yellow oat-grass *Trisetum flavescens*, Locally frequent oxeye daisy occurs with scattered meadow vetchling, common bird's-foot-trefoil, lupin, burnet-saxifrage, meadow buttercup, common sorrel,, goat's-beard and smooth tare, yarrow, bladder campion.	
66	SK 36136 40773	Solar farm with managed semi-improved grassland. High levels of Himalayan balsam border this area.	
67	SK 36088 40865	Willow dominated woodland parcel. Woodland floor covered in common nettle and himalayan balsam.	

N	Grid reference	Description	Photograph
68	SK 35871 40985	Rabbit holes evident within semi-improved grassland between the River Derwent and Railway embankments.	
69	SK 35729 41144	Poor semi-improved grassland dominated this area and was grazed by sheep and cattle. Vegetation included abundant broad-leaved dock with crested dog's-tail, annual meadow-grass, rough meadow-grass, perennial rye-grass and creeping buttercup.	
70	SK 35882 41248	Poor semi-improved grassland dominated this area and was grazed by sheep and cattle. Vegetation included abundant broad-leaved dock, with crested dog's-tail, annual meadow-grass, rough meadow-grass, perennial rye-grass and creeping buttercup.	
71		Yorkshire fog and false oat grass with occasional great willowherb, rosebay willowherb, ragwort and rare early-spotted orchids.	

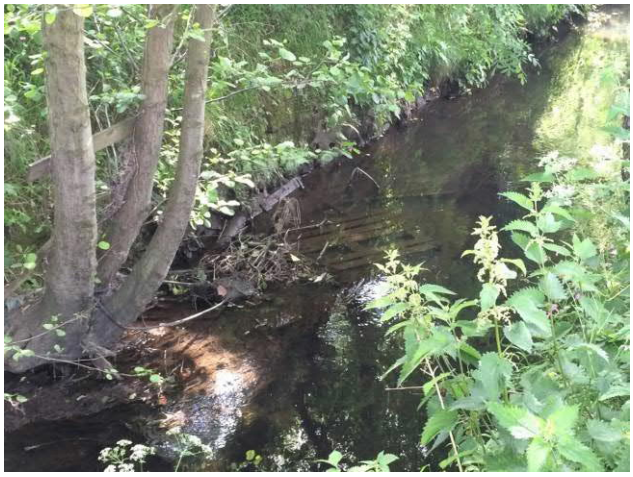
N	Grid reference	Description	Photograph
72		Perennial rye grass dominated pasture with abundant Yorkshire-fog.	
73		Turf farm.	

Appendix F Watercourse Photographs

Watercourse	Photograph
Bramble Brook: Dry northern channel upstream of A38 road bridge.	
Bramble Brook: Shaded channel within Kingsway Junction south island.	
Bramble Brook: Bank Reinforcement within Kingsway Junction south island.	

Watercourse	Photograph
Markeaton Brook: General example of Brook Habitat.	
Markeaton Brook: Example of culverts.	
Markeaton Brook: Bank reinforcement found between culvert lengths.	

Watercourse	Photograph
Middle Brook: Shaded channel.	
Watermeadows Ditch: Overgrown section with shallow banks.	
Dam Brook: Example of Brook Habitat.	

Watercourse	Photograph
Boosemoor Brook: Shaded tree and scrub lined Channel.	
River Derwent: Example of river habitat.	
Bottle Brook: Example of brook habitat.	

Watercourse	Photograph
Bottle Brook: Example of bed substrate.	
Bottle Brook: Example of bank reinforcement.	

Appendix G GCN Habitat Suitability Index

Habitat Suitability Index (HSI)

The HSI is a mathematical model that incorporates ten suitability indices, all of which are thought to influence the likelihood of the presence of GCN in a water body. The output of an HSI assessment is a score between 0 (unsuitable) and 1 (optimal). The HSI is a tool for assessing the suitability of water bodies for GCN; however, it is not a substitute for surveys. It does provide useful baseline data for the creation of new ponds, or the restoration of existing ponds. The HSI is calculated using the following formula (*Oldham et al*., 2000):

$HSI = (SI_1 \times SI_2 \times SI_3 \times SI_4 \times SI_5 \times SI_6 \times SI_7 \times SI_8 \times SI_9 \times SI_{10})^{1/10}$, where SI represent Suitability Indices, as detailed in the following table.

Table G1: Habitat Suitability Indices

Suitability Index	
SI_1	Location
SI_2	Pond Area
SI_3	Pond Drying
SI_4	Water Quality
SI_5	Shade
SI_6	Fowl
SI_7	Fish
SI_8	Ponds Within 1km
SI_9	Terrestrial Habitat
SI_{10}	Macrophyte Cover

Based on the categorisation of HSI scores, a pond's suitability for GCN is rated as follows:

- <0.5 = poor,
- 0.5 – 0.59 = below average,
- 0.6 – 0.69 = average,
- 0.7 – 0.79 = good,
- >0.8 = excellent.

Table G2: HSI calculation results for ponds located within or up to 50m from the proposed scheme boundary (excluding fish ponds)

		Pa1		Pa2		Pa3	
		Results	**Scores**	**Results**	**Scores**	**Results**	**Scores**
SI_1	**Location**	A	1.00	A	1.00	A	1.00
SI_2	**Pond area**	2000m²	0.80	1500m²	0.88	150m²	0.30
SI_3	**Pond drying**	Never	0.90	Never	0.90	Never	0.90
SI_4	**Water quality**	Good	1.00	Good	1.00	Moderate	0.67
SI_5	**Shoreline shade**	10%	1.00	20%	1.00	10%	1.00
SI_6	**Fowl**	Minor	0.67	Minor	0.67	Minor	0.67
SI_7	**Fish**	Absent	1.00	Absent	1.00	Absent	1.00
SI_8	**Pound count**	4	0.72	4	0.72	4	0.72
SI_9	**Terrestrial habitat**	Good	1.00	Good	1.00	Good	1.00
SI_{10}	**Macrophytes**	60%	0.90	30%	0.60	20%	0.50
	HSI		**0.89**		**0.86**		**0.73**
	Pond suitability		**Excellent**		**Excellent**		**Good**

		Pa4		Pa5		Pa9	
		Results	**Scores**	**Results**	**Scores**	**Results**	**Scores**
SI_1	**Location**	A	1.00	A	1.00	A	1.00
SI_2	**Pond area**	20m²	0.04	450m²	0.90	200m²	0.40
SI_3	**Pond drying**	Never	0.90	Never	0.90	Never	0.90
SI_4	**Water quality**	Good	1.00	Moderate	0.67	Moderate	0.67
SI_5	**Shoreline shade**	0%	1.00	10%	1.00	100%	0.20
SI_6	**Fowl**	Minor	0.67	Minor	0.67	Minor	0.67
SI_7	**Fish**	Absent	1.00	Absent	1.00	Absent	1.00
SI_8	**Pound count**	5	0.78	8	0.88	1	0.38
SI_9	**Terrestrial habitat**	Good	1.00	Good	1.00	Good	1.00
SI_{10}	**Macrophytes**	30%	0.60	40%	0.70	60%	0.90
	HSI		**0.64**		**0.86**		**0.64**
	Pond suitability		**Average**		**Excellent**		**Average**

		Pa12		Pb1		Pb4	
		Results	**Scores**	**Results**	**Scores**	**Results**	**Scores**
SI_1	**Location**	A	1.00	A	1.00	A	1.00
SI_2	**Pond area**	1000m²	0.95	1000m²	0.95	300m²	0.60
SI_3	**Pond drying**	Rarely	1.00	Never	0.90	Never	0.90
SI_4	**Water quality**	Moderate	0.67	Moderate	0.67	Good	1.00
SI_5	**Shoreline shade**	5%	1.00	90%	0.40	70%	0.80
SI_6	**Fowl**	Absent	1.00	Minor	0.67	Major	0.01
SI_7	**Fish**	Absent	1.00	Absent	1.00	Absent	1.00
SI_8	**Pound count**	8	0.88	3	0.65	4	0.72
SI_9	**Terrestrial habitat**	Good	1.00	Good	1.00	Moderate	0.67
SI_{10}	**Macrophytes**	20%	0.50	50%	0.80	0%	0.30
HSI			**0.88**		**0.78**		**0.48**
Pond suitability			**Excellent**		**Good**		**Poor**

		Pb5		Pb6		Pb8	
		Results	**Scores**	**Results**	**Scores**	**Results**	**Scores**
SI_1	**Location**	A	1.00	A	1.00	A	1.00
SI_2	**Pond area**	100m²	0.20	300m²	0.60	200m²	0.40
SI_3	**Pond drying**	Annually	0.10	Rarely	1.00	Sometimes	0.50
SI_4	**Water quality**	Poor	0.33	Moderate	0.67	Poor	0.33
SI_5	**Shoreline shade**	50%	1.00	90%	0.40	95%	0.30
SI_6	**Fowl**	Absent	1.00	Absent	1.00	Absent	1.00
SI_7	**Fish**	Absent	1.00	Absent	1.00	Absent	1.00
SI_8	**Pound count**	4	0.72	4	0.72	3	0.65
SI_9	**Terrestrial habitat**	Good	1.00	Good	1.00	Good	1.00
SI_{10}	**Macrophytes**	30%	0.60	0%	0.30	30%	0.60
HSI			**0.56**		**0.71**		**0.61**
Pond suitability			**Below average**		**Good**		**Average**

		Pb9		Pc59		Pc61	
		Results	**Scores**	**Results**	**Scores**	**Results**	**Scores**
SI_1	**Location**	A	1.00	A	1.00	A	1.00

		Pb9		Pc59		Pc61	
		Results	**Scores**	**Results**	**Scores**	**Results**	**Scores**
SI_2	**Pond area**	4000m²	0.49	2 m²	0.00	3 m²	0.01
SI_3	**Pond drying**	Annually	0.10	Never	0.90	Never	0.90
SI_4	**Water quality**	Moderate	0.67	Poor	0.33	Poor	0.33
SI_5	**Shoreline shade**	10%	1.00	100%	0.20	100%	0.20
SI_6	**Fowl**	Major	0.01	Absent	1.00	Absent	1.00
SI_7	**Fish**	Absent	1.00	Absent	1.00	Absent	1.00
SI_8	**Pound count**	1	0.38	5	0.78	5	0.78
SI_9	**Terrestrial habitat**	Good	1.00	Moderate	0.67	Moderate	0.67
SI_{10}	**Macrophytes**	20%	0.50	0%	0.30	30%	0.60
HSI			**0.38**		**0.36**		**0.40**
Pond suitability			**Poor**		**Poor**		**Poor**

		Pc66		Pc12		Pc14	
		Results	**Scores**	**Results**	**Scores**	**Results**	**Scores**
SI_1	**Location**	A	1.00	A	1.00	A	1.00
SI_2	**Pond area**	1000 m²	0.95	120 m²	0.24	85 m²	0.17
SI_3	**Pond drying**	Never	0.90	Rarely	1.00	Never	0.90
SI_4	**Water quality**	Moderate	0.67	Moderate	0.67	Moderate	0.67
SI_5	**Shoreline shade**	0%	1.00	70%	0.80	60%	1.00
SI_6	**Fowl**	Minor	0.67	Absent	1.00	Minor	0.67
SI_7	**Fish**	Major	0.01	Absent	1.00	Absent	1.00
SI_8	**Pound count**	4	0.72	7	0.85	12	0.98
SI_9	**Terrestrial habitat**	Poor	0.33	Good	1.00	Moderate	0.67
SI_{10}	**Macrophytes**	20%	0.50	40%	0.70	10%	0.40
HSI			**0.46**		**0.77**		**0.67**
Pond suitability			**Poor**		**Good**		**Average**

		Pc16		Pc63	
		Results	**Scores**	**Results**	**Scores**
SI_1	**Location**	A	1.00	A	1.00
SI_2	**Pond area**	6 m²	0.01	130 m²	0.26
SI_3	**Pond drying**	Never	0.90	Never	0.90
SI_4	**Water quality**	Good	1.00	Moderate	0.67
SI_5	**Shoreline shade**	0%	1.00	0%	1.00
SI_6	**Fowl**	Absent	1.00	Minor	0.67
SI_7	**Fish**	Absent	1.00	Absent	1.00
SI_8	**Pound count**	12	0.98	12	0.98
SI_9	**Terrestrial habitat**	Moderate	0.67	Moderate	0.67
SI_{10}	**Macrophytes**	10%	0.40	30%	0.60
HSI			**0.56**		**0.73**
Pond suitability			**Below Average**		**Good**

Appendix H Bat Roost Suitability Assessment

Table H1: Potential Roosting Features within the Proposed Scheme Boundary

Feature	Grid reference	Previous survey	Bat Roost Potential (Hund, 2012)	Roost identified in 2015	PRF 2017
Structures					
B1	SK 36184 39988	Bat surveys 2015	High	No	High
B2	SK 36097 39982	Bat surveys 2015	Confirmed	Yes	Confirmed
B3	SK 35871 39946	Bat surveys 2015	Confirmed	Yes	Confirmed
B4	SK 32941 36380	Bat surveys 2015	Low	No	Low
B5	SK 32894 36394	Bat surveys 2015	Low	No	Low
B6	SK 32917 36142	Bat surveys 2015	Moderate	No	Moderate
B7	SK 33355 37008	Bat surveys 2015	Moderate	No	Moderate
B8	SK 33702 37108				Unknown
B9	SK 35999 40152				Unknown
B10					Unknown
B11	SK 35592 41515	Confirmed bat roost - 2016	Confirmed	Yes	Confirmed
B12	SK 35718 41324				Unknown
B13	SK 35609 41493				Unknown
B14	SK 35848 41079				Unknown
Trees					
M1	SK 33709 37134	Bat surveys 2015 (Group T8)	Possible roost	Possible	Possible roost
M2	SK 33713 37133	Bat surveys 2015 (Group T8)	High	No	Moderate
M3	SK 33719 37131	Bat surveys 2015 (Group T8)	High	No	Moderate
M4	SK 33725 37121	Bat surveys 2015 (Group T8)	High	No	Moderate
M6	SK 33726 37169	Bat surveys 2015 (Group T8)	High	No	Moderate
M7	SK 33457 37066	Bat survey 2015 (Group T12)	Moderate	No	Moderate

Feature	Grid reference	Previous survey	Bat Roost Potential (Hund, 2012)	Roost identified in 2015	PRF 2017
M8	SK 33448 37082				Moderate
M9	SK 33453 37066	Bat survey 2015 (Group T12)	Moderate	No	Moderate
M10	SK 33489 37089				Moderate
M11	SK 33442 37089				Moderate
M12	SK 33442 37096				High
M13	SK 33550 37122				Low
M14	SK 33552 37137				Moderate
M15	SK 33570 37126				Moderate
M16	SK 33572 37132				Low
M17	SK 33586 37121	Bat survey 2015 (Group T11)	Moderate	No	Moderate
M18	SK 33591 37105				Low
M19	SK 33595 37117				Low
M20	SK 33603 37118	Bat survey 2015 (Group T11)	Moderate	No	Moderate
M21	SK 33623 37113				Low
M22	SK 33623 37118				Low
M23	SK 33655 37134				Moderate
M24	SK 33469 37113				Moderate
M25	SK 33469 37109				Low
M26	SK 33477 37094				Negligible
M27	SK 33500 37074				Low
M28	SK 33525 37078	Bat survey 2015 (Group T12)	Moderate	No	Moderate
M29	SK 33520 37038	Bat survey 2015 (Group T12)	Moderate	No	Moderate
M30	SK 33506 37097				Low
M31	SK 33515 37105	Bat survey 2015 (Group T11)	Moderate	No	Low
M32	SK 33515 37105	Bat survey 2015 (Group T11)	Moderate	No	Moderate
M33	SK 33515 37105	Bat survey 2015 (Group T11)	Moderate	No	Moderate

Feature	Grid reference	Previous survey	Bat Roost Potential (Hund, 2012)	Roost identified in 2015	PRF 2017
M34	SK 33532 37099	Bat survey 2015 (Group T11)	Moderate	No	Moderate
M35	SK 33533 37119	Bat survey 2015 (Group T11)	Moderate	No	Low
M36	SK 33752 37158	Bat surveys 2015 (Group T8)	High	No	High
M37	SK 33778 37098	Bat surveys 2015 (Group T8)	High	No	Moderate
M38	SK 33782 37129	Bat surveys 2015 (Group T8)	High	No	Moderate
M39	SK 33780 37184	Bat surveys 2015 (Group T9)	High	Yes	Low
M40	SK 33784 37182				Low
M41	SK 33785 37178				Low
M42	SK 33798 37146				Low
M43	SK 33773 37213	Bat surveys 2015 (Group T9)	High	No	Negligible
M44	SK 33774 37219	Bat surveys 2015 (Group T9)	High	No	Low
M45	SK 33776 37198	Bat surveys 2015 (Group T9)	High	No	Low
M46	SK 33796 37220				Moderate
M47	SK 33795 37215				Low
M48	SK 33799 37254				Low
M49	SK 33775 37215	Bat surveys 2015 (Group T9)	High	No	Low
M50	SK 33772 37209	Bat surveys 2015 (Group T9)	High	No	Low
M51	SK 33686 37188				Moderate
M52	SK 33722 37217				Low
M53	SK 33729 37229				Moderate
M54	SK 33743 37253				Low
M55	SK 33592 37155	Bat survey 2015 (T10)	High	No	High
T1	SK 36002 39901	Bat surveys 2015	Moderate	No	

Feature	Grid reference	Previous survey	Bat Roost Potential (Hund, 2012)	Roost identified in 2015	PRF 2017
T2	SK 32494 35879	Bat surveys 2015	Moderate	No	
T3	SK 33041 35921	Bat surveys 2015	Low	No	
T4	SK 32968 36025	Bat surveys 2015	Low	No	
T5	SK 32926 36098	Bat surveys 2015	Moderate	No	
T6	SK 32918 36187	Bat surveys 2015	Low	No	
T7	SK 33087 36562	Bat surveys 2015	Low	No	
T12	SK 33518 37084	Bat survey 2015 (Group T12)	Moderate	No	
T13	SK 33291 37050	Bat surveys 2015	Moderate	Yes	Negligible
T14	SK 32547 35766				Negligible
T14a	SK 32566 35768				Low
T15	SK 32513 35676				Low
T16	SK 35764 41305				Low
T16a	SK 35771 41290				Moderate
T17	SK 35975 41260				Negligible
T18	SK 35949 41288				Negligible
T19	SK 36026 41395				Negligible
T20	SK 35843 40114				Negligible
T21	SK 36665 39751				Unknown
T22	SK 36647 39721				Unknown
T23	SK 35660 41216				Low
T24	SK 35686 41236				Negligible
T25	SK 35646 41158				Low
T26	SK 35684 41117				Negligible
T27	SK 35968 40108				Negligible
T28	SK 35907 39796				Unknown
T29	SK 35713 39775				Unknown
T30	SK 35676 39775				Low
T31	SK 35649 39775				Moderate
T44	SK 33363 37071				Negligible

Feature	Grid reference	Previous survey	Bat Roost Potential (Hund, 2012)	Roost identified in 2015	PRF 2017
T56	SK 33458 37112				Low
T57	SK 33476 37101				Negligible
T60	SK 35717 41080				Negligible
T61	SK 35733 41060				Negligible
T65	SK 35900 40859				Low
T66	SK 35878 40842				Unknown
T67	SK 35880 40834				Unknown
T68	SK 35981 39889				Negligible
T69	SK 36007 39801				High
T70	SK 35945 39763				Unknown
T71	SK 35988 40201				Unknown
T72	SK 35230 39235				Low
T73	SK 35275 39424				Negligible
T74	SK 35288 39430				Low
T75	SK 35122 39180				Negligible
T76	SK 33469 37105				Negligible

Appendix I White-Clawed Crayfish Habitat Assessment

Table I1: Suitability for White-Clawed Crayfish for Watercourses Within (or within close proximity) of the Proposed Scheme Boundary

Watercourse	Suitability for White-clawed Crayfish
Bramble Brook	Bramble brook The lack of any in-channel refugia in the form of large boulders, cobbles and overhanging tree roots also made the habitat unsuitable for white-clawed crayfish.
Markeaton Brook	The invasive American signal crayfish were previously recorded by AECOM in 2015 at the north-western end Markeaton Lake at the inlet. The 2016 AECOM report (AECOM(m), A38 Derby Junctions White-Clawed Crayfish Survey Report Ref. No. 47071319-URS-05-RP-EN-017, 2016) concluded that it was highly likely that there is a strong correlation between the increasing numbers of signal crayfish (carriers of the well documented crayfish plague *Aphanomyces astaci*) and the absence of white-clawed crayfish downstream of Markeaton Park. This includes; the rest of Markeaton Lake, Mill Pond and Mill Dam, the connecting Middle Brook that flows into the lower Markeaton Brook. Markeaton Brook habitat is therefore no longer suitable for white-clawed crayfish and further surveys for this species have been scoped out.
Middle Brook	The habitat was sub-optimal for white-clawed crayfish due to the shaded nature of the channel and lack of bankside and emergent vegetation providing little or no foraging opportunities.
Watermeadows Ditch	In-channel habitat would be sub-optimal for white-clawed crayfish with only limited refugia available. However, the Watermeadows Ditch is hydraulically linked to the positive stretch of the Dam Brook, where white-clawed crayfish were previously recorded, so white-clawed crayfish could also be present in this watercourse.
Dam Brook	White-clawed crayfish have previously been recorded in the Dam Brook immediately adjacent to the A61/A38 roundabout.
Boosemor Brook	The Boosemoor Brook is a tributary of the Dam Brook and is located in close proximity to the most recent white-clawed crayfish record. In-channel habitat is likely to be sub-optimal for white-clawed crayfish due to the absence of in-channel refugia.
River Derwent	The River Derwent has historic records of white-clawed crayfish and bed substrate, including boulders, cobbles, woody material and anthropogenic debris does make the habitat suitable for white-clawed crayfish. It should be noted, however, that no white-clawed crayfish were identified during the AECOM 2015 survey (AECOM(m), 2016).
Bottle Brook	The Bottle Brook has historic records of white-clawed crayfish, as presented in the 2016 AECOM crayfish report (AECOM(m), 2016) and in-channel habitat appeared suitable for this species with frequent suitable refugia noted throughout the watercourse.

Appendix J Reptile Habitat Assessment

Table J1: Suitability for Reptiles within (or within close proximity of the Proposed Scheme Boundary)

Site	Habitat Description
8	Mosaic of disturbed ground including areas of unmanaged poor semi-improved grassland with some more species-rich areas of rabbit grazed shorter grassland. Several wetter pockets with species typical of wetland community were also recorded, Much vehicle disturbance. Extensive scrub encroachment.
10	Area of tall grassland overwhelmingly dominated by Yorkshire-fog, with lesser amounts of other robust grass species. Herbs represent only a minor sward component in this location. The most suitable habitat for reptiles was along the southern edge of the field, by a margin of tall herb and scrub.
19	This tall coarse grassland area occurred adjacent to the River Derwent. It is likely to have been enriched by river silt and flooding events and it was lacking management. The invasive species Himalayan balsam occurs in frequent stands.
Refer to the 2016 AECOM Reptile report (AECOM(d), A38 Derby Junctions Reptile Survey Report Ref. No. 47071319-URS-05-RP-EN-010, 2016) for the locations of the following sites:	
1A	Approx. 0.62ha area of tall, unmanaged, neutral, grassland that is dominated by Yorkshire-fog *Holcus lanatus* with stands of tall herbs such as great willow herb *Epilobium hirsutum* and common nettle *Urtica dioica* and taller coarser grass sward. The levels of great willow herb and soft rush *Juncus effusus* suggest that this area is slightly damper than Areas 1C and 1K. The most suitable habitat for reptiles was along the western edge of the field, by a margin of tall herb and scrub. This particular area measured approx. 0.35ha.
1B	This area is the A38 Roundabout Local Wildlife Site. This physically isolated approx. 0.40ha area, lying between the A38 carriageways, is represented by unmanaged neutral grassland which is succeeding to scrub due to lack of management. Scrub encroachment represents at least 40% cover, comprising largely dog-rose *Rosa canina*, bramble *Rubus fruticosus agg*. and willow sp. *Salix spp*.. Some hawthorn *Crataegus monogyna* scrub is also present. The scrub encroachment reduced the survey area to approx. 0.3ha.
1C	This is an approx. 0.40ha area of tall, unmanaged, neutral, grassland that is dominated by Yorkshire-fog with locally dominant rosebay willowherb *Chamerion angustifolium*.
1D	This tall unmanaged grassland occurs by the Kingsway roundabout and covers approx. 0.32ha in area. It is dominated by false oat-grass *Arrhenatherum elatius* with abundant red clover *Trifolium pratense*.
1E	This is an approx. 1.04ha area of managed grassland within the grounds of the Territorial Army site. It is largely grass dominated with herbs making up a smaller proportion of the sward. There was grass thatch on the ground from mowing on site. The most suitable habitat for reptiles was along the western edge of the field, by a margin of scrub. This particular area measured approx. 0.50ha.

Site	Habitat Description
1F	This is an area of approx. 2ha of mown amenity grassland at Derby University. It is not species-rich and is dominated by perennial rye-grass *Lolium perenne*. The most suitable habitat for reptiles was along the western edge of the field, by a margin of tall herb and scrub. This particular area measured approx. 0.15ha.
1L	In this approx. 1.09ha area, Yorkshire-fog dominates with lesser amounts of false oat grass and frequent meadow foxtail *Alopecurus pratensis* and great willow herb. The most suitable habitat for reptiles was along the western edge of the field, by a margin of scrub. This particular area measured approx. 0.75ha.
2B	This approx. 0.40ha area is a disturbed grassland field which is used as storage /work area for a turf farm. Species present include creeping buttercup *Ranunculus repens* along with frequent stands of invasive common nettle and creeping thistle *Cirsium arvense*.
2C	This tall coarse grassland area occurs adjacent to the River Derwent. It is likely to have been enriched by river silt and flooding events, and is lacking management. The invasive species Himalayan balsam *Impatiens glandulifera* occurs in frequent stands. The area of habitat of potential suitability to reptiles was approx. 0.20ha.
2D	A horse grazed and species poor neutral grassland area of approx. 0.31ha located by the River Derwent with high composition of perennial rye-grass. Stands of common nettle have developed in response to horse grazing. The invasive species giant knotweed *Fallopia sachalinensis* borders the grassland fence along the river edge. Habitat of potential suitability to reptiles was limited in this location and refugia were laid along the southern field boundary. The area of habitat of potential suitability to reptiles was approx. 0.1ha.
2E	This is a horse grazed field of approx. 3.44ha by the A38 with local stands of perennial weeds such as common nettle, creeping thistle and spear thistle *Cirsium vulgare*. The field is variously inundated through the seasons and the invasive species New-Zealand pigmyweed *Crassula helmsii* is locally dominant. There is an area of open water with a drawdown zone at the southern end of the field. Habitat of potential suitability to reptile was located along the eastern boundary of the field measuring approx. 0.42ha in extent.
2H	This tall unmanaged and physically dense grassland sward covering approx. 1.98ha, is overwhelmingly dominated by Yorkshire-fog, with lesser amounts of other robust grass species. Herbs represent only a minor sward component in this location. Suitable habitat was located alongside the hedgerow in this location and measured approx. 0.1ha in extent.
2J	This approx. 0.96ha area is a damp horse-grazed pasture. It has small areas of very shallow, seasonally standing water with poached margins.
2K	This unmanaged species-rich grassland sward covering approx. 0.24ha occurs on a steep slope near a sewage works adjacent to the existing A38. There is extensive scrub and tree encroachment from species including ash *Fraxinus excelsior* and common hawthorn.

Appendix K Water Vole and Otter Habitat Assessment

Table K1: Suitability for Otter and Water Vole of Watercourses within (or within close proximity of the Proposed Scheme Boundary

Watercourse	Suitability for Otter and Water Voles
Bramble Brook	Brook habitat provided potentially suitable resting places and potential holt sites for otter, especially in the secluded sections between the road islands however, there was limited foraging opportunity for this species and this watercourse is likely to only be used as a commuting route to other more suitable habitat. The habitat was sub-optimal for water vole due to the shaded nature of the channel and lack of bankside and emergent vegetation providing little or no foraging opportunities.
Markeaton Brook	The Markeaton Brook was considered suitable for otter with potential holt sites, resting places and foraging opportunities available. In contrast the heavily shaded nature of the brook, the bank reinforcement, culverts and lack of emergent and limited bankside vegetation make the Markeaton Brook sub-optimal for water vole.
Middle Brook	Brook habitat provided potentially suitable resting places and potential holt sites for otter, especially in the secluded sections, however there is limited foraging opportunity for this species and this watercourse may only be used as a commuting route to other more suitable habitat within the connecting Markeaton Brook. The habitat is sub-optimal for water vole due to the shaded nature of the channel and lack of bankside and emergent vegetation providing little or no foraging opportunities.
Mill ponds	The Mill ponds were considered suitable for otter, with potential resting places and foraging opportunities available. In contrast the heavily shaded nature of the ponds, the bank reinforcement, culverts and lack of emergent and limited bankside vegetation make the ponds sub-optimal for water vole.
Watermeadows Ditch	Brook habitat provided potentially suitable resting places and foraging sites for otter, but with limited potential holt sites. The ditch may, however, be used as a commuting route to other more suitable habitat to the River Derwent downstream and otter spraints were recorded in this area by AECOM in 2015 (AECOM(g, 47071319-URS-05-RP-EN-014, 2016. The habitat was suitable for water vole, with a water vole latrine noted immediately upstream of the railway line during the 2015 survey.
Dam Brook	The Dam brook provided suitable habitat for otter with reported spraints recorded in sections of channel adjacent to the A61. The open areas of habitat located adjacent to the A61 and immediately downstream of Breadsall provided suitable habitat for water vole.
Boosemor Brook	The habitat was secluded and was likely to provide suitable holt and resting places for otter however there was limited foraging opportunities for this species. The watercourse was, at most, sub-optimal for water vole with no foraging opportunities due a complete lack of any suitable bankside and emergent vegetation.
River Derwent	On the west bank of the river, at Site 9, scrubby willow dominated woodland provided good habitat for otter with opportunities for holts and lying up areas and otter activity has previously been recorded under the A38 road bridge. The bankside habitat is also considered suitable for water vole with plenty of burrowing opportunities and significant amounts of potential foraging material.

Watercourse	Suitability for Otter and Water Voles
Bottle Brook	The Bottle Brook would be suitable for otter though potential holt sites are considered likely to be lacking due to the extensive bank reinforcement at this location. Water vole habitat was considered to be sub-optimal due to the bank reinforcement and limited availability of burrowing opportunities and in channel vegetation.
Pb1	The dich habitats provided potentially suitable resting places and foraging sites for otter but with limited potential holt sites. The ditch may, however, be used as a commuting route to other more suitable habitat. The habitat was considered to be suitable for water vole.