A Geoarchaeological Assessment from Borehole Survey at the A38 Derby Junctions

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EXECUTIVE SUMMARY

Project Name: A38 Derby Junctions
Site Code: A3816
Planning Authority: Derbyshire County Council
Superficial Geology: Alluvial clay, silt, sand and gravel
Bedrock Geology: Bowland Shale Formation, Carboniferous Mudstone, Siltstone, and Sandstone
NGR: SK 36473 39956
Date of Fieldwork: 13th-15th June 2016
Date of Report: July 2016

Archaeological Research Services Ltd. (ARS Ltd) was commissioned by AECOM Infrastructure & Environment UK Ltd to undertake a geoarchaeological assessment on behalf of Highways England at the A38 Little Eaton Derby Junctions. The assessment comprised the undertaking of a borehole survey and the interpretation of the soil profiles retrieved from ten geoarchaeological boreholes to assess the nature and stratigraphy of buried sediments and the potential for buried archaeological remains. This survey forms part of a phased programme of archaeological works undertaken by ARS Ltd, including geophysical survey and evaluation trenching at the Little Eaton Junction, Derby.

Geoarchaeological boreholes samples were collected from ten locations spread across the proposed development area. All ten boreholes were successfully sampled to a depth of between three and four metres. The sampled sediments consisted of alluvial clay and sand deposits overlain by modern topsoil. Gravel deposits were encountered between 48.56 m aOD and 45.91 m aOD. In those samples taken from a depth of 4m soil retention was often poor in the lowest metre of the sample due to very wet ground conditions.

Archaeological material was recovered from boreholes 2 and 4 in the form of coarse-grained ceramic material, possibly brick. All other cores were archaeologically sterile.

No waterlogged or preserved organic deposits were encountered. Coal was present in several core samples.

1 INTRODUCTION

1.1 Archaeological Research Services Ltd. (ARS Ltd) was commissioned by AECOM Infrastructure & Environment UK Ltd to undertake a geoarchaeological assessment on behalf of Highways England at land adjacent to the A38 Little Eaton junction, Derby.

1.2 The area of proposed development (PDA) is centred at NGR SK36473 39956 (Figure 1), the borehole coring was undertaken between the 13th and 15th June 2016 by Elise McLellan and Tom Parker of ARS Ltd.

1.3- The geoarchaeological assessment comprised the assessment and interpretation of ten geoarchaeological borehole samples as a part of a phased programme of archaeological investigation at the Little Eaton Junction.

1.4 This programme of work is, in line with the National Planning Policy Framework (NPPF) paragraph 141 (DCLG 2012), to record and enhance understanding of the significance of any heritage assets to be lost during proposed development, in a manner proportionate to their importance, and to make this evidence (and any archive generated) publically accessible via the Online Access to the Index of Archaeological Investigations (OASIS) as well as the local authority Historic Environment Record (HER).

1.5 This report describes the results of the palaeoenvironmental sampling (borehole survey) and their assessment and interpretation.

2 SITE LOCATION, LANDFORM, GEOLOGY AND SOILS

2.1 The underlying solid geology of the PDA consists of Millstone Grit of the Bowland Shale formation, formed during the Carboniferous Period when the local environment was dominated by open seas. This is overlain by superficial deposits of alluvial silt, sand and gravel and Glacio-fluvial clays, sands and gravel and head deposits, with the alluvial deposits and Glacio-fluvial clays being uppermost across the PDA and being the material into which the archaeological remains are cut (BGS 2016).

2.2 The PDA is spread over four fields (Figure 1). Field 1 comprises a flat, rectangular, turf field. The fall of slope to the west is gentle, dropping from *c.*49.36m aOD on the eastern side to *c.*49.25m aOD on the western side of the field. In places slightly lower lying pockets of land were encountered in which large amounts of surface water had collected.

2.3 Field 2 also lies to the south-west of the existing roundabout and is broadly rectangular in shape. It slopes from east to west from *c.*50.16m aOD in the east to 49.22m aOD in the middle and then to *c*.49.17m aOD at the west end of the field. Invasive species New Zealand Pygmy Weed (*Crassula helmsii*) and Himalayan Balsam (*Impatiens glandulifera*) are present in this field.

2.4 Field 3 lies to the north-east of the roundabout and consists of a large sub-rectangular field with a partial dividing hedge towards the northern end. It slopes steeply from north-east to south-west at the northern end of the field, fading into a more gradual south facing slope before levelling off towards the southern end of the area. The fall of slope from the northern end of the lower field from *c.*51.09m aOD to *c.*50.33m aOD towards the middle before rising slightly and levelling off to *c.*50.44m aOD at the southern end of the field.

2.5 Field 4 lies to the east/south-east of the roundabout and is broadly rectangular in shape. There is a gentle slope from *c.*51.17m aOD at the north-east end to *c.*50.86m aOD towards the south-west. Boreholes were sampled from the north-eastern, higher end of this field (Figure 1).

3 Archaeological and Historical Background

3.1 A detailed archaeological and historical background of the development area is provided in the written scheme of investigation (WSI) for this scheme of works, prepared by AECOM on behalf of Highways England (Report No. 47071319-URS-05-RP-EN-016) (Copp 2016).

3.2 Previous borehole sampling, undertaken by the British Geological Survey (BGS) prior to the construction of the present A38 junction, identified between 0.2-0.3m of topsoil which overlay soft brown and yellow silty clays and brown and grey mottled clays and sands (BGS Ref. SK34SE58, SK34SE59, SK34SE22, SK34SE23, SK33NE558, SK33NE557).

3.3 More recently, geotechnical investigations undertaken at the Little Eaton Junction as a part of the A38 Derby Junctions Improvements Preliminary Sources Study, (Highways Agency 2014) identified superficial alluvial deposits to a maximum depth of 2.6m. These superficial deposits were comprised of clays with secondary components of sand, gravel and silt. Alluvial deposits were mainly brown, with some orange and grey mottling observed. Organic silts and frequent decomposed roots were noted in some boreholes. Beneath the alluvial clay deposits, sands and gravels were document to an unproven thickness of up to 8m.

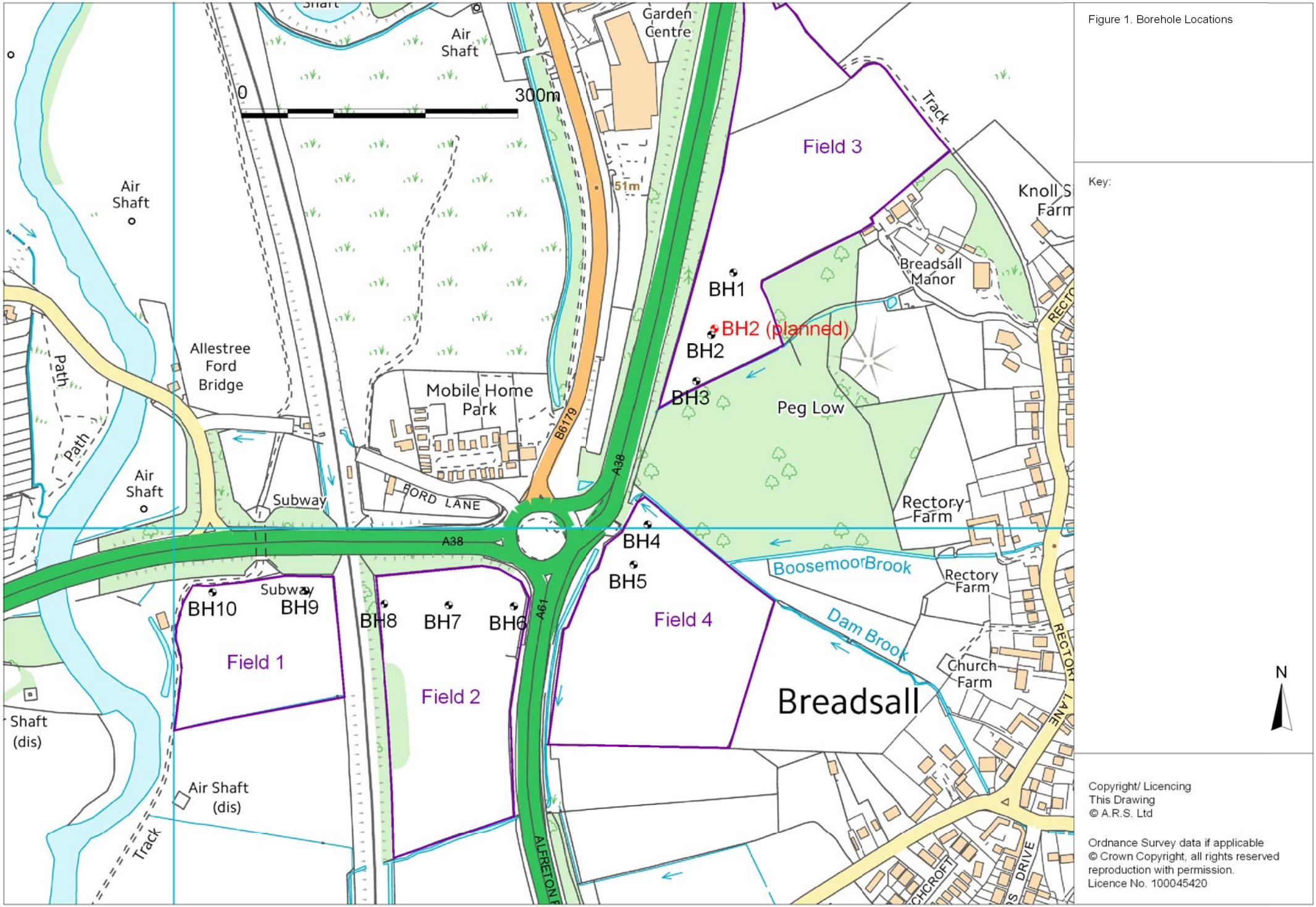

Figure 1. Borehole Locations

Key:

4 METHODOLOGY

4.1 Borehole locations, identified in the WSI for this scheme of works, are shown in Figure 1.

4.2 All boreholes were sampled at the specified locations with the exception of Borehole 2 which was relocated some 7m to the south due to the presence of standing water (Figure 1).

4.3 Boreholes were recovered using a windowless sampling rig in 1m segments to a depth of 4m where possible and a minimum depth of 3m.

4.4 All coring points were surveyed and geo-located using a GPS with an accuracy of ±0.01m.

4.5 Borehole cores were cleaned and described/recorded in the field. Soil characteristics, Munsell colour, and the nature of any inclusions were recorded (see Appendix II for complete borehole logs).

4.6 The cores from boreholes 2 and 4 were sealed, retained, and stored at 4°C in case further analysis is required.

4.7 Due to the presence of various invasive plant species, all sampling activity and movement on site was continuously supervised by a qualified ecologist. All samples taken from fields containing invasive species will be appropriately discarded as hazardous waste.

5 RESULTS

Introduction

5.1 A total of ten boreholes were sampled from four fields across the area of the proposed development. Full borehole logs can be found in Appendix II and a diagram of all boreholes is presented in Figure 3.

5.2 Windowless sampling recovered a minimum of 3m of sediment from each borehole location. Occasionally sediments could be recovered to 4m before gravels were encountered (Figure 3). Where sediments were recovered below 3m, soil retention was universally poor and stratigraphic levels given in such instances are, therefore, approximate.

5.3 Topsoil was identified to a depth of *c.* 0.3m in all cores, with the exception of borehole 10 (Field 1) where topsoil was 1.09m thick. Alluvial clays and sands were observed below the topsoil to a maximum thickness of 2.02m. Although the characteristics of the alluvial clays and sands were broadly similar, the stratigraphy varied depending on the ground level of each sampling location.

Field 3

5.4 Three boreholes (BH1, BH2 and BH3) were sampled from Field 3 (Figure 1). Field 3 was sloped from north-east to south-west, with BH1 located on an area of higher ground

than BH2 and BH3. All three boreholes presented a similar, lower, stratigraphic sequence of grey and greyish brown clayey sand overlaying sand and gravel.

5.5 Below the topsoil of BH1 lay a thick deposit of yellowish brown sand which was absent in BH2 or BH3. Below this sand lay a deposit of thick greyish brown clay flecked with manganese precipitation which was also observed in BH2 and BH3.

5.6 Gravel deposits were encountered at approximately the same level in BH1 (47.88m aOD) and BH3 (47.56m aOD). Gravel deposits were present at a higher level in BH2 (48.56) however, the lower cores from BH2 had very poor soil retention and it is possible that the observed level does not reflect the real height of incidence.

5.7 Field 3 may be characterised by gravel at a depth of 47.88-47.56m aOD followed by an alluvial clayey sand deposit, 1-1.5m of alluvial clay with manganese flecks and an additional alluvial sand deposit (from BH1) located further upslope (Figure 2).

Figure 2. Field 3, looking north and upslope from the BH2 towards BH1.

Field 4

5.8 Two boreholes (BH4 and BH5) were sampled from Field 4 (Figure 1), both to a depth of 4m with both cores presenting a similar stratigraphic sequence.

5.9 Beneath the topsoil, both cores consisted of deposits of yellowish-brown alluvial clays and sands. Yellow and brown clays and sands and grey clays and grey to black sands presented at the same depth in boreholes 4 (48.39m aOD) and 5 (48.38m aOD). The blacker of these sand deposits contained frequent gravel inclusions along with some small charcoal and coal inclusions. These charcoal inclusions are not suitable for radiocarbon dating as the

coal inclusions, also present in the deposit, would contaminate the sample. The grey to black sands gradually transitioned into the underlying gravel deposits at a 47.65m aOD in BH4 and 47.45m aOD in BH5.

5.10 Rounded and abraded fragments of ceramic building material were identified in Boreholes 2 and 4. In both cores the orange, coarse-grained, ceramic fragments were located within mixed clay and sand deposits. In Borehole 2 these deposits were between 49.03m aOD and 48.39m aOD, and in Borehole 4 they were located between 48.99m aOD and 48.56m aOD. The abraded and rounded nature of these ceramic fragments is probably a result of their being incorporated in water-deposited material. The ceramic building material fragments from Borehole 4 are located above the charcoal and coal-containing deposits

Field 2

5.11 Three borehole samples (BH6, BH7 and BH8) were taken from Field 2 (Figure 1). A greater variability in the borehole logs from Field 2 reflects the variations in and unevenness of the ground levels. Borehole 6 was significantly higher than Borehole 7 and Borehole 8 (Figure 3).

5.12 All three boreholes presented the same stratigraphy of topsoil over yellow-brown clays which overlying grey clays and sands which ultimately overlay gravel. However, the level at which these deposits occur is much higher in Borehole 6 than in Borehole 7 and Borehole 8. The lower grey and occasionally black clays and sands were very similar to the lower deposits observed in Field 3. Coal inclusions were also identified in the lower gravel deposits of Borehole 8.

Field 1

5.13 Two borehole samples (BH9 and BH10) were taken from Field 1 (Figure 1). These boreholes did not present the depositional sequence of yellow-brown clays and sands overlying grey clays and sands identified in the other fields with the deposits in BH9 and BH10 more uniformly dark brown and dark greyish brown.

5.14 Below the topsoil BH9 presented a sequence of dark brown sands over a dark greyish brown sand which graded into gravel deposits. BH10 presented a thick, dark greyish brown, deposit of clay which overlay dark greyish brown sands that graded into gravel deposits similar to those in BH9. Gravel deposits were encountered at 47.64m aOD in BH9, and although they were recorded at a slightly greater depth in BH10 this is likely due to loss of sediment in the lower cores of BH10.

5.15 Groundwater was encountered between 0.7m and 1.8m below ground level (48.1m aOD and 48.4m aOD).

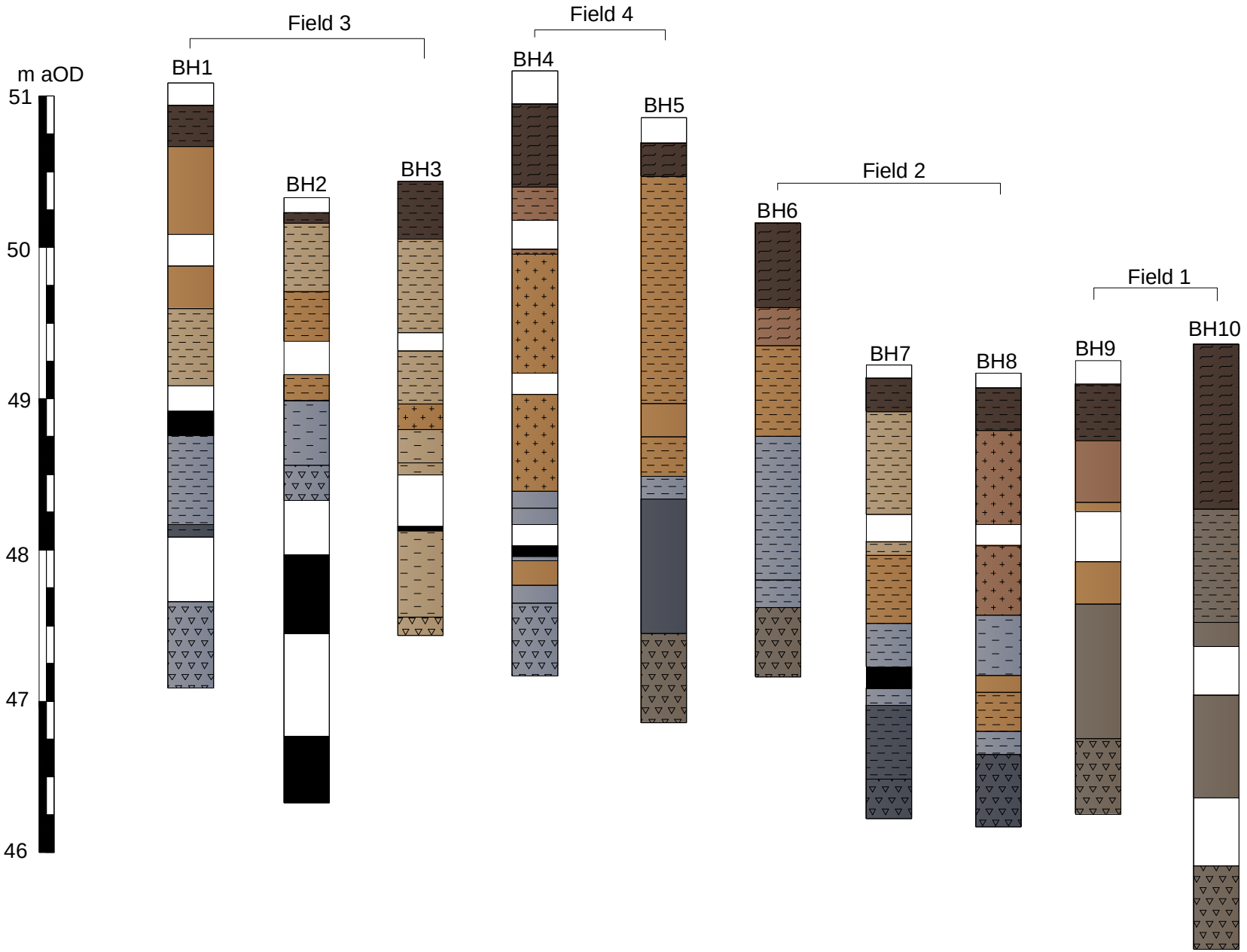

Figure 3. A38 Derby Junctions Geoarchaeological Boreholes

Key: Soil texture

- Silty Clay
- Clay
- Sandy Clay
- Clayey Sand
- Sand
- Sand and Gravel
- Void
- Disturbed Sediment

Colours reflect colour of sediment

6 DISCUSSION AND CONCLUSIONS

6.1 The stratigraphic sequence identified during borehole sampling is reflected in the topography. The borehole sequence from Boreholes 1 to 10 slopes downwards toward the river terrace and this slope defines the observed stratigraphy.

6.2 Those boreholes at the highest elevation, from Field 4 and Field 3, contain upper deposits of yellow-brown and orangey sands and clays and lower deposits of grey and black sands and gravels, some containing coal. Those a little further downslope, in Field 2, have shallower upper yellow-brown and orange alluvial deposits, with similar lower deposits of grey and black sands and gravels. The lowest lying boreholes in Field 1 do not contain yellow-brown and orange deposits and contain more sand, with only very shallow clay deposits directly beneath the topsoil. The sands and gravels are also much browner in colour and contain none of the coal inclusions found in fields 3 and 2.

6.3 The depth at which gravel deposits were encountered reflects this general slope. Boreholes 1-6 log the occurrence of the gravels at between 47.65m aOD and 47.45m aOD, while Boreholes 7 - 10 log the occurrence of the gravels at between 47.25m aOD and 45.91m aOD sloping towards the current river bed.

6.4 The gravel deposit levels from Borehole 2 and Borehole 10 fall outside these ranges and this is probably attributable to measurement error caused by poor soil retention.

6.5 Although windowless sampling has a maximum potential retrieval depth of 5m, previous borehole coring has indicated that these gravel deposits have a thickness of at least 8m, though their full depth has not yet been demonstrated (Highways Agency 2014).

6.6 Though highly organic silt deposits have been previously recorded within the development area in British Geological Survey cores (BGS Ref: SK34SE58, SK34SE59), no organic sediments suitable for radiocarbon dating were identified during the sampling reported on here. Additionally, the presence of coal in many of the lower deposits contaminates any radiocarbon dateable material from the lower deposits and, thus, no suitable material for extracting a radiocarbon date was identified.

6.7 The absence of organic sediments within the samples precludes macrobotanical analysis and the alluvial deposits encountered were not conducive to pollen preservation as the presence of sand and gravel inclusions indicates the probability of significant abrasion to pollen during the alluvial deposition.

6.8 Many alluvial environments are not permanently waterlogged and this results in significant damage to pollen grains through oxidisation and the biasing of the pollen record towards oxidisation-resistant species (Havinga 1967; Havinga 1984). The absence of an organic component in the sampled deposits means that it is unlikely the deposits sampled

were sufficiently waterlogged to ensure unbiased pollen preservation. Further palaeoenvironmental analysis is not recommended.

6.9 All boreholes, other than Boreholes 2 and 4 were archaeologically sterile. No waterlogged deposits with preserved organic material were identified, and as the charcoal from Borehole 4 is likely contaminated by coal no material suitable for radiocarbon dating was recovered.

7 Publicity, Confidentiality and Copyright

7.1 Any publicity will be handled by the client. Archaeological Research Services Ltd (ARS Ltd) will retain the copyright of all documentary and photographic material under the Copyright, Designs and Patent Act (1988).

8 Archive Deposition

8.1 A digital and paper archive will be prepared by Archaeological Research Services Ltd, consisting of all primary written documents, photographs and electronic data. Paper and digital copies of the report will be submitted to the Derbyshire Historic Environment Record (HER), paper and digital copies of the report along with the paper archive will be submitted to Derby Museums and Galleries.

8.2 A copy of the report will be uploaded as part of the OASIS record.

9 Statement of Indemnity

9.1 All statements and opinions contained within this report arising from the works undertaken are offered in good faith and compiled according to professional standards. No responsibility can be accepted by the author/s of the report for any errors of fact or opinion resulting from data supplied by any third party, or for loss or other consequence arising from decisions or actions made upon the basis of facts or opinions expressed in any such report(s), howsoever such facts and opinions may have been derived.

10 Acknowledgements

10.1 Archaeological Research Services Ltd. would like to thank all those involved with this study, including Andy Copp for assistance and advice, Jayne Walker for providing on-site assistance and Darren Sharp for supervising ecological impacts. ARS Ltd would also like to thank landowners Chris Bullivant, Roger Godber, Heather Brighouse and Talbot Turf for providing access to the various sampling locations.

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APPENDIX I – BOREHOLE LOCATIONS

Borehole	Easting	Northing	Top Height (m aOD)
BH1	436608.207	340282.120	51.092
BH2	436584.012	340214.643	50.332
BH3	436567.830	340164.149	50.437
BH4	436514.503	340008.294	51.168
BH5	436499.368	339964.759	50.856
BH6	436369.442	339919.744	50.159
BH7	436298.926	339920.890	49.222
BH8	436228.843	339922.057	49.169
BH9	436145.008	339936.799	49.247
BH10	436043.750	339934.840	49.359

APPENDIX II – BOREHOLE DESCRIPTIONS

(all unit thickness in cm in far left column)

Borehole 1 (BH1) Top height 51.09 m aOD		
Unit thickness (cm)	**Description**	**Depth (m aOD)**
Length 1 (0-1m)		
0-15	VOID	51.09 – 50.94
15-42	Very dark greyish brown (10 YR 3/2) thick clay topsoil. Homogenous and structureless. Very abrupt lower contact. (**UNIT 1**).	50.94 – 50.67
42-100	Yellowish brown (10YR 5/4) sand with degraded stone inclusions suspended in the matrix. Sand becomes increasingly clayey sand towards the base of the unit. (**UNIT 2**).	50.67 – 50.09
Length 2 (1-2m)		
0-21	VOID	50.09 – 49.88
21-49	Yellowish brown (10YR 5/4) sand with degraded stone inclusions suspended in the matrix. Sand becomes increasingly clayey sand towards the base of the unit. Gradual lower contact. (**UNIT 2**).	49.88 – 49.60
49-100	Greyish brown thick clay (10YR 5/2) with yellow mottling. Flecked with black manangese precipitation and dark brown degraded stone inclusions. Abrupt lower contact. (**UNIT 3**)	49.60 – 49.09
Length 3 (2-3m)		
0-17	VOID	49.09 – 48.92
17-33	Disturbed sediment in the top of the core.	48.92 – 48.76
33-92	Dark grey (GLEY1 4/N) thick clay. Homogenous with some flecks of black manganese precipitation. Gradual lower contact. (**UNIT 4**).	48.76 – 48.17
92-100	Black loose clay (GLEY1 2.5/N). Homogenous and structureless. Lower contact unclear due to lack of soil retention. (**UNIT 5**).	48.17 – 48.09
Length 4 (3-4m)		
0-43	VOID	48.09 – 47.66
43-100	Dark grey (GLEY1 4/N) sand with small (3-5mm) rounded gravel inclusions. Bands of dark grey clay at 60-61cm and at 80-83cm. (**UNIT 6**)	47.66 – 47.09
End of Borehole		

Borehole 2 (BH2) Top height 50.33m aOD			
Unit thickness (cm)	**Description**	**Depth (m aOD)**	**Sample Locations (m aOD)**
Length 1 (0-1m)			
0-10	VOID	50.33 – 50.23	
10-17	Very dark greyish brown (10 YR 3/2) thick clay topsoil. Homogenous and structureless, gradual lower contact. (**UNIT 1**).	50.23 – 50.16	
17-62	Greyish brown (10YR 5/2) thick clay mottled with grey and orange-brown bands. Some small flecks of black manganese precipitation. Very gradual lower contact. (**UNIT 2**).	50.16 – 49.71	
62-95	Yellowish brown (10YR 5/4) thick clay flecked with black manganese precipitation and degraded stone inclusions. (**UNIT 3**)	49.71 – 49.38	
95-100	VOID	49.38 – 49.33	
Length 2 (1-2m)			
0-17	VOID	49.33 – 49.16	
17-28	Yellowish brown (10YR 5/4) thick clay flecked with black manganese precipitation and degraded stone inclusions. Very gradual lower contact. (**UNIT 3**)	49.16 – 49.05	
28-34	Interface of yellowish brown (10YR 5/8) sandy clay.	49.05 – 48.99	
34-77	Grey (10YR 6/1) clayey sand. Frequent gravel inclusions and possible water-laid CBM inclusions. Gradual lower contact. (**UNIT 4**).	48.99 – 48.56	
77-100	Grey (10YR 5/1) clayey sand and rounded gravel, increasingly abundance of gravel towards the base of the unit. (**UNIT 5**).	48.56 – 48.33	
Length 3 (2-3m)			
0-36	VOID	48.33 – 47.97	
36-88	Disturbed sediment	47.97 – 47.45	
88-100	VOID	47.45 – 47.33	
Length 4 (3-4m)			
0-56	VOID	47.33 – 46.77	
56-100	Disturbed sediment	46.77 – 46.33	
End of Borehole			

Borehole 3 (BH3) Top height 50.44 m aOD		
Unit thickness (cm)	**Description**	**Depth (m aOD)**
Length 1 (0-1m)		
0-38	Brown (10 YR 4/3) thick clay topsoil. Homogenous and structureless. Very gradual lower contact. (**UNIT 1**).	50.44 – 50.06
38-100	Greyish brown (10YR 5/2) thick clay mottled with grey and orange. Flecked with black manganese precipitation. (**UNIT 2**).	50.06 – 49.44
Length 2 (1-2m)		
0-12	VOID	49.44 – 49.32
12-44	Greyish brown (10YR 5/2) thick clay mottled with grey and orange. Flecked with black manganese precipitation. Becomes yellowish-brown (10YR 5/4) towards the base of the unit with a gradual lower contact. (**UNIT 2**).	49.32 – 49.00
44-47	Yellowish brown (10YR 5/4) sandy clay interface	49.00 – 48.97
47-64	Yellowish brown (10YR 5/6) sandy clay with mottled bands of yellow and grey. Gradual lower contact. (**UNIT 3**)	48.97 – 48.80
64-86	Greyish brown (10YR 5/2) clayey sand, homogenous with no inclusions. Abrupt lower contact (**UNIT 4**).	48.80 – 48.58
86-94	Greyish brown (10YR 5/2) clayey sand, very mottled with bands of yellowish brown and grey. Frequent gravel and brown degraded stone inclusions. Gravel inclusions are well-sorted, increasing in size towards the base of the unit. (**UNIT 5**).	48.58 – 48.50
94-100	VOID	48.50 – 48.44
Length 3 (2-3m)		
0-28	VOID	48.44 – 48.16
28-31	Disturbed sediment in the top of the core	48.16 – 48.13
31-88	Greyish brown (10YR 5/2) clayey sand, very mottled with bands of yellowish brown and grey. Frequent gravel and brown degraded stone inclusions. Gravel inclusions are well-sorted, increasing in size towards the base of the unit. Abrupt lower contact. (**UNIT 5**).	48.13 – 47.56
88-100	Greyish brown (10YR 5/2) clayey sand and angular gravel, gravel abundance *c.*75% (**UNIT 6**).	47.56 – 47.44
End of Borehole		

Borehole 4 (BH4) Top height 51.17m aOD			
Unit thickness (cm)	**Description**	**Depth (m aOD)**	**Sample Locations (m aOD)**
Length 1 (0-1m)			
0-23	VOID	51.17 – 50.94	
23-78	Very dark grey (7.5YR 3/1) thick silty clay topsoil. Homogenous and structureless, gradual lower contact. (**UNIT 1**).	50.94 – 50.39	
78-100	Brown (7.5YR 4/4) thick clay, homogenous with no inclusions. Very gradual lower contact. (**UNIT 2**).	50.39 – 50.17	
Length 2 (1-2m)			
0-19	VOID	50.17 – 49.98	
19-21	Brown (7.5YR 4/4) thick clay, homogenous with no inclusions. Very gradual lower contact. (**UNIT 2**).	49.98 – 49.96	
21-100	Yellowish brown (10YR 5/4) sandy clay with sandier bands. Rounded gravel and possible CBM inclusions. (**UNIT 3**).	49.96 – 49.17	
Length 3 (2-3m)			
0-14	VOID	49.17 – 49.03	
14-78	Yellowish brown (10YR 5/4) sandy clay with sandier bands. Rounded gravel and possible CBM inclusions. Abrupt lower contact. (**UNIT 3**).	49.03 – 48.39	
78-89	Grey (7.5YR 5/1) sand with bands of yellow-grey sand (**UNIT 4**)	48.39 – 48.28	
89-100	Grey (7.5YR 5/1) sand with frequent charcoal inclusions. (**UNIT 5**).	48.28 – 48.17	
Length 4 (3-4m)			
0-14	VOID	48.17 – 48.03	
14-21	Disturbed sediment in the top of the core	48.03 – 47.96	
21-24	Grey (7.5YR 5/1) sand with frequent charcoal inclusions. Gradual lower contact. (**UNIT 5**).	47.96 – 47.93	
24-40	Yellowish brown (10YR 5/4) sand with frequent sub-rounded gravel inclusions. (**UNIT 6**).	47.93 – 47.77	
40-52	Grey (7.5YR 5/1) sand with frequent charcoal inclusions. Gradual lower contact. (**UNIT 5**).	47.77 – 47.65	
52-100	Grey (7.5YR 5/1) sand with well-sorted gravel inclusions. (**UNIT 7**).	47.65 – 47.17	
End of Borehole			

Borehole 5 (BH5) Top height 50.86m aOD		
Unit thickness (cm)	**Description**	**Depth (m aOD)**
Length 1 (0-1m)		
0-17	VOID	50.86 – 50.69
17-39	Dark grey (7.5YR 4/1) thick silty clay topsoil. Homogenous and structureless. Gradual lower contact. (**UNIT 1**).	50.69 – 50.47
39-100	Brown (7.5YR 5/4) thick clay mottled with yellowish grey. Flecked with black manganese precipitation, otherwise homogenous. (**UNIT 2**).	50.47 – 49.86
Length 2 (1-2m)		
0-89	Brown (7.5YR 5/4) thick clay mottled with yellowish grey. Flecked with black manganese precipitation, otherwise homogenous. Abrupt lower contact. (**UNIT 2**).	49.86 – 48.97
89-100	Brown (7.5YR 5/4) sand. Homogenous with no inclusions. (**UNIT 3**).	48.97 – 48.86
Length 3 (2-3m)		
0-11	Brown (7.5YR 5/4) sand. Homogenous with no inclusions. Abrupt lower contact. (**UNIT 3**).	48.86 – 48.75
11-37	Brown (7.5YR 5/4) thick clay mottled with yellowish grey. Flecked with black manganese precipitation, otherwise homogenous. Comparable to UNIT 2. (**UNIT 4**).	48.75 – 48.38
37-52	Dark grey (5YR 4/1) thick clay. Homogenous with a gradational lower contact (**UNIT 5**).	48.38 – 48.34
52-100	Black (5YR 2/1) sand with frequent angular gravel and possible coal inclusions. (**UNIT 6**).	48.34 – 47.86
Length 4 (3-4m)		
0-41	Black (5YR 2/1) sand with frequent angular gravel and possible coal inclusions. (**UNIT 6**).	47.86 – 47.45
41-100	Dark greyish brown (2.5Y 4/2) sand with frequent angular gravel inclusions. Band of abundant gravel located between 83-96cm. (**UNIT 7**)	47.45 – 46.86
End of Borehole		

Borehole 6 (BH6) Top height 50.16 m aOD		
Unit thickness (cm)	**Description**	**Depth (m aOD)**
Length 1 (0-1m)		
0-56	Dark brown (7.5YR 3/2) thick silty clay topsoil. Small (<2cm) stone inclusions, gradual lower contact. (**UNIT 1**).	50.16 – 49.60
56-81	Brown (7.5YR 4/2) silty clay, flecked with dark brown degraded stone. Gradual lower contact. (**UNIT 2**).	49.60 – 49.35
81-100	Yellowish brown (10YR 5/4) thick clay mottled with narrow yellow and grey bands. Flecked with black manganese precipitation and orange ochreous material. Gradual lower contact. (**UNIT 3**).	49.35 – 49.16
Length 2 (1-2m)		
0-41	Yellowish brown (10YR 5/4) thick clay mottled with narrow yellow and grey bands. Flecked with black manganese precipitation and orange ochreous material. Gradual lower contact. (**UNIT 3**).	49.16 – 48.75
41-100	Grey (2.5Y 5/1) thick clay. Flecked with black manganese precipitation, otherwise homogenous. Gradual lower contact. (**UNIT 4**).	48.75 – 48.16
Length 3 (2-3m)		
0-36	Grey (2.5Y 5/1) thick clay. Flecked with black manganese precipitation, otherwise homogenous. Gradual lower contact. (**UNIT 4**).	48.16 – 47.80
36-54	Dark grey (GLEY1 4/N) clay with quarzitic sand inclusions. Homogenous and structureless. Abrupt lower contact. (**UNIT 5**)	47.80 – 47.62
54-100	Dark greyish brown (10YR 4/2) sand with *c.* 50% gravel inclusions. Gravel is subrounded to rounded and poorly sorted. **(UNIT 6**).	47.62 – 47.16
End of Borehole		

Borehole 7 (BH7) Top height 49.22 m aOD		
Unit thickness (cm)	**Description**	**Depth (m aOD)**
Length 1 (0-1m)		
0-10	VOID	49.22 - 49.12
10-32	Dark brown (7.5YR 3/2) thick clay topsoil. Homogenous and structureless, gradual lower contact. (**UNIT 1**).	49.12 – 48.90
32-100	Greyish brown (10YR 5/2) thick clay mottled with narrow yellow and grey bands. Gradual lower contact. (**UNIT 2**).	48.90 – 48.22
Length 2 (1-2m)		
0-18	VOID	48.22 – 48.04
18-27	Greyish brown (10YR 5/2) thick clay mottled with narrow yellow and grey bands. Gradual lower contact. (**UNIT 2**).	48.04 – 47.85
27-71	Yellowish brown (10YR 5/4) thick clay mottled with narrow grey and yellow bands. Flecked with black manganese precipitation and dark brown degraded stone. Gradual lower contact. (**UNIT 3**).	47.95 – 47.51
71-100	Dark grey (GLEY1 4/N) thick clay. Homogenous and structureless with a gradual lower contact. (**UNIT 4**).	47.51 – 47.22
Length 3 (2-3m)		
0-14	Disturbed sediment in the top of the core.	47.22 – 47.08
14-25	Dark grey (GLEY1 4/N) thick clay. Homogenous and structureless with a gradual lower contact. (**UNIT 4**).	47.08 – 46.97
25-74	Black (GLEY1 2.5/N) soft silty clay, with patches of sandier sediment. Gradual lower contact. (**UNIT 5**).	46.97 – 46.48
74-100	Black (GLEY1 2.5/N) sand with frequent inclusions of well sorted rounded to subrounded gravel. (**UNIT 6**).	46.48 – 46.22
End of Borehole		

Borehole 8 (BH8) Top height 49.17m aOD		
Unit thickness (cm)	**Description**	**Depth (m aOD)**
Length 1 (0-1m)		
0-10	VOID	49.17 – 49.07
10-38	Very dark greyish brown (10YR 3/2) thick clay topsoil with quarzitic sand inclusions. Homogenous and structureless. Gradual lower contact. (**UNIT 1**).	49.07 – 48.79
38-100	Brown (10YR 4/3) thick sandy clay. Flecked with black manganese precipitation, otherwise homogenous. Gradual lower contact. (**UNIT 2**).	48.79 – 48.17
Length 2 (1-2m)		
0-14	VOID	48.17 – 48.03
14-60	Brown (10YR 4/3) thick sandy clay. Flecked with black manganese precipitation, otherwise homogenous. Gradual lower contact. (**UNIT 2**).	48.03 – 47.57
60-71	Grey (2.5Y 5/1) clay interface. Homogenous, no inclusions.	47.57 – 47.46
71-100	Grey (2.5Y 5/1) clayey sand, mottled with grey and yellow clay, and bands of yellow sand. (**UNIT 3**).	47.46 – 47.17
Length 3 (2-3m)		
0-11	Brown (7.5YR 5/4) sand. Homogenous with no inclusions. Abrupt lower contact. (**UNIT 4**).	47.17 – 47.06
11-37	Brown (7.5YR 5/4) thick clay mottled with yellowish grey. Flecked with black manganese precipitation, otherwise homogenous. Comparable to UNIT 2. (**UNIT 5**).	47.06 – 46.80
37-52	Dark grey (5YR 4/1) thick clay. Homogenous with a gradational lower contact (**UNIT 6**).	46.80 – 46.65
52-100	Black (5YR 2/1) sand with frequent angular gravel and possible coal inclusions. (**UNIT 7**).	46.65 – 46.17
End of Borehole		

Borehole 9 (BH9) Top height 49.25m aOD		
Unit thickness (cm)	**Description**	**Depth (m aOD)**
Length 1 (0-1m)		
0-16	VOID	49.25 – 49.09
16-44	Very dark greyish brown (10YR 3/2) thick clay. Homogenous and structureless. Gradual lower contact. (**UNIT 1**).	49.25 – 48.81
44-53	Brown (10YR 4/3) thick clayey sand interface with a gradual lower contact.	48.81 – 48.72
53-94	Brown (10YR 4/3) sand, homogenous and structureless with a gradual lower contact. (**UNIT 2**).	48.72 – 48.31
94-100	Dark yellowish brown (10YR 4/6) sand, homogenous and structureless with a gradual lower contact. (**UNIT 3**).	48.31 – 48.25
Length 2 (1-2m)		
0-33	VOID	48.25 – 47.92
33-61	Dark yellowish brown (10YR 4/6) sand, homogenous and structureless with a gradual lower contact. (**UNIT 3**).	47.92 – 47.64
61-100	Dark greyish brown (10YR 4/2) sand with well sorted gravel inclusions increasing in size and abundance towards the base of the unit. Gravel is rounded to semi-rounded. (**UNIT 4**).	47.64 – 47.25
Length 3 (2-3m)		
0-100	Dark greyish brown (10YR 4/2) sand with well sorted gravel inclusions increasing in size and abundance towards the base of the unit. Gravel is rounded to semi-rounded. (**UNIT 4**).	47.25 – 46.25
End of Borehole		

Borehole 10 (BH10) Top height 49.36m aOD		
Unit thickness (cm)	**Description**	**Depth (m aOD)**
Length 1 (0-1m)		
0-100	Dark brown (7.5YR 3/2) thick silty clay topsoil. Homogenous and structureless. Gradual lower contact. (**UNIT 1**).	49.36 – 48.36
Length 2 (1-2m)		
0-9	Dark brown (7.5YR 3/2) thick silty clay topsoil. Homogenous and structureless. Gradual lower contact. (**UNIT 1**).	48.36 – 48.27
9-84	Dark greyish brown (10YR 4/2) thick clay. Flecked with black manganese precipitation and dark brown degraded stone inclusions. Distinct, abrupt lower contact. (**UNIT 2**).	48.27 – 47.52
84-100	Dark greyish brown (10YR 4/2) sand. Flecked with and stained by black manganese precipitation and dark brown degraded stone inclusions. (**UNIT 3**).	47.52 – 47.36
Length 3 (2-3m)		
0-32	VOID	47.36 – 47.04
32-100	Dark greyish brown (10YR 4/2) sand. Flecked with and stained by black manganese precipitation and dark brown degraded stone inclusions. (**UNIT 3**).	47.04 – 46.36
Length 4 (3-4m)		
0-45	VOID	46.36 – 45.91
45-100	Dark greyish brown (10YR 4/2) sand. Abundant, well sorted gravel inclusions increasing in size and abundance towards the base of the unit. Gravel is semi-angular to semi-rounded. Flecked with and stained by black manganese precipitation and dark brown degraded stone inclusions. (**UNIT 4**).	45.91 – 45.36
End of Borehole		

APPENDIX III – WRITTEN SCHEME OF INVESTIGATION

A38 Derby Junctions

Written Scheme of Investigation for Archaeological Surveys

Report Number: 47071319-URS-05-RP-EN-016
February 2016

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Appendices

1. INTRODUCTION

1.1.1 On July 14, 2014 AECOM (formerly URS Infrastructure & Environment UK Limited) was awarded the contract by Highways England to provide design services regarding the development of the A38 Derby Junctions scheme (referred to herein as the proposed scheme).

1.1.2 This proposed scheme concerns three junctions on the A38 in Derby as follows:

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

1.1.3 Underpasses are proposed at the Kingsway and Markeaton junctions which would allow A38 traffic to pass through the junctions without stopping, with pedestrian and cycle routes segregated from A38 traffic. The proposed Little Eaton junction would comprise of an enlarged roundabout at existing ground level with the A38 passing above on two roundabout overbridges to the east and south of the existing roundabout. The existing northbound carriageway would form the northbound slip roads.

1.1.4 This Written Scheme of Investigation (WSI) for Archaeological Surveys, comprising archaeological geophysical survey, geoarchaeological assessment (boreholes), and trial trench evaluation has been prepared by AECOM in accordance with the Design Manual for Roads and Bridges (DMRB) Volume 11 Section 3 Part 2 (Highways Agency 2007) on behalf of Highways England.

1.1.5 Consultation was undertaken with Historic England (formerly English Heritage) and the Derbyshire County Council Planning Archaeologist as part of the Environmental Assessment reported in March 2008. Further consultation is to be undertaken regarding archaeological investigation and mitigation works as part of the current scheme proposals. As such, following Highways England approval, this WSI will be discussed and agreed with the Derbyshire County Council Planning Archaeologist.

1.1.6 The proposed archaeological investigations involve a phased programme of investigation at Little Eaton junction. The investigations are required in order to assess the archaeological potential of areas of land, including farmland at Little Eaton, that is required for the proposed scheme. The results of the investigations will help to inform the archaeological mitigation requirements for the proposed scheme (should it be required).

1.1.7 Archaeological geophysical survey and trial trench evaluation are not proposed at the Kingsway and Markeaton junctions given that the works are largely confined to the highway boundary and to areas previously impacted by development that have low archaeological potential.

1.1.8 Geotechnical Investigations (GI) are planned for 2016 and these will be monitored by a geoarchaeologist (selected trial pits and boreholes). However, this work will form a separate commission to the requirements as set out in this Specification.

1.1.9 AECOM (referred to herein as the Designer's Archaeologist) has undertaken a DMRB Simple Assessment to assess the potential for archaeological deposits within

the proposed scheme footprint. At Little Eaton junction, the proposed improved junction is considered to have a moderate potential to contain currently unrecorded archaeological remains of prehistoric, Roman or medieval date. The floodplain of the River Derwent, and also areas associated with Markeaton Brook at Markeaton Junction and Bramble Brook at Kingsway junction have the potential to contain stratified archaeological horizons.

1.1.10 The works specified in this document will be let by competitive tender to an Archaeological Contractor. The appointed Archaeological Contractor will undertake the works on behalf of the Designer's Archaeologist and Highways England.

2. SITE DETAILS

2.1 Site Location

2.1.1 The A38 Derby Junction scheme comprises three junctions spread over a 5.5 km distance along the A38 to the north and north-west of Derby. The A38 is the principal route from Birmingham to Derby and the M1 at junction 28. The proposed scheme passes through the administrative areas of Derby City Council (DCiC) and Erewash Borough Council (EBC) and Derbyshire County Council (DCC) (Figure 1).

2.1.2 At Little Eaton junction the farmland that is required for the proposed scheme comprises both arable and pasture areas. To the north of the current Little Eaton junction is a mobile home park and refreshment area, that has been subjected to extensive modern disturbances including the operation of a historic landfill site.

2.1.3 Hedgerow field boundaries, some with ditches, form the predominant type of field boundary at Little Eaton.

2.2 Topography and Geology (Little Eaton)

2.2.1 The proposed scheme is situated in a low-lying valley, east of the meandering course of the River Derwent, between approximately 53m Above Ordnance Datum (AOD) in the north, and falling to around 50m AOD in the south and west. The low-lying area contains a number of drainage channels and brooks running along field boundaries which drain into the River Derwent.

2.2.2 The current approaches to Little Eaton junction are largely situated on embankments which are inclined at up to 40°, and heights vary from at grade to approximately 10m. These embankment slopes are densely vegetated with brambles, shrubs and medium-sized trees. Drainage typically comprises a gravel pipe at the embankment toe.

2.2.3 The Little Eaton junction has recently undergone development as part of a Pinch Point scheme to alleviate congestion. These works utilised gabion baskets, ranging from 6.5m to 1m high at three sections, to provide wider embankments to the existing arrangement to accommodate additional lanes.

2.2.4 The ground conditions in the vicinity of Little Eaton junction are anticipated to comprise - topsoil, overlying, artificial ground (including made ground), and superficial deposits of alluvium that is underlain by rocks of the Millstone Grit Group.

2.2.5 Superficial deposits, beneath and immediately surrounding the junction, consist of alluvium. Glacio-fluvial (undifferentiated sand and gravel) and head deposits are shown approximately 600m to the north of the junction and approximately 300m to the south of the junction. Made Ground is shown approximately 100m north and west, and 400m south of the junction. The thickness of alluvial deposits, and consequently the depth to the top of rockhead, is not proven towards the River Derwent in the west.

2.2.6 The bedrock geology beneath the junction comprises Morridge Formation Millstone Grit.

2.2.7 The British Geological Survey (BGS) website records a number of boreholes within the footprint of the Little Eaton junction and along the course of the present A38.

Boreholes were sunk in 1972 prior to the construction of the present A38, and indicate 0.2m of topsoil followed by silty clay with sandstone fragments or flints and lenses of clayey sand and gravel (SK34SE58 LITTLE EATON 1R; SK34SE59 LITTLE EATON 2R; SK34SE60 LITTLE EATON 3R; SK34SE61 LITTLE EATON 4R; SK34SE62 LITTLE EATON 5R).

2.2.8 East of the junction, clays exhibiting organic inclusions and mottling characteristic of waterlogged deposits have been recorded, although no peat deposits have been found (SK34SE58 LITTLE EATON 1R; SK34SE59 LITTLE EATON 2R).

2.2.9 Borehole reports from 1973, relating to the A6 - A61 LINK (SK34SE23 A6-A61 LINK), indicate that approximately 100m east of the River Derwent, topsoil is followed by moist silty alluvium, and then dark grey sandy silts with patches of sands.

2.2.10 Data on the 2012 geotechnical investigations undertaken for the Little Eaton junction is derived from A38 Derby Junctions Improvements Preliminary Sources Study Report No: 47071319-URS-08-RP-GE-003, October 2014 (Highways Agency, 2014a) – details are provided below.

Topsoil

2.2.11 Topsoil was encountered in the majority of exploratory holes to a thickness of up to 0.5m, although typically in the range 0.2 - 0.3 m.

Made Ground

2.2.12 The Made Ground encountered during the 2012 investigation comprises embankment fill material to a maximum depth of 5.75m. The material was typically described as sand and/ or gravel, with secondary constituents of gravel, silt, sand and clay.

Superficial Deposits – Alluvium (Predominantly Silt & Clay)

2.2.13 Superficial deposits were found underling the topsoil or Made Ground (embankment fill) to a thickness of up to 2.6m. The material was generally firm to stiff beneath embankment fill, sometimes soft to firm, typically described as clay with secondary constituents in varying proportions of sand, gravel and silt. Sand was generally fine to medium, and gravel sub angular to sub rounded, fine to coarse, and of limestone, sandstone, mudstone and siltstone. The material was typically brown with orange grey mottling also noted. Occasional decomposed roots were recorded.

2.2.14 Distinct horizons were recorded as dark grey or grey brown, variably sandy to very sandy, silty and slightly gravelly clay or silt. The material was typically soft, sometimes firm to stiff. Organic silt and frequent decomposed roots were noted in some holes. Fine gravel size fragments of carbonaceous material or coal were occasionally noted.

2.2.15 Data from the 1972 investigation indicates typically soft and firm brown and yellow brown grey, sometimes dark brown and mottled, silty clay to depths of up to 2.7m. Lenses of sand and gravel (fine to medium of sandstone and flint) were noted, as were organics.

Superficial Deposits – Alluvium (Predominantly Sand & Gravel)

2.2.16 The 2012 investigation indicates such material to be primarily gravel, with less frequent horizons of sand and sand and gravel. The material underlies the silt and clay alluvial material to an unproven thickness of up to 8m.

2.2.17 Gravel, variously very sandy and slightly to very clayey was recorded. Sand was fine to coarse. The gravel was sub angular to sub rounded, fine to coarse of sandstone, mudstone and siltstone, limestone and mixed lithologies. Material was typically brown and grey brown.

2.2.18 The sand was gravelly and very clayey, brown locally mottled orange brown.

2.2.19 The sand and gravel was medium dense, sometimes loose and sometimes dense with depth. Pockets of grey sandy silt were identified.

2.2.20 Some horizons at depth were noted to be very dark grey fine to coarse sand with rare shell fragments, and dark grey and grey brown slightly clayey sand and gravel. Sand was fine to coarse. The texture of the gravel was fine to coarse and of mixed lithologies.

River Terrace

2.2.21 These deposits were not indicated on the mapping in the immediate vicinity, although an exposure was identified approximately 1 km to the south-west of the junction.

Bedrock

2.2.22 The materials encountered predominantly comprised mudstone overlain further north by siltstone. Sandstone was also recorded to the north of the junction.

2.2.23 There is a record of groundwater at 0.5m to 3.0m Below Ground Level (BGL).

3. ARCHAEOLOGICAL BACKGROUND

3.1 Background

3.1.1 The south-western extent of the Little Eaton junction lies within an area designated as the Derwent Valley Mills World Heritage Site (WHS) and also lies within its buffer zone, which is very narrow at this point and is bounded to the east by the North Midlands Railway. The Derwent Valley Mills WHS comprises the River Derwent Valley, associated mills and other structures and buildings of historical importance, although there are no specific buildings associated with the WHS that are intersected by the proposed scheme.

3.1.2 The floodplain of the River Derwent may contain palaeochannels, which have the potential to contain buried archaeological features, finds and ecofacts. Fossil pollen sequences contained within exposed river valley sediments, which may be disturbed by proposed scheme works within the floodplain, can be important in understanding the past environment of the area.

3.1.3 Recent synthetic research into Derbyshire's archaeological landscapes indicates that floodplain landscapes can yield occasional Palaeolithic and Mesolithic finds, predominantly as secondary deposits, together with isolated Neolithic and Bronze Age finds such as flint and Bronze axes and other tools. These landforms were probably not used for occupation and received primary artefacts through loss or votive deposition. Iron Age archaeology on the alluvial floodplain is also rare, but has been occasionally recorded elsewhere in the form of pit alignments running from the higher ground down to the river's edge. Roman archaeology has been identified elsewhere in the form of fish traps, timber embankments and weirs. Anglo-Saxon archaeology associated with alluvium is largely invisible, but later medieval and post-medieval archaeology is conspicuous in the form of ridge and furrow cultivation. Alluvial floodplain deposits are very fertile accounting for the agricultural colonisation of a former marginal landform type in the medieval period (Brightman & Waddington 2011).

Palaeolithic to Early Post-Glacial Palaeolithic (c.500,000 to 8,500 BC)

3.1.4 Evidence for lower Palaeolithic activity is rare in the Trent and Derwent Valleys and most of Britain. Occupation is generally characterised by isolated finds of stone and flint tools. The region's terrace sequence has been the focus of an ALSF funded Trent Valley Palaeolithic Project which has sought to enhance the understanding of the context of Palaeolithic archaeological records derived from the River Trent deposits (Bridgland 2010; White et al. 2007 & 2009).

3.1.5 The distribution of material focuses on river terrace gravels, and much of this material appears to have been heavily rolled and abraded, which suggests significant reworking from older deposits. However, some upland material has been noted. This bias may be due to a focus on archaeological recording related to quarrying. The remains of fauna and flora characteristic of the Ipswichian interglacial were uncovered at Allenton, south of Derby, and at Boulton Moor, but no trace of human activity was noted (Myers nd (a)).

3.1.6 In Britain as a whole evidence for occupation during the Middle Palaeolithic (c.150,000 to 30,000 BC) is limited, perhaps due to the hostile glacial environment.

All evidence from Derbyshire has been recovered from caves (Myers nd (a)). There are no caves within the low-lying proposed scheme study area.

3.1.7 The environmental changes which resulted from the retreating ice caps gave rise to increased vegetation and forest cover on drier ground, and open grasslands in other areas.

3.1.8 Although the Upper Palaeolithic (c.30,000 to 10,000 BC) is relatively well represented in Derbyshire, the distribution of archaeological sites is still confined almost exclusively to the limestone areas of northern Derbyshire, again focussing on caves and rock-shelters (Myers nd (a)). However, there are a number of Later Upper Palaeolithic open air lithic scatters in a variety of locations, and a growing number of late Devensian open air sites are being found in lowland locations within the East Midlands (Myers nd (a)).

3.1.9 No evidence for Palaeolithic activity has been recovered from the proposed scheme study area.

Later Prehistoric (8,500 to AD 43)

3.1.10 The spatial distribution of Mesolithic sites (8,500 to 4,000 BC) focuses on the Pennines in the north of the county, with little evidence from lowland southern Derbyshire. This may be due to a bias in visibility and a historically uneven distribution of fieldwork.

3.1.11 However, developer-led investigations are increasingly encountering diffuse scatters and isolated Mesolithic stone tools, and occasional tool manufacturing sites (Myers nd (b)). In other areas of the country, mobile Mesolithic populations exploited rich wetland resources, which would have included fish, waterfowl, and plants, and had seasonal camps on the margins of river valleys and channels.

3.1.12 No evidence for Mesolithic activity has been recovered from the proposed scheme study area.

3.1.13 The early Neolithic period (4,000 to 2,400 BC) is characterised by the clearance of forested areas, the introduction of farming and the domestication of animals and crops. The Neolithic period saw the construction of communal monuments, such as henges and barrows for ritual activities and the burial of the dead. Settlement sites are less well understood, but concentrations of artefacts, including flint tools and pottery sherds, indicate areas where groups settled.

3.1.14 As the Neolithic period progressed, people shifted to a more settled agrarian lifestyle, with new forms of pottery and different styles of flint-working, as well as constructing monumental ceremonial earthworks. During the early Neolithic period, inland areas were covered in extensive deciduous forest. Gradually, livestock herders began to open up the forest and cereal cultivation developed, particularly on higher land and gravel terraces. It is likely that the river floodplains continued to be used for foraging, fishing and hunting, with river confluences becoming foci for settlement and ritual activities.

3.1.15 The known archaeology for the Neolithic and Early Bronze Age in Derbyshire is heavily biased towards upland areas where the preservation of earthworks has encouraged research into the period, or where traditions of artefact collection have been such that artefacts have been recovered (Myers nd (c)).

3.1.16 A Neolithic polished dolerite axe was found at Eaton Bank, west of the proposed scheme (EH Monument No. 313721), and a flint arrowhead is recorded from Drum Hill, Breadsall, north-east of the proposed scheme (EH Monument No. 313710).

3.1.17 Evidence for Neolithic activity found within the proposed scheme study area at Little Eaton comprises a find of a Neolithic flint knife found in a garden at Chester Avenue, Allestree in 1957 (MDR105510).

3.1.18 During the early Bronze Age (2,400 to 700 BC), woodland in lowland areas continued to be cleared to create land for small-scale cereal cultivation.

3.1.19 The Beaker Period (Late Neolithic/ Bronze Age transition, c.2700 - 1700 BC) is characterised by pottery types which may reflect growing social distinctions and the emergence of hierarchies (Kristiansen & Larsson 2005) that may be represented by single inhumation burials in round barrows, or cremations in flat cemeteries. Barrows may have origins in earlier Neolithic ritual and funerary monuments; and some were re-used in the Anglo-Saxon period. Many have been levelled by ploughing, but some are still visible in the landscape or have been recorded on aerial photographs. Excavations in advance of the Derby Southern Bypass investigated an extensive Bronze Age barrowfield with rich grave goods (Knight 1998).

3.1.20 Excavations of Bronze Age (2200 - 700 BC) domestic settlement sites have revealed post-built roundhouses and four-post granary structures, which are often surrounded by enclosure ditches and field systems, including stock enclosures.

3.1.21 Bronze Age metalwork has been found in river valleys, and may represent votive deposits in sacred waters and wetland areas, distant from settlements. A fragment of a Bronze Age spearhead was found at Padbrook Park, over 1km north-east of the proposed scheme (EH Monument No. 313713). South of Derby, Bronze Age metalwork was possibly ritually deposited in palaeochannels at Shardlow Quarry, where two logboats were also discovered, found at the base of former river/ stream channels (Martin 2004).

3.1.22 Antiquarian records note the site of a possible tumulus or Bronze Age round barrow (EH Monument No. 313707) ‘in a field belonging to the glebe in Breadsall is a perfect tumulus crowned by an oak' (Lewis 1899). Field investigators have not been able to locate the site on the ground, or through a review of aerial photographs.

3.1.23 The cropmark of a ring ditch was noted on aerial photographs of land approximately 400m east of Holme Nook, Breadsall in about 2006 (MDR11202). Ring ditches may be associated with later Neolithic or earlier Bronze Age round barrows or burial mounds, or with Iron Age roundhouse settlements.

3.1.24 During the Iron Age (700 BC to AD 43), tree clearance continued, clearing land for enclosed arable fields and stock enclosures around farmsteads. During the late Iron Age, the local tribal grouping was the Corieltauvi. There is little evidence of this period in the vicinity of the proposed scheme, probably due to the poor archaeological visibility of lowland sites, and the lack of intrusive archaeological fieldwork in the area. In contrast, excavations undertaken in advance of the Derby Southern Bypass identified extensive evidence for Iron Age farming.

3.1.25 The ring ditch cropmark, located approximately 400m east of Holme Nook, Breadsall in about 2006 (MDR11202) may be associated with late Neolithic or Bronze Age (2,400 to 700 BC) barrows or burial mounds, or with Iron Age (700 BC to AD 43) roundhouses.

Roman (AD 43 to 410)

3.1.26 Following the invasion of Britain in AD 43, by AD 46 - 47, land south of the River Trent was probably occupied by the Roman Army. There were two Roman forts in the area - the earliest at Strutts Park, is thought to date to approximately AD 50 (Higgins 1999). Another was built close to the original fort at Little Chester in *c.AD* 70, fostering the development of an extramural settlement. The forts were probably used until approximately 120 AD by which time the front line had moved further north to Hadrian's Wall.

3.1.27 The Roman small town of Derventio or Derventio Coritanorum was developed at Derby. Excavations in the city have found evidence for Roman industrial activity, metalworking and pottery manufacture. The town had a possible bath-house and a large cemetery containing mausolea. During the Roman period, the rivers would have been used to transport goods such as pottery and lead from the Peak District (Burnham & Wacher 1990) to markets further afield.

3.1.28 During the Romano-British period, cultivation became more extensive, exploiting marginal upland terraces and river floodplains for farming. Increased ploughing, changing plough technologies, and an increase in the cultivated area, resulted in the acceleration of catchment soil erosion and the alluviation of river valleys (Knight & Howard 2004).

3.1.29 Ryknild Street Roman road (RR 18d, Viatores 1964) is recorded to the south of the Little Eaton junction, lying approximately beneath the course of the present Moor Road. A section of the road was investigated to the north of Breadsall, and to the east of the junction. This intervention revealed that it had a foundation of sandstone blocks and two other layers of smaller stones. Ryknild Street ran from Bourton-on-the-Water (near Stow-on-the-Wold, Gloucestershire) to Templeborough (near Rotherham, South Yorkshire) and on to Doncaster (Danum, South Yorkshire).

3.1.30 Another Roman road (RR 71a, Viatores 1964) is known to traverse the area between the Derwent Valley Mills WHS and Little Eaton. This is thought to have run between Derby and Buxton (Aquae Arnemetia).

3.1.31 Despite the presence of these Roman roads there is limited evidence for occupation or settlement activity within or within close proximity to the proposed scheme study area. A Roman coin (Denarius of Galienus Valerius Maximus) was found in a garden in Derby in 1904 (MDR10525). The alleged site of a Roman settlement is recorded at Camp Wood, north of the Little Eaton junction (MDR4743; Watkin, WT 1886). Quarrying activity in the post-medieval and modern period may have destroyed any former evidence of the Roman camp.

3.1.32 Romano-British or Roman archaeological remains may survive in the vicinity of these Roman roads, as roadside settlements, as roadside taverns and services, as burial grounds, and roadside shrines. It is also possible that the remains of field boundaries and agricultural activity are present.

Early Medieval (410 to 1066) and Medieval (1066 to 1540)

3.1.33 During the early medieval period, southern Derbyshire lay within the Kingdom of Mercia. In the 9th century, Derby (then known as Nothworthy) became a Saxon burgh (Hall 1974); another area of urban settlement was focussed on St Werburgh's Church.

3.1.34 The place-name Derby derives from the Norse 'Deorby', meaning 'deer' or 'wild animal' and 'by', a general word for settlement (Northcote & Toller 1898). Derby became one of the five boroughs of the Viking Danelaw (Rogerson 1998), and had a mint between AD 959 - 73.

3.1.35 The site of a medieval deer park lay to the northeast of Markeaton Park (MDR14164).

3.1.36 Breadsall is recorded in various documents dating to the 11th century. In 1002 the settlement was known as Bregdeshale, and in 1004 it was referred to as Braegesheale. The Domesday Survey (Williams & Martin 2003) records that the early farming settlement had five carucates, two ploughs, 21 villans and seven bordars with eight ploughs. The survey also refers to a priest and a church, a mill and 12 acres of meadow.

3.1.37 The proposed scheme study area at Little Eaton is likely to contain buried traces of medieval agricultural activity. It is possible that earlier sub-Roman or Saxon predecessors of the medieval settlement at Breadsall, or outlying farms, are present.

Post-medieval (1540 to 1901)

3.1.38 The enclosure acts of the 18th century replaced much of the medieval openfield farming landscape.

3.1.39 Markeaton Park (MDR10500) was created in the 1770s and was associated with the demolished Markeaton Hall. Fossilised ridge and furrow from the former Markeaton medieval village can be discerned amongst the park landscaping.

3.1.40 In the early 1770s a group known as the 'Derby Committee' began developing plans to build the Derby Canal (MDR9110). The proposed route was to consist of two main branches, one connecting the town with the Trent and Mersey Canal at Swarkestone, and the other with the Erewash Canal at Sandiacre. A branch was also proposed to run to Little Eaton to connect with the tramway (MDR4798). The route of the Little Eaton Tramway is visible as a raised embankment. It was opened in 1793 and closed in 1908. The Derby Canal Act was passed in 1793. Shortly after this, construction began to the designs of the engineer Benjamin Outram. The branch to Little Eaton was opened in 1795 and the main sections of the Derby Canal opened in 1796. The section connecting Derby to Little Eaton was abandoned in 1935. The remaining sections continued in operation until 1964.

3.1.41 Located to the west of this line is the North Midlands Railway which is currently in operation (MDR11347). The railway was opened in 1840 to link Derby with Leeds. Its construction facilitated the exploitation of limestone and coal. Associated with the North Midland Railway line is the Little Eaton and Ripley Branch Railway which is located to the north of Breadsall. This was opened in 1856 and borders the Derwent Valley Mills WHS which includes a small stretch of the A38 to the west of the junction.

3.1.42 The 1887 1st edition Ordnance Survey map depicts Breadsall as a small rural village immediately to the north of Derby. The village and surrounding landscape retains some of its medieval character. The historic core of the village is designated as a conservation area (DDR7043) which encompasses a number of historic assets, including nine listed buildings from the 18th and 19th century.

3.1.43 To the south-east of the proposed scheme, the site of the former Breadsall Station is situated which opened in 1878 and closed in 1964 (MDR4567). This was on the Eggington Branch of the Derbyshire and Staffordshire Railway line which has been dismantled. The line which formerly ran through the centre of the proposed Kingsway junction, to the north of Kingsway Hospital, was established to break Midland Railway's monopoly of the Derbyshire - Nottinghamshire coal field, as well as to establish transport routes to the towns of Ilkeston, Derby, Burton and Stafford.

3.1.44 The Derwent Valley Mills WHS covers a 15-mile stretch of the Lower Derwent Valley and incorporates the historic textile area of Cromford, Belper, Milford, Darley Abbey and Derby. It was designated a WHS in 2001 and contains a series of 18th and 19th century cotton mills, and an industrial landscape of high historical and technological interest.

3.1.45 The proposed scheme area at Little Eaton is likely to contain evidence for post-medieval agricultural activity. It also traverses the course of the in-filled Derby Canal (MDR9110) and the North Midlands Railway (MDR11347).

Modern (1901 to present)

3.1.46 A ford across the River Derwent (MDR9973) was replaced by a bridge in the early 20th century.

3.1.47 By 1914, historic maps indicate several shafts following the course of the River Derwent from north to south; located on either side of the River Derwent. One of these is located in close proximity to the current location of the A38 River Derwent crossing, although none are located near the junction itself. It is possible that these could be associated with the water works, located on the A38 to the north of the junction. The ford over the River Derwent is shown as bridged.

3.1.48 The A38 ring road, west of Derby, is first shown on the 1969 1: 10,000 scale map (SK34SE), however, the Little Eaton junction is not shown until the 1974/ 5 maps. The gravel pit previously noted to the north-east of the junction is no longer shown and may have been in-filled. The 1968 1:2,500 scale map shows ‘ponds’ approximately 600m north of the junction. This is annotated, on the 1974 map as a ‘Water Reclamation Works’. The 1974 map also reveals that a ‘Refuse Tip’ is situated to the north of the junction.

3.1.49 The 1978 aerial photographs indicate that a separate, larger area of land to the north-west of the Little Eaton junction has been disturbed. The size and location of this area is consistent with the recorded location and date of commencement of the licensed waste management facility. However, this is not shown on the later 1981 map, but it is reflected on the 1991 Russian military mapping.

Undated

3.1.50 Analysis of aerial photographs (Baker 2003) indicates the existence of a number of palaeochannels within the River Derwent floodplain which represent former river courses and tributary channels. It is possible that some of these were formed during the prehistoric period; equally it may be the case that settlement activity existed within close proximity to these.

3.1.51 At Little Eaton a crop mark to the south of the proposed scheme appears to be a possible ring ditch (MDR11202).

3.1.52 Peg Low is a natural topographic feature (MDR4777), but was once assumed to be a prehistoric burial ground. A shaft sunk through the top of the feature in the late 1930s found no archaeological evidence, and recorded a series of shale beds.

3.1.53 Also at Breadsall, lynchets (banks of earth that build up on the downslope of a field ploughed over a long period of time) have been identified beyond the proposed scheme footprint, west of Camp Wood, Little Eaton (MDR4755).

4. PROJECT OBJECTIVES

4.1.1 The objectives of the scheme wide archaeological investigations as described herein are as follows:

- To determine the presence/ absence of buried archaeological remains, and to assess the geoarchaeological potential of the proposed scheme corridor;
- To determine the condition and state of preservation of any buried archaeological remains, including the character, depth, extent and date of the deposits;
- Provide evidence to establish the potential of key target areas that could be investigated by trial trench evaluation and detailed geoarchaeological investigation;
- To determine the level of risk that the archaeological resource would present to the proposed scheme; and
- To inform the determination of a suitable mitigation works specification and programme.

5. RESEARCH AGENDAS

5.1.1 The broad principles of a number of existing archaeological UK research agendas are applicable, including those for the early prehistoric period (Prehistoric Society 1999), the Iron Age (Champion *et al.* 2001), the Roman period (James & Millett 2001; EH 2012) and the medieval period (Society for Medieval Archaeology). Key archaeological research agendas comprise:

- Historic England Archaeology Division Research Agenda (EH 1997);
- East Midlands Archaeological Research Framework (Cooper (ed.) 2006) and East Midlands Heritage: An updated research agenda and strategy for the historic environment of the East Midlands (Knight, Vyner & Allen 2012);
- Research Frameworks for the Palaeolithic and Mesolithic of Britain and Ireland (Prehistoric Society 1999);
- Research Frameworks for Holocene Lithics in Britain (Lithic Studies Society 2004);
- Understanding the British Iron Age: An Agenda for Action (Champion et al. 2001);
- Britons and Romans: Advancing an Archaeological Agenda (James & Millett 2001);
- English Heritage Thematic Research Strategies - Research Strategy for the Roman-Period Historic Environment (EH 2012);
- Recommendations by the Society for Medieval Archaeology to the Historic Buildings and Monuments Commission for England (Society for Medieval Archaeology 1987); and

5.1.2 Specific research agendas that could be relevant include:

- Understanding the shifting courses of the River Derwent and its palaeochannels; and understanding the palaeoenvironment of the Derwent Valley;
- Palaeolithic: improving dating of glacial and warm climate sequences, and understanding human activity on the edge of the ice sheets, particularly in lowland riverine environments;
- Mesolithic: seasonal places and transit routes; investigation of the late Mesolithic/ Early Neolithic transition, particularly in lowland riverine environments;
- Neolithic and Bronze Age: late Mesolithic/ Early Neolithic transition; Neolithic/ Bronze Age transition; developments in livestock and arable farming; identification of travel routes, settlement and trading posts; patterns in burial location and rituals;
- Iron Age: settlement distribution and agricultural practices; development of tribal polities, boundaries and exchange networks; patterns in burial location and ritual activity;

- Romano-British: developing a better understanding of environment and agrarian systems in the period of transition from the Late Pre-Roman Iron Age to the Early Roman period; investigating the development of routes, trackways and roads (EH 2012);

- Medieval and post-medieval: development of field systems; impacts of climate, political and demographic change; agricultural economy.

6. SCOPE OF WORK

6.1 Introduction

6.1.1 The works comprise a phased approach to archaeological evaluation and geoarchaeological assessment that will inform the archaeological mitigation for the proposed scheme, should it be appropriate. The first phase of investigation will comprise archaeological geophysical survey (Phase 1), to be followed by geo-archaeological assessment, comprising borehole investigation (Phase 2), and targeted archaeological trial trench evaluation (Phase 3).

6.1.2 Other archaeological investigations are planned as part of the investigation work to inform the archaeological mitigation requirements (e.g. geoarchaeological monitoring of the GI), but these will form a separate element of the overall proposed scheme investigations, and are excluded from this specification.

6.2 Phase 1 Archaeological Geophysical Survey (detailed magnetometry)

6.2.1 Archaeological geophysical survey is required at the Little Eaton junction. The amount of detailed magnetometry is detailed below (Table 1) and is shown on Figure 2.

6.2.2 The geophysical survey will consist of fourteen 30 x 30 m survey grids and nine 40 x 40 m survey grids, amounting to 2.7 hectares (ha), or 27,000m² of detailed magnetometry survey.

6.2.3 If significant archaeological anomalies are detected or inferred during the survey, then these areas might be extended, but only with the prior written agreement of the Designer's Archaeologist.

6.2.4 It may be necessary for the Archaeological Contractor to undertake a preliminary assessment of ground conditions prior to the commencement of the fieldwork. In 2015 the fields were being used as farmland, comprising arable (cereal crops), pasture (livestocking) and commercial crops (turf growing). The Archaeological Contractor will notify the Designer's Archaeologist of any areas that in their opinion are unsuitable for survey, or where the survey will need to be moved to accommodate obstructions.

6.2.5 If additional areas of detailed magnetometry are required then the Designer's Archaeologist will prepare a written addendum to this specification that will set out the amount and location of additional archaeological geophysical survey that is required.

Table 1: Phase 1 Archaeological Geophysical Survey Requirements (refer to Figure 2)

No. of Survey Grids of Detailed Magnetometry (30 x 30 m)	Area (m²)	Description
x14 (grid blocks C, D, E and F)	12,600	To assess the presence/ absence of potential archaeological anomalies that might be present.
No. of Survey Grids of Detailed Magnetometry (40 x 40 m)	**Area (m²)**	**Description**
x9 (grid blocks A and B)	14,400	To assess the presence/ absence of potential archaeological anomalies that might be present.

6.3 Phase 2 Geoarchaeological Assessment

6.3.1 A total of 10 boreholes are proposed at Little Eaton junction where they have been positioned to investigate the potential for buried archaeological remains to survive along the floodplain of the River Derwent. The borehole investigation will be undertaken prior to the start of the Phase 3 evaluation to ensure that any information gained from the boreholes can inform the location of the trenching layout.

6.3.2 The indicative locations of all the boreholes that are required at Little Eaton are shown on Figure 3 and are identified in Table 2. The Archaeological Contractor will ensure that the sample locations avoid any buried underground services and will carry out scanning of each location prior to the start of the works and during excavation for the boreholes (refer to Section 17).

6.3.3 The boreholes have been laid out in transects along the footprint of the proposed scheme, to assess the sequence and distribution of sub-surface deposits within the river floodplain. By interpreting the formation processes of the buried geoarchaeological deposits, such as the depositional and post-depositional processes likely to be represented by the stratigraphy and by reference to the archaeology and palaeo-environmental evidence, information will be gained about the potential archaeological resource within the proposed scheme boundary.

6.3.4 The aim of the survey is to identify where areas of higher and lower archaeological potential are present as represented by buried archaeological remains and land surfaces, topographic variation, and zones of palaeo-environmental interest.

6.3.5 The results will be used to illustrate the main trends in the sequence at each location where borehole investigations are undertaken (depth and distribution of main depositional units by means of schematic cross sections, and if appropriate surface and thickness plots (e.g. surface of gravel/sandstone, thickness of alluvium and organic sediment)).

Table 2: Phase 2 Borehole Requirements at Little Eaton Junction (refer to Figure 3)

Borehole no.	O.S. Grid Reference
BH1	436608.29, 340282.17
BH2	436587.49, 340221.49
BH3	436567.78, 340164.00
BH4	436514.47, 340008.55
BH5	436499.51, 339964.90
BH6	436369.84, 339920.06
BH7	436299.85, 339921.69
BH8	436229.85, 339923.32
BH9	436144.93, 339936.77
BH10	436043.75, 339934.84

6.4 Phase 3 Archaeological Targeted Trial Trench Evaluation

6.4.1 The amount and location of the archaeological trial trenches (Phase 3) will be determined following the results of the archaeological geophysical survey (see Section 6.2) and geoarchaeological assessment (see Section 6.3), but it will consist of a series of trenches set out to evaluate geophysical anomalies at the Little Eaton junction.

6.4.2 Following the completion Phase 1 and Phase 2 investigations, and the interim reporting of the results, the Designer's Archaeologist will prepare a separate addendum to this Specification that will set out the trial trenching requirements. The amount of trenching and locations will be discussed with and approved by DCC Planning Archaeologist prior to the issue of the addendum.

6.4.3 The Archaeological Contractor will ensure that the archaeological trial trench locations avoid any buried underground services and will carry out scanning of each location prior to the start of the works and during the stripping of the trenches (refer to Section 17).

7. WORKS SPECIFICATION

7.1 General Requirements

7.1.1 All investigative work (Phases 1 to 3) will be carried out by the Archaeological Contractor in accordance with this Written Scheme of Investigation (WSI) and any further instructions from the Designer's Archaeologist. This design takes account of the assessment guidance provided by the Design Manual for Roads and Bridges (DMRB) Volume 10, Section 6, Part 1 (Highways Agency, 2001), the standard and guidance issued by the Chartered Institute for Archaeologists (CIfA), including the Standard and Guidance for Archaeological Geophysical Survey (CIfA, 2014), the Standard and Guidance for Archaeological Field Evaluation (CIfA, 2014), the Standard and Guidance for Archaeological Excavation (CIfA, 2014), the Standard and Guidance for the Creation, Transfer and Deposition of Archaeological Archives (CIfA, 2014), and the CIfA Code of Conduct (CIfA, 2014), as well as Historic England guidance (EH, 2008; EH, 2007, EH, 2011) and Archaeology Data Service guidance (Schmidt & Ernenwein 2011). The Archaeological Contractor shall also be aware of other relevant guidance and good practice (see Appendix 1).

7.1.2 The Archaeological Contractor shall prepare and submit a Method Statement and Risk Assessment for each phase of the works prior to the commencement of the fieldwork, for approval by the Designer's Archaeologist (refer to Section 17).

7.1.3 The Archaeological Contractor will undertake any necessary health and safety training and/ or inductions.

7.2 Phase 1 Archaeological Geophysical Survey

7.2.1 The geophysical survey will be undertaken by an experienced operator to provide consistent results with regard to pattern recognition and to provide initial screening of noise resulting from recent ferrous disturbance and local magnetic pollution.

7.2.2 During the survey a record should be made of surface conditions and sources of modern geophysical interference that might have a bearing on subsequent interpretation of field data.

7.2.3 The survey grid/ transects will be established by electronic means using a survey-grade GPS (EH 2003) or equivalent metric survey device and accurately tied to the Ordnance Survey (OS) National Grid. This should be internally accurate to ±100 mm, and the grid locatable on the OS 1:2,500 scale map. An estimate of the precision of survey control is to be included in the Method Statement and it will also address how the survey transects will be laid out. If appropriate, the Archaeological Contractor must ensure that any survey stations are tied into permanent landscapes features, recorded on the latest OS edition, to enable the accurate relocation of archaeological anomalies detected by the survey.

7.2.4 Detailed magnetometer survey will be carried out over the designated survey areas using either a Geoscan FM 36 Fluxgate Gradiometer or a Bartington GRAD 601 Fluxgate Gradiometer (or similar electronic instrument). Readings should be taken at 4 readings per metre at 1 m traverses within a 1 m grid system.

7.2.5 If appropriate a cart-mounted set-up may be used in association with a Differential Global Positioning System capable of Real Time Kinematic navigation.

7.2.6 The data should be downloaded at regular intervals on-site into a laptop computer for initial processing and storage. This will ultimately be transferred to a desktop computer for further processing, interpretation and archiving. Geoplot v.3 software (or comparable) will be used to interpolate the data to form an array of regularly spaced values at 0.25 m x 0.25 m intervals. Continuous tone greyscale images of raw data and an x/y trace plot will also be produced. Palette bars relating the greyscale intensities to anomaly values in ohms will be included with the images.

7.2.7 The raw and processed data should be presented in the Geophysical Survey Report (see below). The processed drawings should be accurately located and presented in relation to the OS base plan and the survey markers should be accurately plotted to aid in the laying out of subsequent evaluation or excavation areas. Interpretation plots shall be included in the report.

Data Processing

7.2.8 The processing of datasets will be concurrent with the fieldwork and immediately after completion of fieldwork the processing of the remaining data will be completed.

7.3 Archaeological Geophysical Survey Report

7.3.1 If requested by the Designer's Archaeologist, an interim plot and statement of results will be submitted by the Archaeological Contractor within an agreed timetable. The interim statement will include a brief summary of the results.

7.3.2 A fieldwork report will be submitted in draft within 1 week of the completion of fieldwork. The preparation of the survey archive and fieldwork report will be undertaken in accordance with this Archaeological Design and relevant archaeological standards and national guidelines (refer to Appendix 1). The report will include the following:

- A non-technical summary;
- Site location;
- Archaeological and historical background;
- Full detailed methodology;
- Aims and objectives;
- Results (to include full description, assessment of condition, quality and significance of the results);
- General and detailed plans showing the location of the results and identifying any areas unsuitable for survey, accurately positioned on an Ordnance Survey base map (to a known scale commensurate with the objectives of the survey);
- Colour/ grey scale plots to aid interpretation. The plots will be contoured (if appropriate) to allow trends to be shown superimposed over data without obscuring it;
- An interpretative plot(s);
- An assessment of potential with recommendations for further survey;

- Images to illustrate the survey work in progress;
- Publication proposals if warranted; and
- A cross-referenced index of the project archive

7.3.3 The report will comment on the potential for extrapolating the results onto adjacent areas.

7.3.4 An electronic copy of the draft report and drawings / figures will be submitted to the Designer's Archaeologist who will forward a copy to the County Archaeologist for comment. In finalising the report, the comments of the Designer's Archaeologist and the County Archaeologist will be taken into account.

7.3.5 Five bound copies, one unbound master-copy and a digital version of the finalised report will be submitted within 1 week of the receipt of comments on the draft report. The digital report shall comprise a CD containing a complete version of the report in PDF format and separate digital text (in Microsoft Word format), CAD mapping files (in ESRI GIS or AutoCAD format) and any other illustrations or plates (in an appropriate format).

7.4 Phase 2 Geoarchaeological Assessment

7.4.1 Geoarchaeological assessment will comprise borehole investigation at Little Eaton junction. Prior to the start of the borehole investigations the Archaeological Contractor's geoarchaeologist will review the results of the previous geotechnical investigations '*A38 Derby Junctions Improvements. Preliminary Sources Study*' Report No: 47071319-URS-08-RP-GE-003 (Highways Agency, 2014a).

7.4.2 All aspects of the borehole investigation will be carried out to an appropriate, professional archaeological standard, in accordance with the relevant Chartered Institute for Archaeologists Standards and Guidance; and will also be guided by recommendations outlined in Historic England guidance.

7.4.3 The location of the boreholes will be set out by the Archaeological Contractor, related to the Ordnance Survey National Grid. The ground level adjacent to the boreholes will be tied into Ordnance Survey Datum.

7.4.4 The boreholes will be drilled by a sub-contracted drilling crew, supervised by the Archaeological Contractor's geoarchaeologist, through the Alluvium – Predominantly Silt and Clay down into the underlying surface of the fluvial deposits (Alluvium – Predominantly Sand and Gravel), or to the surface of the Morridge Formation Millstone Grit (mudstone, siltstones and sandstones), to a maximum depth of 4m from the ground surface whichever level is reached first. The geoarchaeologist will keep a field log of the boreholes and a photographic record of the site and cores.

7.4.5 Continuous sleeved cores will be collected through the alluvial silt and clay deposits. The cores recovered will be collected utilising 1m long Perspex tubes (or their equivalent) of *c.*100mm diameter. The cores will be opened and the sequence of sediments drilled in each borehole will be described on site, with the nature (where possible) and depths of the interfaces between different sediment units noted. A preliminary interpretation of the soil and sediment characteristics of the cores will be made and an overview of the stratigraphy produced, that will characterise the deposit sequence and identify soil /sediment processes.

7.4.6 If suitable organic sediment is recovered, samples will be taken from selected upper and lower interfaces for radiocarbon dating, in order to provide a dating framework for the stratigraphic sequence. It is envisaged that three samples will be submitted for radiocarbon dating.

7.4.7 If suitable fine sand or silt deposits are recovered, selected cores will not be opened, but retained for OSL dating. If appropriate, one core will be submitted for such dating as part of the evaluation in place of a radiocarbon date.

7.4.8 If suitable deposits exist samples will be submitted to specialists for macroscopic/microscopic analysis (such as pollen, diatom and ostracod/foraminifera assessment) to identify the potential for past environment reconstruction (subject to the written approval of the Designer's Archaeologist).

7.4.9 The borehole logs will be drawn on appropriate (proforma) recording sheets and polyester based drawing film.

7.4.10 The completed holes will be backfilled with bentonite (or equivalent inert material).

7.4.11 Selected borehole sequences, which are thought suitable for any future off-site analyses for palaeo-environmental remains or dating, will be retained and taken into controlled storage until such time that they may be needed. Wherever possible the temporary storage of core samples on site will be avoided.

7.4.12 The archive will be so organised as to be compatible with the system used for the archaeological targeted trial trench evaluation, and it will follow national standards and guidance.

7.4.13 In each area where sampling is required a site plan will be prepared based upon the digital Ordnance Survey mapping.

7.4.14 Any finds or samples will be treated in a proper manner in accordance with the method for Targeted Trial Trench Evaluation (Section 7.6).

7.5 Geoarchaeological Assessment Report

7.5.1 A summary statement of the results of the borehole investigations will be prepared within 2 days of the completion of the geoarchaeological investigations, in order that the next phase of work can be programmed.

7.5.2 Separately, a geoarchaeological assessment report will be prepared by the Archaeological Contractor within 6 weeks of the end of the Phase 2 investigations. The results of the borehole investigations may be combined with the results of proposed geoarchaeological monitoring (geotechnical investigations), but only with the approval of the Designer's Archaeologist. The report will summarise the results of the investigations, and will describe/ illustrate sub-surface topography and characteristics of the sediments present on site. It will also indicate the potential of the core samples for past environmental reconstruction. If appropriate, a detailed proposal for analysis of the core samples will be included in the report.

7.6 Phase 3 Targeted Trial Trench Evaluation

7.6.1 The trial trenches will be excavated at the locations proposed by the Designer's Archaeologist and approved by the DCC Planning Archaeologist, and will be sent to the Archaeological Contractor as an addendum to this specification.

7.6.2 The trenches will be positioned using survey-grade GPS (EH 2003) or equivalent metric-survey equipment. The trenches will be opened under archaeological supervision, using an appropriate mechanical excavator fitted with a toothless ditching bucket.

7.6.3 The extent of the trial trenches will be clearly demarcated by temporary barrier fencing to ensure that persons or plant cannot inadvertently traverse across the area of investigation whilst archaeological works are in progress. The fencing will be supplied by the Archaeological Contractor and will be regularly inspected and maintained until works in the area have been completed, inspected and approved by the Designer's Archaeologist and the County Archaeologist.

7.6.4 The trial trenches will be subject to a rapid metal detector scan, under archaeological supervision, in advance of excavation, in order to identify and recover metal artefacts within the topsoil/ subsoil.

7.6.5 The excavation will proceed under direct archaeological supervision, in level spits, until either the top of the first archaeological horizon or undisturbed natural deposits are encountered, including the surface of potential deeply stratified alluvial layers. Particular attention should be paid to achieving a clean and well-defined horizon with the machine. However, under no circumstances should the machine be used to cut arbitrary holes through the natural deposits (refer to Section 7.6.6). It is not anticipated that entire trenches will require hand cleaning, but only where it is required for the acceptable definition of archaeological deposits. The surface achieved through machine excavation will be inspected for archaeological remains. The mechanical excavator will not traverse any stripped areas.

7.6.6 Deeply stratified alluvial deposits which are likely to be present within the floodplain of the River Derwent will be investigated as part of the Phase 2 geoarchaeological assessment (refer to Section 6.3). However, in addition to the excavation of man-made deposits some assessment of 'naturally deposited' levels may be necessary, especially when these are organically preserved and laid down within archaeological timescales; for example alluvial or peat deposits (identified at Phase 2). If further assessment of such naturally deposited levels is required (based upon the Archaeological Contractors professional judgement), then it shall be restricted to a targeted sondage(s) that will be monitored and recorded by the geoarchaeologist. The excavation of deep holes will be avoided, and all work will be undertaken with due regard to health and safety.

7.6.7 Following cleaning/ definition, all archaeological deposits and remains will be planned to enable the selection of features and deposits for sample excavation.

7.6.8 If important concentrations of artefacts are uncovered during machining, suggestive of significant activity, these should be left *in sit*u in the first instance, and if appropriate investigated using hand tools only.

7.6.9 The trial trenches shall not be reinstated without the prior approval of the Designer's Archaeologist, although in exceptional circumstances some backfilling would be permitted if health and safety or ground stability reasons warrant this.

7.6.10 The trial trenches shall only be backfilled by machine under appropriate conditions and with direct archaeological supervision. Arisings will be returned strictly in the correct sequence and will not be compacted.

7.6.11 Where land drains are encountered during the archaeological works, these will be left *in situ* in the first instance and the Designer's Archaeologist contacted in order to determine whether they can be removed. If they are to be retained then at the end of the investigation they will be carefully covered with topsoil and consolidated using hand tools to avoid damage; and any broken or damaged drains will be replaced by the Archaeological Contractor.

Hand Excavation

7.6.12 Sample excavation shall be minimised to that required to meet the key objectives of the evaluation.

7.6.13 Archaeological deposits/ features identified for sample excavation will be hand excavated in an archaeologically controlled and stratigraphic manner in order to meet the aims and objectives of the evaluation. Machine-assisted excavation may be permissible if large deposits are encountered, but only after consultation with the Designer's Archaeologist and approved by the DCC Planning Archaeologist. All deposits/ features will be investigated through sample excavation in each trench to record the horizontal and vertical extent of the stratigraphic sequence to the level of undisturbed natural deposits. No archaeological deposit should be entirely removed unless this is unavoidable.

7.6.14 The following sampling strategies will be utilised as a minimum:

- *Linear features*: A minimum of 20% along the length (each section not less than 1m wide). Key intersections will be investigated to determine the relationship between the component features.

- *Discrete features*: Pits, post-holes and other isolated features will normally be half-sectioned, and stake-holes fully excavated. If large pits or deposits (over 1.5m in diameter) are encountered then the sample excavated should be sufficient to define the extent and maximum depth of the feature and to achieve the objectives of the evaluation, but should not be less than 25%.

- *Structures*: To be sampled sufficiently to define the extent, character, date, stratigraphic complexity and depth of the feature and its associated deposits to achieve the objectives of the evaluation.

Recording

7.6.15 The perimeter of each trench and all archaeological remains within the trenches will be recorded in plan using metric survey-grade equipment (or its equivalent) (EH 2003).

7.6.16 All archaeological remains will be recorded in plan using electronic survey equipment. The resultant digital dataset will be utilised to compare the position of the identified archaeological remains with any relevant geophysical survey and aerial photographic data, as applicable.

7.6.17 A full written, drawn and photographic record will be made of each trench, even where no archaeological features are identified. Hand drawn plans and sections of features will be produced at an appropriate scale (normally 1:20 for plans and 1:10 for sections). One long section of each trench will be drawn at a scale of not less than 1:50 but only after the features within the trench have been excavated. All plans

and sections will include spot heights relative to Ordnance Datum in metres, correct to two decimal places.

7.6.18 Photography (colour transparency and monochrome negative photographs) will be taken using a minimum format of 35mm. In addition to records of archaeological features, a number of general site photographs will also be taken to give an overview of the site. Particular attention should be paid to obtaining shots suitable for displays, exhibitions and other publicity. Digital photography may be used to supplement the formal photographic record, for example, to produce images to illustrate the report or for publicity.

Artefact Recovery

7.6.19 All artefacts will be collected, stored and processed in accordance with standard methodologies and national guidelines (Appendix 1). All non-modern artefacts will be collected and retained. Each 'significant find' will be recorded three dimensionally if in a primary context. Bulk finds will be collected and recorded by context.

7.6.20 Where necessary the artefacts will be stabilised, conserved and stored in accordance with national guidelines by a qualified conservator. Artefacts will be properly conserved after excavation and will be stabilised for storage. If necessary, a conservator will visit the site to undertake 'first aid' conservation treatment.

7.6.21 Artefacts will be stored in appropriate materials and conditions, and monitored to minimise further deterioration.

Environmental Sampling for Trial Trenching

7.6.22 Historic England's Regional Advisor for Archaeological Science will be notified of the commencement of the project and consulted regarding the sampling strategy proposed by the Archaeological Contractor. In addition provision will also be made for the recovery of material suitable for scientific dating. The Archaeological Contractor’s environmental specialist will visit the site to ensure that the agreed sampling strategy is appropriately implemented and to offer specialist advice whenever required.

Human Remains

7.6.23 Should human remains be discovered during the course of the trial trenching, the remains will be covered and protected and left *in situ* in the first instance, in accordance with current good practice. The removal of human remains will only take place in accordance with a licence from the Ministry of Justice and under the appropriate Environmental Health regulations and the Burial Act 1857. In the event of the discovery of human remains the Archaeological Contractor will notify the Designer's Archaeologist immediately, who will contact the DCC Planning Archaeologist to establish whether it is necessary to contact the office of H.M. Coroner.

Treasure

7.6.24 Any artefacts which are recovered that fall within the scope of the Treasure Act 1996 and Treasure (Designation) Order 2002 will be reported to the Designer's Archaeologist immediately. The Designer's Archaeologist will contact H. M. Coroner, and will ensure that the Treasure regulations are enforced and that all the relevant

parties are kept informed. A list of finds that have been collected that fall under the Treasure Act and related legislation will be included in the fieldwork report.

Finds Processing

7.6.25 Any Initial processing of finds (and if appropriate other samples) will be carried out concurrently with the fieldwork. The processing of finds will be finished shortly after completion of the investigations on site. The finds will be retained (according to the Collection Policy), washed, marked, bagged and logged on a MS Access or GIS database (or equivalent), together with their locations according to the National Grid Reference (eastings, northings) and Ordnance Datum (height), accurate to 2 decimal places.

7.6.26 The finds assemblage will be treated, labelled and stored in accordance with the appropriate Historic England guidance documents, local authority guidelines (if appropriate) and the Institute of Conservation guidelines (refer to Appendix 1). The Archaeological Contractor will ensure that the processing of the assemblage is in accordance with the requirements of the recipient repository.

7.6.27 If appropriate each category of find or each material type will be examined by a suitably qualified archaeologist or specialist and the results incorporated into the report.

7.7 Targeted Trial Trench Evaluation Report

7.7.1 An interim statement of the results of the evaluation will be prepared and submitted to the Designer's Archaeologist within two weeks of the completion of the Phase 3 investigations. It will include:

7.7.2 A brief summary of the results;

- A plan of each trench at an appropriate scale, showing the mapped features; and
- Quantification of the primary site archive including contexts, finds and samples.

7.7.3 The finds and samples will be processed (cleaned and marked) as appropriate. Each category of find or environmental/ industrial material will be examined by a suitably qualified archaeologist or specialist and the results incorporated into a fieldwork assessment report.

7.7.4 A fieldwork report will be submitted in draft within four weeks of the completion of the fieldwork. The preparation of the site archive will be undertaken in accordance with this Specification and will follow relevant archaeological standards and national guidelines (Appendix 1). The report will include the following:

- A signed QA sheet detailing as a minimum - title, author, version, date, checked by, approved by;
- A non-technical summary;
- A site location drawing;
- The archaeological and historical background (including the results of previous phases of fieldwork);

- The methodology employed for the evaluation;
- The aims and objectives of the investigations;
- The results of the evaluation (to include full description, assessment of condition, quality and significance of the remains);
- If human remains are encountered the report will include a statement that addresses the future retention of the material, including if appropriate, options for reburial;
- An appendix containing specialist artefact reports, palaeo-environmental reports or their equivalent;
- An appendix illustrating specific finds and general working shots or portraits of specific features or structures as appropriate;
- A list of all finds that fall within the scope of the Treasure Act and associated legislation;
- A stratigraphic matrix for each trench (as appropriate);
- Assessment/ conclusion and a statement of potential with recommendations for further work and analysis;
- A statement of the significance of the results in their local, regional and national context cross-referenced to the Regional Research Framework;
- Publication proposals if warranted;
- The current and proposed arrangements for long term conservation and archive storage (including details of the accredited repository details);
- General and detailed plans showing the location of the survey accurately positioned on an Ordnance Survey base map (at an appropriate and recognised scale);
- Detailed plans and sections illustrating archaeological features and relationships between features (at an appropriate and recognised scale);
- Colour photographic plates illustrating the site setting, work in progress and archaeological discoveries; and
- A cross-referenced index of the project archive.

7.7.5 The fieldwork report will specifically comment on the level of preservation and will comment on the character of the overlying deposits and on the potential for extrapolating the results into adjacent areas.

7.7.6 Two bound hard copies and a digital pdf copy (complete with illustrations and plates) of the completed draft report will be submitted to the Designer's Archaeologist for comment. The Designer's Archaeologist will submit a copy of the draft report to the County Archaeologist for comment, and if appropriate, also the Historic England Inspector. In finalising the report the comments of the Designer's Archaeologist will be taken into account.

7.7.7 Six bound copies, one unbound master-copy and a digital version (Word and PDF) will be submitted to the Designer's Archaeologist within two weeks of the receipt of comments on the draft report.

7.7.8 A project CD shall be submitted containing image files in JPEG or TIFF format, digital text files shall be submitted in Microsoft Word format, illustrations in AutoCAD format or ArcView shapefile format. A fully collated version of the report shall be included in PDF format.

7.7.9 The Designer's Archaeologist (on behalf of the client) shall submit copies of significant interim reports and all final reports for each phase of the works to the DCC Historic Environment Record.

8. COMPLETION OF FIELDWORK

8.1.1 The Archaeological Contractor shall prepare and submit a Completion Statement to the Designer's Archaeologist within one working day for each phase of investigative fieldwork.

8.1.2 The survey areas will be left in a tidy and workman-like condition and the Archaeological Contractor will ensure that all materials brought onto site are removed.

8.1.3 An Arts and Humanities Data Service (AHDS) online database project Online Access to index of Archaeological Investigations (OASIS) entry shall be completed at the end of each phase of fieldwork, as part of the archiving phase of the project, irrespective of whether a formal report is required. The Archaeological Contractor will complete the online form at http://ads.ahds.ac.uk/project/oasis/ within one month following completion of the fieldwork. Archaeological contractors are advised to contact OASIS (oasis@ads.ahds.ac.uk) for technical advice.

9. MONITORING, PROGRESS REPORTS & MEETINGS

9.1.1 The archaeological investigations (all phases) will be subject to monitoring visits by the Designer's Archaeologist who will have unrestricted access to the survey areas, trial trenches, site records or any other information. The work will be inspected to ensure that it is being carried out to the required standards and that it will achieve the stated objectives.

9.1.2 Verbal progress reports will be provided to the Designer's Archaeologist upon request. Weekly written progress reports (via email each Monday morning) will be sent to the Designer's Archaeologist by the Archaeological Contractor whilst the fieldwork is on-going. In addition, progress meetings between the Designer's Archaeologist, the DCC Planning Archaeologist and the Archaeological Contractor may be held on site during the course of the investigations. Progress meetings will be arranged by the Designer's Archaeologist.

9.1.3 The Archaeological Contractor will only accept instruction from the Designer's Archaeologist.

10. REPORTING

10.1.1 Separate reports are required for each phase of archaeological investigations, as set out herein (see Section 7).

11. RESOURCES & TIMETABLE

11.1.1 All archaeological personnel involved in the project should be suitably qualified and experienced professionals. The Archaeological Contractor shall provide the Designer's Archaeologist with staff CVs of the Project Manager, Geoarchaeologist, and Site Supervisor. All site assistants should have an appropriate understanding of fieldwork procedures.

11.1.2 The fieldwork programme will commence (at a future date to be confirmed) once permission has been obtained from the landowners for each phase of the investigations, and clearance has been obtained from other environmental disciplines, such as ecology. It is noted that site access and liaison with landowners will be undertaken by the Designer’s Stakeholder Liaison Officer.

11.1.3 The investigations (all phases) will be completed at the earliest opportunity (subject to land access agreements and the approval of the Archaeological Contractor's Method Statement(s), Risk Assessment, and if appropriate, health and safety plan).

11.1.4 The Designer's Archaeologist will inform the Archaeological Contractor of the start date for each phase of the works, and the Archaeological Contractor will provide the Designer's Archaeologist with a programme for the works (fieldwork and reporting) within 2 days of the start date, and as part of their Method Statement(s) submission. The Designer's Archaeologist shall notify the DCC Planning Archaeologist of the start date prior to the commencement of the works.

11.1.5 All staff will be fully briefed and aware of the work required under this specification and will understand the objectives of the investigation and methodologies to be employed.

12. ARCHIVE PREPARATION & DEPOSITION

12.1.1 Archaeological material recovered from fieldwork is irreplaceable and data recorded in the course of fieldwork should be copied and held securely in a separate location in line with current good practice, until it can be deposited in the recipient repository (EH 2011).

12.1.2 All records and materials produced will be quantified, ordered, indexed and internally consistent. The archive will be produced to the standards outlined by Historic England Management of Research Projects in the Historic Environment (MoRPHE) Guidelines (EH 2006; Brown 2007).

12.1.3 The Archaeological Contractor will, prior to the start of fieldwork, liaise with an appropriate accredited repository to obtain agreement in principle to accept the documentary, digital and photographic archive for long term storage (refer to '*Procedures for the transfer of archaeological archives*', produced by Museums in Derbyshire, 2003; and its addendum, '*archaeological archives in Derbyshire – interim guidance note'* (Draft), issued by Derbyshire County Council in 2014). The Archaeological Contractor will be responsible for identifying any specific requirements or policies of the recipient repository in respect of the archive, and for adhering to those requirements. As a minimum the Archaeological Contractor will keep the repository informed of the likely quantification and content of the archive throughout the progress of the fieldwork. Any charges levied by the repository for the long term storage of the archive will be met by the Archaeological Contractor.

12.1.4 The deposition of the archive forms the final stage for each phase of the proposed scheme. The Archaeological Contractor shall provide the Designer's Archaeologist with copies of communication with the accredited repository and written confirmation of the deposition of the archive. The Designer's Archaeologist will deal with the transfer of ownership and copyright issues.

13. PUBLICATION

13.1.1 If significant results are obtained, and it is likely that further stages of archaeological work will be required, publication shall be deferred until such time as the project works are substantially complete.

14. CONFIDENTIALITY & PUBLICITY

14.1.1 The archaeological works may attract the interest of the public and the press. All communication regarding this project is to be directed through the Designer's Archaeologist. The Archaeological Contractor will refer all inquiries to the Designer's Archaeologist without making any unauthorised statements or comments.

14.1.2 The Archaeological Contractor will not disseminate information or images associated with the project for publicity or information purposes without the prior written consent of the Designer's Archaeologist.

15. COPYRIGHT

15.1.1 The Archaeological Contractor shall assign copyright in all reports, documentation and images produced as part of this project to Highways England. The Archaeological Contractor shall retain the right to be identified as the author or originator of the material. This applies to all aspects of the project. It is the responsibility of the Archaeological Contractor to obtain such rights from sub-contracted specialists.

15.1.2 The Archaeological Contractor may apply in writing to use or disseminate any of the project archive or documentation (including images). Such permission will not be unreasonably withheld.

15.1.3 The results of the archaeological works shall be submitted to Highways England, the DCC Planning Archaeologist, and if appropriate to Historic England by the Designer's Archaeologist, and will ultimately be made available for public access.

16. ACCESS ARRANGEMENTS & SITE INFORMATION

16.1.1 Access to the areas for investigation will be arranged and organised by the Designer's Stakeholder Liaison Officer. Contact details will be provided to the Archaeological Contractor upon appointment. Routes into and out of the survey area(s) will be identified and will be adhered to at all times, including access for plant. If appropriate, suitable locations for welfare facilities and temporary offices will also be agreed with the Designer's Stakeholder Liaison Officer.

16.1.2 The timetable and programme for the investigations will be agreed in advance with the Archaeological Contractor. Areas where fieldwork is planned include pasture and arable land within the floodplain of the River Derwent, that are likely to be sensitive to prevailing ground conditions and landowner requirements.

16.1.3 The Archaeological Contractor will notify the Designer's Archaeologist immediately if any of the archaeological survey areas cannot be investigated and will provide a clear explanation for the situation.

16.1.4 Should the Archaeological Contractor require an adjustment to the location of the survey areas, due to unforeseen circumstances, these shall be agreed with the Designer's Archaeologist in writing prior to their implementation.

16.1.5 The Archaeological Contractor will record photographically (digital photographs) the ground conditions at each location where archaeological survey will take place (Phases 1 to 3), both prior to the start of the survey, and at the end of the survey (including reinstatement of evaluation trial trenches).

17. INSURANCES, HEALTH & SAFETY

17.1.1 These works fall within the definition of Construction Work as defined under the Construction Design and Management (CDM) Regulations, and the Archaeological Contractor will be appointed as Principal Contractor by Highways England.

17.1.2 The Archaeological Contractor will provide the Designer's Archaeologist with details of their public and professional indemnity insurance cover.

17.1.3 The Archaeological Contractor will have their own Health and Safety policy as required under the Health and Safety at Work etc Act 1974. A copy of the Archaeological Contractor's Health and Safety policy will be submitted along with their tender to the Designer's Archaeologist, who will forward on to Highways England.

17.1.4 The Archaeological Contractor shall prepare Risk Assessment(s), Method Statement, and a project specific Health and Safety Plan and submit these to the Designer's Archaeologist for approval prior to starting on site (refer to Section 7.1). The Archaeological Contractor will not be permitted to start on site until Highways England has received confirmation that the Plan is acceptable for the proposed works. If amendments are required to these reports during the works the Designer's Archaeologist and any other interested party must be provided with the revised document at the earliest opportunity.

17.1.5 The site supervisor will be qualified to Site Managers Safety Training Scheme (SMSTS) level. All other staff involved in the fieldwork should be Construction Skills Certification Scheme (CSCS) qualified to a minimum standard as an 'Archaeologist Technician' and hold a valid CSCS card. Staff CVs should include SMSTS and CSCS qualifications and expiry dates.

17.1.6 The Designer’s Archaeologist will provide the Archaeological Contractor with the results of recently conducted service and utility searches; however, the Archaeological Contractor shall be responsible for identifying any buried or overhead services and taking the necessary precautions to avoid damage to such services, prior to and during the fieldwork (refer to Section 6.3 and 6.4). The Archaeological Contractor shall at all times maintain a safe working distance from the overhead and buried services /utilities. The Archaeological Contractor's Risk Assessment(s) and project Health and Safety Plan shall make reference to relevant guidance and good practice (for example: Health and Safety Executive SEGS6 - Avoidance of Danger from Overhead Lines; HS(G)47 - Avoiding Danger from Underground Services; Energy Networks Association The Safe Use of Mechanical Plant in the Vicinity of Electricity Overhead Lines).

17.1.7 The Archaeological Contractor’s supervisor and geoarchaeologist will maintain a record of site attendance and complete a daily briefing at the start of work for each day that there is a team in the field.

17.1.8 All site personnel will wear personal protective equipment (PPE) as defined by the Archaeological Contractor’s risk assessment undertaken in accordance with mandatory requirements. Any visitors to the investigations will require a site induction in accordance with the Archaeological Contractor’s Health and Safety requirements, and will have read the appropriate Archaeological Contractor’s Risk Assessment and Method Statement. The Archaeological Contractor will ensure that any visitors to the

investigations are equipped with suitable PPE prior to entry to the site. All equipment that is used in the course of the fieldwork must be 'fit for purpose' and be maintained in a sound working condition that complies with all relevant Health and Safety regulations and recommendations.

17.1.9 The Archaeological Contractor will assure the provision and maintenance of adequate, suitable and sufficient welfare and sanitary facilities at appropriate locations for the duration of the works. The locations for the temporary site welfare facilities will be agreed with the Designer's Stakeholder Liaison Officer prior to the start of the works, and arrangements for temporary parking shall also be agreed with the Designer's Stakeholder Liaison Officer should they be required. Facilities, roles and responsibilities shall adhere to the provisions of The Construction (Design and Management) Regulations 2015 and related Health and Safety Executive guidance.

18. GENERAL PROVISIONS

18.1.1 The Archaeological Contractor will undertake the works in accordance with this specification and any subsequent written variations. No variation from, or changes to, the specification will occur except by prior agreement with the Designer's Archaeologist and Highways England (and where appropriate approved by the DCC Planning Archaeologist).

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Appendix 1

Archaeological Standards and Guidelines

Methodological Guidelines

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Appendix 2

Figures

NOTES

Little Eaton Proposed Scheme

500m Study Area

3	FINAL						
	GB	25/01/16	NM	25/01/16	MS	25/01/16	
2	APPROVAL: MINOR EDITS						
	GB	01/12/15	NM	01/12/15	HK	01/12/15	
1	APPROVAL						
	PB	17/04/15	NM	17/04/15	HK	17/04/15	
0D	First issue						
	PB	01/04/15	NM	01/04/15	HK	01/04/15	
Rev #	Revision Details						
	Drawn By	Date	Checked By	Date	Approved By	Date	
A	APPROVAL					01/12/15	HK

Job Title

A38 DERBY JUNCTIONS

Drawing Title

LITTLE EATON JUNCTION
SCHEME LOCATION

AECOM Internal Project Number		Zone/Mileage		Suitability
47073944				
Designed	Drawn	Stage 1 check	Stage 2 check	Approved
AC	PB	AC	NM	HX
Scale at A3		Originated		Date
1:10,000				18/03/2015

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Drawing Number

FIGURE 1

0 80 160 240 320 400 m

N

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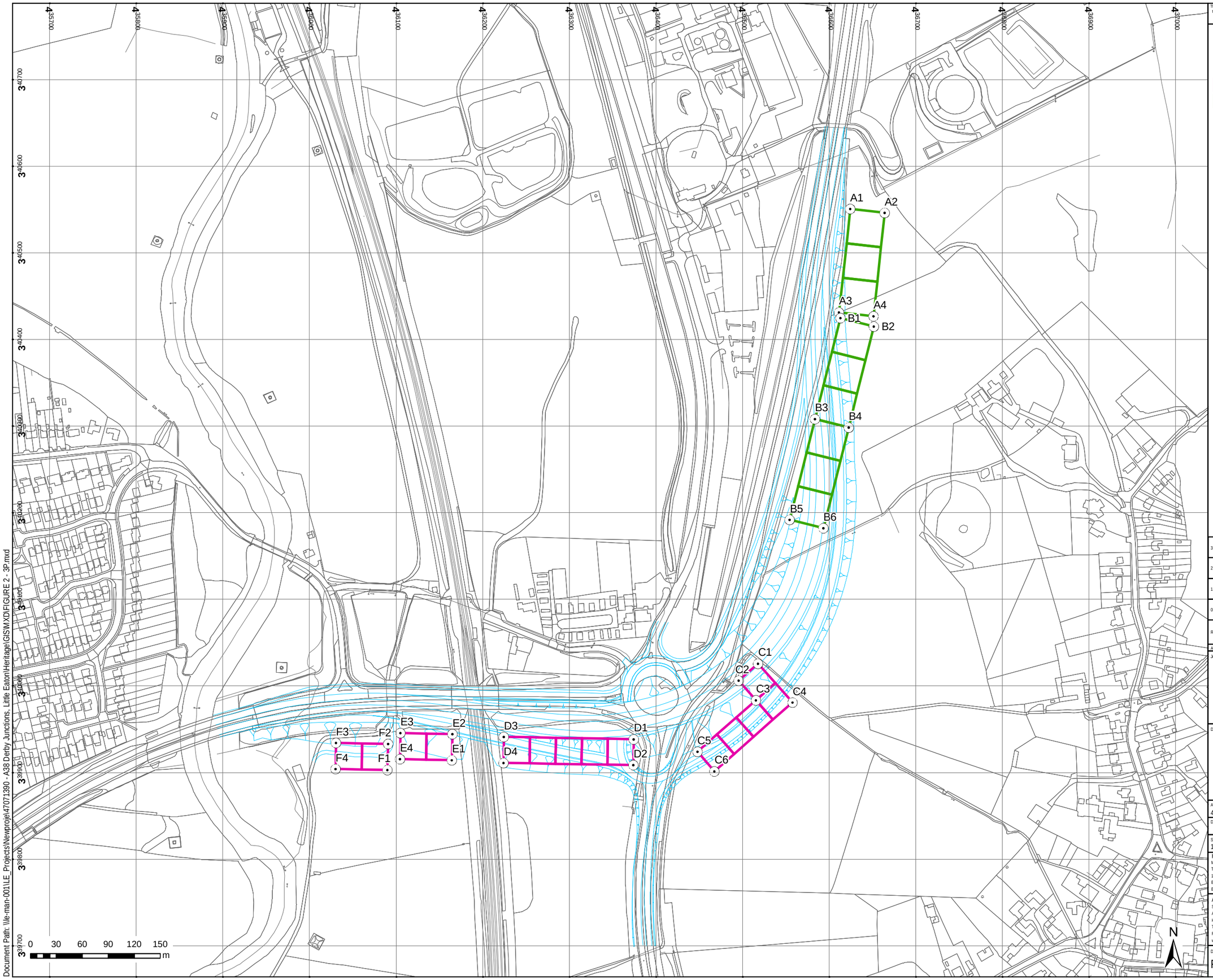

NOTES

- Little Eaton Proposed Scheme
- Setting out point
- 30m X 30m Survey Grid
- 40m X 40m Survey Grid

COORDINATES	EASTINGS	NORTHINGS
A1	436625.70	340551.96
A2	436665.47	340547.75
A3	436613.06	340432.63
A4	436652.84	340428.42
B1	436614.13	340425.76
B2	436652.92	340416.00
B3	436584.84	340309.39
B4	436623.63	340299.631
B5	436555.55	340193.02
B6	436594.34	340183.26
C1	436517.81	340026.26
C2	436495.28	340008.45
C3	436515.08	339983.92
C4	436557.42	339981.19
C5	436447.48	339924.50
C6	436467.28	339901.97
D1	436374.93	339939.06
D2	436374.55	339909.07
D3	436224.94	339941.00
D4	436224.56	339911.00
E1	436165.03	339915.33
E2	436165.66	339945.32
E3	436105.64	339945.32
E4	436105.02	339915.33
F1	436090.64	339903.12
F2	436091.27	339933.12
F3	436031.28	339934.39
F4	436030.65	339904.40

Rev #						
3	FINAL					
	GB	25/01/16	NM	25/01/16	MS	25/01/16
2	APPROVAL: MINOR EDITS					
	GB	01/12/15	NM	01/12/15	HK	01/12/15
1	APPROVAL					
	PB	17/04/15	NM	17/04/15	HK	17/04/15
0D	First issue					
	PB	01/04/15	NM	01/04/15	HK	01/04/15
Rev #	Revision Details					
	Drawn By	Date	Checked By	Date	Approved By	Date
A	APPROVAL					01/12/15 HK

Job Title

A38 DERBY JUNCTIONS

Drawing Title

LITTLE EATON JUNCTION
ARCHAEOLOGICAL
GEOPHYSICAL SURVEY GRIDS

AECOM Internal Project Number			Zone/Mileage		Suitability
47073944					
Designed	Drawn	Stage 1 check	Stage 2 check		Approved
AC	PB	AC	NM		HX
Scale at A3			Originated		Date
1:4,000					18/03/2015

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Drawing Number

FIGURE 2

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NOTES

Little Eaton Proposed Scheme

Boreholes

BH1
BH2
BH3
BH4
BH5
BH6
BH7
BH8
BH9
BH10

0 30 60 90 120 150 m

N

Rev #							
3	FINAL						
	GB	25/01/16	NM	25/01/16	MS	25/01/16	
2	APPROVAL						
	GB	15/01/16	NM	15/01/16	MS	15/01/16	
1	APPROVAL						
	GB	07/12/15	NM	07/12/15	HK	07/12/15	
0	First issue						
	GB	01/12/15	NM	01/12/15	HK	01/12/15	
Revision Details							
Drawn By		Date	Checked By	Date	Approved By	Date	
A	APPROVAL					01/12/15	HK

Job Title

A38 DERBY JUNCTIONS

Drawing Title

LITTLE EATON JUNCTION
ARCHAEOLOGICAL
BOREHOLE LOCATIONS

AECOM Internal Project Number		Zone/Mileage		Suitability
47073944				
Designed	Drawn	Stage 1 check	Stage 2 check	Approved
AC	PB	AC	NM	HX
Scale at A3		Originated		Date
1:4,000				18/03/2015

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Drawing Number

FIGURE 3

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APPENDIX IV– OASIS RECORD

OASIS DATA COLLECTION FORM: England

Printable version

OASIS ID: archaeol5-260500

Project details

Project name	Geoarchaeological Assessment at A38 Derby Junctions
Short description of the project	Archaeological Research Services Ltd. (ARS Ltd) was commissioned by AECOM Infrastructure and Environment UK Ltd to undertake a geoarchaeological assessment on behalf of Highways England at the A38 Little Eaton Derby Junctions. The assessment comprised the undertaking of a borehole survey and the interpretation of the soil profiles retrieved from ten geoarchaeological boreholes to assess the nature and stratigraphy of buried sediments and the potential for buried archaeological remains. This survey forms part of a phased programme of archaeological works undertaken by ARS Ltd, including geophysical survey and evaluation trenching at the Little Eaton Junction, Derby. Geoarchaeological boreholes samples were collected from ten locations spread across the proposed development area. All ten boreholes were successfully sampled to a depth of between three and four metres. The sampled sediments consisted of alluvial clay and sand deposits overlain by modern topsoil. Gravel deposits were encountered between 48.56 m aOD and 45.91 m aOD. In those samples taken from a depth of 4m soil retention was often poor in the lowest metre of the sample due to very wet ground conditions. Archaeological material was recovered from boreholes 2 and 4 in the form of coarse-grained ceramic material, possibly brick. All other cores were archaeologically sterile. No waterlogged or preserved organic deposits were encountered. Coal was present in several core samples.
Project dates	Start: 13-06-2016 End: 15-06-2016
Previous/future work	No / Yes
Any associated project reference codes	archaeol5 - 257100 - OASIS form ID
Type of project	Field evaluation
Current Land use	Cultivated Land 1 - Minimal cultivation
Current Land use	Vacant Land 2 - Vacant land not previously developed
Current Land use	Grassland Heathland 4 - Regularly improved
Monument type	NONE None
Significant Finds	NONE None
Methods & techniques	"Augering"
Development type	Road scheme (new and widening)
Prompt	National Planning Policy Framework - NPPF
Position in the planning process	Not known / Not recorded

Project location

Country	England
Site location	DERBYSHIRE EREWASH BREADSALL Little Eaton Junction, A38 Derby Junctions
Study area	0 Square metres
Site coordinates	SK 36473 39956 52.95542369192 -1.457026644946 52 57 19 N 001 27 25 W Point
Height OD / Depth	Min: 45.36m Max: 51.17m

Project creators

Name of Organisation	Archaeological Research Services Ltd
Project brief originator	AECOM Infrastructure and Environment UK Ltd
Project design originator	AECOM Infrastructure and Environment UK Ltd
Project director/manager	Tony Brennan
Project supervisor	Elise McLellan
Type of sponsor/funding body	Highways England
Name of sponsor/funding body	Highways England

Project archives

Physical Archive Exists?	No
Digital Archive recipient	Derbyshire Museum and Art Gallery and Derbyshire HER
Digital Contents	"Environmental"
Digital Media available	"Images raster / digital photography"
Paper Archive recipient	Derbyshire Museum and Art Gallery and Derbyshire HER
Paper Contents	"Environmental"
Paper Media available	"Context sheet","Report"

Entered by	Elise McLellan (elise@archaeologicalresearchservices.com)
Entered on	18 August 2016

OASIS:

Please e-mail Historic England for OASIS help and advice