

A38 Derby Junctions

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Volume 6

**6.3 Environmental Statement
Appendices**

**Appendix 8.9a: Bat Roost Surveys in
2018**

Regulation 5(2)(a)

Planning Act 2008

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Infrastructure Planning

Planning Act 2008

**The Infrastructure Planning
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6.3 Environmental Statement Appendices
Appendix 8.9a: Bat Roost Surveys in 2018

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A38 Derby Junctions

Bat Roost Survey Report 2018

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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 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; and
 - 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 to define prevailing baseline conditions.
- 1.1.5 Previous bat surveys in 2015, 2016, 2017 and updated extended Phase 1 Habitat surveys in early 2018 defined the scope of bat work for 2018. Details of the previous bat survey work and the scope of bat work for 2018 is provided in Section 1.3 and Section 1.4 respectively. The results of the 2018 survey work are reported herein with recommendations. Details of proposed mitigation measures and the requirement for Natural England European Protected Species Mitigation Licences (EPSML) will be reported within the ecological impact assessment (EcIA) to support the Environmental Statement (ES) for the Scheme.

1.2 Study Site

- 1.2.1 The Scheme under appraisal encompasses Kingsway and Markeaton junctions, west of the City of Derby (grid reference SK 32801 36103) and Little Eaton junction north of Derby (grid reference SK 36402 39990). A plan showing the Scheme boundary is presented in Figure 1, Appendix A. The ecological study area as referred to herein extends up to 50m beyond the Scheme boundary.
- 1.2.2 The A38 is a busy arterial 'A' road carrying traffic around the west and north of the City of Derby. South of the 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 mosaic of habitat types, including semi-improved neutral grassland and native broadleaved woodland. Bramble Brook flows from the west of the 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 embankment.
- 1.2.3 Markeaton junction is bordered to the east by residential properties and to the west by parkland. The outfalls from Markeaton Lake and Markeaton Brook flow through culverts beneath the existing A38 at the northern extent of the Scheme at Markeaton junction.

- 1.2.4 The western boundary of the 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 habitats. A variety of grassland habitats exist at the base of the embankments in this location.

1.3 Previous Bat Surveys

2015 Bat Surveys

- 1.3.1 AECOM undertook an Extended Phase 1 Habitat survey along the route of the Scheme in January 2015. This Extended Phase 1 Habitat survey (AECOM(a) 2016) identified trees, buildings and other built structures with potential to support roosting bats across the survey area (the Scheme boundary plus 50m). Following the initial assessment, each of the identified features, where accessible, was re-assessed by an experienced and licensed bat worker in-line with the then current guidance from the Bat Conservation Trust (BCT) (Hundt, 2012).
- 1.3.2 Between May and September 2015, dusk emergence and/ or dawn re-entry surveys and/ or thermal imaging surveys were undertaken at the trees and bridges identified by the bat roost potential survey as having potential to support roosting bats. All dusk emergence and dawn re-entry surveys were undertaken in line with the then current guidance published by the BCT (Hundt, 2012).
- 1.3.3 During the 2015 surveys, seven (B1 – B7, Figure 2a and 2b, Appendix A) structures were identified with bat roost potential and bat roosts were confirmed at two of these structures, both at Little Eaton junction: B2, a farm access overbridge used as a night roost by brown long eared bats (*Plecotus auritus*); and B3, an overbridge spanning the River Derwent used as a day roost by common pipistrelle (*Pipistrellus pipistrellus*) and as a feeding perch/ resting place by Daubenton's bats (*Myotis daubentonii*) (AECOM(b) 2016).
- 1.3.4 During the 2015 surveys, bat roosting potential was identified at 35 trees with roost surveys undertaken at 31 trees in 2015 (AECOM(b) 2016). A single common pipistrelle (*Pipistrellus pipistrellus*) bat was recorded using tree M39 and an unrecorded species using tree T13; in addition, surveys indicated a suspected roost at tree M1.
- 1.3.5 Static detector surveys, walked transect surveys and bat trapping surveys at Little Eaton junction were also undertaken in 2015 to determine bat activity and species present (AECOM(b) 2016).

2017 Bat Surveys

- 1.3.6 Bat surveys undertaken by AECOM in 2017 covered new buildings and structures not previously surveyed in 2015 (due to Scheme boundary changes and access issues) and on buildings and structures with identified roosts in 2015 to update data on known roosts (AECOM(c) 2016); further tree surveys (AECOM(d) 2018); activity surveys based on updated guidance (Collins 2016) (AECOM(e) 2018); and further bat trapping surveys focusing on Markeaton Park where bat roosts and potential bat roosts had been confirmed in 2015.
- 1.3.7 The 2017 bat roost surveys included: a row of 15 detached residential properties on Queensway and two semi-detached properties on the A52 Ashbourne Road at Markeaton junction (B8 at Figure 2b, Appendix A), not previously accessible in 2015;

and update surveys at structures with roost previously confirmed in 2015 (B2 and B3 above).

- 1.3.8 Properties at Queensway and Ashbourne Road were subject to external, internal and roost surveys where accessible, with a roost of a single whiskered (*Myotis mystacinus*) and common pipistrelle bats recorded at one property (QW30). Update surveys of confirmed roosts recorded in 2015, recorded small numbers of common and soprano pipistrelle (*Pipistrellus pygmaeus*) roosting at Bridge B2; and an estimated 64 bats roosting at B3, River Derwent Bridge.
- 1.3.9 During 2017 tree surveys were updated following new guidance (Collins 2016); with initial ground-based assessments undertaken at the 35 trees identified during 2015 surveys, and a further 65 new trees identified through the Updated Extended Phase 1 Habitat Survey 2017 (AECOM(f) 2018). Tree climbing surveys were undertaken of trees rated as providing Moderate or High bat suitability (AECOM(d) 2018) where access was available and trees were safe to climb. Including all 100 trees identified to this date four were ranked as providing High suitability for bat roosts, 33 with Moderate suitability; 37 trees with Low suitability and 18 were of Negligible suitability (this included four trees assessed in 2015 as having Moderate suitability and four with Low suitability that were not re-assessed in 2017); noting that there was no access to eight trees.

1.4 Scope of Bat Survey Work for 2018

Potential Roost Feature (PRF) Assessment

- 1.4.1 Surveys of previously inaccessible buildings and structures likely to be affected by the Scheme were surveyed to assess their potential to support roosting bats, including external and internal survey assessments where applicable; this included:
- One property at B8 Queensway buildings: QW16 (Figure 2b);
 - B9 Static homes at Ford Farm Mobile Home Park (Figure 2a);
 - Four airshafts associated with a disused Severn Trent Water underground water networks;
 - B10 A toilet block at Markeaton Park (Figure 2b); and
 - B11 Derby Garden Centre (Figure 2a).
- 1.4.2 Assessments of additional buildings due to the Scheme boundary changes at Markeaton junction included B12 The Jonty Farmer Public House and B13 Brook Medical Centre (Figure 2b).
- 1.4.3 Updated assessments were undertaken of a bridge previously incorrectly reported as a roost from an earlier misinterpretation of desk study data (Bridge B1 Figure 2a)), bridges with previously confirmed roosts (Bridges B2 and B3, Figure 2a), and repeat assessment of three bridges assessed as offering potential roosting for bats in 2015 (B4, B5 and B6, Figure 2b).
- 1.4.4 Three trees at Little Eaton junction previously situated outside the Scheme boundary, with no access for further surveys, were now included due to changes to the Scheme boundary and were assessed (T29, T28 and T70, Figure 2a); together with a re-assessment of trees within Woodland block 19a, both identified in an updated Extended Phase 1 Survey (AECOM(f) 2018).

1.4.5 Thirteen trees at Markeaton junction previously situated outside the Scheme boundary, but now included within it due to changes to the Scheme boundary were assessed (T78-T90, Figure 2b) as identified in an updated Extended Phase 1 Survey (AECOM(f) 2018).

1.4.6 Inspection of bat boxes identified in trees M42, M44, M47, M48 and M49 were undertaken (Figure 2b).

Tree Climbing

1.4.7 Two trees with bat roosting potential were identified in an updated Extended Phase 1 Survey (AECOM(f) 2018) were subject to aerial climbed inspections having initially been identified in 2015, but not re-surveyed in 2017; T1 and T5 (Figure 2a). Two further trees were upgraded for climbing to provide additional information identified during surveys undertaken in 2018; trees M8 and M2 (Figure 2a).

Hibernation Assessments

1.4.8 This report includes an assessment of the bat hibernation potential of buildings, structures and trees within the Scheme boundary based on previous survey results, and updated where necessary, which has not been previously reported.

Emergence and Re-entry Roost Surveys

1.4.9 Emergence (dusk) and re-entry (dawn) roost surveys were undertaken to include previously inaccessible areas, new areas, updates to confirmed roosts and repeats of 2015 surveys.

1.4.10 Buildings included:

- B10 A toilet block at Markeaton Park (Figure 2b), not previously surveyed;
- Six properties at B8 Queensway not previously, or insufficiently, surveyed due to access constraints: QW4, QW10, QW12, QW14, QW16 and 259 Ashbourne Road (Figure 2b); and
- An updated survey of a confirmed roost at a Queensway property, QW30 (Figure 2b).

1.4.11 Structures included:

- B2, a farm access overbridge at Little Eaton junction with a previously confirmed roost (Figure 2a); (one survey to update results from 2018 as agreed with Natural England during consultation meeting held on 06/06/2018); and
- Repeat surveys of three bridges at Kingsway junction previously surveyed in 2015: B4, B5, B6 (Figure 2b).

1.4.12 Roost surveys of trees were undertaken of:

- 29 trees at Markeaton Park (M1, M2, M3, M4, M6, M7, M8, M9, M10, M11, M12, M14, M15, M17, M20, M23, M24, M28, M29, M32, M33, M34, M36, M39, M42, M46, M51, M53 and M55) Figure 2a;
- This includes an updated survey of tree M39, a confirmed roost, where a single common pipistrelle bat was recorded emerging from the tree on 03/08/2015;
- Updates of trees previously surveyed in 2015 at Little Eaton junction: T1, T29, T31, T32 and T69 (Figure 2b);

- Updates of trees previously surveyed in 2015 at Kingsway junction: T2 and T5 (Figure 2a); and
- One new tree not identified previously due to the Scheme boundary changes, tree T82 (Figure 2a), at Markeaton junction.

1.5 Relevant Legislation and Policy

- 1.5.1 All species of bat and their roosts (whether bats are present or not) are protected under the Conservation of Habitats and Species Regulations 2017 and under the Wildlife and Countryside Act 1981 (as amended). Taken together, this legislation makes it an offence to deliberately damage, destroy or obstruct access to a bat roost or to deliberately kill, damage, take or disturb bats.
- 1.5.2 A bat roost is defined as 'any structure or place, which is used for shelter or protection' or a 'breeding site or resting place'. Since bats commonly use the same roosts at particular times of the year after periods of absence, the roost is protected whether or not bats are resident.
- 1.5.3 Given the above legislation, the potential presence of bats at a site represents a material consideration in the planning process. Even where planning permission is not required there is still a legal responsibility placed on the developer to ensure that a Natural England licence is obtained to cover any works that have the potential to result in an offence under the above legislation.
- 1.5.4 Seven of the UK bat species are listed as Species of Principal Importance in England under Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006, with a species action plan prepared: namely, the barbastelle bat (*Barbastella barbastellus*), Bechstein's bat (*Myotis bechsteinii*), noctule bat (*Nyctalus noctula*), soprano pipistrelle (*Pipistrellus pygmaeus*), brown long-eared bat (*Plecotus auritus*), greater horseshoe bat (*Rhinolophus ferrumequinum*) and lesser horseshoe bat (*Rhinolophus hipposideros*). In addition, Species Action Plans within the local Lowland Derbyshire Biodiversity Action Plan (2012) have been prepared for common pipistrelle, whiskered bat (*Myotis mystacinus*), Brandt's bat (*Myotis brandtii*), natterer's bat (*Myotis nattereri*), Leisler's bat (*Nyctalus leisleri*) and Nathusius' pipistrelle (*Pipistrellus nathusii*).
- 1.5.5 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; and, in the long term, Highways England should deliver a net gain in biodiversity across its broader range of works. 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 (BAP), which still however carries some relevance as it lists specific species of conservation concern. Bats are listed in the 2002 BAP as priority species. The objectives of this species action plan for bats is to avoid mortality to bats or loss of bat habitat as a result of construction and operation of the SRN, and to enhance habitats for bats where this can be achieved safely.

2 METHODOLOGY

2.1 Desk Study

- 2.1.1 As part of the Extended Phase 1 Habitat Report Update (AECOM(f), 2018), an updated desk study was undertaken that included up-to-date bat records obtained from the Derbyshire Bat Conservation Group (DBCG) and Derbyshire Wildlife Trust (DWT).
- 2.1.2 Data requests were also sent to Highways England databases at EnVIS Data, Derbyshire Mammal Group and A38 Maintaining Agents (Highways England).

2.2 Preliminary and Updated Roost Assessments - Buildings, Structures and Trees

- 2.2.1 Daytime roost inspections of built structures (bridges and buildings) were undertaken between February and September 2018. These assessments were undertaken by experienced and licensed bat ecologists (Class Licence WML-CL18; Level 2).
- 2.2.2 The inspections took into account standard guidance provided by the Collins (2016), English Nature (2004) and Joint Nature Conservation Committee (2004).
- 2.2.3 The surveys entailed a direct search for evidence of bats on both internal and external features of the structures. The inspections were carried out from the ground and from a ladder; other supporting equipment included close focusing binoculars, a powerful torch, endoscope and mirrors. The structures were examined externally for features that could support roosting bats and features that could lead to internal potential roost spaces. The structures were subject to detailed internal examination, including the roof void (when safe to do so), assessing the roof timbers, beneath roofing felt and thatch where possible, the ridge line, and behind timber cladding.
- 2.2.4 The suitability of the wider landscape for bats was also assessed, including the connectivity of habitats immediately adjoining the site.
- 2.2.5 The presence of roosting bats can be indicated through signs such as accumulations of moth or butterfly wings or bat droppings and staining and/ or scratch marks around potential entrance and exit points. However, the absence of droppings/ evidence cannot be treated as conclusive evidence that bats are not present, and therefore an assessment was made of the potential of the building to support bats based on the scale provided in Table 1.
- 2.2.6 Ground Level Tree Assessments (GLTA) were undertaken in July 2018 to identify Potential Roosting Features (PRFs). These were undertaken by a licensed bat ecologist (Class Licence WML-CL18; Level 2), aided by a torch and where features were accessible from the ground, an endoscope.
- 2.2.7 During the GLTA, features considered to provide suitable roost sites for bats such as the following were sought (also see Table 1 for details on roost categorisation):
- Trunk cavity – Large hole in trunk caused by rot or injury;
 - Branch cavity – Large hole in branch caused by rot or injury;
 - Trunk split – Large split/ fissure in trunk caused by rot or injury;
 - Branch spilt – Large split/ fissure in branch caused by rot or injury;
 - Branch socket cavity – Where a branch has fallen from the tree and resulted in formation of an access point in to a cavity;

- Woodpecker hole – Hole created by nesting birds suitable for use by roosting bats;
- Lifted bark – Areas of bark which has rotted/ lifted to form suitable access point/ roost site for bats;
- Hollow trunk – Decay in heartwood leading to internal cavity in trunk;
- Hazard beam failure – Where a section of the tree stem/ branch has failed causing collapse and leading to longitudinal fractures/ splits/ cracks;
- Ivy cover – Dense/ mature ivy cover where the woody stems could create small cavities/ crevices.

2.2.8 In some instances where it was not possible to fully assess a tree from every angle, a precautionary approach was adopted with the trees being categorised as moderate or high potential to ensure further detailed inspections were undertaken.

Table 1: Guidelines for assessing the potential suitability of proposed development sites for bats, based on the presence of habitat features within the landscape, to be applied using professional judgement (Collins 2016)

Roost suitability	Description - roosting habitats	Description - commuting and foraging habitats
Confirmed	Known roost where bats or evidence of bats has been recorded.	-
High	A tree or structure with one or more PRFs that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions and surrounding habitat.	Continuous, high-quality habitat that is well connected to the wider landscape that is likely to be used regularly by commuting bats such as river valleys, streams, hedgerows, lines of trees and woodland edge. High-quality habitat that is well connected to the wider landscape that is likely to be used regularly by foraging bats such as broadleaved woodland, tree-lined watercourses and grazed parkland. Site is close to and connected to known roosts.
Moderate	A structure or tree with one or more PRFs that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only).	Continuous habitat connected to the wider landscape that could be used by bats for commuting such as lines of trees and scrub or linked back gardens. Habitat that is connected to the wider landscape that could be used by bats for foraging such as trees, scrub, grassland or water.
Low	A structure with one or more potential roost sites that could be used by individual bats opportunistically. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions and/or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats (i.e. unlikely to be suitable for maternity or hibernation). A tree of sufficient size and age to contain PRFs but with none seen from the ground or features seen with only very limited roosting potential.	Habitat that could be used by small numbers of commuting bats such as a gappy hedgerow or un-vegetated stream, but isolated, i.e. not very well connected to the surrounding landscape by other habitat. Suitable, but isolated habitat that could be used by small numbers of foraging bats such as a lone tree (not in a parkland situation) or a patch of scrub.

Roost suitability	Description - roosting habitats	Description - commuting and foraging habitats
Negligible	Negligible features likely to be used by bats for roosting.	Negligible habitat features on site likely to be used by commuting or foraging bats.

2.3 Aerial Tree Inspections

- 2.3.1 Where safe to do so, an at-height PRF inspection (tree climbing survey) was undertaken of trees with moderate and high roosting suitability within the Scheme boundary, as necessary to update previous surveys.
- 2.3.2 The aim of this survey was to identify and locate signs of bats or bat roosts within trees. In addition, the survey enabled a more accurate assessment of bat roosting potential through close examination of PRFs to re-classify (downgrade or upgrade) PRFs where appropriate. Any trees downgraded to low or negligible suitability were not subject to further survey effort.
- 2.3.3 These surveys were undertaken by staff certified to climb trees and perform aerial rescue, one of whom held a Natural England bat survey licence (Class Licence WML-CL18; Level 2). The climbing methodology used follows that detailed within the Arboriculture and Forestry Advisory Group (AFAG) Tree Climbing Operations Leaflet (AFAG40115).
- 2.3.4 Features identified as providing potential to support roosting bats during the climbing inspection were thoroughly examined using endoscopes, mirrors and torches. Evidence of bat occupation sought included: the physical presence of bats, droppings, urine staining, and mammalian oil staining. Identification and assessment of PRFs was based on methods, examples and the combined experience of ecologists outlined in the Bat Tree Habitat Key (Andrews *et al* 2016, Bat Habitat Key 2018).

2.4 Hibernation Potential Assessment

- 2.4.1 Updates of previous preliminary appraisals and assessments of buildings and structures have been made with reference to bat hibernation roost potential. This assessment of potential to be used as a hibernation roost was part of the preliminary appraisal. It should not be confused with a specific winter hibernation survey to visit structures during winter to look for and identify hibernating bats or other evidence of bat occupation.
- 2.4.2 All trees assessed for their suitability to support roosting bats within the Scheme boundary plus 50m buffer during the PRF assessment in 2017 and 2018, were also assessed for their suitability to provide hibernation potential as part of the GLTA and/or climbed inspection.
- 2.4.3 Potential for bats to use trees as winter roosts to hibernate cannot be subject to the same survey protocol for inspecting and assessing hibernation sites in caves and built structures as detailed in Collins 2016. It may be possible to visually inspect roost features in a tree using an endoscope via a climbed inspection, but this would assume all available potential roost features in a tree were available for inspection and deep cavities may be beyond the reach of an examination via endoscope. Therefore, an assessment of hibernation potential for bats in trees is based on a precautionary approach identifying trees where; either suitable features do exist, or (in the case of trees not subject to a full climbed inspection) could exist.

2.5 Roost (Emergence/ Re-entry) Surveys

- 2.5.1 Where required emergence (dusk) and re-entry (dawn) surveys were undertaken to assess current usage by bats, species, number and breeding status. These surveys involve observers noting whether bats emerge from or enter roosting sites, recording any foraging or commuting activity and behaviour using bat detectors and to assess species and numbers present. These surveys were undertaken, following best practice outlined in Collins (2016), as well as the Bat Workers Manual (Joint Nature Conservation Committee, 2004).
- 2.5.2 Emergence surveys commenced approximately 15 minutes before sunset, finishing 1.5 to 2 hours after sunset. Dawn/ re-entry surveys commenced 1.5 to 2 hours before sunrise, finishing approximately 15 minutes after sunrise. Surveys were undertaken in good weather conditions, within the range of conditions required by published guidance. A licensed bat ecologist or experienced surveyor (Accomplished CIEEM level) was present during each survey visit.
- 2.5.3 During the dusk and dawn survey periods the surveyors observed potential access/ egress points. Surveyors carried full spectrum bat echolocation detectors (Elekon Batlogger M) to assist in detecting bats and species identification.
- 2.5.4 The time, location, number, species (where possible) and direction of flight were recorded for each bat pass (discrete burst of echolocation heard, or bat activity observed) encountered during the survey. All sound files have been analysed using Analook W software, where possible down to species level following the call parameters outlined in Russ (2012).

2.6 DNA Analysis of Droppings

- 2.6.1 Where bat droppings were found during surveys, and additional information was required to identify species (in the absence of other survey data), a sample of droppings were sent for analysis to SureScreen Scientifics. Details of methodologies and analysis are given in Appendix E.

2.7 Survey Constraints

- 2.7.1 Only external assessments of the static homes at Ford Farm Mobile Home Park (Figure 2b) were conducted and no access was sought for internal surveys. Where roosts were identified at the static caravans these were noted, but no further surveys were undertaken to characterise the type or status of the roost and the species present.
- 2.7.2 Access to Queensway Building QW16 was not permitted by the site owner until September 2018 (see Appendix F) and as such only an external assessment was undertaken as by then, it was outside the period to commence roost surveys on the property. No access to undertake roost surveys was available to Queensway Buildings QW4, QW12 and QW14 (see Appendix F). Given the extent of previous bat roost surveys at neighbouring properties in 2017 (AECOM(c), 2018(a)), this was not considered to be a significant constraint as it is considered that any roosts situated within the area would have been noted during the multiple roost surveys undertaken on the surrounding buildings.

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- 2.7.3 No access was available to 259 Ashbourne Road until a date in late August 2018 (see Appendix F). At the appointed survey time rain forced the survey to be cancelled and it was not possible to rearrange another survey with the site owner for a survey to be undertaken within the appropriate survey period. This is not considered a significant constraint as this building No. 259, was fully visible during the roost survey on the adjoining property No. 257, undertaken in 2017 (AECOM(c), HE514503-ACM-EBD-A38_SW_PR_ZZ-RP-EG-0006) where no bats were confirmed roosting at either building.
- 2.7.4 Trees T28 and T70 which had been flagged as requiring further assessment for their suitability to support roosting bats during the Updated Extended Phase 1 Habitat Assessment (AECOM(f) 2018) were no longer present at the time of the PRF assessment.
- 2.7.5 Sub-optimal survey weather conditions (low temperatures) were noted on one occasion during dawn surveys at T29 and T31 on the 7 September 2018; however, this was still above the minimum recommended survey temperature of 7°C and was therefore not expected to significantly affect the survey results.

3 RESULTS

3.1 Desk Study

- 3.1.1 Up to date bat records were obtained from the DBCG and DWT. No ecological data was recorded in EnVIS Data. No response was received from Derbyshire Mammal Group.
- 3.1.2 Table 2 and Figure 4 present a list of the closest known bat roosts for each species within 2km of the Scheme in the last 10 years.

Table 2: Biological data records for bat species from DWT, DBCG and AECOM for the last 10 years within 1km of the Site (*Maternity Roost)

Common name	Scientific name	Description of record	Location of nearest record (approx. km)	Date of record	Source of data ¹
Kingsway and Markeaton junctions					
Common pipistrelle	<i>Pipistrellus pipistrellus</i>	Roost in M39 tree	Within the site	2015	AECOM
		Roost	0.06	2016	DWT
			0.09	2012	DBCG
			0.09	2015*	DBCG
			0.10	2015	DWT
			0.10	2012	DWT
			0.14	2014	DBGC
			0.17	2014	DWT
			0.20	2009	DWT
			0.35	2015	DWT
			0.63	2011	DBCG
			0.85*	2007	DWT
Soprano pipistrelle	<i>Pipistrelle pygmaeus</i>	Roost	0.09	2012	DBCG
			0.10	2012	DWT
			0.70	2012	DBCG
Pipistrelle species	<i>Pipistrelle species</i>	Roost	Within the site	2016	DBCG
			0.40	2016	DWT
			0.75*	2012	DWT
Brown long-eared bat	<i>Plecotus auritus</i>	Roost	0.09	2012	DBCG
			0.09	2012	DWT
			0.17	2014	DWT
Unidentified bat	<i>Chiroptera</i>	Roost	On site boundary	2015	DBCG
			0.10	2003	DWT
Little Eaton junction					
Common pipistrelle	<i>Pipistrellus pipistrellus</i>	Roost in B3	Within the site	2015	AECOM
		Roost	0.50	2017	DWT
			0.60	2013	DWT
			0.65	2007	DWT
			0.74	2017	DWT
			0.79	2017	DWT
Soprano pipistrelle	<i>Pipistrelle pygmaeus</i>	Roost	0.40	2015	DWT

Common name	Scientific name	Description of record	Location of nearest record (approx. km)	Date of record	Source of data ¹
Pipistrelle species	<i>Pipistrellus</i> species	Roost	0.55	2016	DWT
Brown long-eared	<i>Plecotus auritus</i>	Roost in B2	Within the site	2015	AECOM
		Roost	0.28	2015	DBCG
			0.35	2016	DBCG
			0.38	2010	DWT
			0.43	2016	DWT
			0.75	2013	DWT
			0.90	2007	DWT
Whiskered	<i>Myotis mystacinus</i>	Roost	0.40	2016	DWT

1. Key: AECOM: AECOM, DBCG: Derbyshire Bat Conservation Group, DWT: Derbyshire Wildlife Trust

- 3.1.3 Around the Scheme boundary at Kingsway and Markeaton junctions, there are three records of known roosts situated within the site; these included a common pipistrelle, *Pipistrellus* species (common or soprano pipistrelle) and an unidentified species roosts. Up to 1km from the Scheme boundary there are eight common pipistrelle, two soprano pipistrelle, two *Pipistrellus* species and two brown long-eared known roosts; a further two common pipistrelle roosts are situated between 1 - 2km from the Scheme boundary.
- 3.1.4 Around the Scheme boundary at Little Eaton junction, records of two bat roosts were provided; a common pipistrelle and brown long-eared roost respectively. Up to 1km from the Scheme boundary there are records of two common pipistrelle, one soprano pipistrelle, two *Pipistrellus* species and five brown long-eared roosts; a further three common, one *Pipistrellus* species and one unidentified species roosts are situated between 1 - 2km from the Scheme boundary.
- 3.1.5 Monitoring data supplied by the A38 Maintaining Agents (Highways England) include records of a confirmed and known bat roost at B3 the main A38 bridge over the River Derwent. On 14 June 2018 70 (seventy) *Pipistrellus* species bats were recorded exiting a roost in the bridge on the northern side of the eastern bank of the river, emerging from the joint between the fixed and suspended sections of the bridge. Sixty-four bats had been recorded in 2017.

3.2 Roost Assessments - Queensway Building QW16

- 3.2.1 An external assessment of Queensway property QW16 was undertaken on the 5 September 2018. The building was an occupied two storey detached brick house with a tiled mansard roof with plastic soffits and fascias with single storey extension to the side of the property. To the rear of the property hanging wall tiles were present. The building was assessed as Moderate suitability to support roosting bat species, the full description of the suitability assessment is provided in Appendix B.

3.3 Roost Assessments – B9 Static Homes

Twenty-eight permanent static homes are situated within Ford Farm Mobile Home Park. Table 4 presents the summary results of the findings with the full results of homes with suitability provided in Appendix C.

Table 3: B9. Ford Mobile Home Park potential roosting features suitability summary

Caravan	Description of structure	PRF suitability
A	Single storey building with pitched plastic tiled roof and felt edging, plastic fascias. No evidence or features present. No.7.	Negligible
B	Single storey flat roofed building with wooden soffits and plastic fascia. Wood rot cavities present on the west side of the building. Soffit on North side heavily cobwebbed. Small extension to the north side, broken exposed cavity in soffit fascia on west of extension allowing access into soffit box, no evidence present of roosting bats at time of survey. No.7a.	Moderate
C	Single storey building with pitched plastic tiled roof and felt edging, plastic fascias. Single storey porch extension with plastic cladding. No.5.	Negligible
D	Single storey building with domed tiled roof and felt edging, plastic fascias. Single storey porch extension with plastic cladding. No.9.	Negligible
E	Single storey building with pitched plastic tiled roof and felt edging, plastic fascia's. Single storey porch extension with plastic cladding. 0.5cm cavity along south side and north side of building. No evidence of roosting bats No.9a.	Low
F	Single storey building with felt pitched roof with overhang and wooden fascia's. Single storey porch extension with lean to roof and plastic door. Cavity present long the west side of building where a 1cm gap runs along the length of the fascia and exterior cladding, single bat dropping on wall underneath exposed cavity. No.9b.	Confirmed
G	Single storey building with pitched plastic tiled roof and felt edging, plastic fascia's. Bay plastic windows east facing, new guttering and fascia boarding present. No evidence or features present. Single width building. No.18.	Negligible
H	Single storey building with domed tiled roof and felt edging, wooden fascia's and wooden framing around windows. Disused building all windows open and entry points across the building accessible however, no suitable roosting locations visible or evidence No.18a.	Negligible
I	Partially constructed double width building with large cavity on the east (front of building) exposed leading to wooden beamed roof cavity, works currently being undertaken. Suitability due to exposed wooden timber framed roof however unknown if works are currently taking place if works are occurring then Negligible suitability due to disturbance. No.19.	Low
J	Half a building with exposed side covered with plastic.	Negligible
K	No longer present.	N/A
L	Single storey building with pitched plastic tiled roof and felt edging, plastic fascia's. Bay plastic windows, new guttering and fascia boarding present. Heavily cobwebbed cavity under fascia boarding 0.5cm cavity. No.10.	Negligible
M	Double width single storey building with pitched tiled roof, plastic windows, bay window to front of property with felt above all intact. Wood fascia present. Wooden door and wood panelling to front of property. No.12.	Negligible
N	Double width single storey building with pitched tiled roof, plastic windows. Metal trim present along roof edge. Plastic soffit and fascia boarding with 1cm cavity behind. Dropping present on N side of building underneath cavity behind plastic soffit. No.11.	Confirmed
O	Double width single storey building with pitched tiled roof, plastic windows and plastic fascia boarding, in good condition.	Negligible





Caravan	Description of structure	PRF suitability
P	Double width single storey building with pitched tiled roof, plastic windows. 1cm cavities along the east and west facing of the building under the fascia boarding. No.15.	Low
Q	Double width single storey building with pitched tiled roof and plastic framed windows and fascia. 0.5cm cavity along west and eastern side of building under fascia boarding. Cavity present on north side of building on gable end behind plastic fascia boarding. No.16.	Low
R	Single width single storey building with pitched tiled roof, with wooden fascia's and plastic windows and plastic guttering. No cavities present.	Negligible
S	Single width single storey building with pitched tiled roof, with wooden fascia's and plastic windows and plastic guttering. Cavity on north-west corner however does not go anywhere to open to be utilised. No.1.	Negligible
T	Single width single storey building with pitched tiled roof, with wooden fascia's and plastic windows and plastic guttering. No.2.	Negligible
U	Double width single storey building with pitched tiled roof with wooden fascia's. Single story extension with corrugated lean to roof and plastic exterior cladding. No features. No.3.	Negligible
V	Double width single storey building with pitched tiled roof, with wooden fascia's and plastic windows and plastic guttering. Flat roofed porch with plastic exterior cladding. No.4.	Negligible
W	Double width single storey building with pitched tiled roof, with wooden fascia's and plastic windows and plastic guttering. No.6.	Negligible
X	Double width single storey building with pitched tiled roof and felt edging, plastic fascia's. Single storey porch extension with plastic cladding. Potential entrance point on south side leading to false tiles, no evidence or suitable perching areas. No.8.	Negligible
Y	Double width single storey building with pitched tiled roof with plastic fascia's. Wood and plastic cladding on exterior of building. Single story flat roofed porch extension with felt roof, no cavities present. No.17.	Negligible
Z	Steel framed open garage with corrugated pitched roof, active workshop.	Negligible
ZA	Single storey, pitched tiled roof, plastic fascia, felt edging with single storey extension. Plastic exterior cladding. Entrance point on south side allows access into false tiles, brick exterior shell, large cavities between breeze block and brick exterior around all windows and doors cavity of 2cm - 5cm in places. Active building utilised as office space. Suitable for hibernation and summer roosting, no evidence at the time of the survey.	Moderate
ZB	Large brick warehouse style building with pitched tiled roof and corrugated steel upper cladding with adjoining single storey brick flat roofed extensions. Large cavities present allowing access into the building between the brick and cladding and tiles.	Moderate

3.4 Roost Assessments - Airshafts

- 3.4.1 A potential roosting feature assessment was conducted of four airshafts identified within the Scheme boundary on the 23 July 2018. These have connecting underground pipe network beneath the groundwater across the site (see Figures 2b and 3 for locations and underground connectivity). The four airshafts, associated with a disused Severn Trent Water groundwater supply network, were sealed units with large man-hole covers. These shafts link underground tunnels that are located beneath the prevailing groundwater levels (Figure 3).

3.4.2 No potential access points were recorded at these airshafts, which would allow bats access to the interior of these structures and so were assessed as of negligible suitability for roosting bats and were scoped out of any further assessment. Table 4 provides a summary of the airshafts and their suitability with associated photographs.



Table 4: Airshaft potential roosting feature suitability

Airshaft No.	Description	Photo	Suitability
1	Airshaft cover heavily scrubbed over. Small cavities between lid and ground; however box rim prevents access into airshaft and vegetation cover extremely overgrown prevents access to cavities.		Negligible
2	Airshaft sealed but surrounded by an extensive badger sett, unsure as to airshaft stability and whether the badgers are utilising the shaft.		Negligible
3	Airshaft situated within dense scrub and not clearly visible at the time of the survey, not suitable to support roosting bats species.		Negligible
4	Airshaft within heavily scrubbed area on top of a mound, airshaft is sealed and intact.		Negligible

3.5 Roost Assessments – B10. Markeaton Park Toilet block

3.5.1 This disused toilet block is situated within the Scheme boundary at Markeaton Park. The building was assessed on the 7 August 2018 as providing Low suitability to support roosting bats. Results are presented in Table 5.

Table 5: Potential roosting feature assessment of toilet block

Building	Description of features	Photo	Suitability
B10 Toilet block	<p>Single storey brick building with pitched tiles roof with wood soffit and fascia. Grilled doors are present around the building. The building is no longer in use.</p> <p>The soffit box has a small cavity present on the south-eastern corner. On either gable end there is missing mortar on the edge of the tiles allowing access under the tiles, a single tile on the eastern face of the building has a slipped tile. All grills have mesh present behind. A lamp post is situated adjacent to the building and as such the building is illuminated at night.</p>	 	Low

3.6 Roost Assessments – B11 Derby Garden Centre

- 3.6.1 This series of buildings is located north of Long Eaton junction (Figure 2b). The garden centre is comprised of a series of connected structures making up the main part of the garden centre, with a small older outbuilding serving as stores and staff facilities. On 2 October 2018 the main building was assessed as providing Negligible suitability to support roosting bat and the Clocktower outbuilding was assessed as providing Low suitability to support roosting bats; results are presented in Table 6.

Table 6: Potential roosting feature assessment of Derby Garden Centre

Building	Description of features	Suitability
B11a Derby Garden Centre. Main buildings	A series of large inter-connected well-lit stores. Metal framed buildings open to the roof with no voids. Connects through open-sided 'outside section' to another large metal framed building previously converted from a large greenhouse. No potential roofing features were present at these buildings.	Negligible
B11b Derby Garden Centre. Clocktower	Single storey brick building with concrete tiles hipped to the north with a pitched roof and gable end to the south. A small central clock-tower was present in the middle of the roof. Potential roof features were noted at gaps where bats could gain access to either the underside of roof tiles, or the roof void, at a missing tile on the northern aspect of the roof and missing ridge tiles from the northern hipped section of roof. No gaps were present along the eaves of the roof which were blocked by plastic mesh. Wasps were observed	Low

Building	Description of features	Suitability
	entering the roof through a small gap in the mesh on the eastern side of the building. No barge-boards, soffits or fascia were present. No access was available to the roof void. The building was in constant use as stores and staff facilities and situated in a busy storage area of the garden centre.	

3.7 Roost Assessments – B12 Jonty Farmer Public House and B13 Brook Medical Centre

- 3.7.1 Two new buildings were assessed on 2 October 2018 following their inclusion to the schedule due to the Scheme boundary changes (Figure 2b). A confirmed *Pipistrelle* species bat roost was recorded at B13 Brook Medical Centre. Access was not sought to the interior roof voids of the public house, which was assessed as providing Moderate suitability for roosting bats. A summary of the results of the re-inspection is provided in Table 7.

Table 7: Potential roosting feature assessment of Jonty Farmer Public House & Brook Medical Centre

Building	Description of features	Suitability
B12 Jonty Farmer Public House	Two storey brick building with a pitched concrete pantile roof of multiple pitches. The roof tiles were in good condition with no obvious gaps or defects. No bargeboards, fascias or soffits were present; plastic mesh was present at the eaves blocking the naturally shaped gap below pantiles. Potential roof features were noted at gaps where bats could gain access to either the underside of roof tiles, or the roof void, at missing verge mortar on the north-eastern gable end; at missing mesh grill at eaves on the north-eastern wall/roof; and gaps around lead flashing surrounding a chimney on the northern side of the building. Gaps were also present in-between bricks above ground floor windows on the western aspect of the building. No access was sought into the roof void. The building is situated adjacent to mature trees and Markeaton Brook providing suitable foraging and commuting routes for bats.	Moderate
B13 Brook Medical Centre	Brick built single storey medical surgery dating to 1991 with lean-to single pitched slate roofs with skylights. Potential roof features were noted at gaps where bats could gain access at missing verge mortar on the eastern side of the building, under ridge tiles and under fascias under the a wall below the apex of the higher pitched roof, above the lower pitched roof. Gaps were also noted at the apex of the southern /southwestern gable end under flashing. This later gap served as a potential access points to an area on the inside of the building where a series of bat droppings were noted high on an internal wall. Droppings were identified from distance as <i>Pipistrellus</i> species droppings. Ceiling of rooms under the highest points of the roof extended to the roof level. Small roof voids were present at the lower parts of the roof by the eaves, which were not accessed.	Confirmed

3.7.2 Medical centre staff confirmed that they were aware of a *Pipistrelle* species roost at the location detailed above and had previously sought advice regarding this from the Local Authority and Natural England. However, no record of this roost was present in the up-to-date data search, nor in the Bat Conservation Trust database of Natural England volunteer roost visits (pers. comm.).

3.8 Roost Assessments - Bridges/ Structures


3.8.1 Three structures were re-assessed during the 2018 survey season, as detailed below. A summary of the results of the re-inspection is provided in Table 8.





3.8.2 Bridge B1 carrying the existing A38 over a mainline railway had been given a precautionary rating of High suitability for roosting bats in 2015, due to access restrictions (AECOM(b) 2016). In February 2018, the bridge was re-assessed from beyond the Network Rail boundary using binoculars, as low vegetation levels allowed a better view of the structure than was possible in 2015. It was re-assessed to have Negligible potential.

3.8.3 Bridge B3 carrying the existing A38 over the River Derwent was inspected in February 2018 to update assessments following the confirmation of a suspected common pipistrelle maternity roost during roost surveys undertaken in 2017 (AECOM(c) 2018).

3.8.4 Bridge B6 was assessed as providing Moderate suitability for roosting bats in 2015 (AECOM(b) 2016). The bridge was re-assessed on 20 July 2018 in advance of an evening roost survey.

Table 8: Potential roosting feature assessment of structures



Building	Description of features	Photo	Suitability
B1. Existing A38 over mainline railway	The bridge was constructed of concrete beams and abutments, with brick supporting walls to the north and south. No suitable features were observed on the bridge. The bridge did include small concrete bays in the interior of the bridge to which access was not possible; however, this was discounted due to the low suitability of the structure as a roost because of the busy mainline railway which would present a high risk of fatal collisions for any bats roosting at this location.		Negligible

Building	Description of features	Photo	Suitability
B2 Flood Arch Bridge	<p>Concrete section farm access bridge underneath existing A38. Previously surveyed in 2015 and 2017.</p> <p>Features that were likely to have previously been used as a day roost (by common and soprano pipistrelle and brown long-eared bats) as recorded in 2015 and 2017 surveys in-between large hay bales and the walls of the bridge; were missing in 2018 and there were no other obvious roosting features recorded.</p>	<p>-</p> 	<p>Previously Confirmed roost</p> <p>But lack of suitable features recorded in 2018.</p>
B3. Existing A38 over the River Derwent	<p>Prefabricated concrete sections over concrete east and west abutments and east and west bank pier walls. No potential features between abutment walls and piers.</p> <p>Horizontal concrete decking over the central section of the bridge (the river) adjoin curved concrete sections with (shown in the photograph), with large crevice gaps in-between and over the join between these two sections which provides suitable bat roosting locations.</p> <p>Roost surveys in 2017 recorded bats returning to roost at the northern side of the eastern bank pier as shown in the photograph.</p>	 	<p>Confirmed roost</p> <p>Presumed common pipistrelle maternity based on numbers of bats from Highways England records over a number of years (pers. comm.)</p>
Bridge B6	<p>Previously rated as Moderate in 2015. Reduced available foot access to the underside of the bridge structure due to littering and fly-tipping of spoil and aggregates has decreased bat roost suitability rating to Low due to increased risk of predation from ground predators.</p>	<p>-</p> 	<p>Low</p>

3.9 Ground Level Tree Assessments

3.9.1 Three trees were assessed for their suitability to support roosting bats on the 25 July 2018 at Little Eaton junction. These trees had previously been situated outside the Scheme boundary, but due to a change in the Scheme boundary these now lie within it. Of the three trees (T29, T28 and T70, Figure 2b), only one tree remained (T29) and was assessed as Moderate suitability to support roosting bats. Table 9 provides the suitability assessment of the trees.

Table 9: Tree potential roosting feature assessments


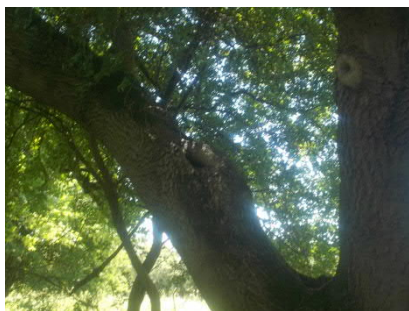
Tree Number	Tree species	Description of features	Photo	Suitability
T29	Oak	<p>Mature tree 2m diameter at breast height (dbh). Dead wood branch with horizontal cavity south-west facing with snapped branch 3m high. 2 x branches with stripped bark and splits, north facing 3m high. Main trunk cavity shallow east facing 2m high. Bark absent at base of tree to the north bracket fungus present. Branch snap south facing large cavity present at 5m height.</p>		Moderate
T28	Hawthorn	Tree felled		N/A

Tree Number	Tree species	Description of features	Photo	Suitability
T70	Alder	Tree felled and removed		N/A

Woodland Site 19a

- 3.9.2 The woodland situated south of the A38 and immediately west of the River Derwent was dominated by immature and semi-mature ash and hawthorn, lacking bat roosting features, except for very limited shallow cavities. The woodland did however, provide moderate foraging habitat for bat species. One tree, T77b, was recorded which provided Moderate suitability to support roosting bats. Table 10 provides the suitability assessment of the tree.

Table 10: Tree T77 suitability assessment

Tree number	Tree species	Description of features	Photo	Suitability
T77 SK35857 39853	Ash	<p>Mature ash tree 2m dbh.</p> <p>Hazard beam with split branch 4.5m high east facing.</p> <p>Callus roll 2m high with upward facing cavity north-west facing.</p> <p>Large callus roll with upward facing possible cavity x2 on main trunk.</p> <p>Callus roll north facing 4m high shallow cavity and North-west facing.</p>	 	Moderate

Area 25/ thirteen trees at Markeaton junction

- 3.9.3 Thirteen trees at Markeaton junction previously situated outside the Scheme boundary, but which are now included within it due Scheme boundary changes were assessed (T78 - T90) – these are detailed in Table 11 and Figure 2a.

Table 11: Tree T78 - T90 suitability assessment

Tree number	Tree species	Description of features	Suitability
T78	Oak	Light ivy cover. Callus roll on underside of branch. No cavities, 4m above ground level.	Negligible
T79	Copper beech	-	Negligible
T80	Oak	-	Negligible
T81	Alder	Two trunks meeting with a possible southwest-facing cavity 5m above ground level. Numerous shallow cavities.	Low
T82	Dead tree by elder	Peeling bark covering the main trunk. With a west-facing split. Branch tear out with west-facing cavities present.	Moderate
T83	Weeping beech	Sparse ivy.	Negligible
T84	Semi-mature sycamore	East-facing shallow callus roll 4m above ground level. East-facing branch split. 12 m above ground level.	Low
T85	Mature beech	North-facing callus roll with shallow cavities 6 m above ground level. West-facing branch split. 4m above ground level. East-facing branch split and callus roll on underside of branch, 2m long and 3m above ground level.	Low
T86	Sycamore	Two bat boxes.	Negligible
T87	Semi-mature sycamore	Large amounts of ivy that would need stripped before removal (if required).	Low
T88	Group of trees	Variable amounts of ivy that would need to be stripped before removal (if required).	Low
T89	Oak	Peeling bark on branch 6m above ground level. Shallow callus roll with an 8m clear drop zone. Filled callus roll, east-facing, located 4m above ground level.	Low
T90	Oak	Hanging over fence. Branch snap located 4m above ground level.	Low

3.10 Bat Box Checks - Mill Pond

3.10.1 All bat boxes in trees M42, M44, M47, M48 and M49, adjacent to Mill Pond (Figure 2a) were inspected on the 1 June 2018. No evidence of roosting bats was encountered during the inspection. Some boxes had evidence of bird usage, however, the majority were empty with no evidence of current occupation by bats or birds.

3.11 Aerial Tree Inspections

3.11.1 Four trees were further assessed through a climbed inspection, as detailed in Table 12. Two trees, T5 and M8, were downgraded to Negligible suitability as no suitable features were noted. One tree T1 was upgraded from Moderate to High suitability following a partial climb which was restricted for health and safety reasons; and a noctule bat was recorded at a confirmed roost at tree M2.

Table 12: Tree climbing survey results

Tree number	Species	Description	Previous suitability	Features	Suitability after climbed survey
M8	Oak	Potential roost due to high bat activity recorded during dawn roost surveys.	High	Many features on tree only superficial and did not provide adequate shelter to support a roost. No suitable features identified after full climb of this tree.	Negligible – immediate surrounding trees also with no suitability
M2	Oak	Known roost - climbed to confirm roost and species.	Confirmed	A single bat was recorded within a potential roost feature, an upward facing cavity 1.5m in height situated approximately 20m high, during the survey. Provisional identification of bat suggested Noctule. Droppings taken for confirmation through DNA analysis.	Confirmed roost – Noctule (see DNA results Appendix C)
T1	Ash	Tree identified for tree climbing through initial GLTA or Extended Phase 1 Survey.	Moderate	Tree assessed from ground as too dangerous to climb in full due to significant decay and dead timbers in the crown preventing high anchor points to be established. Lower safe anchor point deemed suitable to assess proportion of tree and some specific lower features. Tree climbing commenced, but after first anchor was reached more significant decay was identified higher up preventing further ascent within the tree. One feature on NE side of tree was reached but found to have very active wasp nest present. Climb subsequently aborted	High
T5	Hawthorn	Tree identified for tree climbing through Extended Phase 1 Survey.	Moderate	Features searched by endoscope and found to be superficial and not providing adequate shelter to support a bat roost.	Negligible

3.12 Assessment of Hibernation Potential

- 3.12.1 An assessment of the properties along Queensway B8, including internal investigations, was undertaken in 2017 (AECOM(c) HE514503-ACM-EBD-A38_SW_PR_ZZ-RP-EG-0006). Following this the building suitability to support hibernating bats species was assessed. Due to the type of building and the fact that all the properties are currently occupied, this will result in varying temperature changes within the properties throughout the winter. No basements or sealed voids were present. All loft voids were open with exposed beams, the majority were tiles straight on battens. It is considered that these properties making up B8 Queensway and 259/ 257 Ashbourne Road have Negligible suitability to support hibernating bats species.
- 3.12.2 Bridges were also considered for their potential to offer sites suitable for hibernating bats, but no suitable features, such as deep cavities, were recorded. At the four airshafts located within the Scheme boundary, no potential access points were recorded.
- 3.12.3 Based on initial GLTA surveys and subsequent climbed inspections undertaken between 2015 and 2018, an assessment of bat hibernation roost potential of trees has been undertaken, based on the possible presence of deep cavities where deeper features with more stable temperatures may be utilised by bats during the winter period. In contrast to assessments of buildings and structures, this provides a more precautionary assessment where it is identified that such features *may* be present as full climbed assessments of all trees was either not required or not possible.
- 3.12.4 Figures 5a and 5b show the locations of 11 trees noted as having suitability for hibernating bats based on the possible presence of deep cavities: M2, M14, M23, M36, M42, M55, T14a, T15, T29, T31 and T69. A further 17 trees were assessed as additionally *potentially* having this same suitability where full surveys and assessments of hibernation suitability were not possible due to, for example where a tree was not safe to climb or access was restricted. These trees should be treated as having suitability for hibernating bats as a precaution: M1, M3, M4, M6, M10, M12, M15, M24, M32, M33, M37, M38, M52, M53, T2, T21, T22 and T71.
- 3.12.5 For full details of the ground based and climbed tree assessments, refer to the reports AECOM(b) (2016) and AECOM(d) (2018).

3.13 Roost Surveys – Buildings

- 3.13.1 Dusk emergence and/ or dawn re-entry surveys were undertaken between August and September 2018 at three buildings within the Scheme boundary, see Table 13. Access constraints prevented dusk or dawn surveys within the appropriate survey period at two other buildings, QW16 and 259 Ashbourne Road.

Table 13: Building emergence/ re-entry weather conditions

Building number	PRF	Number of surveys	Dates of surveys	Weather conditions
Toilet block	Low	1	07/08/2018 DUSK	Dry, warm and humid with a light air and scattered wispy clouds. Temperature 22°C
QW10	Low	1	29/08/2018 DAWN	Dry, overcast, mild and still Temperature 14°C

Building number	PRF	Number of surveys	Dates of surveys	Weather conditions
QW30	Confirmed*	2	10/08/2018 DAWN	Cool, dry, clear and still. Temperature 11°C
			13/09/2018 DUSK	Dry and mild with a gentle breeze. Overcast at start of survey. Temperature 17°C - 15°C
*survey conducted to update confirmed roost records from 2017 (AECOM(c) HE514503-ACM-EBD-A38_SW_PR_ZZ-RP-EG-0006) two survey approach agreed by Natural England.				

3.13.2 No bats were recorded at any of the three buildings - a summary of the results of these surveys is presented in Table 14.

Table 14: Building emergence/ re-entry survey results

Building number	Survey date	Species detected in order of abundance	Description of activity	Roost
Toilet block	07/08/2018 DUSK	Common pipistrelle	Very low bat activity was detected during the survey; tree individual bat passes by common pipistrelle only were detected. All passes were brief and only one bat was observed foraging from the roadside past the building towards the park.	No
QW10	29/08/2018 DAWN	Soprano pipistrelle Common pipistrelle Noctule	Bat activity was low with most calls being composed of a single brief pass. The last bat detected was a soprano pipistrelle commuting 9 minutes before sunrise. No re-entry was observed.	No
QW30	10/08/2018 DAWN	Soprano pipistrelle Common pipistrelle <i>Myotis</i> sp Noctule	Foraging activity by pipistrelle bats were observed particularly around the mature trees in the garden, bats were observed foraging up and down the tree line along the back of the properties. Low number of <i>Myotis</i> species were detected with a single Noctule pass. The last bat detected was a soprano pipistrelle 15 minutes before sunrise flying around conifer in the garden.	No
	13/09/2018 DUSK	Soprano pipistrelle Common pipistrelle Noctule <i>Myotis</i> sp Long-eared	Foraging activity was predominant in the back garden of the property two main flight paths were utilised one from the school field through the garden and round into No.32 doping a circle the other was from south-north across the gardens towards mill pond. The first bat detected was a soprano pipistrelle 1 minute before sunset a second soprano pipistrelle was also detected 1 minute after sunrise therefore a roost is likely to be within close proximity to the property. No bats were observed emerging from the building.	

3.14 Roost Surveys – Structures

3.14.1 Dusk emergence and/ or dawn re-entry surveys were undertaken between July and August 2018 at bridges B2, B4 & B5, B6, as detailed in Table 15.

Table 15: Structure emergence/ re-entry weather conditions

Structure number	PRF	Number of surveys	Dates of surveys	Weather conditions
B2	Confirmed roost	1	27/07/2018 DAWN	Warm and humid with a gentle breeze. 10 minute thunderstorm at 11pm night before survey.
B4 & B5	Low	1	03/08/2018 DAWN	Warm and humid with clear skies at start of survey, became cloudy at the end of survey.
B6	Moderate (2015) Low (2018)	1	20/07/2018 DAWN	Dry, mild and still.

3.14.2 No bats were recorded at the four structures. Common pipistrelle with an occasional soprano pipistrelle were noted foraging and landing on the concrete wall at B2 Flood Arch Bridge. The features that may have previously been used as a day roost, in-between large hay bales and the walls of the bridge, were missing and no bats entered any bridge deck cavities. Survey results are given in Table 16.

Table 16: Structure emergence/ re-entry survey results

Structure number/ name	Survey date	Species detected in order of abundance	Description of activity	Roost
B2	27/07/2018 DAWN	Common pipistrelle <i>Myotis</i> spp. Soprano pipistrelle	Common pipistrelle bats were observed foraging under the bridge as well as landing on the concrete bridge deck spans, likely to be utilised as a feeding perch by common pipistrelle with occasional soprano pipistrelle bats. A maximum of 4 bats was observed at any one time. <i>Myotis</i> species were observed foraging under the bridge however perching was not observed. Last detection was a Common pipistrelle, 30 minutes before sunrise. No bats entered the structure.	Feeding roost utilised predominantly by common pipistrelle and occasional soprano pipistrelle bats.
B4 & B5	03/08/2018 DAWN	Common pipistrelle <i>Nyctalus</i> sp	No bats were observed during the survey. A brief distant pass by a single common pipistrelle and <i>Nyctalus</i> species was detected only.	No
B6	20/07/2018 DAWN	Common pipistrelle	Common pipistrelle bats only were detected during the survey foraging over the grassland to the west of the bridge. Last bat detected was Common pipistrelle, 39 minutes before sunrise.	No

3.15 Roost Surveys - Trees

3.15.1 Dusk emergence and/ or dawn re-entry surveys were undertaken between June and September 2018 as detailed in Table 17. Figures 2a and 2b show the tree locations.

Table 17: Tree emergence/ re-entry survey details

Tree number	PRF	Number of surveys	Dates of surveys	Weather conditions
M12, M7, M8, M9, M11, M24, M55, M14, M15, M17, M20, M23, M51, M53, M10, M28, M29, M32, M33, M34	Moderate	2	01/06/2018 DAWN	Dry, humid and overcast with a light breeze and slight mist, temperature 16°C.
			06/07/2018 DAWN	Dry and mild with a light air temperature 14°C, cloud cover clear at the start of the survey to full cloud cover.
M1, M36, M2, M3, M4, M6, M36, M42, M4, M46 ----- (M1, M2, M36 M42)	Moderate	2	15/06/2018 DAWN	Mild, dry with a light air, temperature 12 - 9°C
			05/07/2018* ¹ DAWN	Warm and dry with a light air and clear skies, 73% humidity, temperature 16 - 13°C.
			24/07/2018 DAWN	Warm, dry and humid with still air and wispy clouds. Temperature 19 - 17°C.
	High	3	20/08/2018 DUSK	Warm and dry with a light breeze and overcast. Temperature 22°C.
T82	Moderate	2	03/07/2018 DUSK	Dry, warm, wispy clouds with a light breeze. Temperatures range from 19 - 15°C.
			04/09/2018 DAWN	Cool, dry and humid with slight mist, 15°C with a light air. Rain the previous evening.
T1 & T69	High	3	08/08/2018 DUSK	Dry, with scattered clouds, light air and 62% humidity. Temperature 19.5°C
			29/08/2018 DAWN	Dry, overcast and still, 67% humidity, temperature 13 - 14°C.
			11/09/2018 DAWN	Dry at the start of survey with light rain at the end, overcast, with gently breeze and 80% humidity. Temperature 18.7°C
T2 & T5	Moderate	2	08/08/2018 DUSK	Dry, with scattered clouds, light air and 62% humidity. Temperature 19.5°C
			29/08/2018 DAWN	Dry, overcast and still, 67% humidity, temperature 13 - 14°C.
T29 & T31	Moderate	2	21/08/2018 DUSK	Clear, dry, mild and calm, temperature 21°C.
			07/09/2018 DAWN	Cool, dry, still with clear skies. Temperature 8 - 7°C.

*¹ – Only Tree M42 surveyed on this survey occasion

3.15.2 Bat roosts were confirmed at tree M2, with a maximum count of ten Noctule bats; and a suspected common pipistrelle roost noted at tree M8 (not confirmed); however M8 was confirmed to have negligible suitability for roosting bats during subsequent tree climbing.

3.15.3 A summary of the findings during the survey are presented in Table 18 and Figure 6.

Table 18: Tree emergence/ re-entry survey results

Tree number	Survey date	Number of surveyors	Species detected in order of abundance	Description of activity	Roost
M12, M7, M8, M9, M11, M24, M55, M14, M15, M17, M20, M23, M51, M53, M10, M28, M29, M32, M33, M34	01/06/2018 DAWN	2	Common pipistrelle Soprano pipistrelle Myotis sp Noctule <i>Nyctalus sp</i>	Foraging activity predominantly by common pipistrelle with the occasional <i>Myotis</i> species was observed within the park, very little foraging towards the trees, low levels of bat activity noted. High levels of bat activity by pipistrelles were noted foraging above the tree canopy with a flurry of <i>Myotis</i> calls 60 minutes before sunrise; the occasional noctule pass was also detected. Active foraging was observed around M10 and M8 15 minutes before sunrise, bat suddenly disappeared, no re-entry observed but possible. High levels of foraging activity were noted around the street laps adjacent to the tree cline adjacent to the entrance to the park.	Unconfirmed - Possible re-entry in vicinity of M8. (however M8 was confirmed to have negligible suitability for roosting bats during subsequent tree climbing)
	06/07/2018 DAWN		Common pipistrelle Soprano pipistrelle <i>Myotis sp</i> Noctule	Foraging and commuting activity by common pipistrelle and noctule species were observed along the tree line park side. Pipistrelle, <i>Myotis</i> species and occasional noctule passes were detected above the canopy of the trees surveyed. Soprano pipistrelle was foraging 15 minutes before sunrise around M10 and M11, no re-entry observed. High levels of pipistrelle foraging activity adjacent to the over footbridge. Active foraging over park entrance roadway going west and around street lights and tree canopy, high activity around M12/ M11.	No
M1, M36, M2, M3, M4, M6, M39, M42*, M4, M46	15/06/2018 DAWN	4	Noctule <i>Nyctalus/ Eptesicus sp.</i> Common pipistrelle Soprano pipistrelle	Active foraging observed by pipistrelle around tree tops around trees M1 and M2. <i>Nyctalus</i> species observed re-entering M2, last bat re-entered 20 minutes before sunrise. Lower bat activity was noted around M36 with sporadic activity noted only. Common pipistrelle was predominantly detected at the beginning of the survey over Mill Pond with a total of five bats seen at any one time.	Confirmed at M2 re-entry of 10 bats – <i>Nyctalus sp.</i>
	05/07/2018* ¹ DAWN	2	Common pipistrelle Soprano pipistrelle Noctule	Constant foraging activity by common and soprano pipistrelles over Mill Pond, 3-5 bats observed at any one time. No re-entry into M2. Occasional passes of Noctule. The last bat detected was a common pipistrelle 31 minutes before sunrise.	No

Tree number	Survey date	Number of surveyors	Species detected in order of abundance	Description of activity	Roost
	24/07/2018 DAWN	5	Soprano pipistrelle Common pipistrelle Noctule <i>Nyctalus/Eptesicus</i> sp <i>Myotis</i> sp	Abundant foraging activity was observed over Mill Pond with occasional common pipistrelle and noctule activity noted between M39, M42 and M46. Foraging activity was noted from Mill pond towards M1 and M2 below the tree canopy. High levels of soprano pipistrelle foraging were detected. Foraging activity observed by common and soprano pipistrelle around M1 and M2 with occasional passes by Noctule bats, a single noctule re-entry into M2 was observed 33 minutes before sunrise.	Confirmed - M2 re-entry 1 bat - Noctule
M1, M2, M11, M12, M36 M42, M46	20/08/2018 DUSK	4	Soprano pipistrelle Common pipistrelle Noctule <i>Nyctalus/Eptesicus</i> sp <i>Myotis</i> sp Long-eared sp.	Soprano pipistrelle was the most prominently detected species detected foraging in and around Mill pond adjacent to tree M42 and M46. Occasional passes of common pipistrelle and noctule were detected with a single <i>Myotis</i> species. Activity was similar around M36 with soprano pipistrelle being most abundant, however noctule were initially detected at the start of the survey in this area; long-eared bats were also noted with the highest level of <i>Myotis</i> species detected. Constant soprano and common pipistrelle foraging activity observed around the trees at M1 and M2, with sporadic noctule and long-eared activity. The first bat detected was a noctule bat three minutes before sunset as such indicating a roost within close proximity to the site.	None-observed
T82	03/07/2018 DUSK	2	Soprano pipistrelle Common pipistrelle Noctule <i>Myotis</i> sp.	Foraging activity was abundant along the tree line to the north-west of the tree with active foraging by soprano and common pipistrelles observed. Occasional passes by Noctule was detected as well as <i>Myotis</i> sp., however these were not observed in flight. The first bat pass was by a pipistrelle species 19 minutes after sunset.	No
	04/09/2018 DAWN		Soprano pipistrelle Common pipistrelle <i>Myotis</i> sp.	The most predominant species detected was soprano pipistrelle which was observed foraging along the tree line north-west of the tree. No bats were observed re-entering the tree. The last bat detected was a soprano pipistrelle 3 minutes after sunrise, foraging along the tree line to the west of the tree, indicating a roost within close proximity to the site.	
T1	08/08/2018 DUSK	2	Noctule Common pipistrelle Soprano pipistrelle <i>Myotis</i> sp Daubenton's	The most abundant species recorded was Noctule bats followed by common and soprano pipistrelles which were observed with foraging and commuting using the tree lines to the north and west. A single Daubenton's bat and two other individual passes by <i>Myotis</i> species were detected. Bats were actively foraging around this tree during the survey, but no emergence or re-entry into any of the many features present on this tree was observed. The first bat detected was a common pipistrelle 28 minutes after sunset.	No

Tree number	Survey date	Number of surveyors	Species detected in order of abundance	Description of activity	Roost
	29/08/2018 DAWN		Soprano pipistrelle	Two brief passes detected only. Activity extremely low. No re-entry.	
	11/09/2018 DAWN		Common pipistrelle Soprano pipistrelle <i>Myotis</i> sp	Continuous feeding around the treeline adjacent to the river with occasional activity around tree T1. Activity predominantly by common and soprano pipistrelle with occasional <i>Myotis</i> species passes. Last bat pass was 22 minutes before sunrise by a soprano pipistrelle. Pipistrelle social calls were abundant during the survey.	
T69	08/08/2018 DUSK	2	Common pipistrelle Soprano pipistrelle Noctule <i>Myotis</i> sp Daubenton's	Moderate activity was noted with the most abundant species being that of common pipistrelle. Activity was primarily associated with the treeline and water course located to the west. No bats were actively observed foraging around the tree itself. No emergence. The first bat pass was a noctule 25 minutes after sunset.	No
	29/08/2018 DAWN		Soprano pipistrelle <i>Myotis</i> sp Brown long-eared	Most abundant species detected was soprano pipistrelle which was observed foraging along the River bank, however, most passes were heard only and brief. A single brown long-eared was observed foraging along the riverbank. No re-entry. The last bat detected was a soprano pipistrelle 35 minutes before sunrise.	
	11/09/2018 DAWN		Common pipistrelle Soprano pipistrelle Noctule <i>Myotis</i> sp.	The most abundant species detected was common pipistrelle with soprano pipistrelle. Infrequent noctule and a single <i>Myotis</i> species were detected. Bats were observed foraging along the river corridor. The last bat detected was a soprano pipistrelle 28 minutes before sunrise. No bats were observed re-entering the tree.	
T2	08/08/2018 DUSK	2	Common pipistrelle	A single bat pass only was detected. No emergence or re-entry was detected.	No
T29	21/08/2018 DUSK	2	Common pipistrelle Soprano pipistrelle Noctule <i>Myotis</i> sp. Long-eared sp	High levels of common pipistrelle foraging activity was noted during the survey, with occasional noctule and <i>Myotis</i> species foraging and commuting passes. The first bat was a Noctule bat detected 24 minutes after sunset. No bats were observed emerging from the tree.	No
	07/09/2018 DAWN		<i>Myotis</i> sp (likely Brandt's/whiskered)	A single <i>Myotis</i> species was detected at 77 minutes before sunrise foraging. No other bat species were detected during the survey. Potential Buzzard nest present in the tree.	

Tree number	Survey date	Number of surveyors	Species detected in order of abundance	Description of activity	Roost
T31	21/08/2018] DUSK	1	Soprano pipistrelle Common pipistrelle Noctule Long-eared sp.	High levels of common pipistrelle foraging activity was noted during the survey, with occasional soprano pipistrelle and noctule foraging and commuting passes. Active foraging around the tree was observed. The first bat was a pipistrelle bat detected 22 minutes after sunset. No bats were observed emerging from the tree.	No
	07/09/2018 DAWN		-	No bats were detected during the survey.	

4 CONCLUSIONS AND DISCUSSION

4.1 2018 Surveys: Buildings and Structures

- 4.1.1 No new roosts were identified within buildings and structures within the Scheme boundary; however, a new confirmed roost was recorded in a building, Brook Medical Centre, within 50m of the revised Scheme boundary. A summary of confirmed roosts within or adjacent to the Scheme boundary is provided in Table 19 and Figures 2a and 2b.
- 4.1.2 Accessible buildings at B8 Queensway were surveyed, with QW16 assessed as providing Moderate suitability for roosting bats. A toilet block opposite at Markeaton Park was assessed as providing Low suitability for roosting bats. No bats were recorded during roost surveys at QW10, QW30 and the Markeaton Park Toilet Block. Access was not available to QW16 or 259 Ashbourne Road.
- 4.1.3 Bat roosts were previously recorded at property QW30, with a single common pipistrelle recorded using the building during roost surveys in 2017 and a small number of whiskered bat droppings located inside the roof void in early 2017. The whiskered roost (a rarer species) is provisionally assessed as of County value with the pipistrelle roost as Local value. Proposed demolition of this building due to the Scheme would result in the loss of these roosts and a European Protected Species Mitigation Licence (EPSML) would be required from Natural England.
- 4.1.4 Where surveys were not possible at QW4, QW12, QW14, QW16 and 259 Ashbourne Road pre-construction surveys are recommended when Highways England take possession (subject to the granting of the Development Consent Order (DCO) application). Should any bats be recorded using these buildings during pre-construction surveys, the draft EPSML for buildings within the Scheme (QW30) would be amended to include any additional roosts. This is not considered a constraint, as multiple surveys have been undertaken in the vicinity of these buildings during 2017, including at neighbouring properties, and bat activity associated with any significant roosts would have been recorded had they been present. It is considered a low possibility that these buildings could support low conservation status roosts (small roosts of common species) and that roosts of higher conservation value (maternity roosts or roosts of rarer species) are unlikely to be present.
- 4.1.5 Two confirmed bat roosts were identified through the presence of bat droppings at the mobile home park at Little Eaton junction adjacent to the Scheme boundary, namely Caravans F (No.9b) and N (No.11). A further caravan and two buildings had Moderate suitability and four caravans had Low suitability to support roosting bats species. Given the record of a common pipistrelle bat at one caravan (F) and one dropping at another (N), it is reasonable to presume that these structures do not provide opportunities for roosts of higher conservation value and are most likely used by small numbers of common species (*Pipistrelle* species) of lower conservation value. As these low value roosts are not subject to any direct and potentially only minor indirect impacts, effects would be negligible and therefore no further bat surveys are proposed at this location.
- 4.1.6 Buildings at B11 Derby Garden Centre north of Long Eaton junction were confirmed as providing Negligible potential for roosting bats; with the exception of an outbuilding B11b, the Clocktower, which was rated as providing Low potential. No further

surveys are recommended with respect to this building, given that this building is outside the Scheme boundary and thus there would be no direct impacts.

- 4.1.7 Building B12, the Jonty Farmer Public House alongside Kedleston Road south of the existing A38, was rated as providing Moderate potential for roosting bats. A *Pipistrellus* bat roost was confirmed at the B13 Brook Medical Centre from identification of droppings high on an internal wall. This corresponded with knowledge of the Medical Centre staff of a roost they have been aware of for a number of years. No record of this roost was present on data searches or from other enquires. No further surveys are recommended with respect to this building, as no direct impacts are anticipated in this area as it is beyond the Scheme boundary. However, the potential indirect impacts upon this bat roost due to the Scheme will be considered and reported within the Environmental Statement.
- 4.1.8 No potential access points for bats were recorded at the airshafts within the Scheme boundary at Little Eaton junction and consequently these are considered to offer no roosting potential for bats.
- 4.1.9 Updated assessments of bridges resulted in Bridge B1 being down-graded to Negligible potential for bat roosts and B6 downgraded to Low potential for bat roosts.
- 4.1.10 Bats were recorded feeding and perching at B2 Flood Arch Bridge, but no bats were recorded re-entering any part of the structure. This bridge had been previously confirmed as a small day roost. As this bridge was previously recorded as a roost for a small number of common species (common and soprano pipistrelle and brown long-eared) and potential current use as a feeding roost proposed, modification of this structure would be subject to an EPSML from Natural England.
- 4.1.11 Bridge B3 where the A38 crosses the River Derwent is outside, but adjacent to, the Scheme boundary. A common pipistrelle maternity roost is confirmed at this bridge from Highways England data records, whilst roost surveys were undertaken in 2015 and 2017. No further surveys were undertaken at this bridge in 2018 as the bridge is subject to regular Highways England monitoring and the roost status has been confirmed as a maternity roost for a common species of bat. It is noted that in addition to common pipistrelle, soprano pipistrelle and Daubenton's bats have also previously been recorded in the vicinity of the bridge and occasional roosting by these two species cannot be ruled out (refer to results of previous surveys AECOM(c) 2016, AECOM(e) 2018).
- 4.1.12 No direct impacts due to the Scheme are anticipated to the B3 River Derwent Bridge. Potential indirect impacts associated with any nearby works would be mitigated through the Construction Environmental Management Plan (CEMP), including for example restrictions on lighting and night-time working.
- 4.1.13 No bats were recorded during the 2018 activity surveys at bridges B4, B5 and B6; confirming results from surveys undertaken in 2015 that bats are absent from these structures.
- 4.1.14 None of the buildings or structures across the Scheme were considered to provide hibernation potential for bats.

4.2 2018 Surveys: Trees

- 4.2.1 Bat roosts were confirmed in one tree (M2) and (initially) suspected at one further tree (M8) within or adjacent to the Scheme boundary. No bats were recorded at tree M39 where a single common pipistrelle bat was recorded roosting in 2015. A summary of confirmed roosts within or adjacent to the Scheme is provided in Table 19.
- 4.2.2 Trees subject to bat roost inspections in 2018 found Moderate suitability at trees T29 and T77 and negligible suitability at trees T28 and T70.
- 4.2.3 No signs of bat use or recent activity were recorded in bat boxes at trees T42, M44, M47, M48 and M49.
- 4.2.4 Aerial inspections of trees recorded a confirmed roost at tree M2, and subsequently identified as Noctule through DNA analysis. Roost surveys at this tree recorded a maximum count of ten Noctule bats. This roost is assessed as a potential maternity roost of high conservation value. Other aerial inspections resulted in Tree T1 being upgraded from Moderate roosting suitability to High suitability; tree M11 downgraded from High to Negligible suitability and tree T5 downgraded from Moderate to Negligible suitability.
- 4.2.5 A suspected roost was noted at tree M8 where common pipistrelle bats were observed close to the tree at dawn. A subsequent climbed inspection of tree M8 recorded no suitable roosting features present.
- 4.2.6 Tree T77 was not subject to further roost surveys, as no direct or indirect impacts are anticipated due to the Scheme at this location.
- 4.2.7 Any trees with confirmed bat roosts that would be lost to the Scheme would be subject to an EPSML from Natural England. Trees with unconfirmed roosts, but with High, Moderate or Low suitability for bats lost to the Scheme would be soft-felled under a Method Statement. Pre-construction surveys of these trees as part of the Method Statement may upgrade these to confirmed roosts, in which case the EPSML for the Scheme would be amended.
- 4.2.8 Trees that require felling that have been assessed with potential for use as a bat hibernation roost, (or where such potential cannot be ruled out) would be subject to felling under Method Statement.

4.3 Summary

- 4.3.1 Table 19 provides a summary of bat roosts within and adjacent to the Scheme, including previous survey results, together with recommendations and mitigation options (which are subject to confirmation in the Scheme Environmental Statement).

Table 19: Summary of bat roosts within or adjacent to the Scheme

Building Structure or Tree Number	Species	Roost Status	Description	Impact	Recommendation/ mitigation options (subject to confirmation in the Environmental Statement)
B8. QW30	Common pipistrelle, Whiskered	Small occasional day roosts	1 common pipistrelle recorded emerging in 2017, small number of whiskered droppings recorded February 2017. No bats recorded in 2018.	Direct loss	EPSML
B13 Brook Medical Centre	<i>Pipistrelle</i> species	Unknown	Droppings noted inside building, allegedly previously subject to LPA and/ or Natural England Volunteer Bat Warden advice, but no records found.	Negligible indirect impacts	Control lighting and timing of vehicle movements into the area during construction as a precaution – implemented through the CEMP Outside the Scheme boundary.
B9 Ford Park Static Homes: Caravan F (9b) & N (11).	<i>Pipistrelle</i> species	Small day roost (presumed)	A single common pipistrelle at caravan F from desk study data and one bat dropping at caravan N.	Negligible indirect impacts	None. Buffer maintained around static homes during construction / operation.
B2 Flood Arch bridge	Common pipistrelle, Brown Long-eared – day roosts Common and soprano pipistrelle feeding roost	Small occasional day roosts and/ or feeding roosts	Small occasional day roosts for the pipistrelle species recorded in 2017, feeding roost for brown long-eared recorded in 2015, feeding roost for common and soprano pipistrelle recorded in 2018. The 3 rd expansion joints were predominantly utilised on either side of the bridge in 2018. Features associated with roosting in 2017 are no longer present.	Direct impact through modifications to the structure	EPSML

Building Structure or Tree Number	Species	Roost Status	Description	Impact	Recommendation/ mitigation options (subject to confirmation in the Environmental Statement)
B3 River Derwent Bridge	Common pipistrelle Daubenton's, Soprano pipistrelle	Maternity Possible occasional day roosts	Established maternity roost subject to regular Highways England monitoring. 2017 surveys suggested other bats may also occasionally use the roost	Negligible indirect disturbance impacts.	Control lighting and timing of vehicle movements into the area during construction as a precaution – implemented through the CEMP. Outside the Scheme boundary.
Tree M2	Noctule	Maternity (hibernation potential, while Noctule bats are unlikely to use the same feature all year this cannot be discounted)	A maximum of 10 individual bat species were identified in the tree at any one time, bats have been detected within the tree from June to August. The cavity was inspected and the feature is composed of a 1.5m long cavity going upwards from a callus hole entrance.	Direct loss	EPSML
Tree M39	Common pipistrelle	Previous confirmed day roost (1 bat)	A single common pipistrelle bat was recorded returning to roost at this tree in 2015. No bats were recorded using this tree as a roost in 2018.	Negligible Indirect disturbance impacts	Tree retained no record of bat roost during 2018 surveys.

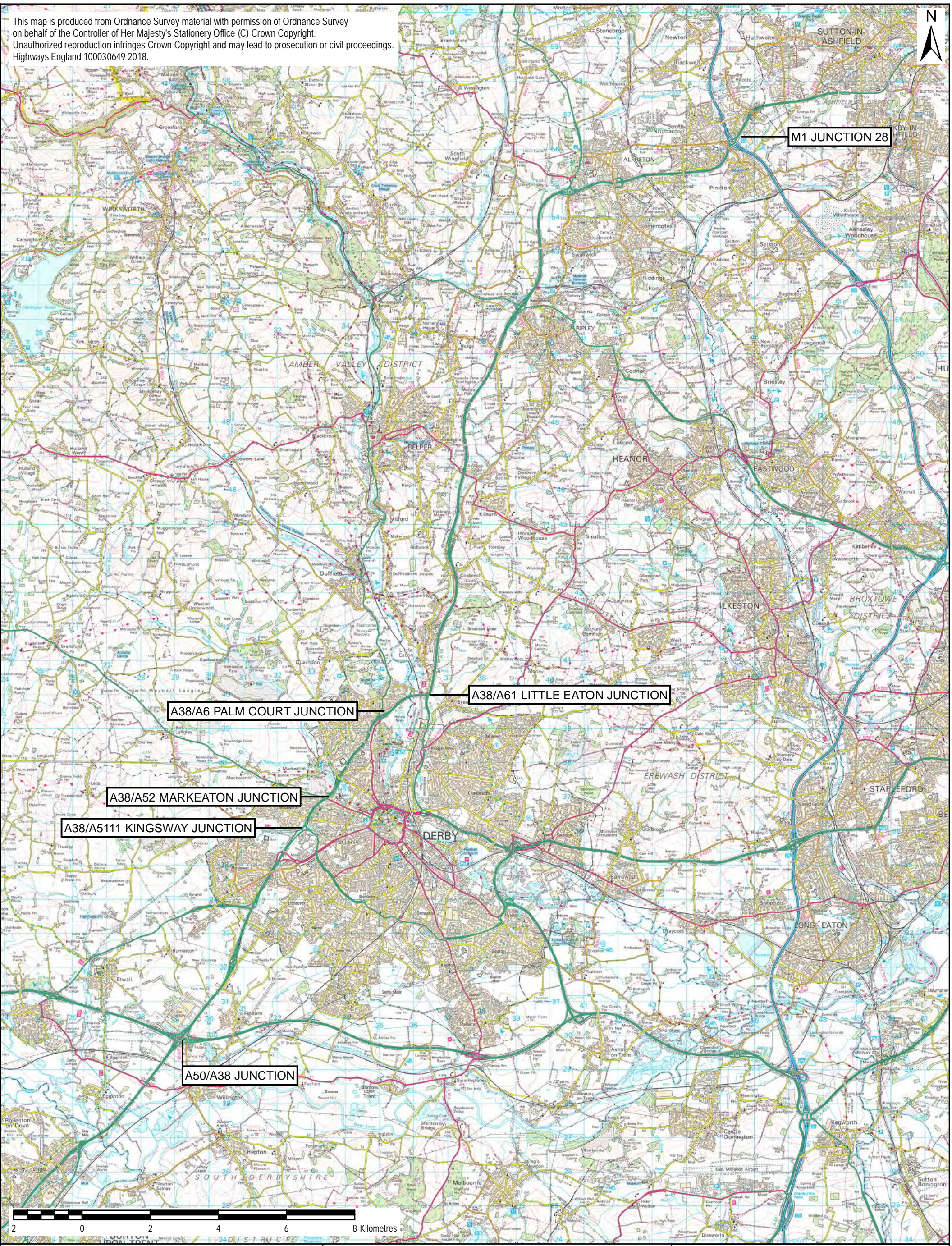
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Appendix A

Figures

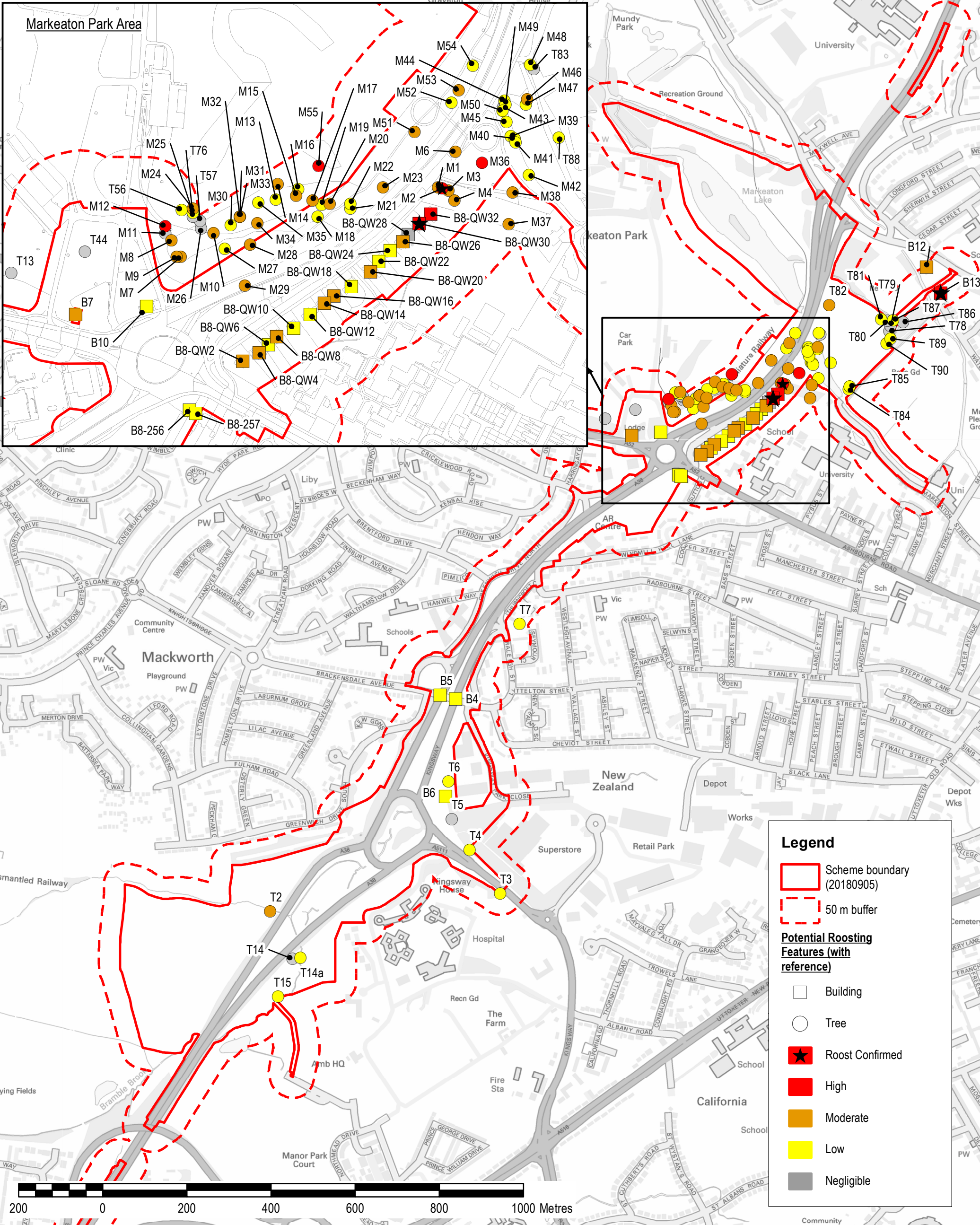
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Project Title/Drawing Title		AECOM Internal Project Number		Highways England	
A38 DERBY JUNCTIONS SCHEME LOCATION PLAN		60533462		A38 Derby Junctions Project	
		Drawn	Checked	Highways England, Floor 5	
		GB	SR	2 Colmore Square	
		Date	Scale @ A3	38 Colmore Circus	
		01/10/2018	1:100,000	Birmingham	
				B4 6BN	
				AECOM	
				Royal Court	
				Basil Close, Chesterfield	
				Derbyshire, S41 7SL	
				+44 (0) 1246 209221	
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		Figure 1		1F	

File Name: \\ch-wip-001\CH_Roads\A38 Derby Jns - POT33912 CAD\12.1 WIP\FIGURE 1.1 - LOCATION PLAN F1.mxd

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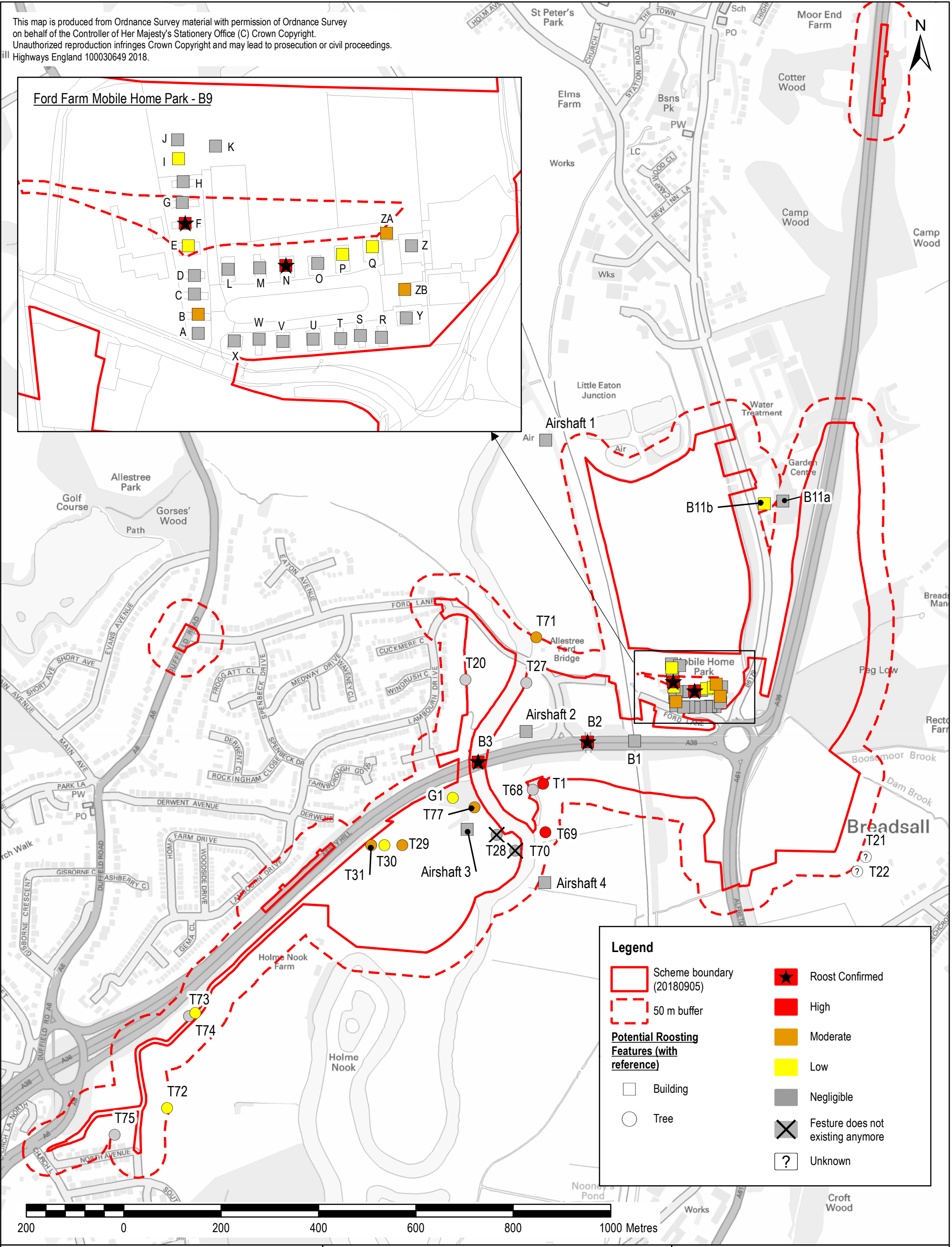




Project Title/Drawing Title		AECOM Internal Project Number		A38 Derby Junctions Project	
A38 DERBY JUNCTIONS		60533462		Highways England, Floor 5	
KINGSWAY - MARKEATON		Drawn	Checked	Approved	2 Colmore Square
POTENTIAL ROOSTING FEATURES		GSB	JT	PB	38 Colmore Circus
Date		Date	Scale @ A3	Purpose of issue	Birmingham
06/11/2018		06/11/2018	1:3,500	FINAL	B4 6BN
Drawing Number		Rev		AECOM	
Figure 2a				Royal Court	
				Basil Close, Chesterfield	
				Derbyshire, S41 7SL	
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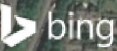
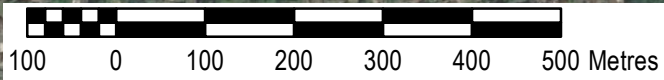


Project Title/Drawing Title A38 DERBY JUNCTIONS LITTLE EATON POTENTIAL ROOSTING FEATURES	AECOM Internal Project Number 60533462			<div>A38 Derby Junctions Project Highways England, Floor 5 2 Colmore Square 38 Colmore Circus Birmingham B4 6BN</div> <div></div>
	Drawn GSB	Checked JT	Approved PB	
	Date 06/11/2018	Scale @ A3 1:1,500	Purpose of issue FINAL	<div>AECOM Royal Court Basil Close, Chesterfield Derbyshire, S41 7SL +44 (0) 1246 209221 +44 (0) 1246 209229 www.aecom.com</div> <div></div>
	Drawing Number Figure 2b			
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Legend

- Scheme boundary
(20180905)
- Airshaft
- Filter Tunnel

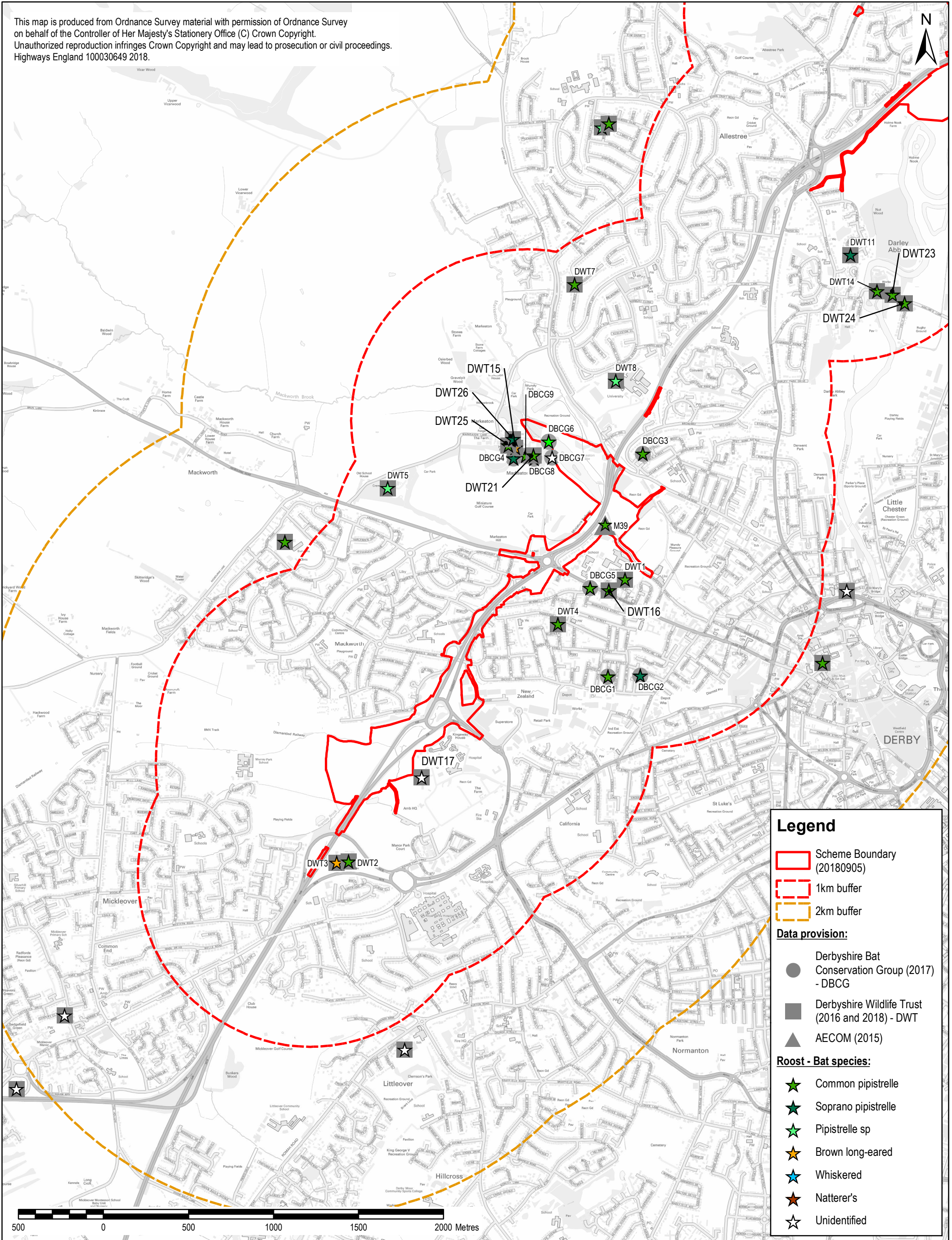


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Project Title/Drawing Title A38 DERBY JUNCTIONS BAT SURVEYS 2018 AIRSHAFT MAP	AECOM Internal Project Number 60533462			A38 Derby Junctions Project Highways England, Floor 5 2 Colmore Square 38 Colmore Circus Birmingham B4 6BN	
	Drawn GSB	Checked HP	Approved PB		
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	Drawing Number Figure 3		Rev .		
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File Name: \\W:\Highways Agency\47071390 A38 Derby Jns - Environment\Technical\Ecology\GIS A38_2018\project_files\Bats\Bat report\A38 Little Eaton_Airshaft_2018.mxd

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Legend

Scheme Boundary (20180905)

1km buffer

2km buffer

Data provision:

Derbyshire Bat Conservation Group (2017) - DBCG

Derbyshire Wildlife Trust (2016 and 2018) - DWT

AECOM (2015)

Roost - Bat species:

Common pipistrelle

Soprano pipistrelle

Pipistrelle sp

Brown long-eared

Whiskered

Natterer's

Unidentified

Project Title/Drawing Title

**A38 DERBY JUNCTIONS
KINGSWAY MARKEATON
DESK STUDY 2018
BAT ROOSTS RECORDS**

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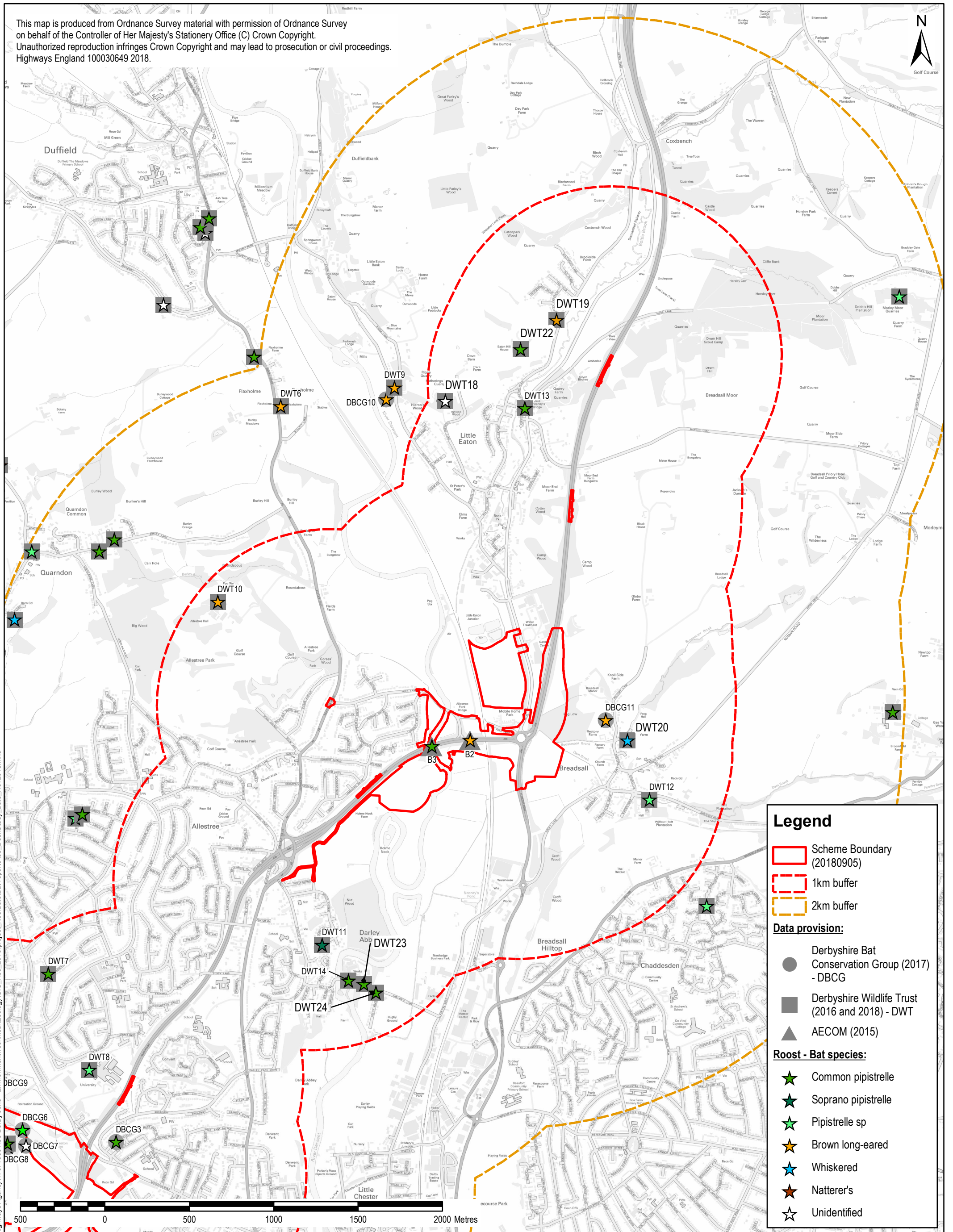
AECOM Internal Project Number 60533462		
Drawn GSB	Checked JT	Approved PB
Date 09/11/2018	Scale @ A3 1:20,000	Purpose of issue FINAL
Drawing Number Figure 4a		Rev .

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38 Colmore Circus
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File Name: \\N:\MAN-001\Jobs\Highways Agency\47071390 A38 Derby Jcns - Environment\Technical\Ecology\GIS_A38_2018\project_files\Bats\Bat report\A38_DeskStudy_Bats_Nov2018.mxd

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Project Title/Drawing Title

A38 DERBY JUNCTIONS
LITTLE EATON
DESK STUDY 2018
BAT ROOSTS RECORDS

AECOM Internal Project Number
60533462

Drawn
GSB

Checked
JT

Approved
PB

Date
09/11/2018

Scale @ A3
1:20,000

Purpose of issue
FINAL

Drawing Number
Figure 4b

Rev

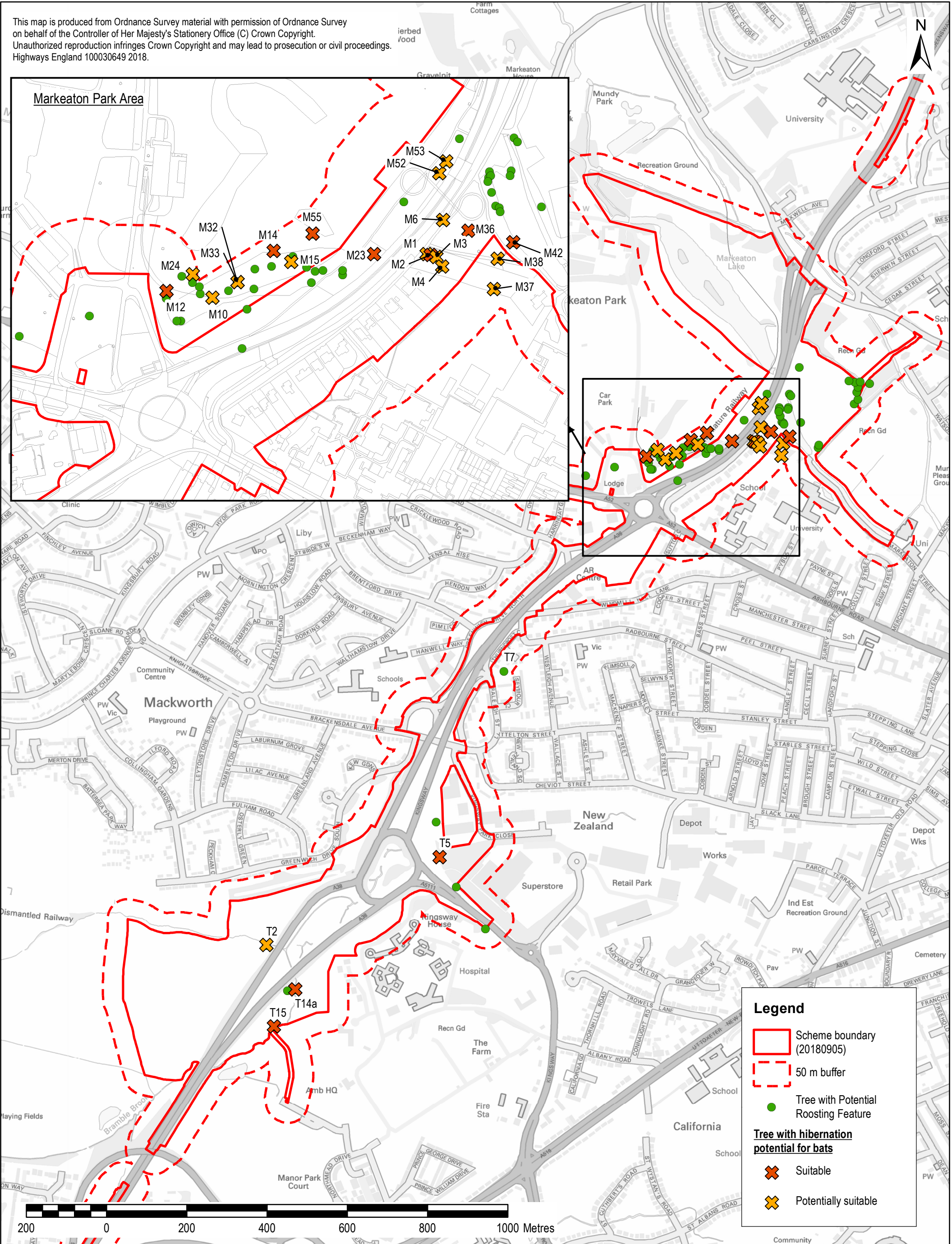
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38 Colmore Circus
Birmingham
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Project Title/Drawing Title		AECOM Internal Project Number		A38 Derby Junctions Project	
A38 DERBY JUNCTIONS KINGSWAY - MARKEATON TREES WITH HIBERNATION POTENTIAL		60533462		Highways England, Floor 5	
		Drawn	Checked	2 Colmore Square	
		GSB	JT	38 Colmore Circus	
		Date	Scale @ A3	Birmingham	
		12/11/2018	1:3,500	B4 6BN	
		Drawing Number	Purpose of issue	AECOM	
		Figure 5a	Rev	Royal Court	
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Legend

Scheme boundary
(20180905)

50 m buffer

Tree with Potential
Roosting Feature

Tree with hibernation
potential for bats

Suitable

Potentially suitable

Project Title/Drawing Title			AECOM Internal Project Number			<div><div><div></div><div>highways england</div></div><div><div>A38 Derby Junctions Project</div><div>Highways England, Floor 5</div><div>2 Colmore Square</div><div>38 Colmore Circus</div><div>Birmingham B4 6BN</div></div></div>
A38 DERBY JUNCTIONS LITTLE EATON TREES WITH HIBERNATION POTENTIAL			Drawn	Checked	Approved	
			GSB	JT	PB	
Date			Scale @ A3		Purpose of issue	<div><div><div></div><div>AECOM</div></div><div><div>Royal Court</div><div>Basil Close, Chesterfield</div><div>Derbyshire, S41 7SL</div><div>+44 (0) 1246 209221</div><div>+44 (0) 1246 209229</div><div>www.aecom.com</div></div></div>
12/11/2018			1:7,000		FINAL	
Drawing Number			Rev			
Figure 5b						

File Name: Y:\Highways Agency\47071390 A38 Derby Jns - Environment\Technical\Ecology\GIS_A38_2018\project_files\Bats\Bat report\A38 LE_Bat_Hibernation_2018.mxd

Appendix B B8 Queensway Building 16 Potential Roosting Feature Assessment

Building No.	Building Description	Description of Potential Roosting Features	Roosting Suitability
16	Two-storey detached brick building with mansard roof. Wall hanging tiles are present between the two back bay windows.		Moderate
	External Features	<p>A 2-cm gap between soffit boxing and brick work above top left front window and around the roofline of the property. A hole in soffit board and roof where board was missing. However, roof appeared well- sealed from the inside.</p> <p>To the rear of the property loose lead flashing and loose roofing felt above rear top bay window as well as along the hanging wall tiles and below the rear first floor bat window is present. Loose hanging wall tiles below the first floor bay window to the rear of the property are also present.</p> <p>A gap is present between the tiles and soffits above the back bay window.</p> <p>A large hole is present in the soffit boarding allowing access into the full length of the remaining soffit panelling.</p> <p>Lifted edging tiles are present with missing mortar along the roof edge.</p>	

Appendix C

Static Homes. B9 Ford Park Potential Roosting Feature Assessment

Caravan No.	Description of Potential Roosting Features	Roosting Suitability
A	Single storey building with pitched plastic tiled roof and felt edging, plastic fascia's. No evidence or features present. No.7	Negligible
B	Single storey flat roofed building with wooden soffits and plastic fascia. Wood rot cavities present on the west side of the building. Soffit on North side heavily cobwebbed. Small extension to the north side, broken exposed cavity in soffit fascia on west of extension allowing access into soffit box, no evidence present of roosting bats at time of survey. No.7a	Moderate
C	Single storey building with pitched plastic tiled roof and felt edging, plastic fascia's. Single storey porch extension with plastic cladding. No.5	Negligible
D	Single storey building with domed tiled roof and felt edging, plastic fascia's. Single storey porch extension with plastic cladding. No.9	Negligible
E	Single storey building with pitched plastic tiled roof and felt edging, plastic fascia's. Single storey porch extension with plastic cladding. 0.5cm cavity along south side and north side of building. No evidence of roosting bats No.9a.	Low
F	Single storey building with felt pitched roof with overhang and wooden fascia's. Single storey porch extension with lean to roof and plastic door. Cavity present long the west side of building where a 1cm gap runs along the length of the fascia and exterior cladding, bat dropping on wall underneath exposed cavity. No.9b	Confirmed
G	Single storey building with pitched plastic tiled roof and felt edging, plastic fascia's. Bay plastic windows east facing, new guttering and fascia boarding present. No evidence or features present. Single width building. No.18	Negligible
H	Single storey building with domed tiled roof and felt edging, wooden fascia's and wooden framing around windows. Disused building all windows open and entry points across the building accessible however, no suitable roosting locations visible or evidence No.18a	Negligible
I	Partially constructed double width building with large cavity on the eat (front of building) exposed leading to wooden beamed roof cavity, works currently being undertaken. Suitability due to exposed wooden timber framed roof however unknown if works are currently taking place if works are occurring then Negligible suitability due to disturbance. No.19	Low
J	Half a building with exposed side covered with plastic.	Negligible
K	No longer present	N/A
L	Single storey building with pitched plastic tiled roof and felt edging, plastic fascia's. Bay plastic windows, new guttering and fascia boarding present. Heavily cobwebbed cavity under fascia boarding 0.5cm cavity. No.10	Negligible
M	Double width single storey building with pitched tiled roof, plastic windows, bay window to front of property with felt above all intact. Wood fascia present. Wooden door and wood panelling to front of property. No.12	Negligible
N	Double width single storey building with pitched tiled roof, plastic windows. Metal trim present along roof edge. Plastic soffit present and soffit boarding with 1cm cavity present behind present. Dropping present on N side building underneath cavity behind plastic soffit. No.11.	Confirmed
O	Double width single storey building with pitched tiled roof, plastic windows and plastic fascia boarding, in good condition.	Negligible

Caravan No.	Description of Potential Roosting Features	Roosting Suitability
P	Double width single storey building with pitched tiled roof, plastic windows. 1cm cavities along the east and west facing of the building under the fascia boarding. No.15.	Low
Q	Double width single storey building with pitched tiled roof and plastic framed windows and fascia. 0.5cm cavity along west and eastern side of building under fascia boarding. Cavity present on north side of building on gable end behind plastic fascia boarding. No.16.	Low
R	Single width single storey building with pitched tiled roof, with wooden fascia's and plastic windows and plastic guttering. No cavities present.	Negligible
S	Single width single storey building with pitched tiled roof, with wooden fascia's and plastic windows and plastic guttering. Cavity on north-west corner however does not go anywhere to open to be utilised. No.1.	Negligible
T	Single width single storey building with pitched tiled roof, with wooden fascia's and plastic windows and plastic guttering. No.2.	Negligible
U	Double width single storey building with pitched tiled roof with wooden fascia's. Single story extension with corrugated lean to roof and plastic exterior cladding. No features. No.3.	Negligible
V	Double width single storey building with pitched tiled roof, with wooden fascia's and plastic windows and plastic guttering. Flat roofed porch with plastic exterior cladding. No.4.	Negligible
W	Double width single storey building with pitched tiled roof, with wooden fascia's and plastic windows and plastic guttering. No.6.	Negligible
X	Double width single storey building with pitched tiled roof and felt edging, plastic fascia's. Single storey porch extension with plastic cladding. Potential entrance point on south side leading to false tiles, no evidence or suitable perching areas. No.8.	Negligible
Y	Double width single storey building with pitched tiled roof with plastic fascia's. Wood and plastic cladding on exterior of building. Single story flat roofed porch extension with felt roof, no cavities present. No.17.	Negligible
Z	Steel framed open garage with corrugated pitched roof, active workshop.	Negligible
ZA	Single storey, pitched tiled roof, plastic fascia, felt edging with single storey extension. Plastic exterior cladding. Entrance point on south side allows access into false tiles, brick exterior shell, large cavities between breeze block and brick exterior around all windows and doors cavity of 2cm-5cm in places. Active building utilised as office space. Suitable for hibernation and summer roosting, no evidence at the time of the survey.	Moderate
ZB	Large brick warehouse style building with pitched tiled roof and corrugated steel upper cladding with adjoining single storey brick flat roofed extensions. Large cavities present allowing access into the building between the brick and cladding and tiles.	Moderate

Appendix D DNA Results

Folio No: E3940
Report No: 1
Order No: AECOM18
Client: PEAK ECOLOGY LTD
Contact: Jessica Eades
Contact Details: jessicaeades@peakecology.co.uk
Date: 30/08/2018

TECHNICAL REPORT

ANALYSIS OF ENVIRONMENTAL DNA FOR THE DETECTION OF BAT SPECIES

Date sample received at Laboratory: 23/08/2018
Date Reported: 30/08/2018
Matters Affecting Results: None

RESULTS

Lab Sample ID.	Site Name	O/S Reference	Genetic Sequence	Common Name	Result	Sequence Similarity
E3940	Markeaton oak tree M2	SK33713 37132	Nyctalus noctula	Noctule	Nyctalus noctula	99%

METHODOLOGY

First, the DNA from a single bat dropping is extracted and purified. Then, a short fragment of a mitochondrial gene is amplified using polymerase chain reaction (PCR). If the analysis is unassigned the first time, the reaction is performed with different primer. The amplified product is analysed on a gel to confirm that the expected product size was amplified. It then goes through one more purification step before being Sanger sequenced. The sequence results are aligned against a library of known bat reference sequences using bioinformatics software, and we are able to confirm that the dropping sample came from a certain bat species with the reported percent sequence similarity.

INTERPRETATION

Degradation: Samples are extracted following protocol. If DNA is unsuccessfully amplified with SFF primers, specific to bat genome, the reserve samples are then extracted following protocol yet this time with a restorase enzyme which helps repair degraded DNA. If the reserve samples are amplified unsuccessfully, then the sample is amplified with universal 16S primers, these universal primers will amplify the most prolific DNA in the sample so will detect Bat mitochondrial DNA if it is there, or mouse DNA or bacterial DNA. If bacterial DNA is found this is an indicator that the sample has degraded to such an extent that the SFF primers can no longer detect Bat DNA. If no DNA is amplified whatsoever then the sample has long been degraded as the

technique is ultra sensitive. We get few samples with DNA degradation. DNA degrades with time and expedited with the environmental conditions it is exposed to such as sunlight and temperature and moisture, therefore we recommend samples are taken out of direct sunlight, away from moisture and away from warmth where possible. If the sample with the freshest appearance, on top of the surface, is collected taking in to account these environmental parameters then it is likely that the sample has degraded due to the sample being there a long time and Bats may no longer be present. We analyse a sample up to three times to achieve a result. If no DNA is detected after three times, we are confident, there is no longer any DNA in the sample to detect.

Genus: A samples goes through DNA extraction, PCR to amplify, electrophoresis and then genetically sequenced to give the genetic code for that sample GCTATATACGCGC etc. The genetic sequence obtained is used to cross reference against millions of known genomes to find the closest match. If the sample sequence is not long enough due to sample degradation, or if a non specific part of the genetic code is obtained, then the results may indicate the precise genus but not the precise species. This is especially important for Myotis species as there are so many similar Myotis species with very similar genetic coding. If the results come back an non specific for a species, then the sample resubmitted through the entire analysis again to see if a better quality sequence, a longer sequence or a sequence in a different area of the genome could have been obtained so that we were able to differentiate between the species.

Reported by: Yaroslav Terentyev

Approved by: Yaroslav Terentyev

End Of Report

Appendix E Access Constraints

Bat Survey Building Access Constraints at Markeaton Junction

Building Structure Number	Survey Type	Access Arrangement Details/ Evidence
QW 4	Activity emergence/ re-entry	Email Log: 09/06/2017 23/06/2017 28/06/2017 28/06/2017 30/06/2017 31/07/2017
QW 12	Activity emergence/ re-entry	Email Log: 06/06/2017 Letter Log: 06/07/2018
QW 14	Activity emergence/ re-entry	<u>Email Log:</u> 06/06/2017
QW 16	Activity emergence/ re-entry	<u>Email Log:</u> 31/07/2018 10/08/2018 <u>Letter Log:</u> 21/08/2018
Ashbourne 259	Activity emergence/ re-entry	<u>Letter Log:</u> 15/06/2018 07/08/2018 <u>Telephone Log:</u> 27/07/2018 30/07/2018 31/07/2018 01/08/2018 03/08/2018 03/08/2018