A38 Derby Junctions

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6.3 Environmental Statement Appendices

Appendix 8.5a: River Habitat Survey in 2018

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

A38 Derby Junctions Development Consent Order 202[ ]

6.3 Environmental Statement Appendices
Appendix 8.5a: River Habitat Survey in 2018

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A38 Derby Junctions

River Habitat Survey Report

Report Number: HE514503-ACM-EBD-A38_SW_PR_ZZ-RP-EG-0020 P02 S4
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Contents

1 Introduction 1
1.1 Background and Scope 1
1.2 Study Site 1
1.3 Relevant Legislation 2

2 Methodology 4
2.1 Desk-Based Study 4
2.2 River Habitat Survey 6
2.3 Hydromorphological Indices 7

3 Results 11
3.1 Desk-Based Study 11
3.2 River Habitat Survey 13
3.3 Hydromorphological Indices 17

4 Discussion and recommendations 18
4.1 Watercourse Assessment 18
4.2 Invasive Non-Native Species 18
4.3 Protected and Notable species 19
4.4 Potential Impacts to Specific Watercourses 19

5 References 20

Appendices

Appendix A Figures

Appendix B River Habitat Survey Forms

Appendix C Site Photographs

List of Tables

Table 1: Summary of Relevant Previous Surveys Undertaken by AECOM for the Scheme 5
Table 2: River Habitat Survey Locations 6
Table 3: HMS scoring criteria 8
Table 4: HQA scoring criteria 9
Table 5: HMS and HQA Scores 17

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 Scheme" herein).

1.1.2 The 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.

1.1.4 In order to assist with the assessment of the Scheme's potential environmental effects, a range of environmental surveys have been undertaken since 2015 to define prevailing baseline conditions.

1.1.5 Plans showing the areas surveyed are presented in Figures 2 and 3 (Appendix A).

1.1.6 The 2018 River Habitat survey (RHS) across the Scheme comprised the following:

- **RHS of Dam Brook and Bramble Brook (previously surveyed by RHS and River Corridor Survey (RCS) in 2015/16)** to update data on river and riparian habitats, as well as their potential to support protected or notable species i.e. within the post-2015 Scheme boundary. The age of the 2015/ 2016 RHS survey results means that potential changes in habitat conditions needed investigating.
- **RHS of Middle Brook and Mickleover Railway Cutting** due to their location within or adjacent to the revised Scheme boundary and the possibility that they may be subject to direct or indirect impacts through the proposed works. Middle Brook is the location of a proposed temporary construction compound incorporating a temporary crossing of the watercourse (at NGR approximately SK 33984 37281). Mickleover former Railway Cutting (the former Derbyshire and North Staffordshire Extension of the Great Northern Railway) is located beside the Scheme boundary to the west of Kingsway junction.

1.1.7 The RHS of both Dam Brook and Bramble Brook documented in this report was undertaken on the 17 May 2018.

1.1.8 The RHS of Middle Brook and Mickleover Railway Cutting were undertaken on 2 August 2018.

1.1.9 Results of the 2018 RHS are documented herein, together with desktop data.

1.1.10 Note: This document is based on data available at the time of writing, both in terms of contemporary survey data and surveys for other habitats and species.

1.2 Study Site

1.2.1 The Scheme encompasses Kingsway and Markeaton junctions, west of the city of Derby and Little Eaton junction north of Derby. A plan showing the junction locations

is presented in Figure 1, Appendix A. The watercourses subject to RHS in 2018 lie within the Scheme boundary.

1.2.2 The Scheme proposals indicate that there would be no direct impacts to Markeaton Brook, sections of which lie within the Scheme boundary, the River Derwent, and Bottle Brook which is outside the Scheme boundary. Therefore, these watercourses were excluded from RHS in 2018, although they were subject to RHS and RCS in 2015/ 2016.

1.2.3 In accordance with standard RHS methodology, a 500m stretch of each watercourse was surveyed, within and overlapping where necessary the Scheme boundary and referred to herein as the ecological study area for the RHS.

1.2.4 The A38 is an existing and busy arterial 'A' road carrying traffic around the west and north of the City of Derby. 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 east in this location, through culverts located under both carriageways and along a deep gully inside the central reservation and Kingsway roundabout before connecting with other culverts located between Kingsway and Markeaton junction roundabouts.

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

1.2.6 The western boundary of the Scheme at Little Eaton junction borders the road bridge over the River Derwent. The existing A38 is on embankment which forms the banks of Dam Brook in some sections. A variety of grassland habitats exist at the base of the embankments in this location. Dam Brook flows through two culverts; one located directly east of the Little Eaton junction roundabout and beneath the A61, downstream of which it becomes Watermeadows Ditch.

1.3 Relevant Legislation

1.3.1 The RHS sought to assess the habitats within the watercourses, riparian zones and wider river corridors, their degree of habitat quality and habitat modification, and their potential to support protected and/or notable species. The assessment is supported by, and makes reference, where appropriate, to the following legislation:

- The EU Water Framework Directive (2000)
- The Natural Environment and Rural Communities (NERC) Act 2006
- The Wildlife and Countryside Act (1981) (as amended) (WCA)
- The EC Habitats Directive (Directive 92/43/ECC) as translated into UK law by The Habitats and Species Regulations 2017

1.3.2 Highways England, through the national Road Investment Strategy (RIS) aims for the operation, maintenance, and enhancement of the Strategic Road Network (SRN) to reduce net loss of biodiversity by 2020; and, in the long term, aims to deliver a net gain in biodiversity across its broader range of works by 2040. Highways England published a Biodiversity Plan in 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 A contextual analysis of each study site was undertaken using historic maps and other publicly available data. Historic maps provide an indication of the degree of change in the route of a watercourse over time, and the extent of any man-made modifications.

2.1.2 A review of statutory and non-statutory designated sites, and protected species, is presented in the Extended Phase 1 Habitat Survey report (AECOM, 2017). Where such records are considered relevant to the RHS, these results have been referenced in this report.

2.1.3 Sections of the Scheme extent have been subject to a range of ecological surveys since 2015. A summary of the survey effort for protected/ notable fauna undertaken by AECOM are presented in Table 1.

Table 1: Summary of Relevant Previous Surveys Undertaken for the 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 Site boundary_2015 and Little Eaton 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 Extended Phase 1 Habitat Survey Update Report	Extended Phase 1 Habitat Survey	Resurvey of the habitats previously surveyed in 2015 and 2016; survey of nine new areas identified in 2017 because of Scheme boundary changes	February to June 2017	Extended Phase 1 Habitat Survey (JNCC, 2015)	HE514503-ACM-EBD-A38_SW_PR_ZZ-RP-EG-0004 August 2018 (AECOM, 2018)
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)	47071319-URS-05-TN-EN-023 (AECOM(c))
A38 Derby Junctions River Corridor Survey and River Habitat Survey Report	River Habitat and River Corridor Survey	Kingsway Markeaton Site boundary_2015 and Little Eaton 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 Site boundary_2015 and Little Eaton Site boundary_2015	2015 + Updates	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 White-Clawed Crayfish Survey Report	White-clawed Crayfish Survey	Kingsway Markeaton Site boundary_2015 and Little Eaton Site boundary_2015	Summer 2015 + Updates	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))
A38 Derby Junctions Aquatic Macroinvertebrate Survey Report	Aquatic Invertebrate Survey	Kingsway Markeaton Site boundary_2015 and Little Eaton Site boundary_2015	2015 + Updates	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))

2.2 River Habitat Survey

2.2.1 River Habitat Surveys (RHS) were carried out on 17 May 2018 and 2 August 2018 by appropriately qualified and experienced aquatic ecologists (Peter Cowley: Environment Agency RHS accreditation code FA061, Lauren Vickers and Liam Byrne). Weather conditions during the surveys were dry and warm, with low to normal river flows. Conditions were considered optimal for the RHS surveys, including an assessment of aquatic macrophyte flora and riparian vegetation. Low flow conditions and low turbidity allowed for an accurate assessment of in-stream features such as riffles and potential fish spawning habitat.

2.2.2 For lowland rivers, May and June are considered the optimal period for RHS survey as the presence of key diagnostic features such as flowers and fruiting bodies facilitate the identification of macrophytes, but vegetation cover remains insufficient to obscure bank and channel features. However, an accurate picture of river character can be obtained outside this period.

2.2.3 RHS survey locations are summarised in Table 2 and shown on Figure 2 and 3, Appendix A.

Table 2: River Habitat Survey Locations

Watercourse name	NGR Start (downstream)	NGR Centre	NGR End (upstream)	Waterbody description
Bramble Brook	SK 32827 36120	SK 32651 35990	SK 32464 35902	Small heavily modified watercourse with multiple culverted sections beneath the A38 and Kingsway roundabout
Mickleover Railway Cutting	SK 32717 36068	SK 32496 36015	SK 32222 35977	Artificial waterbody within a former railway cutting, forming a tributary of Bramble Brook
Middle Brook	SK 34074 37300	SK 33971 37290	SK 33746 37417	Heavily modified tributary of Markeaton Brook, fed via a weir from Markeaton Lake
Dam Brook	SK 36318 39668	SK 36415 39865	SK 36560 40007	Heavily modified tributary of the River Derwent with two culverted sections, including beneath the A61

2.2.4 RHS is a method designed to characterise and assess the physical structure of freshwater streams and rivers, including recognition of vegetation types and basic geomorphological principles and processes. RHS is carried out along a standard 500m stretch of river channel, with observations made at ten equally-spaced 'spot-checks', with additional context provided by observations of land-use and valley form in the river corridor. Surveyor training and accreditation facilitates accurate and consistent recording of features to allow standardised conclusions to be drawn.

2.2.5 The RHS methodology includes a mandatory health and safety risk assessment component, stringent requirements for the recording of grid references and photographic evidence, and recording of any unusual features with special notes and photographs as supporting evidence. RHS is not designed to provide the level of detail needed for specialist surveys for specific flora or fauna; however, RHS can support recommendations for and findings of surveys for aquatic macro-

invertebrates, macrophytes, fish, hydro-geomorphology and other protected or notable species and habitats.

2.2.6 RHS surveys may be utilised to 'benchmark' top quality sites based on their catchment characteristics, investigate species-habitat relationships (with fish passage as an example), contribute to environmental impact assessment, or inform proposed works to the river alongside hydro-geomorphological and other assessments, including the requirement for watercourses to meet the requirements of Water Framework Directive (WFD) monitoring and 'no deterioration' targets.

2.2.7 RHS methodology includes the following:

- Desk study preparatory work – maps and analysis of online data, including historic maps, provide context on landscape characteristics and river planform over time to assist in identifying historic channel management; however, this does not override field observations.
- Field survey and RHS survey form completion – the presence / absence of features, and in some cases the number and extent thereof, is recorded at ten spot checks and the whole 500m site, including natural and artificial features, and channel measurements.
- General site information is recorded on page 1 of the survey form.
- Spot check information is recorded on page 2 of the survey form, including predominant channel, bank and river corridor features at 10 locations evenly spaced along the 500m RHS site. This includes: predominant channel substrate types (where visible), flow type, habitat features, channel and bank modifications, channel vegetation types, bank and banktop vegetation structure, and adjacent land use. Physical features are assessed using a 1m-wide transect across the channel; all other elements are assessed using a 10m-wide transect across the watercourse.
- Sweep-up information – general information is recorded on page 3 of the survey form by means of a 'sweep-up' checklist. This allows information not occurring in the spot checks to be recorded over the whole 500m length, thus allowing a broad picture of river character to be established.
- Channel dimensions are recorded on page 4 of the survey form – these are measured at one representative location in the 500m survey stretch, normally across a riffle, if present, otherwise in a straight, uniform location with clearly defined banks. On page 4 is also recorded the presence of features of interest including nuisance plant species and alders.

2.3 Hydromorphological Indices

2.3.1 RHS data can be used to provide an assessment of habitat quality and the extent of channel modification, and this can then inform physical quality objectives for river works and restoration. Hydromorphological indices were calculated using the RHS Input and Analysis Software (Naura, 2017). These include the Habitat Modification Score (HMS) and Habitat Quality Assessment (HQA) as follows.

Habitat Modification Score

2.3.2 Habitat Modification Score (HMS) scoring criteria were derived from an earlier scoring system developed by the Environment Agency (EA) in 1998 and then further developed by Riverdene Consultancy (2016). The scoring criteria indicate the degree of modification of the river habitat, with a higher score indicating a higher degree of modification. HMS results in a Habitat Modification Class (HMC) with each river stretch allocated a HMC Description ranging from Pristine/ Semi-natural to Severely Modified. The HMS scoring criteria are summarised in Table 3.

Table 3: HMS Scoring Criteria

HMS Scoring Criteria	Recorded in RHS Survey Form	HMS Score
Culverts sub-score	Spot check Channel Modification – Culverts (CV) Sweep-up Artificial Features – Culvert	+ 400, + 50 for additional criteria + 400 for each remaining feature
Bank and Bed Reinforcement sub-score	Spot check Bank Material Spot check Bank Modification – Reinforced (RI) Sweep-up Bank Profiles – Reinforced Spot check Channel Substrate Spot check Channel Modification – Reinforcement (RI)	Specific scores for bank materials + 20 for additional bank reinforcement Additional score for extensive reinforcement + 200 for artificial substrate + 200 for channel modification
Bank and Bed Re-sectioning sub-score	Spot check Bank Modification – Re-sectioned (RS) Sweep-up Bank Profiles – Re-sectioned Spot check Channel Modification – Re-sectioned (RS) Sweep-up Channel Modification – Over-deepened	+ 40-160 for re-sectioned spot check Additional score for re-sectioned sweep-up + 200 for spot check RS (channel mod.) + 40-160 for over-deepened
Berms & Embankments sub-score	Spot check Bank Modification – Berms (BM) Spot check Bank Modification – Embankments (EM) Sweep-up Bank Profiles – Artificial two-stage Sweep-up Bank Profiles – Embanked Sweep-up Bank Profiles – Set-back Embankment	+ 20 each spot check BM + 20 each spot check EM + 20-80 for artificial two-stage channel + 20-80 for embankment in sweep-up + 4-16 for set-back embankment
Weirs/ Dams/ Sluices sub-score	Sweep-up Artificial Features – Weirs/dams/sluices	Specific scores for impoundment by weir/dam and each weir/sluice feature
Bridges sub-score	Sweep-up Artificial Features – Bridges	+ 100-250 for each sweep-up bridge
Poaching sub-score	Spot check Bank Modification – Poaching (PC or PC(B)) Sweep-up Bank Profiles – Poached	+ 10 for each spot check PC or PC(B) + 10-40 for sweep-up poaching
Fords sub-score	Sweep-up Artificial Features – Fords	+ 40-200 for each sweep-up ford

HMS Scoring Criteria	Recorded in RHS Survey Form	HMS Score
Outfalls/Deflectors sub-score	Sweep-up Artificial Features – Outfalls Sweep-up Artificial Features – Deflectors	+ 25-100 for each sweep-up outfall + 50-150 for each sweep-up deflector
HMS final site score (HMC) **Habitat Modification Class**	**HMC Description**	**HMS Score**
1	**Pristine/semi-natural**	**0-16**
2	**Predominantly unmodified**	**17-199**
3	**Obviously modified**	**200-499**
4	**Significantly modified**	**500-1399**
5	**Severely modified**	**1400+**

Habitat Quality Assessment

2.3.3 Habitat Quality Assessment provides a broad indication of river quality and habitat diversity by collating natural features assessed through the field survey. The HQA score is allocated based on features including point, side and mid-channel bars, eroding cliffs, large woody debris, waterfalls, backwaters and floodplain wetlands. Additional points are scored for variety of channel substrata, flow-types, in-channel vegetation, and also the distribution of bank-side trees and the extent of near-natural land-use adjacent to the river, resulting in a total HQA score. HQA score can only be used to compare sites of similar river type or character. For example, river stretches in lowland floodplains should not be compared to those in upland wooded valleys.

2.3.4 A more diverse site in terms of natural river habitats will result in a higher HQA score, converse to the HMS score where a higher score indicates a less natural state. Therefore, HMS and HQA in combination provide an assessment of the influences of natural variation and the extent of human intervention in the river corridor and adjacent land covered by the RHS survey.

2.3.5 HQA scoring criteria are summarised in Table 4.

Table 4: HQA Scoring Criteria

HQA Scoring Criteria	Description	HQA Scoring Criteria	Description
Flow Types	Score for variety of flow types; additional sweep-up types score extra	Point Bars	Total number of un-vegetated and vegetated point bars
Channel Substrates	Score for variety of natural substrate types: bedrock, boulder, cobble, gravel/pebble, sand, silt, clay, peat	In-Stream Channel Vegetation	Score for channel vegetation grouped into six categories for scoring purposes
Channel Features	Natural channel features: exposed bedrock/boulders, un-vegetated mid-channel bar, vegetated mid-channel bar, mature island	Land-Use Within 50m	Score allocated on sweep-up only: broadleaf woodland (or native pinewood), moorland/heath, and wetland score
Bank Features	Score for each natural feature: eroding earth cliff, stable earth cliff, un-vegetated point bar, vegetated point bar, un-vegetated side-bar, vegetated side-bar	Trees And Associated Features	Score allocated for bankside trees, Overhanging boughs, exposed bankside roots, underwater tree roots, coarse woody debris and fallen trees

HQA Scoring Criteria	Description	HQA Scoring Criteria	Description
Bank Vegetation Structure	Score for banktop and bankface simple and complex vegetation structure	Special Features	Score if recorded: waterfall more than 5m high, braided or side channel, debris dams, natural open water, fen, carr, flush, bog
NB. Due to the nature of HQA score and within the limitations of this study, HQA scores herein have been used to provide a comparison between habitat quality in the study areas only. Further interpretation of HQA scores would require comparison of survey stretches against those with similar physical characteristics (e.g. gradient, distance from source, geology etc.) via the Environment Agency RHS Database.			

3 RESULTS

3.1 Desk-Based Study

General Watercourse Character and WFD Classification

3.1.1 All surveyed watercourses are in the Derwent Lower – Derbyshire Operational Catchment.

3.1.2 Dam Brook is within the Derwent from Bottle Brook to Trent WFD waterbody, and Dam Brook constitutes a tributary of the River Derwent itself, with the confluence approximately 1.9km downstream of the RHS survey stretch. In the most recent EA WFD classification, this heavily modified waterbody is classified as 'Moderate potential' (2016 cycle), limited by the Moderate assessment for Macrophytes and Phytobenthos Combined. One reason for the waterbody not reaching "Good" potential" is due to diffused pollution from urban, transport and livestock sources.

3.1.3 The remaining RHS sites (Bramble Brook, Middle Brook and Mickleover Railway Cutting) are within Markeaton Brook from Mackworth Brook to Derwent WFD waterbody, and together form tributaries of Markeaton Brook, and ultimately the River Derwent. The latter is approximately 2.6km downstream of Middle Brook. This heavily-modified waterbody is also classified as 'Moderate potential' (2016 cycle), with reasons for failure including transport drainage and intermittent sewage discharge leading to moderate classification for Macrophytes and Phytobenthos Combined.

3.1.4 All surveyed watercourses are classified as Good or High potential for aquatic invertebrates and fish in the most recent WFD classification.

3.1.5 Bramble Brook and Dam Brook have previously been modified and realigned to facilitate highways construction, namely the A38 and A61.

3.1.6 Bramble Brook rises in Mickleover in the western extent of the suburbs of Derby. It runs in three channels in the Mackworth Park area which enter culverts beneath the A38 and converge in the centre of the A38 Kingsway junction in a steep-sided gully. Many sections of the watercourse are culverted, and the central channel was dry during the RHS survey, with the flow appearing to have diverted into the Mickleover Railway Cutting.

3.1.7 As described above, Mickleover Railway Cutting is an artificial channel along the route of a former railway line, which appears to carry diverted flow from the Bramble Brook catchment. The northernmost channel of the Bramble Brook intercepts the railway cutting at NGR approximately SK 32128 35958, and it is likely that at this point the flow is diverted into the artificial channel.

3.1.8 Middle Brook remains unchanged in its alignment since pre-1882, before which it was engineered as an overflow from Markeaton Lake in the grounds of Markeaton Hall. The watercourse is now culverted beneath the A38, with the culverted section included in the current RHS survey.

3.1.9 Dam Brook underwent repeated and significant realignment before 1882, to facilitate the construction of the now defunct Derby Canal and the Derby branch of the Midland Mainline railway. The current alignment of the watercourse includes two culverts to accommodate the A61 and Little Eaton junction.

Riparian and Surrounding Habitats

3.1.10 The Extended Phase 1 Habitat Survey (AECOM, 2017) provides more detail of riparian and terrestrial habitats associated with the survey areas. A brief description of the dominant habitats associated with each watercourse is provided below.

Bramble Brook

3.1.11 Riparian habitats dominated by plantation broad-leaved woodland and scrub, with amenity grassland and suburban development in the wider area.

Mickleover Railway Cutting

3.1.12 Uniformly steep tall banks in the form of a railway cutting, dominated by plantation broad-leaved woodland. Suburban development on the left banktop and amenity grassland beyond the right banktop, with the A38 carriageways and Kingsway junction to the east.

Middle Brook

3.1.13 Bankside and riparian habitats dominated by plantation broad-leaved woodland, scrub and tall ruderal vegetation. Amenity grassland sports pitches, allotments and suburban development present beyond the banktop.

Dam Brook

3.1.14 Immediate riparian habitats dominated by tall ruderal vegetation, scattered trees and scrub. Improved grassland fields to the east and west, with the A61 dual carriageway and A38 Little Eaton junction on the right banktop. A large area of natural open water directly north of spot check 1 due to Dam Brook overflowing into the floodplain field.

Designated Sites

3.1.15 None of the sections of watercourses subject to RHS are within a statutory designated site. Refer to the Extended Phase 1 Habitat Survey for details of such sites in the wider study area.

3.1.16 The RHS survey sections are within or associated with several Local Wildlife Sites (LWS) as follows:

- The survey section of Bramble Brook is within the A38 Roundabout LWS, and the Bramble Brook and Margins LWS is approximately 60m upstream of the survey section.
- The entire survey section of Mickleover Railway Cutting is within the Mickleover Railway Cutting LWS.
- The entire survey section of Middle Brook is within the Markeaton Brook System LWS.
- Dam Brook is adjacent to Alfreton Road Rough Grassland LWS and the Old Derby Canal, the latter identified as an ‘Other Site of Interest’ in data provided to inform the Phase 1 Habitat Survey. Approximately 400m downstream of the RHS survey section the Dam Brook corridor forms the Watermeadows Ditch LWS.

3.1.17 Further details of the LWS referred to above are provided below.

- A38 Roundabout LWS (DE010) – semi-improved neutral grassland - within the Scheme boundary near Kingsway junction. Although designated for neutral

grassland, the majority of this area is dominated by plantation broad-leaved woodland and scrub within the steep sided valley of Bramble Brook.

- Mickleover Railway Cutting LWS (DE004) - Habitat mosaic - within the Scheme boundary continuing up to 0.8km west of the Scheme boundary near Kingsway junction.
- Markeaton Brook System LWS (DE003) - Invertebrate assemblage (including white-clawed crayfish *Austropotamobius pallipes*, although this species is now considered absent from this part of the catchment due to displacement by American signal crayfish *Pacifastacus leniusculus*) - within the Scheme boundary and continuing up to 0.8km south-east of the Scheme boundary and 1.2km north of the Scheme boundary near Markeaton junction.
- Bramble Brook and Margins LWS (DE014) - secondary broad-leaved woodland - within the Scheme boundary near Kingsway junction.
- Alfreton Road Rough Grassland LWS (ER002) – floodplain grassland semi-improved - within the Scheme boundary near Little Eaton junction.
- Watermeadows Ditch LWS (DE047) - Standing open water - Approx. 0.4km south of the Little Eaton junction Scheme boundary.

3.1.18 The Extended Phase 1 Habitat Survey report also details the Local Biodiversity Action (LBAP) habitats recorded within 2km of the Scheme. The two LBAP habitats within or adjacent to the Scheme are lakes and ponds associated with Markeaton Park LWS, Markeaton Brook System LWS, and other ponds.

Protected and/ or Notable Species

3.1.19 Relevant records of protected and notable species for a 1km search area from the Scheme boundary are provided in the Extended Phase 1 Habitat Survey report, including species records from previous protected species surveys for the Scheme.

3.1.20 Protected species recorded within or adjacent to the watercourses surveyed and considered relevant to this survey include water vole *Arvicola amphibius*, otter *Lutra lutra*, white-clawed crayfish, American signal crayfish, aquatic invertebrate assemblage, Himalayan balsam *Impatiens glandulifera* and Japanese knotweed *Fallopia japonica*.

3.2 River Habitat Survey

3.2.1 RHS survey forms are presented in Appendix B and a summary of the characteristics of each watercourse is provided below. Survey photographs are provided in Appendix C and referenced throughout the sections below.

Bramble Brook

3.2.2 The surveyed section of Bramble Brook extended from the northern end of the Kingsway roundabout downstream, to approximately 60m west of the A38 northbound carriageway at the upstream end. The brook was culverted beneath the A38 carriageways in three sections and a major weir was present in a reinforced section of channel downstream of the central culvert.

3.2.3 Valley form was considered asymmetrical due to the steep sided valley being situated closer to the northbound carriageway of the A38.

3.2.4 Natural sections of bank were composed of earth, and generally covered with broad-leaved plantation woodland, scrub and associated ground flora. Culverted sections and the four upstream spot checks consisted of reinforced banks of laid concrete blocks, or solid concrete in the case of culverts (Photos 1 and 2, Appendix C). These sections were obviously re-sectioned and straightened.

3.2.5 Channel substrate was generally silt or artificial, with some gravel present in the form of side bars. Some urban trash was also present in the channel. Several point bars were also present, along with both vegetated and unvegetated mid-channel bars, largely composed of accumulated silt deposits.

3.2.6 Channel vegetation was sparse due to the heavily shaded nature of the watercourse. Only bryophytes/ lichens, emergent broad-leaved herbs such as willowherb *Epilobium* sp., emergent reeds/ sedges and filamentous algae were present, however these were predominantly localised.

3.2.7 Although largely contiguous with the bank profile, the A38 embankment was considered to represent a set-back embankment as it had clearly been constructed above the existing floodplain of the watercourse.

3.2.8 Trees were semi-continuous throughout the survey section, with extensive shading and overhanging boughs. Exposed bankside roots, underwater tree roots, fallen trees and large woody debris were also present.

3.2.9 Flow was considered lower than normal at the time of the survey, with rippled flow the extensive flow type, and smooth flow and areas of no perceptible flow also present. Evidence of high flows was observed, with debris accumulated in culvert entrances and trapped in bankside vegetation.

3.2.10 Himalayan balsam was recorded on the bankface and banktop.

3.2.11 The upstream section of Bramble Brook to the west of the A38 northbound carriageway was dry at the time of the survey (Photo 3, Appendix C).

Mickleover Railway Cutting

3.2.12 Mickleover Railway Cutting was an artificial channel following the route of the former railway cutting. The cutting was deep and steep sided with a relatively flat bottom and shallow gradient, resulting in a shallow, slow flowing and braided channel. Photo 9, Appendix C shows a representative section of the watercourse.

3.2.13 This watercourse appeared to carry flows intercepted from the tributary of Bramble Brook further upstream, where the latter flows very close to the railway cutting. This is supported by analysis of historic maps and the assessment of Bramble Brook, which showed the upper reaches of this channel to be dry.

3.2.14 The Mickleover Railway Cutting channel was culverted beneath the footpath bridge providing access to the allotments and beneath the northbound carriageway of the A38 before joining Bramble Brook within the junction.

3.2.15 One intermediate bridge was present over the Allotment culvert and a minor footbridge upstream of the A38 culvert.

3.2.16 Banks of the watercourse were generally unmodified, but artificially created in the context of the railway cutting. Concrete reinforcement was present through the long culvert beneath the allotment bridge. Due to the wide, shallow nature of the channel,

vegetated and un-vegetated side bars and mid-channel bars were widespread throughout the survey area. The channel was straight within the confines of the railway cutting, and therefore neither meanders nor point bars were present.

3.2.17 Bank material was dominated by earth on the steep wooded banks of the railway cutting.

3.2.18 Channel substrate varied with earth most abundant, and gravel/ pebble, silt and artificial substrate also present. The artificial substrate was considered to be formed from remaining artificial material from the bed of the former railway and urban debris.

3.2.19 Land use adjacent to the channel was dominated by semi-natural broad-leaved woodland on the steep sides of the railway cutting within the Mickleover Railway Cutting LWS, with scrub and urban development also present. The left banktop consisted of suburban residential development and gardens, and the right banktop of parkland and amenity grassland.

3.2.20 Channel vegetation was largely dominated by amphibious macrophyte species including horsetail *Equisetum* sp., willowherb and terrestrial plant species.

3.2.21 Both flow regime and habitats within the watercourse were fairly uniform with little channel diversity and features. Flow was dominated by rippled flow and smooth flow, with depth generally no deeper that 10cm.

3.2.22 Urban trash was abundant throughout the watercourse and along the banks of the railway cutting, with evidence of deliberate fly tipping.

3.2.23 No evidence of invasive non-native species was observed during the survey.

Middle Brook

3.2.24 Middle Brook was considered to represent a naturalised channel, despite being historically created as an overflow channel from Markeaton Lake. The survey section began at a weir on the lake margin, and flowed through a long culvert before meandering through an area of land known as Sturgess Fields before joining Markeaton Brook.

3.2.25 The watercourse consisted of a diverse riffle-pool sequence with notable diversity within the channel. Eight riffles, a scour pool, several point bars and side bars were present.

3.2.26 A single culvert and minor bridge (Photo 6, Appendix C) were present, together with three deflectors including two outfall pipe structures. Outfalls were generally considered to be land drainage, although an outfall immediately downstream of the culvert (Photo 7, Appendix C) was characterised by a significant growth of sewage fungus covering 90% of the substrate at that spot check, indicating an input to the channel of organic pollution at that point; however, this not considered to represent a significant impact upon water quality due to the abundance of freshwater sponge as described below.

3.2.27 There was a notable abundance of freshwater sponge (Spongillidae) throughout the survey section. Sponges are filter feeders and play an important role in filtering and recycling water. Their presence in abundance in Middle Brook may indicate good oxygenation and water quality or other factors providing optimal habitat conditions such as suitable firm, permanent substratum.

3.2.28 Bank material was earth or gravel/ sand in places, with some eroding cliffs indicating the dynamic nature of the channel. The entire channel was noted as re-sectioned, but the banks had adopted a natural profile and were considered largely unmodified.

3.2.29 Channel substrate was dominated by gravel and pebbles, with sand and silt, together with some larger substrate types, also present.

3.2.30 Flow type was extensively rippled or smooth, with unbroken standing waves in areas of riffles, and chute flow and areas of marginal deadwater also present. Photo 8, Appendix C illustrates a representative section of Middle Brook.

3.2.31 Channel vegetation was almost entirely absent from the survey section due to heavy shading by riparian broad-leaved woodland; however, small patches of emergent and amphibious broad-leaved herbs, sedges and filamentous algae were present.

3.2.32 Bank profile was extremely variable, again indicating the dynamic nature of the channel, varying from vertical and undercut to gentle. Some small areas of poaching were present due to the presence of recreational land users, including dog walkers.

3.2.33 At the approximate location of the proposed temporary crossing, bankfull width was 10m, and water width in a shallow riffle section 3.5m, although the remainder of the watercourse was generally narrower.

3.2.34 Himalayan balsam was again present in large stands on both the bankface and banktop, most abundantly in the upstream third of the survey section.

Dam Brook

3.2.35 The surveyed section of Dam Brook ran alongside the A61 for much of its length, with a culverted section beneath the A61 at its downstream end (Photo 4, Appendix C). This culvert was partially blocked with trash and woody debris, resulting in a significant section of the watercourse being impounded upstream of the culvert. A further culvert was present at the upstream end, where an embankment for the construction of Little Eaton roundabout and southbound carriageway had encroached over the watercourse.

3.2.36 The channel was considered to represent a natural watercourse rather than an artificial channel; however, the brook had been historically realigned and re-sectioned for the entire survey section.

3.2.37 The watercourse itself was rather featureless, with only a single riffle, and no pools or point bars present. Photo 5, Appendix C shows a representative section of Dam Brook.

3.2.38 A major weir was present above the upstream culvert, with a section of watercourse with reinforced channel constructed of bricks or cobbles as scour protection. An intermediate weir was present in the form of a debris dam, with flow clearly impounded behind it.

3.2.39 Five minor outfalls were associated with highways drainage. Each had an outfall pipe and wingwall apron as scour protection, with scour protection also present on the opposite bank in places.

3.2.40 Banks were predominantly earth, with concrete reinforcement present in the form of culverts. Poaching was evident at spot checks 1 and 2 where horses were grazing in the adjacent field.

3.2.41 Channel substrate was dominated by silt with only gravel/ pebble and artificial substrate recorded at spot checks 8 and 9 respectively. Silt was observed to be particularly dominant between spot checks 3 and 7, with this area found to provide optimal habitat for brook lamprey *Lampetra planeri* during the subsequent fish survey.

3.2.42 Channel vegetation was dominated by fringing emergent reeds and grasses, with emergent broad-leaved, amphibious, submerged broad-leaved and submerged linear-leaved plants, and filamentous algae also present.

3.2.43 The left bank was extensively embanked to provide flood protection, and a setback embankment was present for much of the right bank in the form of the A61 carriageway.

3.2.44 Flow type was dominated by rippled flow and smooth flow uniformly throughout he survey section.

3.2.45 Himalayan balsam was present on the bankface and banktop, and Japanese knotweed was present in the form of a very small shoot growing through a tarmac path above the upstream culvert.

3.3 Hydromorphological Indices

3.3.1 Based on the criteria outlined in Section 2.3, Habitat Modification Scores (HMS) and Habitat Quality Assessment (HQA) scores for each survey stretch are detailed in Table 5, with a summary of the resulting assessment (or site comparison in the case of HQA) also provided. Survey sites are ranked in order of HQA score, with the highest scoring site ranked 1 and the lowest scoring site ranked 4, with further detail provided in Section 4.

Table 5: HMS and HQA Scores

RHS site reference	HMS Score / Class	HMS Interpretation	HQA Score	HQA Site Rank
Bramble Brook	3527 / 5	Severely modified	56	3
Mickleover Railway Cutting	2700 / 5	Severely modified	59	2
Middle Brook	3465 / 5	Severely modified	63	1
Dam Brook	5224 / 5	Severely modified	50	4

KEY to HMS Class

1	Pristine/semi-natural
2	Predominantly unmodified
3	Obviously modified
4	Significantly modified
5	Severely modified

KEY to HQA Class

The more diverse the site in terms of natural river habitats, the higher the HQA score and lower the site ranking

4 DISCUSSION AND RECOMMENDATIONS

4.1 Watercourse Assessment

4.1.1 Four watercourses (Bramble Brook, Mickleover Railway Cutting, Middle Brook and Dam Brook) were surveyed using the RHS techniques. The RHS data were analysed using the Habitat Quality Assessment (HQA) scoring system and Habitat Modification Score (HMS) system. HMS score relates only to modification of a watercourse channel, while the HQA score is derived from features in the channel and the watercourse corridor, in particular for the watercourse's ability to support a diverse range of habitats and species.

4.1.2 A high HMS score is indicative of a modified watercourse, with a HMS class of 5 indicative of a severely modified watercourse. Therefore, as shown in Table 5, all four surveyed watercourses have undergone severe modification. This is consistent with the findings of the 2015 RHS/ RCS survey report, in which Bramble Brook and Dam Brook were assessed as 'severely modified' and 'significantly modified' respectively.

4.1.3 Bramble Brook, Middle Brook and Dam Brook have undergone severe historic modification for highways and railway construction; and in the case of Middle Brook for environmental engineering works for the creation of artificial waterbodies within Markeaton Park. The main features of modification of these channels were channel realignment, banks re-sectioning and bank reinforcement.

4.1.4 Mickleover Railway Cutting is an entirely artificial channel created by the likely diversion of the upper reaches of Bramble Brook into the former railway cutting. This is evidenced by the upper reaches of Bramble Brook being completely dry at the time of the RHS survey.

4.1.5 Further artificial features were also recorded along the surveyed sections of these watercourses, including culverts, bridges, outfalls and deflectors.

4.1.6 HQA scores are an indication of habitat quality and diversity, and therefore the ability of the watercourse to support flora and fauna. A typical watercourse of average habitat quality would score in the region of 50 in terms of HQA.

4.1.7 All of the surveyed watercourses score fairly consistently between a HQA of 50 and 63. Middle Brook scored highest indicating a degree of recovery from severe modification to naturalised and diverse river habitats. However, the HMS score indicates that it remains limited in terms of habitat quality through modification.

4.1.8 All four watercourses demonstrate some degree of recovery in terms of HQA score, but are still limited in terms of habitat quality through historic modification, and continued impacts including siltation, water quality inputs and urban trash.

4.2 Invasive Non-Native Species

4.2.1 The following invasive non-native species (INNS) were recorded along the corridors of the surveyed watercourses:

- Himalayan balsam – recorded on the banktop and bankface of Bramble Brook, Middle Brook and Dam Brook, but absent from Mickleover Railway Cutting during the survey.

- Japanese knotweed – present above the upstream culvert of Dam Brook, growing through a tarmac path.

4.2.2 These species are listed in Schedule 9 of the Wildlife and Countryside Act 1981, and as such it is an offence to plant or otherwise cause them to grow in the wild, including by the spread of contaminated soils containing seeds or plant fragments. In addition, soil containing fragments or seeds of these plants may be classified as controlled waste and therefore must be disposed of through a registered waste carrier and an authorised landfill site or suitable disposal site.

4.3 Protected and Notable Species

4.3.1 The potential presence of protected/ notable species has been further evaluated in species specific reports for otter, water vole, aquatic invertebrates, fish and white-clawed crayfish.

4.3.2 These reports will inform recommendations for pre-construction surveys and species-specific mitigation where considered appropriate; to be reported in the Environmental Statement.

4.4 Potential Impacts to Specific Watercourses

4.4.1 Potential impacts and opportunities in relation to these watercourses will be described in Water Framework Directive (WFD) assessments to be included in the Environmental Statement.

4.4.2 A WFD objective is to ensure the ecological status of watercourses show ‘no deterioration’ and where possible undergo enhancement and restoration.

4.4.3 Further details on the potential impacts of the Scheme to specific watercourses will be reported within the Environmental Statement.

5 REFERENCES

AECOM (2018) A38 Derby Junctions Extended Phase 1 Habitat Survey 2017 Report Ref. No. HE514503-ACM-EBD-A38_SW_PR_ZZ-RP-EG-004.

AECOM (2018) A38 Derby Junctions Fish Survey Report 2018 Ref. No. HE514503-ACM-EBD-A38_SW_PR_ZZ-RP-EG-0021.

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

AECOM(g) (2016) A38 Derby Junctions Otter and Water Vole Survey Report Ref. No. 47071319-URS-05-RP-EN-014.

AECOM(m) (2016) A38 Derby Junctions White-Clawed Crayfish Survey Report Ref. No. 47071319-URS-05-RP-EN-017.

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Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (Water Framework Directive WFD).

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Naura, M. (2017) *River Habitat Survey Input and Analysis Software: Riverdene Consultancy*. Version 1: March 2017.

The River Restoration Centre (RRC) (2014) *Manual of River Restoration Techniques*. [Online] Available at: http://www.therrc.co.uk/manual-river-restoration-techniques (Accessed 9March 2018).

Riverdene Consultancy (2016) *Hydromorphology and geomorphology guidelines: Hydromorphological indices derivation: Instructions for calculating the Habitat Modification Score using River Habitat Survey data*. (Based on Environment Agency guidelines for calculating HMS scores, 2003).

Appendix A Figures

Figure 1: Scheme Location Plan
Figure 2: River Habitat Survey 2018 Locations Kingsway and Markeaton
Figure 3: River Habitat Survey 2018 Locations Little Eaton

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
60533462

Drawn	Checked	Approved
GB	SR	DD
Date	Scale @ A3	Purpose of issue
01/10/2018	1:100,000	FINAL
Drawing Number		Rev
Figure 1		1F

Highways England
A38 Derby Junctions Project
Highways England, Floor 5
2 Colmore Square
38 Colmore Circus
Birmingham
B4 6BN

AECOM
Royal Court
Basil Close, Chesterfield
Derbyshire. S41 7SL
+44 (0) 1246 209221
+44 (0) 1246 209229
www.aecom.com

File Name:\\ch-wip-001\CH_Roads\A38 Derby Jcns - PO1339\2 CAD\12.1 WIP\FIGURE 1.1 - LOCATION PLAN F1.mxd

N

SK 33746 37417

SK 34074 37300

Middle Brook

SK 32827 36120

SK 32717 36068

SK 32222 35977

Mickleover Railway Cutting

Bramble Brook

SK 32464 35902

Legend

- Scheme boundary
- Flowing water
- RHS Survey area

200 0 200 400 600 800 1000 Metres

File Name:\\nm-man-001\jobs\Derby-Jobs\Highways Agency\47071390 A38 Derby Jcns - Environment\Technical\Ecology\GIS_A38_2018\project_files\RHS\A38 Kingsway Markeaton RHS 2018.mxd

Project Title/Drawing Title

A38 DERBY JUNCTIONS
RIVER HABITAT SURVEY 2018
KINGSWAY MARKEATON

AECOM Internal Project Number
60533462

Drawn	Checked	Approved
GSB	PC	PB
Date	**Scale @ A3**	**Purpose of issue**
20/10/2018	1:8,000	FINAL
Drawing Number		**Rev**
Figure 2		0

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N

Legend

- Scheme Boundary
- Flowing water
- RHS Survey area

SK 36560 40007

SK 36318 39668

Dam Brook

200 0 200 400 600 800 1000 Metres

File Name:\\nm-man-001\jobs\Derby-Jobs\Highways Agency\47071390 A38 Derby Jons - Environment\Technical\Ecology\GIS_A38_2018\project_files\RHS\A38 Little Eaton RHS 2018.mxd

Project Title/Drawing Title

A38 DERBY JUNCTIONS
RIVER HABITAT SURVEY 2018
LITTLE EATON

AECOM Internal Project Number
60533462

Drawn	Checked	Approved
GSB	PC	PB
Date	Scale @ A3	Purpose of issue
20/10/2018	1:8,000	FINAL
Drawing Number		Rev
Figure 3		0

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Appendix B River Habitat Survey Forms

River Habitat Survey Data for Site 2

A FIELD SURVEY DETAILS

SIte reference:	A38 Dam Brook
CoordinateSystem:	OSGB36 (British National Grid)
Spot-check 1 coordinates:	SK3631839668
Spot-check 6 coordinates:	SK3641539865
End of site coordinates:	SK3656040007
Reach Reference:	Dam Brook adj A61
River name:	Dam Brook
Date:	17/05/2018 10:30
Surveyor Name:	Peter Cowley
Surveyor code:	FA061

Project Name: A38

Is the site part of a river or an artificial channel?: RIVER

Are adverse conditions affecting survey?: ○ Yes ◉ No

If yes, state:

Is bed of river visible?: PARTIALLY

Is health and safety assessment form attached?: YES

Number of photographs taken: 55

Photo references: 353-408

Site surveyed from: BOTH BANKS

B PREDOMINENT VALLEY FORM (within the horizon limit)

○ shallow vee ○ concave/bowl ◉ No obvious valley sides

○ deep vee ○ asymmetrical floodplain

○ gorge ○ U-shaped valley

Distinct flat valley bottom?: YES

Terraced valley floor?: NO

C NUMBER OF RIFFLES, POOLS AND POINT BARS (indicate total number)

Riffle(s): 1 Pool(s): 0 Unvegetated point bar(s) 0 Vegetated point bar(s) 0

D ARTIFICIAL FEATURES (indicate total number or tick appropriate box)

If none, tick box ☐

	Maior	Intermediate	Minor		Maior	Intermediat	Minor
Weirs/sluices	1	1	0	Outfalls/intakes	0	0	5
Culverts	2			Fords	0	0	0
Bridges	0	0	0	Deflectors/groynes/croys	0	0	0
Other	0						

Is channel obviously realigned?

YES, >=33%

Is channel obviously over-deepened?

YES, >=33%

Is water impounded by weir/dam?

YES, <33%

E PHYSICAL ATTRIBUTES (to be assessed across channel within a 1m wide (transect)

Spot check 1 is a DOWNSTREAM END Additional substrate None

Description	1	2	3	4	5	6	7	8	9	10	Catch All
Left Bank Material	EA	EA	EA	EA	EA	EA	EA	EA	CC	EA	
Left Bank Modification	RS	RS	RS	RS	RS	RS	RS	RS	RS	RS	
Left Bank Modification #2	PC	PC	EM	EM	EM		EM	EM	RI		
Left Bank Modification #3											
Left Bank Modification #4											
Left Bank Features	NO	NO	NO	EC	SC	EC	SC	SC	SC	SC	
Left Bank Features #2											
Left Bank Features #3											
Channel Substrate	SI	SI	SI	SI	SI	SI	SI	GP	AR	SI	
Flow Type	RP	SM	SM	RP	SM	SM	SM	RP	RP	SM	
Channel Modification(s)	RS	RS	RS	RS	RS	RS	RS	RS	RS	RS	
Channel Modification(s) #2									RI		
Channel Feature(s)	NO	NO	NO	TR	NO	NO	NO	MB	NO	NO	
Channel Feature(s) #2											
Channel Feature(s) #3											
Number of sub-channels											
Right Bank Material	EA	EA	EA	EA	EA	EA	EA	EA	CC	EA	
Right Bank Modification	RS	RS	RS	RS	RS	RS	RS	RS	RS	RS	
Right Bank Modification #2			EM	EM	EM	EM	EM	EM	EM		
Right Bank Modification #3									RI		
Right Bank Modification #4											
Right Bank Features	NO	NO	NO	NO	NO	NO	SC	SC	SC	SC	
Right Bank Features #2											
Right Bank Features #3											
Land use within 5m of bank top (Left)	IG	IG	SH	IG	IG	IG	IG	IG	IG	IG	
Left bank-top vegetation structure	U	S	S	S	S	S	S	S	S	S	
Left bank face vegetation structure	S	S	S	S	S	S	S	S	B	S	
Right bank face vegetation structure	S	S	C	C	S	S	S	S	B	S	
Right bank-top vegetation structure	S	C	S	S	U	U	S	S	S	C	
Land use within 5m of bank top (Right)	IG	IG	SU	SU	SU	SU	SU	SU	SU	BP	
Channel Vegetation: NONE		NO								NO	
Bryophytes/lichens	N	N	N	N	N	N	N	N	N	N	N
Emerg broad-leaved herbs	P	N	N	N	N	N	N	N	N	N	P
Emerg reeds/sedges/rushes	N	N	P	P	P	P	P	P	N	N	P
Floating-leaved (rooted)	N	N	N	N	N	N	N	N	N	N	N
Free-floating	N	N	N	N	N	N	N	N	N	N	N
Amphibious	P	N	N	P	N	N	P	P	N	N	P
Submerged broad-leaved	P	N	N	N	N	N	N	N	N	N	P
Submerged linear-leaved	N	N	N	N	N	N	N	N	N	N	P
Submerged fine-leaved	N	N	N	N	N	N	N	N	N	N	N
Filamentous Algae	N	N	N	N	N	N	N	N	P	N	P

H LAND USE WITHIN 50m OF BANKTOP Use ✓(present) or E (> 33% banklength)

	L	R		L	R		L	R
Broadleaf/mixed woodland (semi-natural)	NONE	NONE	Moorland/heath	NONE	NONE	Rock and scree	NONE	NONE
Broadleaf/mixed plantation	NONE	PRESE	Artificial open water	NONE	NONE	Suburban/urban development	PRESEN	EXTEN
Coniferous woodland (semi-natural)	NONE	NONE	Natural open water	NONE	PRESE	Tilled land	NONE	NONE
Coniferous plantation	NONE	NONE	Rough pasture	NONE	NONE	Irrigated land	NONE	NONE
Scrub	EXTEN	PRESE	Improved/semi-improved grass	EXTENS	EXTEN	Parkland or gardens	NONE	NONE
Orchard	NONE	NONE	Tall herbs rank vegetation	PRESEN	PRESE	Not visible	NONE	NONE
Wetland (eg bog,marsh,fen)	NONE	NONE						

I BANK PROFILES Use ✓(present) or E (> 33% banklength)

Natural/unmodified	L	R	Artificial/modified	L	R		L	R
Vertical/undercut	NONE	NONE	Resectioned	EXTENS	EXTENSI	Embanked	EXTEN	PRESE
Vertical + toe	NONE	NONE	Reinforced - whole bank	PRESEN	PRESEN	Set-back embankments	NONE	PRESE
Steep (>45)	NONE	NONE	Reinforced - top only	NONE	NONE			
Gentle	NONE	NONE	Reinforced - toe only	PRESEN	PRESEN			
Composite	NONE	NONE	Artificial two-stage	NONE	NONE			
Natural berms	NONE	NONE	Poached	PRESEN	NONE			

J EXTENT OF TREES AND ASSOCIATED FEATURES (tick one box per feature) *record even if <1%

Left	Occasional clumps	Right	Occasional clumps	Shading of channel	PRESENT	* Overhanging boughs	PRESENT
* Exposed bankside roots	NONE	* Underwater tree roots	PRESENT	Fallen trees	NONE	Large woody debris	PRESENT

K EXTENT OF CHANNEL FEATURES (tick one box per feature) *record even if <1%

* Free fall	NONE	Smooth flow	EXTEN	Exposed bedrock	NONE	Unvegetated side bar(s)	NONE
Chute	NONE	No perceptible flow	PRESE	Exposed boulders	NONE	Vegetated side bar(s)	NONE
Broken standing waves	NONE	No flow	NONE	Vegetated Bedrock Or Boulders	NONE	Unvegetated Point Bar(s)	NONE
Unbroken standing waves	PRESE	Marginal deadwater	NONE	Unvegetated mid-channel bar(s)	PRESE	Vegetated Point Bar(s)	NONE
Rippled flow	EXTEN	Eroding Cliffs	PRESE	Vegetated mid-channel bar(s)	NONE	* Discrete unvegetated silt deposit(s)	NONE
* Upwelling	NONE	Stable Cliffs	EXTEN	Mature island(s)	NONE	* Discrete unvegetated sand deposit(s)	PRESE
						* Discrete unvegetated gravel deposit(s)	NONE

L CHANNEL DIMENSIONS (to be measured at one side on a straight uniform section, preferably across a riffle)

Left banktop height (m)	1.80	Bankfull width (m)	6.00	Right banktop height (m)	4.00
Left banktop height is also bankfull height? (Y or N)	YES	Water width (m)	1.50	Right banktop height is also bankfull height? (Y or N)	NO
Left embanked height (m)	0.50	Water depth (m)	0.10	Right embanked height (m)	3.00

If trashline lower than banktop , indicate height above water (m) and width from bank to bank (r

Bed material at site is consolidated ○ unconsolidated ◉ unknow ○ missing value ○

Location of measurement is: RIFFLE Other state

M FEATURES OF SPECIAL INTEREST Use (present) or E (> 33% banklength) *record even if <1%

If none, tick box ☐

Braided channels	NONE	Very large boulders (>1m)	NONE	Backwater(s)	NONE	Marsh(es)	NONE
Side channels	NONE	* Debris dams	NONE	Floodplain boulder deposits	NONE	Flush(es)	NONE
* Waterfalls > 5m high	NONE	* Leafy debris	NONE	Water meadow(s)	NONE	Natural open water	PRESE
* Waterfalls < 5m high	NONE	Fringing reed bank(s)	NONE	Fen(s)	NONE	Other	NONE
Natural cascade(s)	NONE	Quaking bank(s)	NONE	Bog(s)	NONE	State:	
		*Sink hole(s)	NONE	Wet woodland(s)	NONE		

N CHOKED CHANNEL (tick one box)

Is 33% or more of the channel choked with vegetation? No

O NOTABLE NUISANCE PLANT SPECIES

If none, tick box ☐

Hogweed banktop	NONE	Himalayan Balsam banktop	PRESE	Japanese Knotweed banktop	PRESE	Other banktop	NON
Hogweed bankface	NONE	Himalayan Balsam bankface	PRESE	Japanese Knotweed bankface	NONE	Other bankface	NON

Other name:

P OVERALL CHARACTERISTICS (Add appropriate words)

Major impacts: Pollution, Road Construction, Silting

Recent management

Animals: Lamprey, Trout, Water Vole

COMMENTS:

Minor outfall into flooded field at SC1. Culvert beneath A61 dual carriageway u/s of SC2. Road runoff pollution - grey water. Potential water vole plop at SC2, SC4 and SC7. Sand deposit at outfall at SC8.

Q ALDERS (tick appropriate box(es))

Alders? PRESENT Diseased Alders? NONE

Map Data

Altitude (m):	50
Slope (m/km):	20
Distance to source (km):	3.5
Height of source (m):	120
Solid geology:	Upper Carboniferous
Drift geology:	ALLUVIUM
Planform:	Straightened/realigned
Tributary:	Yes
Navigation:	No

PCA1:	0.6438
PCA2:	-1.0241
PCA3:	0.4365
PCA4:	0.5184

Mid-site easting:	436415
Mid-site northing:	339865
Latitude SC1:	52.95
Longitude SC1:	-1.46
Latitude SC6:	52.95
Longitude SC6:	-1.46
Latitude end of site:	52.96
Longitude end of site:	-1.46

Photographs

RHS indices

Habitat Modification Score	
Habitat Modification Class:	5
Habitat Modification Score:	5224
HMS Culverts subscore:	800
HMS Reinforced Bank Bed subscore:	280
HMS Resectioned Bank Bed subscore:	2800
HMS Realigned subscore:	400
HMS Berms Embankments subscore:	244
HMS Weirs dams and sluices subscore:	555
HMS Bridges subscore:	0
HMS Poaching subscore:	20
HMS Fords subscore:	0
HMS Outfall/ Deflector subscore:	125

Hydromorphological Indices			
Channel Substrate Index:	-1.8330	CSI Weight:	10
Geomporphic Activity Index:	-0.1120	GAI Weight:	10
Flow Regime Index:	-0.5370	FRI Weight:	10
Chanel Vegetation Index:	-0.4740	CVI Weight:	10
Banktop Vegetation Index:	0.3140	BTV Weight:	20
Bankface Vegetation Index:	0.3930	BFV Weight:	20

Habitat Quality Assessment	
HQA Score:	50
HQA 1994 adjusted:	46
Baseline HQA class:	3
HQA class position:	44.00%
General Habitat Quality class:	5
HQA flow type 95-97:	8
HQA flow type 94:	6
HQA channel substrate:	5
HQA channel features:	2
HQA bank features:	8
HQA bank vegetation structure:	12
HQA channel vegetation 95-97:	7
HQA channel vegetation 94:	6
HQA land use:	0
HQA trees:	7
HQA special features 95-97:	1

River Habitat Survey Data for Site 3

A FIELD SURVEY DETAILS

SIte reference:	A38 Bramble Brook
CoordinateSystem:	OSGB36 (British National Grid)
Spot-check 1 coordinates:	SK3282736120
Spot-check 6 coordinates:	SK3265135990
End of site coordinates:	SK3246435902
Reach Reference:	Bramble Brook Mickleover
River name:	Bramble Brook
Date:	17/05/2018 14:30
Surveyor Name:	Peter Cowley
Surveyor code:	FA061

Project Name: A38

Is the site part of a river or an artificial channel?: RIVER

Are adverse conditions affecting survey?: (•) Yes ( ) No

If yes, state: Some sections of watercourse inaccessible due to culverts and road crossings

Is bed of river visible?: ENTIRELY

Is health and safety assessment form attached?: YES

Number of photographs taken: 41

Photo references: 415-455

Site surveyed from: BOTH BANKS AND CHANNEL

B PREDOMINENT VALLEY FORM (within the horizon limit)

( ) shallow vee ( ) concave/bowl ( ) No obvious valley sides

( ) deep vee (•) asymmetrical floodplain

( ) gorge ( ) U-shaped valley

Distinct flat valley bottom?: NO

Terraced valley floor?: NO

C NUMBER OF RIFFLES, POOLS AND POINT BARS (indicate total number)

Riffle(s): 1 Pool(s): 0 Unvegetated point bar(s) 3 Vegetated point bar(s) 1

D ARTIFICIAL FEATURES (indicate total number or tick appropriate box)

If none, tick box ☐

	Maior	Intermediate	Minor		Maior	Intermediat	Minor
Weirs/sluices	1	0	0	Outfalls/intakes	0	0	6
Culverts	3			Fords	0	0	0
Bridges	0	0	0	Deflectors/groynes/croys	0	0	0
Other	0				0	0	0

Is channel obviously realigned? YES, <33%

Is channel obviously over-deepened? NO

Is water impounded by weir/dam? YES, <33%

E PHYSICAL ATTRIBUTES (to be assessed across channel within a 1m wide (transect)

Spot check 1 is a DOWNSTREAM END Additional substrate None

Description	1	2	3	4	5	6	7	8	9	10	Catch All
Left Bank Material	EA	EA	BR	CC	EA	EA	BR	BR	BR	BR	
Left Bank Modification	NO	NO	RI	RI	NO	RS	RS	RS	RS	RS	
Left Bank Modification #2							RI	RI	RI	RI	
Left Bank Modification #3											
Left Bank Modification #4											
Left Bank Features	NO	SC	NO	NO	NO	SC	NO	NO	NO	NO	
Left Bank Features #2											
Left Bank Features #3											
Channel Substrate	SI	SI	AR	AR	SI	SI	NV	NV	NV	SI	
Flow Type	NP	RP	SM	SM	RP	RP	NV	NV	NV	NP	
Channel Modification(s)	NO	NO	CV	CV	NO	RS	RS	RS	RS	RS	
Channel Modification(s) #2											
Channel Feature(s)	NO	NO	NV	NV	TR	NO	NV	NV	NV	MB	
Channel Feature(s) #2											
Channel Feature(s) #3											
Number of sub-channels											
Right Bank Material	EA	EA	CC	CC	EA	EA	BR	BR	BR	BR	
Right Bank Modification	NO	NO	RI	RI	NO	RS	RS	RS	RS	RS	
Right Bank Modification #2							RI	RI	RI	RI	
Right Bank Modification #3											
Right Bank Modification #4											
Right Bank Features	NO	PB	NO	NO	PB	SB	NO	NO	NO	NO	
Right Bank Features #2											
Right Bank Features #3											
Land use within 5m of bank top (Left)	BL	BL	BL	BL	BL	BL	BL	BL	BL	BL	
Left bank-top vegetation structure	S	C	C	C	S	C	C	C	C	S	
Left bank face vegetation structure	S	S	B	B	S	S	S	S	S	S	
Right bank face vegetation structure	S	U	B	B	S	U	S	S	S	S	
Right bank-top vegetation structure	S	C	C	C	C	S	C	C	C	C	
Land use within 5m of bank top (Right)	BL	BL	BL	BL	BL	BL	BL	BL	BL	BL	
Channel Vegetation: NONE	NO	NO		NV			NV	NV	NV	NO	
Bryophytes/lichens	N	N	P	NV	N	N	NV	NV	NV	N	P
Emerg broad-leaved herbs	N	N	N	NV	P	P	NV	NV	NV	N	P
Emerg reeds/sedges/rushes	N	N	N	NV	P	P	NV	NV	NV	N	P
Floating-leaved (rooted)	N	N	N	NV	N	N	NV	NV	NV	N	N
Free-floating	N	N	N	NV	N	N	NV	NV	NV	N	N
Amphibious	N	N	N	NV	N	N	NV	NV	NV	N	N
Submerged broad-leaved	N	N	N	NV	N	N	NV	NV	NV	N	N
Submerged linear-leaved	N	N	N	NV	N	N	NV	NV	NV	N	N
Submerged fine-leaved	N	N	N	NV	N	N	NV	NV	NV	N	N
Filamentous Algae	N	N	P	NV	N	N	NV	NV	NV	N	P

H LAND USE WITHIN 50m OF BANKTOP Use ✓(present) or E (> 33% banklength)

	L	R		L	R		L	R
Broadleaf/mixed woodland (semi-natural)	EXTEN	EXTEN	Moorland/heath	NONE	NONE	Rock and scree	NONE	NONE
Broadleaf/mixed plantation	NONE	NONE	Artificial open water	NONE	NONE	Suburban/urban development	EXTENSI	EXTEN
Coniferous woodland (semi-natural)	NONE	NONE	Natural open water	NONE	NONE	Tilled land	NONE	NONE
Coniferous plantation	NONE	NONE	Rough pasture	NONE	NONE	Irrigated land	NONE	NONE
Scrub	PRESE	PRESE	Improved/semi-improved grass	NONE	NONE	Parkland or gardens	NONE	NONE
Orchard	NONE	NONE	Tall herbs rank vegetation	PRESEN	PRESE	Not visible	NONE	NONE
Wetland (eg bog,marsh,fen)	NONE	NONE						

I BANK PROFILES Use ✓(present) or E (> 33% banklength)

Natural/unmodified	L	R	Artificial/modified	L	R		L	R
Vertical/undercut	PRESENT	PRESENT	Resectioned	EXTENS	EXTENSI	Embanked	NONE	NONE
Vertical + toe	NONE	NONE	Reinforced - whole bank	PRESEN	PRESEN	Set-back embankments	EXTEN	EXTEN
Steep (>45)	EXTENSI	EXTENSI	Reinforced - top only	NONE	NONE			
Gentle	PRESENT	PRESENT	Reinforced - toe only	PRESEN	PRESEN			
Composite	NONE	NONE	Artificial two-stage	NONE	NONE			
Natural berms	NONE	NONE	Poached	NONE	NONE			

J EXTENT OF TREES AND ASSOCIATED FEATURES (tick one box per feature) *record even if <1%

Left	Semi-continuous	Right	Semi-continuous	Shading of channel	EXTENSIVE	* Overhanging boughs	EXTENSIVE
* Exposed bankside roots	PRESENT	* Underwater tree roots	PRESENT	Fallen trees	PRESENT	Large woody debris	PRESENT

K EXTENT OF CHANNEL FEATURES (tick one box per feature) *record even if <1%

* Free fall	NONE	Smooth flow	PRESE	Exposed bedrock	NONE	Unvegetated side bar(s)	PRESE
Chute	NONE	No perceptible flow	PRESE	Exposed boulders	NONE	Vegetated side bar(s)	PRESE
Broken standing waves	NONE	No flow	PRESE	Vegetated Bedrock Or Boulders	NONE	Unvegetated Point Bar(s)	PRESE
Unbroken standing waves	PRESE	Marginal deadwater	NONE	Unvegetated mid-channel bar(s)	PRESE	Vegetated Point Bar(s)	PRESE
Rippled flow	EXTEN	Eroding Cliffs	PRESE	Vegetated mid-channel bar(s)	PRESE	* Discrete unvegetated silt deposit(s)	NONE
* Upwelling	NONE	Stable Cliffs	PRESE	Mature island(s)	NONE	* Discrete unvegetated sand deposit(s)	NONE
						* Discrete unvegetated gravel deposit(s)	NONE

L CHANNEL DIMENSIONS (to be measured at one side on a straight uniform section, preferably across a riffle)

Left banktop height (m)	1.50	Bankfull width (m)	5.00	Right banktop height (m)	6.00
Left banktop height is also bankfull height? (Y or N)	YES	Water width (m)	1.00	Right banktop height is also bankfull height? (Y or N)	NO
Left embanked height (m)	0.00	Water depth (m)	0.20	Right embanked height (m)	0.00

If trashline lower than banktop , indicate height above water (m) and width from bank to bank (r

Bed material at site is consolidated ○ unconsolidated ◉ unknow ○ missing value ○

Location of measurement is: OTHER Other state SC2

M FEATURES OF SPECIAL INTEREST Use (present) or E (> 33% banklength) *record even if <1%

If none, tick box ☐

Braided channels	NONE	Very large boulders (>1m)	NONE	Backwater(s)	NONE	Marsh(es)	NONE
Side channels	NONE	* Debris dams	PRESE	Floodplain boulder deposits	NONE	Flush(es)	NONE
* Waterfalls > 5m high	NONE	* Leafy debris	PRESE	Water meadow(s)	NONE	Natural open water	NONE
* Waterfalls < 5m high	NONE	Fringing reed bank(s)	NONE	Fen(s)	NONE	Other	NONE
Natural cascade(s)	NONE	Quaking bank(s)	NONE	Bog(s)	NONE	State:	
		*Sink hole(s)	NONE	Wet woodland(s)	NONE		

N CHOKED CHANNEL (tick one box)

Is 33% or more of the channel choked with vegetation? No

O NOTABLE NUISANCE PLANT SPECIES

If none, tick box ☐

Hogweed banktop	NONE	Himalayan Balsam banktop	PRESE	Japanese Knotweed banktop	NONE	Other banktop	NON
Hogweed bankface	NONE	Himalayan Balsam bankface	PRESE	Japanese Knotweed bankface	NONE	Other bankface	NON

Other name:

P OVERALL CHARACTERISTICS (Add appropriate words)

COMMENTS:

Major impacts: Litter, Road, Silting

Recent management

Animals:

Q ALDERS (tick appropriate box(es))

Alders? NONE Diseased Alders? NONE

Map Data

Altitude (m):	70
Slope (m/km):	7
Distance to source (km):	1.5
Height of source (m):	80
Solid geology:	Triassic mudstones including Ke
Drift geology:	ALLUVIUM
Planform:	Irregular meanders
Tributary:	No
Navigation:	No

PCA1:	0.2956
PCA2:	-1.4206
PCA3:	-0.3697
PCA4:	0.0496

Mid-site easting:	432651
Mid-site northing:	335990
Latitude SC1:	52.92
Longitude SC1:	-1.51
Latitude SC6:	52.92
Longitude SC6:	-1.52
Latitude end of site:	52.92
Longitude end of site:	-1.52

Photographs

RHS indices

Habitat Modification Score	
Habitat Modification Class:	5
Habitat Modification Score:	3527
HMS Culverts subscore:	1070
HMS Reinforced Bank Bed subscore:	400
HMS Resectioned Bank Bed subscore:	1400
HMS Realigned subscore:	100
HMS Berms Embankments subscore:	32
HMS Weirs dams and sluices subscore:	375
HMS Bridges subscore:	0
HMS Poaching subscore:	0
HMS Fords subscore:	0
HMS Outfall/ Deflector subscore:	150

Hydromorphological Indices			
Channel Substrate Index:	-1.4060	CSI Weight:	7
Geomporphic Activity Index:	-0.2800	GAI Weight:	10
Flow Regime Index:	-0.4900	FRI Weight:	7
Chanel Vegetation Index:	0.0490	CVI Weight:	6
Banktop Vegetation Index:	1.1900	BTV Weight:	20
Bankface Vegetation Index:	-0.0360	BFV Weight:	20

Habitat Quality Assessment	
HQA Score:	56
HQA 1994 adjusted:	53
Baseline HQA class:	
HQA class position:	
General Habitat Quality class:	
HQA flow type 95-97:	8
HQA flow type 94:	7
HQA channel substrate:	3
HQA channel features:	3
HQA bank features:	8
HQA bank vegetation structure:	12
HQA channel vegetation 95-97:	3
HQA channel vegetation 94:	3
HQA land use:	4
HQA trees:	12
HQA special features 95-97:	3

River Habitat Survey Data for Site 4

A FIELD SURVEY DETAILS

SIte reference:	A38 Middle Brook
CoordinateSystem:	OSGB36 (British National Grid)
Spot-check 1 coordinates:	SK3407437300
Spot-check 6 coordinates:	SK3397137290
End of site coordinates:	SK3382137387
Reach Reference:	Middle Brook
River name:	Middle Brook
Date:	02/08/2018 11:00
Surveyor Name:	Peter Cowley
Surveyor code:	FA061

Project Name: A38

Is the site part of a river or an artificial channel?: RIVER

Are adverse conditions affecting survey?: ○ Yes ◉ No

If yes, state:

Is bed of river visible?: ENTIRELY

Is health and safety assessment form attached?: YES

Number of photographs taken: 20

Photo references: 1-20

Site surveyed from: BOTH BANKS AND CHANNEL

B PREDOMINENT VALLEY FORM (within the horizon limit)

○ shallow vee ○ concave/bowl ◉ No obvious valley sides

○ deep vee ○ asymmetrical floodplain

○ gorge ○ U-shaped valley

Distinct flat valley bottom?: YES

Terraced valley floor?: NO

C NUMBER OF RIFFLES, POOLS AND POINT BARS (indicate total number)

Riffle(s): 8 Pool(s): 1 Unvegetated point bar(s) 5 Vegetated point bar(s) 1

D ARTIFICIAL FEATURES (indicate total number or tick appropriate box)

If none, tick box		Maior	Intermediate	Minor		Maior	Intermediat	Minor
☐	Weirs/sluices	0	0	0	Outfalls/intakes	0	0	5
	Culverts	1			Fords	0	0	0
	Bridges	0	0	1	Deflectors/groynes/croys	1	0	2
	Other					0	0	0

Is channel obviously realigned?

YES, >=33%

Is channel obviously over-deepened?

NO

Is water impounded by weir/dam?

NO

E PHYSICAL ATTRIBUTES (to be assessed across channel within a 1m wide (transect)

Spot check 1 is a DOWNSTREAM END Additional substrate SA, SI

Description	1	2	3	4	5	6	7	8	9	10	Catch All
Left Bank Material	EA	EA	EA	EA	EA	EA	GS	GS	GS	BR	
Left Bank Modification	NO	NO	NO	NO	NO	NO	NO	NO	NO	RS	
Left Bank Modification #2										RI	
Left Bank Modification #3											
Left Bank Modification #4											
Left Bank Features	NO	NO	NO	NO	NO	NO	ECR	NO	ECR	NO	
Left Bank Features #2											
Left Bank Features #3											
Channel Substrate	GP	GP	GP	GP	GP	GP	GP	GP	GP	GP	
Flow Type	RP	SM	RP	RP	RP	RP	SM	RP	SM	RP	
Channel Modification(s)	RS	RS	RS	RS	RS	RS	RS	RS	RS	RS	
Channel Modification(s) #2											
Channel Feature(s)	NO	TR	NO	NO	TR	NO	NO	NO	NO	NO	
Channel Feature(s) #2											
Channel Feature(s) #3											
Number of sub-channels											
Right Bank Material	EA	EA	EA	GS	GS	GS	EA	EA	EA	BR	
Right Bank Modification	NO	NO	NO	NO	NO	NO	NO	NO	NO	RS	
Right Bank Modification #2										RI	
Right Bank Modification #3											
Right Bank Modification #4											
Right Bank Features	NO	NO	NO	NO	NB	ECR	SB	SB	VP	NO	
Right Bank Features #2											
Right Bank Features #3											
Land use within 5m of bank top (Left)	BL	BL	BL	BL	BL	BL	TH	BL	BL	BL	
Left bank-top vegetation structure	U	C	C	C	C	C	C	C	C	C	
Left bank face vegetation structure	U	C	C	C	C	C	C	C	S	S	
Right bank face vegetation structure	U	S	C	C	C	C	C	C	S	S	
Right bank-top vegetation structure	B	S	C	C	C	S	S	C	C	C	
Land use within 5m of bank top (Right)	BL	SH	BL	TH	TH	TH	TH	BL	BL	BL	
Channel Vegetation: NONE	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Bryophytes/lichens	N	N	N	N	N	N	N	N	N	N	N
Emerg broad-leaved herbs	N	N	N	N	N	N	N	N	N	N	P
Emerg reeds/sedges/rushes	N	N	N	N	N	N	N	N	N	N	P
Floating-leaved (rooted)	N	N	N	N	N	N	N	N	N	N	N
Free-floating	N	N	N	N	N	N	N	N	N	N	N
Amphibious	N	N	N	N	N	N	N	N	N	N	P
Submerged broad-leaved	N	N	N	N	N	N	N	N	N	N	N
Submerged linear-leaved	N	N	N	N	N	N	N	N	N	N	N
Submerged fine-leaved	N	N	N	N	N	N	N	N	N	N	N
Filamentous Algae	N	N	N	N	N	N	N	N	N	N	P

H LAND USE WITHIN 50m OF BANKTOP Use ✓(present) or E (> 33% banklength)

	L	R		L	R		L	R
Broadleaf/mixed woodland (semi-natural)	EXTEN	EXTEN	Moorland/heath	NONE	NONE	Rock and scree	NONE	NONE
Broadleaf/mixed plantation	NONE	NONE	Artificial open water	NONE	NONE	Suburban/urban development	PRESEN	PRESE
Coniferous woodland (semi-natural)	NONE	NONE	Natural open water	NONE	NONE	Tilled land	NONE	NONE
Coniferous plantation	NONE	NONE	Rough pasture	NONE	NONE	Irrigated land	NONE	NONE
Scrub	PRESE	EXTEN	Improved/semi-improved grass	NONE	NONE	Parkland or gardens	EXTENSI	EXTEN
Orchard	NONE	NONE	Tall herbs rank vegetation	PRESEN	EXTEN	Not visible	NONE	NONE
Wetland (eg bog,marsh,fen)	NONE	NONE						

I BANK PROFILES Use ✓(present) or E (> 33% banklength)

Natural/unmodified	L	R	Artificial/modified	L	R		L	R
Vertical/undercut	EXTENSI	EXTENSI	Resectioned	PRESEN	PRESEN	Embanked	NONE	NONE
Vertical + toe	PRESENT	PRESENT	Reinforced - whole bank	NONE	NONE	Set-back embankments	NONE	NONE
Steep (>45)	EXTENSI	EXTENSI	Reinforced - top only	NONE	NONE			
Gentle	PRESENT	PRESENT	Reinforced - toe only	PRESEN	PRESEN			
Composite	NONE	NONE	Artificial two-stage	NONE	NONE			
Natural berms	NONE	PRESENT	Poached	PRESEN	NONE			

J EXTENT OF TREES AND ASSOCIATED FEATURES (tick one box per feature) *record even if <1%

Left	Continuous	Right	Semi-continuous	Shading of channel	EXTENSIVE	* Overhanging boughs	EXTENSIVE
* Exposed bankside roots	PRESENT	* Underwater tree roots	EXTENSIVE	Fallen trees	PRESENT	Large woody debris	PRESENT

K EXTENT OF CHANNEL FEATURES (tick one box per feature) *record even if <1%

* Free fall	NONE	Smooth flow	EXTEN	Exposed bedrock	NONE	Unvegetated side bar(s)	PRESE
Chute	PRESE	No perceptible flow	NONE	Exposed boulders	NONE	Vegetated side bar(s)	PRESE
Broken standing waves	NONE	No flow	NONE	Vegetated Bedrock Or Boulders	NONE	Unvegetated Point Bar(s)	PRESE
Unbroken standing waves	PRESE	Marginal deadwater	PRESE	Unvegetated mid-channel bar(s)	PRESE	Vegetated Point Bar(s)	PRESE
Rippled flow	EXTEN	Eroding Cliffs	PRESE	Vegetated mid-channel bar(s)	NONE	* Discrete unvegetated silt deposit(s)	NONE
* Upwelling	NONE	Stable Cliffs	PRESE	Mature island(s)	NONE	* Discrete unvegetated sand deposit(s)	NONE
						* Discrete unvegetated gravel deposit(s)	NONE

L CHANNEL DIMENSIONS (to be measured at one side on a straight uniform section, preferably across a riffle)

Left banktop height (m)	1.50	Bankfull width (m)	10.00	Right banktop height (m)	1.40
Left banktop height is also bankfull height? (Y or N)	NO	Water width (m)	3.50	Right banktop height is also bankfull height? (Y or N)	YES
Left embanked height (m)		Water depth (m)	0.05	Right embanked height (m)	

If trashline lower than banktop , indicate height above water (m) and width from bank to bank (r

Bed material at site is consolidated ○ unconsolidated ◉ unknow ○ missing value ○

Location of measurement is: RIFFLE Other state

M FEATURES OF SPECIAL INTEREST Use (present) or E (> 33% banklength) *record even if <1%

If none, tick box ☐

Braided channels	NONE	Very large boulders (>1m)	NONE	Backwater(s)	NONE	Marsh(es)	NONE
Side channels	NONE	* Debris dams	PRESE	Floodplain boulder deposits	NONE	Flush(es)	NONE
* Waterfalls > 5m high	NONE	* Leafy debris	PRESE	Water meadow(s)	NONE	Natural open water	NONE
* Waterfalls < 5m high	NONE	Fringing reed bank(s)	NONE	Fen(s)	NONE	Other	NONE
Natural cascade(s)	NONE	Quaking bank(s)	NONE	Bog(s)	NONE	State:	
		*Sink hole(s)	NONE	Wet woodland(s)	NONE		

N CHOKED CHANNEL (tick one box)

Is 33% or more of the channel choked with vegetation? No

O NOTABLE NUISANCE PLANT SPECIES

If none, tick box ☐

Hogweed banktop	NONE	Himalayan Balsam banktop	PRESE	Japanese Knotweed banktop	NONE	Other banktop	NON
Hogweed bankface	NONE	Himalayan Balsam bankface	PRESE	Japanese Knotweed bankface	NONE	Other bankface	NON

Other name:

P OVERALL CHARACTERISTICS (Add appropriate words)

Major impacts:	Road, Sewage Outfall
Recent management	
Animals:	

COMMENTS:

Sparrowhawk at SC9. Freshwater sponge abundant in places: e.g. SC3 and SC9/10. Potential sewage outfall and impacts from road runoff. Abundant sewage fungus at outfall at SC10, 90% coverage at that point.

Q ALDERS (tick appropriate box(es))

Alders? NONE Diseased Alders? NONE

Map Data

Altitude (m):	50
Slope (m/km):	11.2
Distance to source (km):	12.5
Height of source (m):	190
Solid geology:	Triassic mudstones including Ke
Drift geology:	ALLUVIUM
Planform:	Straightened/realigned
Tributary:	Yes
Navigation:	No

PCA1:	0.2959
PCA2:	0.1002
PCA3:	0.3274
PCA4:	0.5815

Mid-site easting:	433971
Mid-site northing:	337290
Latitude SC1:	52.93
Longitude SC1:	-1.49
Latitude SC6:	52.93
Longitude SC6:	-1.50
Latitude end of site:	52.93
Longitude end of site:	-1.50

Photographs

RHS indices

Habitat Modification Score	
Habitat Modification Class:	5
Habitat Modification Score:	3465
HMS Culverts subscore:	400
HMS Reinforced Bank Bed subscore:	100
HMS Resectioned Bank Bed subscore:	2080
HMS Realigned subscore:	400
HMS Berms Embankments subscore:	0
HMS Weirs dams and sluices subscore:	0
HMS Bridges subscore:	100
HMS Poaching subscore:	10
HMS Fords subscore:	0
HMS Outfall/ Deflector subscore:	375

Hydromorphological Indices			
Channel Substrate Index:	-0.6040	CSI Weight:	10
Geomporphic Activity Index:	0.0430	GAI Weight:	10
Flow Regime Index:	-0.0420	FRI Weight:	10
Chanel Vegetation Index:	0.7100	CVI Weight:	10
Banktop Vegetation Index:	1.0620	BTV Weight:	20
Bankface Vegetation Index:	1.1870	BFV Weight:	20

Habitat Quality Assessment	
HQA Score:	63
HQA 1994 adjusted:	57
Baseline HQA class:	
HQA class position:	
General Habitat Quality class:	
HQA flow type 95-97:	8
HQA flow type 94:	7
HQA channel substrate:	4
HQA channel features:	5
HQA bank features:	11
HQA bank vegetation structure:	12
HQA channel vegetation 95-97:	3
HQA channel vegetation 94:	0
HQA land use:	4
HQA trees:	13
HQA special features 95-97:	3

River Habitat Survey Data for Site 5

A FIELD SURVEY DETAILS

SIte reference:	Mickleover Railway Cutting
CoordinateSystem:	OSGB36 (British National Grid)
Spot-check 1 coordinates:	SK3271736068
Spot-check 6 coordinates:	SK3249636015
End of site coordinates:	SK3222235977
Reach Reference:	Mickleover Railway Cutting
River name:	Bramble Brook
Date:	02/08/2018 13:30
Surveyor Name:	Peter Cowley
Surveyor code:	FA061

Project Name: A38

Is the site part of a river or an artificial channel?: ARTIFICIAL

Are adverse conditions affecting survey?: ○ Yes ◉ No

If yes, state:

Is bed of river visible?: ENTIRELY

Is health and safety assessment form attached?: YES

Number of photographs taken: 20

Photo references: 1-20

Site surveyed from: RIGHT BANK AND CHANNEL

B PREDOMINENT VALLEY FORM (within the horizon limit)

○ shallow vee ○ concave/bowl ◉ No obvious valley sides

○ deep vee ○ asymmetrical floodplain

○ gorge ○ U-shaped valley

Distinct flat valley bottom?: NO

Terraced valley floor?: NO

C NUMBER OF RIFFLES, POOLS AND POINT BARS (indicate total number)

Riffle(s): 10 Pool(s): 0 Unvegetated point bar(s) 0 Vegetated point bar(s) 0

D ARTIFICIAL FEATURES (indicate total number or tick appropriate box)

If none, tick box ☐

	Maior	Intermediate	Minor		Maior	Intermediat	Minor
Weirs/sluices	0	0	0	Outfalls/intakes	0	0	0
Culverts	2			Fords	0	0	0
Bridges	0	1	1	Deflectors/groynes/croys	0	0	1
Other					0	0	0

Is channel obviously realigned? NO

Is channel obviously over-deepened? NO

Is water impounded by weir/dam? NO

E PHYSICAL ATTRIBUTES (to be assessed across channel within a 1m wide (transect)

Spot check 1 is a DOWNSTREAM END Additional substrate None

Description	1	2	3	4	5	6	7	8	9	10	Catch All
Left Bank Material	EA	EA	EA	EA	EA	EA	EA	CC	EA	NV	
Left Bank Modification	NK	NO	NO	NO	NO	NO	NO	RI	NO	NO	
Left Bank Modification #2											
Left Bank Modification #3											
Left Bank Modification #4											
Left Bank Features	NV	NO	VS	SB	SB	SB	VS	NO	SB	NK	
Left Bank Features #2											
Left Bank Features #3											
Channel Substrate	SI	GP	GP	EA	EA	EA	EA	AR	EA	NV	
Flow Type	RP	RP	RP	RP	RP	RP	RP	NV	SM	NV	
Channel Modification(s)	RS	RS	RS	RS	RS	RS	RS	CV	RS	NK	
Channel Modification(s) #2											
Channel Feature(s)	NO	NO	TR	MB	VB	MB	VB	NV	TR	NV	
Channel Feature(s) #2			MB	TR	TR	TR	TR				
Channel Feature(s) #3											
Number of sub-channels											
Right Bank Material	EA	EA	EA	EA	EA	EA	EA	CC	EA	NV	
Right Bank Modification	NK	NO	NO	NO	NO	NO	NO	RI	NO	NK	
Right Bank Modification #2											
Right Bank Modification #3											
Right Bank Modification #4											
Right Bank Features	NV	NO	SB	SB	NO	SB	SB	NO	SB	NK	
Right Bank Features #2											
Right Bank Features #3											
Land use within 5m of bank top (Left)	SH	BL	BL	BL	BL	BL	BL	SU	BL	BL	
Left bank-top vegetation structure	S	C	C	C	C	C	C	B	C	C	
Left bank face vegetation structure	S	S	C	C	C	C	C	B	C	C	
Right bank face vegetation structure	S	C	C	C	C	C	C	B	C	C	
Right bank-top vegetation structure	C	C	C	C	C	C	C	B	C	C	
Land use within 5m of bank top (Right)	BL	BL	BL	BL	BL	BL	BL	SU	BL	BL	
Channel Vegetation: NONE	NO	NO		NO	NO			NO		NV	
Bryophytes/lichens	N	N	N	N	N	N	N	N	N	NV	N
Emerg broad-leaved herbs	N	N	N	N	N	N	N	N	N	NV	P
Emerg reeds/sedges/rushes	N	N	N	N	N	N	N	N	P	NV	N
Floating-leaved (rooted)	N	N	N	N	N	N	N	N	N	NV	N
Free-floating	N	N	N	N	N	N	N	N	N	NV	N
Amphibious	N	N	P	N	N	P	E	N	E	NV	N
Submerged broad-leaved	N	N	N	N	N	N	N	N	N	NV	N
Submerged linear-leaved	N	N	N	N	N	N	N	N	N	NV	N
Submerged fine-leaved	N	N	N	N	N	N	N	N	N	NV	N
Filamentous Algae	N	N	N	N	N	N	N	N	N	NV	P

H LAND USE WITHIN 50m OF BANKTOP Use ✓(present) or E (> 33% banklength)

	L	R		L	R		L	R
Broadleaf/mixed woodland (semi-natural)	EXTEN	EXTEN	Moorland/heath	NONE	NONE	Rock and scree	NONE	NONE
Broadleaf/mixed plantation	NONE	NONE	Artificial open water	NONE	NONE	Suburban/urban development	EXTENSI	PRESE
Coniferous woodland (semi-natural)	NONE	NONE	Natural open water	NONE	NONE	Tilled land	NONE	NONE
Coniferous plantation	NONE	NONE	Rough pasture	NONE	NONE	Irrigated land	NONE	NONE
Scrub	EXTEN	EXTEN	Improved/semi-improved grass	NONE	NONE	Parkland or gardens	NONE	EXTEN
Orchard	NONE	NONE	Tall herbs rank vegetation	PRESEN	PRESE	Not visible	NONE	NONE
Wetland (eg bog,marsh,fen)	NONE	NONE						

I BANK PROFILES Use ✓(present) or E (> 33% banklength)

Natural/unmodified	L	R	Artificial/modified	L	R		L	R
Vertical/undercut	NONE	NONE	Resectioned	NONE	NONE	Embanked	NONE	NONE
Vertical + toe	NONE	NONE	Reinforced - whole bank	NONE	NONE	Set-back embankments	NONE	NONE
Steep (>45)	EXTENSI	EXTENSI	Reinforced - top only	NONE	NONE			
Gentle	PRESENT	PRESENT	Reinforced - toe only	PRESEN	PRESEN			
Composite	NONE	NONE	Artificial two-stage	NONE	NONE			
Natural berms	NONE	NONE	Poached	PRESEN	PRESEN			

J EXTENT OF TREES AND ASSOCIATED FEATURES (tick one box per feature) *record even if <1%

Left	Continuous	Right	Continuous	Shading of channel	EXTENSIVE	* Overhanging boughs	PRESENT
* Exposed bankside roots	NONE	* Underwater tree roots	PRESENT	Fallen trees	PRESENT	Large woody debris	PRESENT

K EXTENT OF CHANNEL FEATURES (tick one box per feature) *record even if <1%

* Free fall	NONE	Smooth flow	EXTEN	Exposed bedrock	NONE	Unvegetated side bar(s)	EXTEN
Chute	NONE	No perceptible flow	PRESE	Exposed boulders	NONE	Vegetated side bar(s)	PRESE
Broken standing waves	NONE	No flow	NONE	Vegetated Bedrock Or Boulders	NONE	Unvegetated Point Bar(s)	NONE
Unbroken standing waves	PRESE	Marginal deadwater	NONE	Unvegetated mid-channel bar(s)	EXTENS	Vegetated Point Bar(s)	NONE
Rippled flow	EXTEN	Eroding Cliffs	NONE	Vegetated mid-channel bar(s)	PRESE	* Discrete unvegetated silt deposit(s)	NONE
* Upwelling	NONE	Stable Cliffs	NONE	Mature island(s)	NONE	* Discrete unvegetated sand deposit(s)	NONE
						* Discrete unvegetated gravel deposit(s)	NONE

L CHANNEL DIMENSIONS (to be measured at one side on a straight uniform section, preferably across a riffle)

Left banktop height (m)	12.00	Bankfull width (m)	25.00	Right banktop height (m)	12.00
Left banktop height is also bankfull height? (Y or N)	YES	Water width (m)	2.00	Right banktop height is also bankfull height? (Y or N)	YES
Left embanked height (m)		Water depth (m)	0.05	Right embanked height (m)	

If trashline lower than banktop , indicate height above water (m) 1 and width from bank to bank (r 10.00

Bed material at site is consolidated ○ unconsolidated ◉ unknow ○ missing value ○

Location of measurement is: RIFFLE Other state

M FEATURES OF SPECIAL INTEREST Use (present) or E (> 33% banklength) *record even if <1%

If none, tick box ☐

Braided channels	NONE	Very large boulders (>1m)	NONE	Backwater(s)	NONE	Marsh(es)	NONE
Side channels	PRESE	* Debris dams	PRESE	Floodplain boulder deposits	NONE	Flush(es)	NONE
* Waterfalls > 5m high	NONE	* Leafy debris	PRESE	Water meadow(s)	NONE	Natural open water	NONE
* Waterfalls < 5m high	NONE	Fringing reed bank(s)	NONE	Fen(s)	NONE	Other	NONE
Natural cascade(s)	NONE	Quaking bank(s)	NONE	Bog(s)	NONE	State:	
		*Sink hole(s)	NONE	Wet woodland(s)	NONE		

N CHOKED CHANNEL (tick one box)

Is 33% or more of the channel choked with vegetation? No

O NOTABLE NUISANCE PLANT SPECIES

If none, tick box ☑

Hogweed banktop	NONE	Himalayan Balsam banktop	NONE	Japanese Knotweed banktop	NONE	Other banktop	NON
Hogweed bankface	NONE	Himalayan Balsam bankface	NONE	Japanese Knotweed bankface	NONE	Other bankface	NON

Other name:

P OVERALL CHARACTERISTICS (Add appropriate words)

Major impacts: Litter, Tipping

Recent management

Animals:

COMMENTS:

Artificial channel in former railway cutting, forming part of the Bramble Brook catchment. Abundant litter and urban trash.

Q ALDERS (tick appropriate box(es))

Alders? NONE Diseased Alders? NONE

Map Data

Altitude (m):	70
Slope (m/km):	20
Distance to source (km):	1.5
Height of source (m):	100
Solid geology:	Triassic mudstones including Ke
Drift geology:	NONE
Planform:	Straight
Tributary:	No
Navigation:	No

PCA1:	0.8720
PCA2:	-1.4990
PCA3:	0.1705
PCA4:	0.3663

Mid-site easting:	432496
Mid-site northing:	336015
Latitude SC1:	52.92
Longitude SC1:	-1.51
Latitude SC6:	52.92
Longitude SC6:	-1.52
Latitude end of site:	52.92
Longitude end of site:	-1.52

Photographs

RHS indices

Habitat Modification Score	
Habitat Modification Class:	5
Habitat Modification Score:	2700
HMS Culverts subscore:	730
HMS Reinforced Bank Bed subscore:	0
HMS Resectioned Bank Bed subscore:	1600
HMS Realigned subscore:	0
HMS Berms Embankments subscore:	0
HMS Weirs dams and sluices subscore:	0
HMS Bridges subscore:	300
HMS Poaching subscore:	20
HMS Fords subscore:	0
HMS Outfall/ Deflector subscore:	50

Hydromorphological Indices			
Channel Substrate Index:	-0.6590	CSI Weight:	4
Geomporphic Activity Index:	0.7100	GAI Weight:	8
Flow Regime Index:	0.2470	FRI Weight:	8
Chanel Vegetation Index:	0.1080	CVI Weight:	9
Banktop Vegetation Index:	1.2030	BTV Weight:	20
Bankface Vegetation Index:	1.3690	BFV Weight:	20

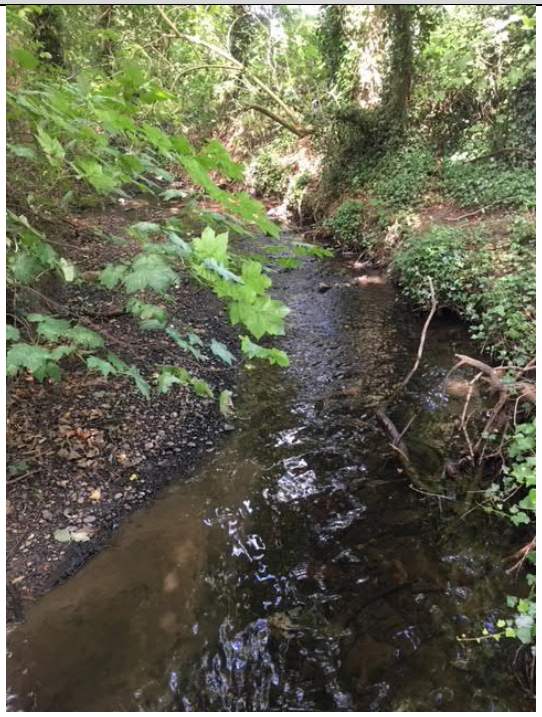
Habitat Quality Assessment	
HQA Score:	59
HQA 1994 adjusted:	54
Baseline HQA class:	
HQA class position:	
General Habitat Quality class:	
HQA flow type 95-97:	6
HQA flow type 94:	6
HQA channel substrate:	6
HQA channel features:	5
HQA bank features:	8
HQA bank vegetation structure:	12
HQA channel vegetation 95-97:	4
HQA channel vegetation 94:	3
HQA land use:	4
HQA trees:	10
HQA special features 95-97:	4

Appendix C Site Photographs

Watercourse	Photo No.	Description	Photo
Bramble Brook	1	Culverted and reinforced section upstream of A38	
Bramble Brook	2	Reinforced section within Kingsway roundabout	

Watercourse	Photo No.	Description	Photo
Bramble Brook	3	Dry section of Bramble Brook upstream of A38	
Dam Brook	4	Upstream end of culvert beneath A61	
Dam Brook	5	Representative section of Dam Brook	

Watercourse	Photo No.	Description	Photo
Middle Brook	6	Minor bridge downstream of wide shallow section (proposed location of temporary bridge crossing)	
Middle Brook	7	Culvert, immediately downstream of A38, with outfall pipe on left bank (right of picture)	

Watercourse	Photo No.	Description	Photo
Middle Brook	8	Representative section of Middle Brook	
Mickleover Railway Cutting	9	Representative section of Mickleover Railway Cutting channel