

A38 Derby Junctions

TR010022

Volume 6

**6.3 Environmental Statement
Appendices**

**Appendix 3.1: Alternative Options
Assessment - Kingsway**

Regulation 5(2)(a)

Planning Act 2008

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

April 2019

Infrastructure Planning

Planning Act 2008

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

A38 Derby Junctions
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6.3 Environmental Statement Appendices
Appendix 3.1: Alternative Options Assessment - Kingsway

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A38 Derby Junctions

**Alternative Options Assessment –
Kingsway**

**Report Number: 47071319-URS-06-RP-RD-014-3F
February 2016**

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EXECUTIVE SUMMARY

This report details the assessment of the alternative scheme options for the A38/A5111 Kingsway junction, as received during the public consultation. It sets out the options considered, provides cost estimates and assesses the options in terms of engineering, environmental and traffic/economic considerations.

General

Highways England (formally Highways Agency) intends to improve the three, existing, at-grade junctions on the A38 at Derby, namely the:

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

As part of the scheme development, Highways England held a non-statutory consultation exercise to

- Raise awareness and understanding of the need and rationale for the proposed junction improvements; and
- Obtain objective feedback to enable the scheme design to be refined and developed prior to statutory consultation in advance of Development Consent Order (DCO) application planned for 2017.

Scheme Proposals

The proposed improvements at Kingsway junction, as shown at the consultation events, involve the following key elements:

- Construction of the A38 in cutting through the existing junction at Kingsway, with construction of associated overbridge, slip roads, dumbbell roundabout junction with the following options to link the local road network:
 - Option K1 link to Greenwich Drive South;
 - Option K2 link to Kingsway Park Close; and
 - Option K3 no local access provided.
- Closure of the existing access from Brackensdale Avenue and Raleigh Street onto the A38

Consultation Feedback

The Kingsway junction layout presented at the consultation (the Presented Junction Layout) was generally well received (70% of respondents in agreement with the proposals), however, concerns raised by those opposed to the presented Kingsway option were the closure of existing local access routes onto the A38 and safety concerns regarding the proposed dumbbell roundabout arrangement. Options for connecting to the local network were presented along with the Presented Junction Layout (27% preferred Option K2 with 30% of respondents having no preference).

Options

As a result of the consultation feedback, which included some alternative options being suggested, an Alternative Options Assessment has been carried out. Given mixed feedback from the public consultation exercise, the assessment of options included options K1 and K2. Following an initial sifting exercise ("Initial Assessment"), several options were identified as warranting further examination:

- The Presented Junction Layout with Option K1;
- The Presented Junction Layout with Option K2; and
- Mr Jennison Option (With Option K1).

The last option listed was provided by a member of the public that had a specific interest in the impacts of the scheme on the A38; the option was enhanced by the project team to pass initial sifting by including a link to the local network and is essentially a variation on the Presented Junction Layout but with the eastern roundabout of the dumbbell junction omitted.

The alternative options were developed to 1:2500 scale to indicate the approximate dimensions of the embankment and cuttings and the locations of principal structures. From these layout plans, the engineering, environmental, traffic and economic advantages, disadvantages and constraints associated with the options were identified and cost estimates were developed. These, were used to evaluate and compare the options on a qualitative basis.

Comparison of Options

The results are summarised in the table below. Options were assessed and ranked in order of preference across a number of sub-headings for each other the themes: Cost, Engineering, Environment and Traffic and Economics. A ranking of 1 has been assigned to the best performing option.

Summary of Results	Presented Junction Layout with Option K1	Presented Junction Layout with Option K2	Mr Jennison Option (with Option K1)
Cost	1	2	1
Engineering	2	1	3
Environment	1	1	2
Traffic	2	1	3
Overall Ranking	2	1	3

The Presented Junction Layout with Option K2 has been shown as performing the best by comparison, providing better traffic solutions whilst minimising community severance. Environmental issues noted will, in the main, affect the construction period of the junction, these can be controlled and mitigated and will have no long term impacts for users and residents.

The option submitted by Mr Jennison with the addition of Option K1 has been shown to perform poorly in comparison, as it would impose a significant diversion for trips to and from Mackworth and would, therefore, have detrimental impacts to traffic and all users, including pedestrians on the local roads connecting to the junction.

Based on this assessment of the options and bearing in mind the limitations of the qualitative nature of the study, it is recommended that the Presented Junction Layout with Option K2 should be progressed as the preferred option for the A38/A5111 Kingsway junction.

1. INTRODUCTION

1.1. Scheme Introduction

1.1.1. The A38 is the strategic route from Birmingham to Derby and through to the M1 at Junction 28. It carries significant volumes of north-south long distance traffic. Where the A38 passes through Derby, significant volumes of traffic making local journeys cross, join and leave the A38 which disrupts, and is disrupted by, the strategic traffic. This results in congestion and delay at the three at-grade roundabout junctions, to the west and north of Derby City Centre. A location plan showing the position of the junctions is shown in Figure 1/1. The three junctions are:

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

Figure 1/1 – Junctions location plan



1.1.2. The free-flow of traffic on the A38 as it passes the west of Derby is currently constrained by the at-grade roundabout junctions at Kingsway, Markeaton and Little Eaton. Several proposals have been developed to address congestion at these junctions, most recently via the Government's 'Pinch Point' schemes, however these interim schemes were not intended to provide long-term relief from existing traffic congestion. As such, it has been identified that a grade-separated scheme on the A38 is still required.

1.1.3. The proposed A38 Derby Junctions scheme aims to improve economic competitiveness, the environment, journey time reliability and increase capacity; and to improve safety for both road users and non-motorised users.

1.2. Public Consultation

- 1.2.1. A non-statutory Public Consultation was carried out in February and March 2015. This included a two day exhibition in central Derby and supplementary exhibitions held in Breadsall, Little Eaton and Mackworth.
- 1.2.2. As a part of the consultation exercise, consultees were encouraged to indicate whether they were in favour of or against the scheme; to provide their comments on the scheme; and to provide suggestions for any alternative solutions.
- 1.2.3. All alternative scheme options, identified from a review of the consultation feedback, have been considered under a two-stage assessment process comprising:
 - an Initial Assessment as described below; and
 - all options passing the Initial Assessment were then subject to a more detailed assessment as detailed in this report.
- 1.2.4. The purpose of the Initial Assessment was to sift the alternative options to identify the better performing ones.
- 1.2.5. The Initial Assessment was a preliminary examination of each alternative option carried out based on the information provided by the consultee and it followed the Department for Transport's web-based Transport Analysis Guidance (WebTAG) - The Transport Appraisal Process¹. The assessment was against the following criteria:
 - Scheme objectives;
 - Deliverability; and
 - Feasibility.
- 1.2.6. Options had to achieve a baseline score against each of these criteria in order to pass the Initial Assessment. The assessment process and outcomes are described in more detail in the Technical Note 47071319-HE-02-TN-PM-001 and the Report on Public Consultation (47071319-URS-02-PCF-PM-009). The summary of the outcomes is contained in Appendix A.
- 1.2.7. The Initial Assessment included the options published for the public consultation to form a baseline. Options identified by the public were then compared to the relevant baselined published option, combination of options or the whole scheme, as appropriate.

1.3. Report Purpose

- 1.3.1. The purpose of this Options Assessment report is to provide a detailed review of the alternative options for the A38/A511 Kingsway junction which are deemed feasible and deliverable following the Initial Assessment and to recommend options to be progressed as part of the overall A38 Derby Junctions scheme.

¹ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/370529/webtag-tag-transport-appraisal-process.pdf

1.4. Document Structure

1.4.1. This Options Assessment Report structure is based upon TD37/93 Stage 2 Assessment Report and is structured as follows:

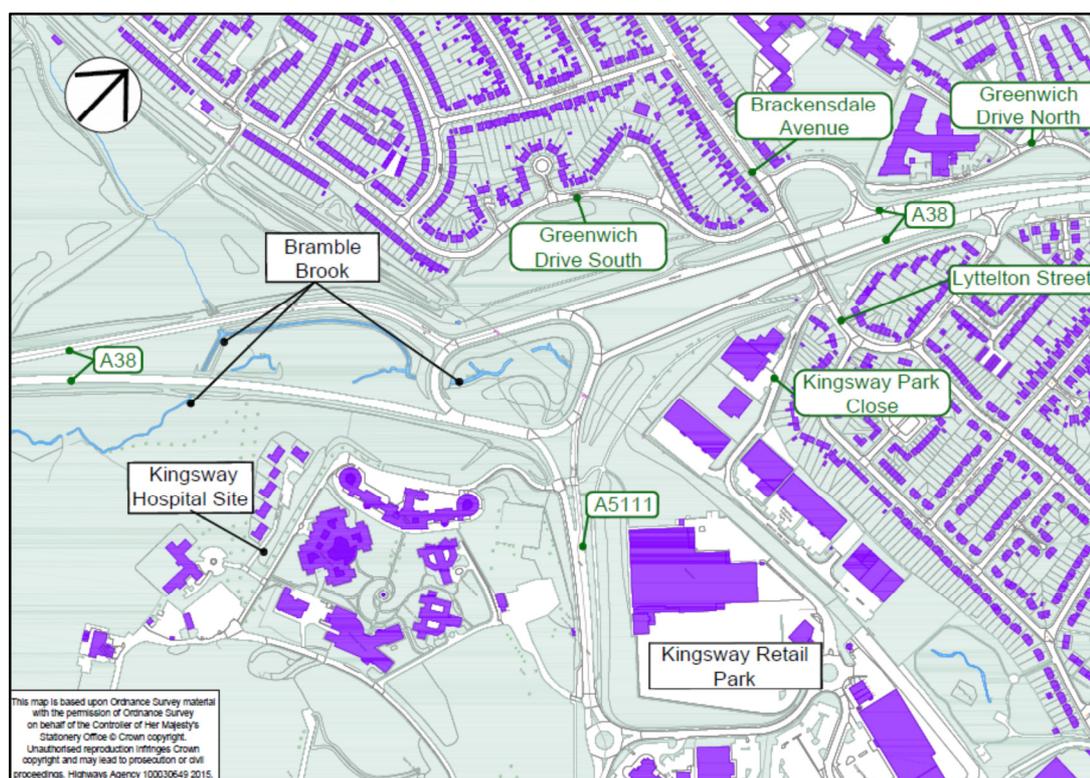
- Section 1** provides an introduction to the scheme and a brief background to its development
- Section 2** provides details on the existing conditions of the junction.
- Section 3** provides details on the alternative options assessed.
- Section 4** provides the cost estimates and comparisons of each of the junction options.
- Section 5** outlines the methodology used for engineering assessment and provides an engineering assessment of each of the junction options.
- Section 6** outlines the methodology used for the qualitative environmental assessment and provides a qualitative environmental assessment of each of the junction options
- Section 7** outlines the methodology used for the qualitative traffic and economic assessment and provides a qualitative traffic and economic assessment of each of the junction options
- Section 8** provides a summarised comparison of the proposed options.
- Section 9** provides recommendations for junction options to be progressed further.

2. EXISTING CONDITIONS

2.1. General

- 2.1.1. The A38/A5111 Kingsway junction is situated to the west of the city. At the roundabout the A38 dual carriageways to the north and south of the junction are separated by wide central reserves and the A5111 is a single carriageway to the east. The roundabout has a fall from north to south of approximately 2m.

Figure 2/1 – Existing Junction



- 2.1.2. To the northwest there is the Mackworth housing estate and to the northeast are light industrial units in front of further housing. The area to the southwest is open grassland that is designated in the Derby City Local Plan as Public Open Space. To the south east of the junction is the Kingsway Hospital site, part of the land is being developed into residential properties. The Kingsway Retail Park roundabout (A5111) is to be altered to provide access to this site.
- 2.1.3. To the north of the junction, there are existing left off/left on junctions in each direction of the A38 providing access to Mackworth via Brackensdale Avenue to the west and Lyttelton Street to the east. This section of the A38 is subject to a 40mph speed restriction which becomes the national speed limit to the south of the existing Kingsway roundabout.
- 2.1.4. To the east, the A5111 carriageway is separated by a large splitter island and is also subject to a 40mph speed limit.

-
- 2.1.5. The centre of the Kingsway junction roundabout and the land between the A38 carriageways to the south of the roundabout are designated in the City of Derby Local Plan as areas of High Natural History Value. The roundabout is transected by the line of the disused Mickleover Railway Line, which runs east/west and is designated by Derby City as a Local Wildlife Site. Historical information has revealed that the old railway bridge was not demolished but is partially buried in the Kingsway junction embankments to the northeast outer edge of the roundabout.
- 2.1.6. Bramble Brook also transects the roundabout, being culverted beneath the existing embankments and in open channel to the south and in the centre of the roundabout. To the east the brook flows in culvert for a considerable distance along the south edge of the abandoned railway line. The open sections of the brook are designated by Derby City as the Bramble Brook Local Wildlife Site.

3. PROPOSED JUNCTION OPTIONS

3.1. The Presented Junction Layout with Option K1

- 3.1.1. The layout of this option is shown on drawing HA514503-URS-06-DR-GD-25.035 contained in Appendix B.
- 3.1.2. Following an initial review of grade separation junction options in early 2003, this option was presented at a public consultation. In February 2015 the scheme was presented at public consultation to refresh and update public knowledge.
- 3.1.3. This solution provides full grade separation (two levels) of the junction; the proposed alignment is within the existing A38 corridor with the existing A38 carriageways retained to form the new junction slip roads.
- 3.1.4. As a result of closing the existing local access routes to and from Brackensdale Avenue and Raleigh Street, Option K1 was developed to ensure access for residents in the Mackworth area is maintained to Brackensdale Avenue. K1 provides local access via Greenwich Drive South. The proposed link runs north-west of the west roundabout and is to be constructed partly at grade and partly on embankment.

3.2. The Presented Junction Layout with Option K2

- 3.2.1. The layout of this option is shown on drawing HA514503-URS-06-DR-GD-25.010 contained in Appendix B.
- 3.2.2. This option is essentially the same as the Presented Junction Layout with Option K1 but with the following variant for provision of local access.
- 3.2.3. Option K2 was developed as an alternative means of ensuring local access for residents in the Mackworth area is maintained. It would also provide the Kingsway industrial park with direct access to the strategic road network, reducing journey times. K2 provides local access via Kingsway Park Close. The proposed link passes at-grade behind the existing Kingsway Retail Park and in cutting across a historic landfill site and dismantled railway.

3.3. Mr Jennison Option (with Option K1)

- 3.3.1. The layout of this option is shown on drawing HA514503-URS-06-DR-GD-25.033 contained in Appendix B – the layout is based on a sketch provided by Mr Jennison and modified as necessary to meet certain minimum design criteria so that it could be compared on a like-for-like basis with the other options. The provided sketch is included in Appendix C.
- 3.3.2. The solution provides full grade separation (two level) of the junctions. The proposed alignment is within the existing A38 corridor with the existing A38 carriageway being retained to form the new junction slip roads.
- 3.3.3. The solution is a variant of the Presented Junction Layout, replacing the east roundabout, originally accommodating A38 southbound and Kingsway traffic movement, with a merge and a diverge slip road from and to the A38 southbound.
- 3.3.4. As a result of removing the east roundabout, all turning movements are not catered for. This means traffic leaving the A38 southbound and traffic from Greenwich Drive South wishing to travel southbound on the A38 would need to travel on Kingsway and perform a U-turn at the Kingsway Retail Park roundabout. Due to the junction arrangement of this proposal, there is no mitigation available for this issue.

- 3.3.5. It should be noted that the original option proposed by Mr Jennison did not include provision for local access to Mackworth. Consequently the option was deemed to be undeliverable during the Initial Assessment (see Appendix A). As a result the option has been amended by the project team to accommodate the K1 local access route. Due to the removal of the eastern roundabout it was not possible to accommodate the local access option K2.

4. COST ESTIMATE

4.1. Data Used

- 4.1.1. All of the options for Kingsway junction are, essentially, relatively minor variants to the scheme presented at the public consultation exhibition held in February 2015. It has not been necessary, therefore, to provide an updated detailed estimate of the total cost of the junction improvement as this assessment is concerned with the relative differences in the costs of each of the alternatives. The forecast cost of the whole of Kingsway junction improvement is in the order of £46m.
- 4.1.2. A District Valuer's estimate was used to price land take and Statutory Undertakers estimates were used to price the Statutory Undertakers costs. Elements of cost not priced with current data were Preliminaries, Employer's Agent costs and Risk. These elements were all derived on a pro rata basis from the last approved estimate produced in 2014. Programme Risk and Inflation were also applied based on the proportion of cost associated with the previous approved estimate.

4.2. Cost Comparison of Options K1 and K2

- 4.2.1. The cost estimate was prepared by taking off the major quantities from the layout drawings prepared for each option. A schedule of activities was created and then priced using Highways England's cost estimating database.

Table 4/1 – K1/K2 cost comparison

	K1	K2
Pre-Construction Design (PCF Stages 2 to 5)	30,000	105,000
Land	30,000	55,000
Indirect Cost	65,000	150,000
Direct Cost	255,000	586,287
Preparation and Supervision	35,000	115,000
Stats, LA Costs	10,000	45,000
NRVAT	20,000	185,000
Total Base Cost	445,000	1,241,287
Project Risk	0	0
Inflation	98,000	273,240
Programme Risk	41,948	117,100
Total Outturn	584,948	1,631,627

- 4.2.2. The higher costs to deliver Option K2 are principally related to the associated costs of design and construction of the link across the existing landfill site with an allowance for the potential removal of contaminated material and treatment of material left insitu. Additionally, Option K2 is a longer link so there is an increase in the basic cost of delivering it and the associated land that is required.

4.3. Mr Jennison Option (with Option K1)

- 4.3.1. A detailed estimate of this option has not been carried out but it is likely that the cost of this will be very similar to that for the Presented Junction Layout with Option K1 (any difference would be likely to be less than 5%). There are likely to be a small reduction in the roadworks construction element due to the Presented Junction Layout having a dumbbell arrangement with two roundabouts and this option eliminates one of these roundabouts. This is likely to be offset, however, by the likely need for some traffic management (e.g. temporary traffic lights) in order to manage the traffic flows during construction of this option.

4.4. Cost Comparison

- 4.4.1. The options considered by this report form only part of the proposed Kingsway junction, any variations in the estimated costs between these options are in the order of 1 to 3.5% of the overall delivery costs for this junction. As such the cost element should not be the deciding factor in influencing option choice.

5. ENGINEERING ASSESSMENT

5.1. Introduction

- 5.1.1. The engineering assessment has been undertaken on the options based upon the engineering aspects of the approach equivalent to a Stage 2 Assessment detailed in TD 37/93, Scheme Assessment Reporting, of the Design Manual for Roads and Bridges (DMRB) Volume 5.

5.2. Methodology

- 5.2.1. Each of the scheme options has been sufficiently developed to indicate the approximate dimensions of the embankments, cuttings and the locations of principal structures. These and other engineering characteristics are reported on, drawing attention to significant differences between the scheme options.
- 5.2.2. Each junction option is, as far as possible, assessed for compliance with standards. An assessment table has been prepared and a preferred option, in engineering terms has been selected by ranking the options.
- 5.2.3. The results of the Engineering Assessment for each of the engineering characteristics are summarised in Table 5/1 at the end of this section.

5.3. Topography and Land Use

- 5.3.1. All the land lies within the corridor of the A38 and predominantly within the suburban area to the south west of Derby City centre.
- 5.3.2. The land is largely flat with the A5111 rising away from the existing junction to the east. A short section of the A38 lies on embankment north of the junction to where it crosses Brackensdale Avenue before the surrounding ground rises to match the road level.
- 5.3.3. The land to the immediate west and south west is public open space, separating the A38 from residential housing. To the south east of the junction is the Kingsway Hospital site, to the east is the Kingsway Retail Park accessed via the A5111. To the immediate north east corner is Kingsway Park Close Industrial Estate with more residential properties north of the estate.
- 5.3.4. The area of land that lies between the north and southbound carriageways to the south and the centre of the Kingsway Island accommodates the Bramble Brook river bed and is designated as a Local Wildlife Site.
- 5.3.5. The existing Kingsway junction is sited over a disused rail cutting running east/west. The cutting remains to the west of the A38, however the cutting to the east and the land between the cutting and the A5111 is a former landfill site on which the Kingsway Retail Park is located.

5.4. Constraints

- 5.4.1. There are a number of important and influential constraints to be overcome and/or be considered in the formulation of any design solution associated with the Kingsway junction Improvement. These are summarised in the following paragraphs.
- 5.4.2. The Kingsway Hospital site immediately to the southwest of the junction forms the main boundary restriction to the junction.

5.4.3. Bramble Brook water course runs between the existing north and southbound carriageways, through the centre of the existing junction before discharging through a long culvert past the Kingsway Retail Park. The area of land within the existing junction is currently used to attenuate water during storm/flood events. The control of this water will impact the main carriageway levels, junction roundabouts and overbridge.

5.4.4. The underbridges at Brackensdale Avenue are to remain insitu maintaining the east-west link under the A38 for local traffic.

5.5. Structures

5.5.1. The alternative options presented in this report have no impacts upon existing structures, or proposed or generate additional requirements for further structures to be constructed.

5.6. Design Standards

5.6.1. The layouts considered during the development of the options were produced to Highways Agency Standards and Advice Notes, in particular:

- TD 9/93, Highway Link Design;
- TD 27/05, Cross Sections and Headroom;
- TD 22/06, Layout of Grade Separated Junctions; and
- TD 16/07, Geometric Design of Roundabouts.

5.6.2. In each of the options assessed below, the proposals for the A38 mainline carriageway remains the same. This Options Report is the assessment of the junction arrangements and their connection to the local road network.

5.7. Geometry

5.7.1. Journey times and construction costs are a function of the carriageway length of the various elements making up the layout of the junction; journey times are also affected by the driving speed that the alignment and speed limits will safely permit

5.7.2. The Presented Junction Layout with Option K1

5.7.2.1 The proposed link to Greenwich Drive South connects Kingsway junction directly to Brackensdale Avenue. Access to Mackworth will be along the remaining half of Greenwich Drive South via a T-Junction sited on the curve of the new link road.

5.7.2.2 The new link consists of a single 50m radius curve, whilst this is less than the minimum 90m curve for a 50kph design speed, such curves are normally acceptable on local road networks. A 30mph speed limit would be applied to the link as this matches the existing limit applied to Greenwich Drive South. However, the Stopping Sight Distance to low object height is two steps below desirable minimum for the eastbound approach to the A38 Junction.

5.7.3. The Presented Junction Layout with Option K2

5.7.3.1 The link to Kingsway Park Close will be a continuation of the existing road, where the link is made a T-Junction will provide access to the remainder of the close.

5.7.3.2 The new link has a 70m radius curve applied, whilst this is less than the minimum 90m curve for a 50kph design speed, such curves are normally acceptable on local road networks. A 30mph speed limit would be applied to the link as this matches the existing limit applied to Kingsway Park Close with the desirable minimum Stopping Sight Distance achieved.

5.7.4. **Mr Jennison Option (with Option K1)**

5.7.4.1 This option utilises the same link to Greenwich Drive South as the Presented Junction Layout with Option K1.

5.7.4.2 The main difference provided by this option is the replacement of the eastern roundabout with merge and diverge links to the A38 southbound slip roads.

5.7.4.3 The proposed link roads for the A38 southbound diverge to the A5111 and the A5111 merge to the A38 southbound carriageway are designed with 90m radius curves. The existing speed on the A5111 is 40mph, a design speed of 60kph is applicable to the slip roads. The 90m radius curves are three steps below the desirable minimum (255m) and as such are a relaxation from the standards. However, the southbound merge slip is subject to a stopping sight distance reduction, this in combination with the horizontal curvature relaxations is a departure from standards. To mitigate such a departure, verge widening with an associated retaining wall would be required along the boundary to the Kingsway Hospital Site and a speed limit of 40mph could be applied to the slip roads.

5.7.5. **Geometry Summary**

5.7.5.1 In terms of geometry, the Presented Junction Layout with Option K2 ranks the best with the Mr Jennison Option ranking the lowest. Option K2 has the best alignment thus allowing the existing speed limits to be applied to the junction and connector roads. Option K2 connects to an existing industrial estate thus minimising the impact to residential properties.

5.8. **Public Utilities**

5.8.1. The following services would need to be diverted or protected as a part of the scheme proposals for the mainline through the junction. Severn Trent Water (Sewers), Western Power Distribution (11kv and 33kv), GTC High Voltage (HV) cable (to be adopted by WPD) and BT apparatus pass through the centre of the existing roundabout and the central median north of the junction.

5.8.2. **The Presented Junction Layout with Option K1**

5.8.2.1 For this option the connection to Greenwich Drive South would require diversion or protection of apparatus from Western Power (11kv and 33kv), GTC HV cable and BT. The diversions to Western Power (11kv and 33kv) and the GTC HV cable would be extensions of the diversion works required where they pass under the proposed mainline.

5.8.3. **The Presented Junction Layout with Option K2**

5.8.3.1 For this option, the connection to Kingsway Park Close, a number of utilities run along the edge of the highway boundary, all of these would require localised diversions or protection. In this location, the existing services present are Severn Trent Water (Trunk Main and Sewers), two BT cables, National Grid (medium pressure main) and Western Power (11kv and 2No 132kv)

5.8.3.2 Where the new link connects to Kingsway Park Close localised diversions and protection works are required to Western Power (11kv, LV cables and 33kv), Severn Trent Water (Sewers) and National Grid (low pressure connections).

5.8.4. **Mr Jennison Option (with Option K1)**

5.8.4.1 This option has the same impact on the Utilities as The Presented Junction Layout with Option K1.

5.8.5. **Public Utilities Summary**

5.8.5.1 The Presented Junction Layout with Option K2 ranks the lowest due to the additional work required to divert or protect the services crossed by the local access link. The Presented Junction Layout with Option K1 and the Mr Jennison Option rank equally.

5.9. **Non-Motorised User (NMU) Provision**

5.9.1. For all identified NMU routes refer to the NMU Context Report (report ref. 47071319-URS-06-RP-RD-001).

5.9.2. **The Presented Junction Layout with Option K1**

5.9.2.1 The introduction of the link connecting Greenwich Drive South will create a new NMU desire line for Mackworth residents wishing to access the Kingsway Retail Park. This new route will require controlled crossing points across the junction.

5.9.2.2 The connecting link severs two key NMU routes, National Cycle Route 54 and the Local Strategic Route that circulates Derby. A further proposed local route would become severed by this connection. Therefore, a short diversion to create an “at grade” crossing point close to the existing Greenwich Drive South route would be required to maintain these routes. The outcome from the traffic modelling will be used to determine if a controlled or uncontrolled crossing is required.

5.9.2.3 The resulting increase in traffic and introduction of HGVs on Greenwich Drive South has negative effects with regard to NMU safety. Following feedback from the public consultation, the area of Public Open Space reportedly is regularly used by children and dog walkers and there is equipment present for the sole use of ball games. The existing traffic conditions on the road are typically quiet and low speed, the proposed connection will have a severing effect upon this space.

5.9.3. **The Presented Junction Layout with Option K2**

5.9.3.1 The introduction of the link connecting Kingsway Park Close will create a new NMU desire line from Lyttelton Street for residents wishing to access the Kingsway Retail Park. The new connection bisects an existing footway/cycleway route. An “at grade” crossing point will be provided at this point.

5.9.4. **Mr Jennison Option (with Option K1)**

5.9.4.1 This option would retain identified NMU routes with exception of the following comments.

5.9.4.2 This option would generate the same new NMU desire line for Mackworth residents wishing to access the Kingsway Retail Park as the Presented Junction Layout with Option K1. However, the proposed link road arrangement connecting the A38 to the A5111 on the eastern side of the junction, makes this route less desirable.

5.9.4.3 This option utilises the same link to Greenwich Drive South as the Presented Junction Layout with Option K1 and as such has the same impacts upon NMUs (see 5.9.2).

5.9.4.4 The toucan crossing that forms part of the conditions related to the housing development on the Kingsway Hospital site, as an improvement to an existing crossing point of the A5111 approximately 70m from the Kingsway junction will not be possible to retain with the proposed junction arrangement.

5.9.5. **NMU Summary**

5.9.5.1 Option K2 maintains existing routes in the area with the addition of NMU provision along the link. This option minimises any severance that would be caused by additional traffic. Hence, for NMUs, Option K2 ranks the highest with Mr Jennison Option ranking low due to the numerous reasons given above.

5.10. **Drainage**

5.10.1. The proposed A38 mainline passes through the current flood storage within the existing Kingsway junction. The three junction options will generate similar additional surface water outfall; attenuation may be required to deal with the additional carriageway surface water runoff and compensatory storage is likely to be required for loss of the flood storage area. This may require additional land to locate these facilities and licences to make improvements along outfall watercourses.

5.10.2. Bramble Brook watercourse passes through the centre of the junction. There are existing culverts which may need to be extended. The open sections of the watercourse will need to be diverted culverted as appropriate. The engineering aspects of this work are not considered to cause any major difficulties.

5.10.3. Due consideration will need to be made of the impacts on the flood storage and flood risk in this area. This is assessed in the Environmental Assessment section of this report (refer to section 6).

5.10.4. All options are considered to be of equal ranking for drainage.

5.11. **Geotechnics**

5.11.1. The Presented Junction Layout with Option K1 and the Mr Jennison Option (with Option K1) generally utilises the same existing or proposed earthworks.

5.11.2. **Ground Conditions**

5.11.2.1 In general the ground conditions in the vicinity of the link are anticipated to comprise topsoil and existing road embankment construction underlain by Mercia Mudstone.

5.11.2.2 Groundwater levels maybe near the surface towards the northern extent of the link.

5.11.2.3 Option K1 has a section of proposed embankment that may be located over a dismantled railway cutting, which was subsequently used as a landfill site to receive inert waste. It is anticipated that there may be soft, compressible and contaminated material

5.11.2.4 Option K2 has a strip of potentially soft and compressible alluvium intercepting the northern extent of the link. In addition there may be soft material, remnants and potential contamination associated with the dismantled railway. A fault is inferred to be located to the north of the link.

5.11.2.5 A proportion of the Option K2 link is located within the recorded extent of a landfill site at the Kingsway Retail Park. The types of waste recorded to have been deposited at the site include inert, industrial, commercial, household and special wastes. Gas venting points are located within the landfill.

5.11.3. **Earthworks Option K1**

5.11.3.1 Embankments are proposed to be constructed primarily from site won general fill material.

5.11.3.2 Due to the presence of potentially soft and compressible infill to the dismantled railway cutting, ground treatment may be necessary to provide suitable founding conditions for the embankment and reduce post-construction settlement. This may comprise removal or in-situ compaction of the waste material. Excavated contaminated material and leachate is likely to require treatment and / or off-site disposal. A granular starter layer is proposed to provide a suitable construction platform for the embankment. Post-construction gas and groundwater monitoring is anticipated to be required.

5.11.4. **Earthworks Option K2**

5.11.4.1 In the section where the cutting is to be excavated through the landfill site, a liner system including gas venting is proposed to segregate the road and drainage construction from landfill material. It is likely that temporary land take will be required to construct the liner system. Excavated contaminated material and leachate is likely to require treatment and / or off-site disposal. Post-construction gas and groundwater / leachate monitoring is anticipated to be required.

5.11.4.2 Due to the potentially soft and compressible alluvium, fault disturbed material and artefacts of the dismantled railway towards the northern extent of the link, excavation and replacement would be necessary to provide a stable carriageway foundation, along with treatment and / or off-site disposal of contaminated material.

5.11.5. **Geotechnics summary**

5.11.5.1 The disbenefit of Option K2 is the requirement to excavate through the deposited materials and to install a liner system including gas venting to segregate the road and drainage construction from landfill material. In term of the geotechnical work, both Option K1 and the Mr Jennison Option rank equal first. The additional landfill works rank Option K2 lower.

5.12. **Departures and Relaxations**

5.12.1. **The Presented Junction Layout with Option K1**

5.12.1.1 The most significant Departures from Standards that are likely to be required specifically for this Option as part of the junction are:

- Forward visibility to low object height is two steps below desirable for the eastbound approach to the junction along the new link from Greenwich Drive South; and
- Horizontal curve (50m) below minimum (90m) for 50kph design speed.

5.12.2. **The Presented Junction Layout with Option K2**

5.12.2.1 The most significant Relaxations to Standards that are likely to be required specifically for this Option as part of the Junction are:

- Horizontal curve (70m) below minimum (90m) for 50kph design speed.

5.12.3. **Mr Jennison Option (with Option K1)**

5.12.3.1 The most significant Departures from Standards that are likely to be required are the same as for Option K1 plus the additional issues list below:

- Substandard curves applied to A38 southbound diverge and merge slip roads to maximise use of existing carriageway. 90m Radius. 30mph speed limit to be applied to slip roads with additional advisory signing to mitigate; and
- Horizontal curve (50m) below minimum (90m) for 50kph design speed.

5.12.4. Departures and Relaxations Summary

5.12.4.1 The link to Greenwich Drive South requires a Departure from Standards due to the reduced Stopping Sight Distance to the junction approach. Option K2 utilises Relaxations to Standards without compounding factors requiring Departures from Standard. The Mr Jennison Option requires further Departures to those for Option K1 so this ranks the lowest and Option K2 as the highest.

5.13. Construction Phasing

5.13.1. Both Option K1 and K2 would be subject to the same construction phasing as the mainline A38. Construction of the local accesses would be offline.

5.13.2. A construction sequence with three phases has been envisaged for this option. Construction of all those works off-line would be carried out in the first phase with traffic maintained along existing carriageways. The junction overbridge and two roundabouts will be constructed. For Option K1 the link to Greenwich Drive South would be completed or for Option K2 the link to Kingsway Park Close to be completed, before switching traffic for Phase 2.

5.13.3. Phase 2 of the works will be switch traffic onto the new junction and the existing accesses to Brackensdale Avenue and Lyttelton Street permanently closed. Construction completed of the mainline in the areas of the existing junction either side of the new bridge.

5.13.4. Phase 3 sees traffic on the new alignment with minor completion of outstanding work.

5.13.5. The Mr Jennison Option (with Option K1) presents additional challenges during construction and is subject to additional work and phasing and is detailed as follows.

5.13.6. A construction sequence with four phases has been envisaged to better handle traffic through the works. Construction of all those works off-line would be carried out in the first phase with traffic maintained along existing carriageways. The junction overbridge will be constructed with the roundabout partially constructed, temporary signalled junctions to be constructed at each end of the new bridge. The link to Greenwich Drive South will be completed but will remain closed to traffic for phase two.

5.13.7. Phase 2 of the works traffic will remain on the existing A38 and continue using the existing accesses to Brackensdale Avenue and Lyttelton Street, the temporary signals will operate across the bridge to permit A5111 to A38 northbound traffic. The right turn from A38 northbound to A5111 will be prohibited. Construction will complete the mainline in the areas of the existing junction either side of the new bridge.

5.13.8. Phase 3 will see the A38 mainline opened to traffic. Work to complete the roundabout and fully open the Greenwich Drive South link. The accesses to Brackensdale Avenue and Lyttelton Street permanently closed. Work to alter the existing A38/A5111 into slip link road merge and diverge. The junction overbridge will remain closed avoiding traffic conflict.

5.13.9. Phase 4 sees traffic on the new alignment with minor completion of outstanding work.

5.14. Construction Programme

5.14.1. A potential construction programme has been developed for the Presented Junction Layout which includes either Option K1 or K2. It is considered that the Mr Jennison Option would have a similar construction duration to Options K1 and K2. However, it is anticipated that due to the additional temporary works, including temporary traffic signals, to minimise the use of diversion routes during construction and additional phasing of the works, there is a likelihood of a nominal increase to the duration by comparison, therefore, the Mr Jennison Option ranks lowest for construction phasing with Options K1 and K2 ranked equally.

5.14.2. Although additional remediation work would be required for the landfill area over which local access K2 crosses, this is expected to be conducted within the duration of the main A38 works.

5.15. Comparison Matrix

Table 5/1 Comparison Matrix of the Significance of Potential Effects of all the considered Options

	Presented Junction Layout with Option K1	Presented Junction Layout with Option K2	Mr Jennison Option (with Option K1)
Geometry	2	1	3
	Option K2 has the best alignment thus allowing the existing speed limits to be applied to the junction and connector roads. Option K2 connects to an existing industrial estate thus minimising the impact to residential properties.		
Public Utilities	1	2	1
	Option K2 is considered the worst as the link crosses additional Statutory Undertakers apparatus.		
NMU Provision	2	1	3
	Option K2 maintains existing routes in the area with the addition of a NMU provision along the link. This option minimises any severance that would be caused by additional traffic.		
Drainage	1	1	1
	All options would require diversions of local watercourses and would all involve construction in the flood storage area so would all require similar mitigation. All have therefore been scored equally in this aspect.		
Geotechnics	1	2	1
	An existing land fill site along the line of the disused rail line impacts upon all the options, the excavation and replacement would be necessary to provide a stable carriageway foundation including treatment and / or off-site disposal of contaminated material. The disbenefit of Option K2 is the requirement to excavate through the deposited materials and install a liner system including gas venting is proposed to segregate the road and drainage construction from landfill material.		
Departures and Relaxations	2	1	3
	The link to Greenwich Drive South requires a Departure from Standards due to the reduced Stopping Sight Distance to the junction approach. Option K2 utilises Relaxations to Standards without compounding factors requiring Departures from Standard.		
Construction Phasing	1	1	2
	The Mr Jennison Option will require an additional phase to the construction works to enable the continual flow of traffic through the junction during the works. Additional temporary works, including temporary traffic signals, to minimise the use of diversion routes during construction. The choice of local access option does not affect the construction sequence or programme.		

Note: The scoring of each option is based upon how each element is ranked. The elements are ranked in order of performance 1 to 3. A score of 1 is given to the highest performing option.

5.16. Limitations

5.16.1. The following limitations are noted with regard to the qualitative assessment as presented above:

- **Geometry:** The design of Options K2 and the Mr Jennison Option have not been developed in as much detail as the Presented Junction Layout with Option K1. A basic model was developed which allowed outline estimates of earthworks quantities to be obtained and the fundamental geometric parameters (horizontal and vertical curves, sight stopping distances) to be assessed for compliance with standards;
- **Geotechnics:** No detailed ground information is available for any of the options. The assessments have been carried out based on historic data and available geological mapping. A ground investigation is planned for 2016 from which more up-to-date and more detailed information will become available;
- **Departures from Standards:** For all options, assessment of requirements of numbers of traffic lanes on main line and slip roads and slip road merge and diverge taper types have all been based on the traffic model developed in 2005; and
- **Construction Phasing:** A construction phasing sequence and a construction programme has been developed for the Presented Junction Layout with either Option K1 or K2 applied. For the Mr Jennison Option an assessment has been made of the likely changes that would be required when compared with the sequencing and programme developed for the Presented Junction Layout.

6. ENVIRONMENTAL ASSESSMENT

6.1. Introduction

6.1.1. This section of the report provides a qualitative assessment of the potential environmental impacts as associated with the Presented Junction Layout followed by a comparison of those impacts that are anticipated to occur as associated with the alternative options as detailed above in Section 3.

6.2. Methodology

6.2.1. In accordance with the Design Manual for Roads and Bridges (DMRB) Volume 11 Environmental Assessment and associated guidance, this qualitative environmental assessment has considered the following environmental disciplines:

- Air Quality;
- Archaeology and Cultural Heritage;
- Landscape and Visual Impacts;
- Nature Conservation;
- Geology and Soils;
- Materials;
- Noise and Vibration;
- Effects on All Travellers;
- Community and Private Assets; and
- Road Drainage and the Water Environment (including flood risk).

6.2.2. The qualitative assessment considers the potential impacts and effects as associated with the Presented Junction Layout with Option K1 the Presented Junction Layout with Option K2, and the Mr Jennison Option (with Option K1). The assessment includes a qualitative scoring of potential effect significance such as the following:

- Neutral/ negligible;
- Slight adverse/ beneficial;
- Moderate adverse/ beneficial;
- Large adverse/ beneficial; and
- Very large adverse/ beneficial.

6.2.3. It is noted that some assessments such as air quality, landscape and visual impacts and noise and vibration, focus upon potential operational phase effects, given that construction phase effects are temporary and can largely be managed by best-practice construction methods. In addition, some of the assessments focus upon the specific impacts and effects of the Option K1 and K2 accesses, whilst for others the effects of these access options are considered in combination with the effects of the wider junction development proposals.

6.2.4. The findings of the qualitative environmental assessment are presented in Table 6.1 for easy comparison. Assumptions and limitations as associated with the assessment are detailed in Section 6.7.

6.3. Presented Junction Layout with Option K1

6.3.1. Air Quality

- 6.3.1.1 Potentially air quality sensitive receptors in the vicinity of Kingsway junction include the Kingsway Hospital site to the south-east, the residential area of Mackworth to the west and New Zealand to the east. A new housing development is proposed at the Kingsway Hospital site, whilst there are other ongoing developments in the area (such as redevelopment of Mackworth College site). The closest residential properties to the west of the existing Kingsway junction are located on Greenwich Drive South. To the north-east of the junction the closest buildings are industrial/commercial in nature on Kingsway Park Close (which are not considered to be sensitive to changes in air quality). Residential properties in the New Zealand area of Derby back onto the eastern side of Kingsway Park Close, beyond the industrial buildings. The retail park to the west of the existing junction is not considered to be sensitive to changes in air quality. This area is not designated as an air quality management area (AQMA), although there is an AQMA on the Derby Inner ring road. The closest points to the Presented Junction Layout with Option K1 are on the A5111 (Kingsway, Manor Road, Warwick Avenue), A516 (Uttoxeter New Road) and A52 (Ashbourne Road, east of Uttoxeter Old Road).
- 6.3.1.2 Annual mean concentrations of nitrogen dioxide (NO₂) are anticipated to be elevated close to the objective value² at receptors in close proximity to the existing A38 (e.g. on Raleigh Street and Thorncroft Close). For receptors set further back from the A38, annual mean concentrations are anticipated to be lower (e.g. on Greenwich Drive South and Cheviot Street (backing onto Kingsway Park Close)).
- 6.3.1.3 The Presented Junction Layout with Option K1 includes the re-alignment of the A38 mainline into a cutting through Kingsway junction, away from sensitive receptors on both sides of the scheme. The new slip roads follow a similar alignment to the current A38, and would carry considerably less traffic than in the current existing situation. Accesses to the A38 at Brackensdale Avenue and Raleigh Street would be closed with the Presented Junction Layout with Option K1, reducing the number of vehicle movements close to sensitive receptors near these access roads.
- 6.3.1.4 The new eastern roundabout at the revised Kingsway junction would be in the vicinity of the north-west corner of the Kingsway Hospital site, industrial buildings on Kingsway Park Close and the Kingsway Retail Park. The new eastern roundabout would not substantially change the proximity of these buildings to traffic at the junction. The new western roundabout would incorporate a new link onto Greenwich Drive South which would form a new access on/ off the A38 into Mackworth. Greenwich Drive South is currently a minor residential road - therefore, a large increase in traffic flows is likely on this section of road between the new western roundabout and Brackensdale Avenue. Smaller traffic flow increases would be likely on other minor local roads as traffic using the new access disperses through the residential areas of Mackworth and New Zealand.

² The Air Quality Objectives are policy targets generally expressed as a maximum ambient concentration to be achieved, either without exception or with a permitted number of exceedences, within a specified timescale. The Objectives are set out in the UK Government's Air Quality Strategy for key air pollutants.

6.3.1.5 On the basis of the above, the area of the Presented Junction Layout with Option K1 around the Kingsway junction is considered to have lower air quality risks than areas closer to the mainline to the north. Whilst air quality along local roads in Mackworth (including along Greenwich Drive South) may deteriorate due to traffic increases, anticipated air quality concentrations would be well below applicable air quality objectives such that significant air quality impacts in this area are unlikely. Similarly, as receptors south of the new Kingsway junction would be set back from the new mainline A38 and new junction, significant air quality adverse effects in this area are not anticipated. The Presented Junction Layout with Option K1 has a higher risk of significant air quality effects to the north of the junction, where sensitive receptors would be in close proximity to the A38. Overall, the impact of the Presented Junction Layout with Option K1 on air quality is anticipated to be slight adverse.

6.3.2. **Archaeology and Cultural Heritage**

6.3.2.1 The Presented Junction Layout with Option K1 would not have any impacts (including setting impacts) upon any designated cultural heritage assets (see Figure 6.1 in Appendix D).

6.3.2.2 The introduction of the proposed new infrastructure (new bridge, embankments and road structures) would impact the setting of the non-designated 1930's Kingsway House. However, the significance of the potential effect on this asset would be neutral.

6.3.2.3 Previous A38 development at Kingsway junction would have destroyed other non-designated assets that are recorded on the historic environment record - including the route of the former Great Northern Railway line (Derbyshire and North Staffordshire Extension) and the former Thornhill Park. There is the potential that unknown deeply stratified palaeo-environmental deposits that are of archaeological interest may be impacted by the Presented Junction Layout with Option K1 during the construction of the mainline cutting. The potential effect upon such palaeo-environmental deposits would be neutral, as this resource is likely to extend beyond the footprint of the Presented Junction Layout with Option K1.

6.3.2.4 Overall, the effect of the Presented Junction Layout with Option K1 on archaeology and cultural heritage is anticipated to be neutral, and thus not significant.

6.3.3. **Landscape and Visual Impacts**

6.3.3.1 Option K1 would cut across an area of Public Open Space and join Greenwich Drive South adjacent to the Mackworth Estate Townscape Character Area (TCA). The Mackworth Estate TCA comprises a 1950s housing estate with semi-detached housing and forms the main visual receptor of the proposed Option K1, along with users of both the Public Open Space and National Cycle Route 54.

6.3.3.2 Option K1 would thus result in the loss of Public Open Space (approximately 2,000 m²) and severe linkages between areas of Public Open Space to the north and south of the Option K1 access. It is anticipated that the partial loss of this Public Open Space and increased highway infrastructure would result in a slight adverse effect on landscape character specifically due to Option K1.

6.3.3.3 Option K1 would result in increased visibility of Kingsway junction from adjacent properties and along National Cycle Route 54 due to the raised nature of the junction and the access onto Greenwich Drive South. This would be exacerbated by the loss of vegetation to facilitate the junction as this vegetation currently screens the road from views from this direction. Therefore, it is anticipated that the increased visibility of both the junction and the main A38 carriageway at this point would produce a slight adverse visual effect.

6.3.4. Nature Conservation

- 6.3.4.1 The Presented Junction Layout with Option K1 does not have the potential to directly impact the Mickleover Meadows Local Nature Reserve (LNR) which is located within 2 km of the Presented Junction Layout with Option K1 boundary (refer to Figure 6.2 in Appendix D). This statutory designated site is of up to Regional Value. The Presented Junction Layout with Option K1 could potentially indirectly impact the LNR, although it is not anticipated that such impacts would generate adverse effects on the functional integrity of this site equivalent to its baseline value. Impacts are considered to be not significant.
- 6.3.4.2 The Presented Junction Layout with Option K1 would have the potential to impact on the following non-statutory designated sites, located within and adjacent to the Presented Junction Layout with Option K1 (refer to Figure 6.2 and 6.3 in Appendix D):
- A38 Roundabout Local Wildlife Site (LWS); and
 - Bramble Brook and Margins LWS.
- 6.3.4.3 These sites are of Regional Value. Construction of the Presented Junction Layout with Option K1 is likely to result in direct habitat loss and/ or impacts on the functional integrity of these sites, which could be a moderate significant effect at up to³ the Regional level.
- 6.3.4.4 A further non-statutory designated site, Mickleover Railway Cutting LWS, is located within 2km of the Presented Junction Layout with Option K1 boundary, and is of Regional Value (see Figure 6.2 in Appendix D). It is not anticipated that there will be any direct impacts on this site, whilst any indirect effects are likely to be significant at no more than the Local level i.e. slight significant adverse effect at up to Local level.
- 6.3.4.5 The Presented Junction Layout with Option K1 has the potential to impact on the following habitat receptors within or adjacent to the Presented Junction Layout with Option K1 boundary (effect and level of significance detailed in brackets):
- Semi-natural broadleaved woodland (likely a large significant adverse effect at up to Regional level);
 - Semi-improved grassland (likely a large significant adverse effect at up to Regional level);
 - Watercourses (likely a large significant adverse effect at up to Regional level as a consequence of potential direct and indirect impacts);
 - Mixed plantation woodland (likely a effect at up to County or Unitary Authority level);
 - Amenity grassland (likely a slight significant adverse effect at Local level);
 - Scattered trees (likely a slight significant adverse effect at Local level); and
 - Hard-standing (likely an adverse but not significant effect at Site level).
- 6.3.4.6 Refer to Figure 6.3 and 6.4 in Appendix D, which illustrate the habitats in the vicinity of the Presented Junction Layout with Option K1 and water bodies respectively.
- 6.3.4.7 The Presented Junction Layout with Option K1 has potential to impact on the following species receptors within or adjacent to the Presented Junction Layout with Option K1 boundary (effect and level of significance detailed in brackets):

³ 'Up to' acknowledges that the significance of effect may be at a level less than the value of the ecological receptor

- Bats – Roosting (likely a large significant adverse effect at up to Regional level, potentially National level (i.e. very large significant), depending on the rarity of species and/ or size of the roost identified within or adjacent to the Presented Junction Layout with Option K1). Refer to Figure 6.5 in Appendix D which shows the location of potential bat roosting features identified;
- Bats – Foraging and Commuting (likely a large significant adverse effect at up to Regional level depending on the species and number of individuals impacted on by the development proposals);
- Aquatic Invertebrates (likely a large significant adverse effect at up to Regional level, depending on the rarity of species identified during ongoing baseline surveys);
- Breeding Birds (likely a large significant adverse effect at up to Regional level);
- Otter *Lutra lutra* (likely a moderate significant adverse effect at up to County or Unitary Authority level – although their baseline value is of Regional Value, old otter signs were found to be present on Bramble Brook and it is considered that there is only occasional use by otter);
- Terrestrial Invertebrates (likely a moderate significant adverse effect at up to Regional level, depending on the rarity of species identified during ongoing baseline surveys); and
- Badgers *Meles meles* (likely slight significant adverse effect at Local level).

6.3.4.8 It is noted that water voles *Arvicola amphibius* and great crested newts *Triturus cristatus* were surveyed in 2015 as part of the baseline surveys for the Presented Junction Layout. However, water voles and great crested newts were not found to be present within any of the watercourses/ bodies surveyed. Therefore, water voles and great crested newts are not considered further in this assessment (or the assessment of other alternatives).

6.3.4.9 The potential spread of invasive plant species currently present on site as a result of the Presented Junction Layout with Option K1 construction activities has potential to result in a moderate significant adverse effect at up to County or Unitary Authority level (refer to Figure 6.6 in Appendix D).

6.3.4.10 Given the above, it is considered that the Presented Junction Layout with Option K1 has the potential to result in an overall large significant adverse effect with regard to nature conservation at up to the Regional level. However, it is considered that an appropriate ecological mitigation strategy can be developed that has the potential to reduce residual nature conservation effects to non-significant levels. This strategy will be defined following confirmation of which option is to be taken forward..

6.3.5. Geology and Soils

6.3.5.1 The Presented Junction Layout with Option K1 has the potential to impact on both the geology and soils in the local area as associated with the following:

- Physical effects of the Presented Junction Layout with Option K1: For example, changes in topography, soil compaction, soil erosion, ground stability;
- Effects associated with ground contamination that may already exist on site: For example, introducing or changing pathways of contamination migration, or changes to the characteristics and contamination receptors;

- Effects associated with the potential for polluting substances used during construction or operation to cause new ground contamination issues on site, such as the accidental loss/ spillage of fuels and oils to ground;
 - Impacts associated with re-use of soils and waste soils: Re-use of site-sourced materials on- or off-site, disposal of site-sourced materials off-site, importation of materials to the site; and
 - Effects on soils as a valuable resource: For example, loss or damage to soils of good agricultural quality.
- 6.3.5.2 Of note is that historic landfills are located to the east (Rowditch Tip) and adjacent to the Greenwich Drive South Option K1 (Disused Railway Cutting and Tunnel). The potential for leachate and/ or gas from these former landfilled areas to affect the Presented Junction Layout will be investigated following the completion of a planned ground investigation.
- 6.3.5.3 The Presented Junction Layout with Option K1 would not result in the permanent loss of any agricultural soils.
- 6.3.5.4 Bramble Brook is located within and immediately to the south of the existing Kingsway junction. The surface water features in the vicinity of the Presented Junction Layout with Option K1 are considered to be of medium sensitivity. Underlying superficial deposits and bedrock deposits are classified by the Environment Agency as Secondary A and Secondary B aquifers, respectively. Groundwater is present at shallow depth in this area.
- 6.3.5.5 Excavated materials may be contaminated (i.e. foundry sand in embankments) and may not meet acceptability criteria for re-use of ground materials within the Presented Junction Layout with Option K1. Where materials are identified as being unacceptable for reuse within the Presented Junction Layout, they would require treatment and/ or disposal to an appropriately licenced landfill.
- 6.3.5.6 Given the above, and given that standard good construction practices would be employed together with compliance with applicable land contamination and waste management legislation, overall it is considered that the Presented Junction Layout with Option K1 has the potential to result in a slight adverse effect upon soils and geology.
- 6.3.6. Materials**
- 6.3.6.1 The potential materials impacts of the Presented Junction Layout with Option K1 are those as associated with the use of material resources during construction and the generation, storage and disposal of waste.
- 6.3.6.2 Although the quantities and type of materials are not known at present, the types of materials that are likely to be used are likely to include: steel safety barrier; steel reinforcement bars; kerbs and gullies; subsurface drainage; precast concrete chambers; imported acceptable material; imported topsoil; noise barriers; cement bound granular mixture; dense base/ binder asphalt concrete thin surface course system; concrete gullies/ culverts.
- 6.3.6.3 Waste arisings would potentially be from the demolition of existing highway, excavations, vegetation clearance and top soil removal. The Presented Junction Layout with Option K1 is not anticipated to impact upon the areas of historic landfilling located to the east (Rowditch Tip) and adjacent to the Greenwich Drive South Option K1 (Disused Railway Cutting and Tunnel (refer to Section 6.3.5), and thus contaminated waste arisings are not anticipated to be generated.

6.3.6.4 The transportation of materials and waste has the potential to have knock-on environmental impacts as associated with HGV usage. There is also the potential for waste arisings to impact on the capacity of local waste management facilities.

6.3.6.5 With adherence to appropriate materials sourcing and usage, and adherence to local waste and planning policies that promote and seek sustainable waste management practices, it is considered that materials effects as associated with the Presented Junction Layout with Option K1 would be no worse than slight adverse.

6.3.7. Noise and Vibration

6.3.7.1 Potentially noise sensitive receptors identified in the vicinity of the existing Kingsway junction include the Kingsway Hospital site to the south-east, the residential area of Mackworth to the west, and New Zealand to the east. A new housing development is proposed at the Kingsway Hospital site, whilst there are other ongoing developments in the area (such as redevelopment of Mackworth College site). The closest residential properties to the west are located on Greenwich Drive South. To the north-east of the junction the closest buildings are industrial/ commercial in nature on Kingsway Park Close, which are not considered to be sensitive to changes in road traffic noise. Residential properties in the New Zealand area of Derby back onto the eastern side of Kingsway Park Close, beyond the industrial buildings. The retail park to the west of the junction is not considered to be sensitive to changes in road traffic noise levels.

6.3.7.2 The Presented Junction Layout with Option K1 would relocate the mainline A38 traffic further away from receptors to both the east and west of the existing A38, as the new mainline would be constructed in-between the two existing carriageways. The new mainline would also be in a cutting which would provide some noise shielding to nearby receptors. The existing north/ southbound A38 carriageways would be reused as the junction slip roads, and therefore would carry considerably less traffic than in the existing situation. The new eastern roundabout at the proposed junction would be in the vicinity of the north-west corner of the Kingsway Hospital site, industrial buildings on Kingsway Park Close and the Kingsway Retail Park. The new eastern roundabout would not substantially change the proximity of these buildings to traffic at the junction. The new western roundabout would incorporate a new link onto Greenwich Drive South (Option K1) which would form a new access on/ off the A38 into Mackworth. Greenwich Drive South is currently a minor residential road; therefore, a large increase in traffic flows is likely on this section of road between the new western roundabout and Brackensdale Avenue (also noting that vehicles and HGVs from commercial properties in Kingsway Industrial Park on Kingsway Park Close would need to access the A38 via Greenwich Drive South). Smaller traffic flow increases are likely on other minor local roads as traffic using the new access disperses through the residential areas of Mackworth and New Zealand.

6.3.7.3 Based on a qualitative noise assessment of the Presented Junction Layout with Option K1, a moderate (3.0 - 4.9dB)/ major (+5dB) increase in traffic noise levels is considered likely in the opening year at the closest affected properties on Greenwich Drive South (between the new western roundabout and Brackensdale Avenue). Based on the high sensitivity of residential receptors along Greenwich Drive South, a corresponding moderate/ large adverse effect is anticipated in this area.

6.3.7.4 A minor (1.0 - 2.9dB) reduction in traffic noise is considered likely on Greenwich Drive South to the south/west of the new roundabout and the closest approach of the Kingsway Hospital site, as the existing A38 carriageway would be relocated further away and in a cutting. A corresponding slight beneficial effect is anticipated in this area. A negligible (0.1 - 0.9dB) change in traffic noise is anticipated at residential properties on Kingsway Park Close, which would be shielded from the A38 by intervening industrial/commercial buildings - the corresponding effect in this area is likely to be negligible.

6.3.7.5 It is noted that the noise level changes are presented above are subject the limitations as detailed in Section 6.7 and are based upon professional judgement as no traffic noise modelling results or traffic data are available at this stage.

6.3.8. **Effects on All Travellers**

6.3.8.1 The Presented Junction Layout with Option K1 would have a range of potentially adverse and beneficial impacts upon people's journey patterns and amenity. Potential impacts include the following:

- With regard to non-motorised users (NMUs), there may be some temporary disruption during the construction phase.
- During the construction phase, it is anticipated that there would be a temporary adverse impact on views from the road and driver stress due to construction activities, diversions, congestion and queuing that could increase journey times that is common with many road infrastructure projects. However, during Presented Junction Layout operation, these impacts would be eliminated and driver benefits would be delivered by reducing congestion and delays;
- During the operation phase, Option K1 would impact upon a cycleway (National Cycle Route 54)/ footpath that traverses the area of Public Open Space to the south of Greenwich Drive South, unless provisions are specifically provided;
- Some residents in the Mackworth area would be impacted due to the closure of the two existing local access roads onto the A38, thus extending journey times. Journeys currently using the Brackensdale Avenue/ A38 northbound access would increase in length by a maximum of 0.5 miles. Journeys using the Raleigh Street/ A38 southbound access would increase in length by between 0.3 and 1.0 miles.

6.3.8.2 The Presented Junction Layout with Option K1 would potentially result in a slight adverse effect on drivers and NMUs during the construction phase and for some Mackworth residents with regard to increase in journey times during the operational phase. However, the Presented Junction Layout operation would deliver a moderate beneficial effect by reducing congestion and delays on the A38. Appropriate provisions would be needed to enable NMUs using the cycleway/ footpath through the area of Public Open Space to the south of Greenwich Drive South to traverse the Option K1 link road such that they are not adversely impacted.

6.3.9. **Community and Private Assets (including impacts upon Land Use and Public Open Space)**

6.3.9.1 The Option K1 access road from the Kingsway junction to Greenwich Drive South would be constructed through an area of Public Open Space (occupying an area of approximately 2,000m²). In terms of its function, the Public Open Space affected can best be described as ‘informal’ open space, mostly consisting of open land with no formal recreational equipment or other similar facilities, although the area is traverse by a footpath/cycleway. Given the nature and size of the space, it is primarily used by local residents within the immediate surrounding area, although cyclists from further afield are likely to pass through the area (National Cycle Route 54). There is currently an undersupply of amenity open space within the area and this would reduce further as a result of the Presented Junction Layout with Option K1. Depending upon which option is selected; proposals for Public Open Space exchange land will need to be considered further.

6.3.9.2 Option K1 access road would also result is a degree of community severance by dividing the Public Open Space, whilst significant traffic flow increases along Greenwich Drive South would also have the potential to cause community severance.

6.3.9.3 Overall, it is considered that Option K1 would result in a potentially moderate adverse effect with regard to the loss of Public Open Space and community severance issues. However, if appropriate exchange land can be locally sourced, residual effects could be reduced to non-significant levels.

6.3.10. **Road Drainage and the Water Environment**

Water Resources

6.3.10.1 The Kingsway junction is located within the Derbyshire Derwent catchment within the Humber River Basin Management Plan. Bramble Brook flows south-west to north-east through the junction, with two tributaries joining the brook upstream of the junction (see Figure 6.4 in Appendix D). These are classified as ordinary watercourses, whilst no formal Water Framework Directive (WFD) water quality classification exists for Bramble Brook. There are six culverted sections of the watercourses in the current junction: five for Bramble Brook and one for its tributary. There are no watercourses in the vicinity of the Option K1 access.

6.3.10.2 There is no groundwater Source Protection Zones within the area of the existing Kingsway junction. The bedrock strata underlying Kingsway junction are classified as a Secondary B aquifer, whilst there is a small area of Secondary A aquifer associated with the alluvial sediments of the Bramble Brook within the area of the junction.

6.3.10.3 The Presented Junction Layout with Option K1 would have the potential to impact upon the water resources as detailed above as follows:

- The Presented Junction Layout with Option K1 would require alteration/widening of the culverts, and a diversion of Bramble Brook within the area of the junction;
- Construction works in the vicinity and within Bramble Brook would be required, with potential to affect the river via accidental deposition, spillage or leakage of soils, fuels, oils or other construction materials. Impacts may occur directly, via deposition or spillage into the river, or, for liquid chemicals indirectly via spillage onto the ground, with subsequent transport via groundwater; and

- The Presented Junction Layout with Option K1 would likely increase impermeable area coverage and thus potentially alter local surface water runoff quantities and quality.

6.3.10.4 Assuming that best practice measures to protect the water environment are adopted during construction activities, it is considered that the Presented Junction Layout with Option K1 would have the potential to result in slight adverse effect to surface water resources, and a neutral effect on groundwater resources during its construction.

6.3.10.5 Assuming that the Presented Junction Layout with Option K1 is provided with a suitable surface water drainage and management system, it is considered that the scheme operation would have no more than a slight adverse effect upon water resources as related to surface water runoff and operational runoff contamination/potential operational spillage risk.

Flood Risk

6.3.10.6 In terms of flooding, the main risk associated with the Presented Junction Layout with Option K1 would be the requirement to cross Bramble Brook at an area where the watercourse is known locally as the Grand Canyon, due to its deep channel and the volume of water that is stored there during high flow events. Bramble Brook drains to the existing Kingsway junction from the catchment to the west, before entering a culvert in the centre of the existing junction that drains several hundred metres to the east. The highway design, involving tie-in options with the local road network to the north and/ or south therefore has little influence on the fluvial flood risk to the site.

6.3.10.7 The flood storage area would have to be moved to a different part of the catchment to enable the Kingsway junction realignment, and early assessments suggest that flood storage upstream of the junction would have to be increased significantly in order to reduce predicted peak flood levels to safely below the road levels. This has implications for land take requirements, but also presents the opportunity to reduce existing local flood risks.

6.3.10.8 The increase in impermeable road surface area compared to permeable greenfield is likely to result in increased rainfall runoff, and this may need to be controlled with several balancing ponds so that flood risks are not increased away from the site. This could also require land take and is currently being assessed.

6.3.10.9 Hydraulic modelling of the Bramble Brook and the local sewer network is currently being undertaken to analyse existing river flows and the effects of the Presented Junction Layout with Option K1, and this will be used to identify the need for and amount of flood storage that is required.

6.3.10.10 Without mitigation, the Presented Junction Layout with Option K1 would have the potential to result in a large adverse effect in terms of flooding. However, a preliminary compensation strategy has been qualitatively assessed as having a slight beneficial potential flood risk effect relative to the existing Kingsway junction, in that local flood risks may be reduced as part of the new junction design.

6.4. Presented Junction Layout with Option K2

6.4.1. Air Quality

6.4.1.1 Details of air quality sensitive receptors and existing air quality conditions in the vicinity of the existing Kingsway junction are as detailed in Section 6.3.1.1.

- 6.4.1.2 With Option K2, the new eastern roundabout would not substantially change the proximity of receptors to traffic at the junction. However, the proposed new link road would link the eastern roundabout and Kingsway Park Close. The new length of road would pass between industrial/ commercial buildings and the retail park, which are not considered to be sensitive to changes in road traffic. However, residential properties back onto the northern end of the existing Kingsway Park Close. This is currently a minor access road to a small industrial area - therefore a large increase in traffic flows is likely on the existing section of Kingsway Park Close between the new link road and Brackensdale Avenue. Smaller increases are likely on other minor local roads as traffic using the new access disperses through the residential areas of New Zealand and Mackworth. With Option K2, significant traffic flow increases on Greenwich Drive South would be avoided as associated with Option K1.
- 6.4.1.3 The area in the vicinity of Option K2 is considered to have lower air quality risks than areas closer to the A38 mainline to the north.
- 6.4.1.4 Whilst air quality along local roads in Mackworth (including along Kingsway Park Close) may deteriorate due to traffic increases, anticipated air quality concentrations would be well below applicable air quality objectives such that significant air quality impacts in this area are unlikely. Similarly, as receptors south of the new Kingsway junction would be set back from the mainline A38 and new junction, significant adverse effects in this area are also not anticipated. Overall, the impact of the Presented Junction Layout with Option K2 on air quality is anticipated to be slight adverse.
- 6.4.1.5 Based upon the above, it is considered that sensitive receptors close to Kingsway Park Close would experience a greater air quality impact with Option K2 than with Option K1, whilst air quality effects along Greenwich Drive South as associated with Option K1 would be avoided. However, as annual mean concentrations of NO₂ at receptors in the vicinity of Kingsway Park Close are anticipated to be below the air quality objective, the impact is not anticipated to be significant. Overall, the significance of air quality effects of the Presented Junction Layout with Options K1 or K2 is considered to be comparable.
- 6.4.2. Archaeology and Cultural Heritage**
- 6.4.2.1 The archaeological and cultural heritage assets in the vicinity of Kingsway junction are detailed in Section 6.3.2.1.
- 6.4.2.2 It is considered that the archaeological and cultural heritage effects of the Presented Junction Layout with Option K2 would essentially be the same as those that would be experienced with the Presented Junction Layout with Option K1.
- 6.4.2.3 Thus overall, the effect of the Presented Junction Layout with Option K2 on archaeology and cultural heritage is anticipated to be neutral, and thus not significant. The significance of archaeological and cultural heritage effects of the Presented Junction Layout with Option K1 or K2 are thus considered to be comparable.
- 6.4.3. Landscape and Visual Impacts**
- 6.4.3.1 Option K2 would pass through a commercial/retail urban environment, partially in cutting and join Kingsway Park Close at the edge of Morley Estate Townscape Character Area (which consists of inter-war, semi-detached housing). The main visual receptors of Option K2 would be users of the adjacent industrial estate.

6.4.3.2 It is expected that localised removal of vegetation would be undertaken in order to accommodate Option K2, whilst with Option K2 losses of Public Open Space would be reduced to approximately 500 m². Given the overall industrial context, it is anticipated that there would be a negligible effect on the landscape character due to the Option K2 access.

6.4.3.3 Construction of the roundabout off the northbound carriageway would result in limited removal of existing mature vegetation and the potential for increased views to the A38 from the adjacent residential properties. On the eastern side of the proposed A38, there are limited visual receptors in the immediate surroundings of Option K2. Overall, it is considered that despite the partial loss of vegetation to construct the junction and Option K2, it is considered that there would be an anticipated negligible effect on visual amenity.

6.4.3.4 As detailed above, Option K2 would have a potential negligible effect with regard to landscape character and visual amenity. Due to Option K2 significantly reducing losses and severance of Public Open Space (as associated with the Presented Junction Layout with Option K1), it is considered that this option would reduce landscape and visual effects as compared to the Presented Junction Layout with Option K1.

6.4.4. **Nature Conservation**

6.4.4.1 The Presented Junction Layout with Option K2 would be unlikely to result in any change in the significance of effect on statutory and non-statutory designated sites relative to those that would arise through construction and operation of the Presented Junction Layout with Option K1 (refer to Section 6.3.4).

6.4.4.2 However, construction of the Option K2 access would result in further loss, or impacts upon, the following habitats:

- Semi-natural broadleaved woodland;
- Scrub;
- Amenity grassland; and
- Hardstanding.

6.4.4.3 With Option K2, there would be a slight reduction in the loss of some of these habitats in the vicinity of Greenwich Drive South (that would be impacted by Option K1) (principally amenity grassland).

6.4.4.4 It is considered that such additional habitat loss are unlikely to result in any change in the significance of effect on these habitats (or species that use these habitats) relative to those that would arise through construction and operation of the Presented Junction Layout with Option K1.

6.4.4.5 Given the above, it is considered that the Presented Junction Layout with Option K2 has the potential to result in an overall large significant adverse effect at up to the Regional level which would be comparable to that which would be experienced due to the Presented Junction Layout with Option K1. However, it is considered that an appropriate ecological mitigation strategy can be developed that has the potential to reduce residual nature conservation effects to non-significant levels. This strategy will be defined following confirmation of which option is to be taken forward.

6.4.5. **Geology and Soils**

6.4.5.1 The geology and soils effects as associated with the Presented Junction Layout with Option K2 would be similar to those that would be experienced with the Presented Junction Layout with Option K1. However, a number of different soils effects would occur with Option K2 as follows:

- Option K2 would cross the Rowditch Tip site within a cutting. As such, with this option there is a risk that leachate and/or gas from the landfilled area could have a potential adverse impact upon the proposed road infrastructure, whilst contaminated materials could be encountered during the construction phase with knock on impacts upon controlled water and construction workers. In addition, the risks of generating material that is not suitable for reuse is greater with this option as compared with the Presented Junction Layout with Option K1.

6.4.5.2 Given the above, it is considered that Presented Junction Layout with Option K2 has the potential to result in a moderate adverse effect upon soils and geology due to interaction with the Rowditch Tip site. However, it is considered that an appropriate soils mitigation strategy could be developed that has the potential to reduce residual effects to non-significant levels (e.g. no worse than slight adverse and thus similar to the Presented Junction Layout with Option K1).

6.4.6. **Materials**

6.4.6.1 The materials effects as associated with the Presented Junction Layout with Option K2 are considered to be comparable to those as associated with the Presented Junction Layout with Option K1. However, Option K2 would encroach upon an area of historic landfilling (Rowditch Tip site) within a cutting, thus potentially generating contaminated waste which would require off site treatment and/ or disposal, this impact is considered slight/moderate adverse unmitigated. However, significant effects would be avoided through adherence to good construction practices and compliance with relevant land contamination legislation (e.g. no worse than slight adverse and thus similar to the Presented Junction Layout with Option K1).

6.4.7. **Noise and Vibration**

6.4.7.1 Details of noise sensitive receptors and receptor distances from the existing A38 are detailed in Section 6.3.7.1.

6.4.7.2 The Presented Junction Layout with Option K2 would relocate the mainline A38 traffic further away from receptors to both the east and west of the existing A38 as the new mainline would be constructed between the two existing carriageways. The new mainline would also be in a cutting which would provide some shielding to nearby receptors. The existing north/southbound A38 carriageways would be reused as the junction slip roads, and therefore would carry considerably less traffic than in the existing situation. The new western roundabout would not substantially change the proximity of receptors on Greenwich Drive South to traffic at the junction. The new eastern roundabout at the junction would be in the vicinity of the north-west corner of the Kingsway Hospital site, industrial buildings on Kingsway Park Close and the Kingsway Retail Park. The new eastern roundabout would not substantially change the proximity of these receptors to traffic at the junction. However, Option K2 would connect the eastern roundabout and Kingsway Park Close. The new access road would pass between industrial/commercial buildings and the retail park, which are not considered to be sensitive to changes in road traffic noise. However, residential properties back onto the northern end of the existing Kingsway Park Close. This is currently a minor access road to a small industrial area – therefore, a large increase in traffic flows is likely on the existing section of Kingsway Park Close between the new access road and Brackensdale Avenue. Smaller increases are likely on other minor local roads as traffic using the new access disperses through the residential areas of New Zealand and Mackworth.

6.4.7.3 Based on a qualitative assessment of the Presented Junction Layout with Option K2, a moderate (3.0 - 4.9dB)/major (+5dB) increase in traffic noise levels is considered likely in the opening year at the closest affected properties which back onto Kingsway Park Close. Based on the high sensitivity of residential receptors which back onto Kingsway Park Close, a corresponding moderate/ large adverse effect is anticipated in this area. A minor (1.0 - 2.9dB) reduction in traffic noise is considered likely on Greenwich Drive South to the west of the new junction and the closest approach of the Kingsway Hospital site as the existing A38 carriageway would be relocated further away and in a cutting. A corresponding slight beneficial noise effect is anticipated in this area.

6.4.7.4 The Presented Junction Layout with Option K2 would thus transfer the moderate/ large adverse noise effect identified for the Presented Junction Layout with Option K1 from Greenwich Drive South onto Kingsway Park Close. Based on the number of residential properties likely to be directly affected (slightly less properties adversely affected on Kingsway Park Close), the overall impact is therefore likely to be slight beneficial, as compared to the Presented Junction Layout with Option K1.

6.4.8. **Effects on All Travellers**

6.4.8.1 It is considered that effects on all travellers as associated with the Presented Junction Layout with Option K2 would be similar to those that would be experienced due to the Presented Junction Layout with Option K1, although the following differences are noted:

- Option K2 would provide better connectivity from Kingsway Park Close and Mackworth to the A38. Some journeys would be reduced, although it is anticipated that a few journeys using the Brackensdale Avenue/A38 northbound access would increase in length by a maximum of 0.5 miles, whilst journeys using the Raleigh Street/A38 southbound access would increase in length by between 0.3 and 1.0 miles; and
- Option K2 would avoid impacts upon the cycleway/footpath that traverse the area of Public Open Space to the south of Greenwich Drive South, although provisions would be needed to enable walkers and cyclists to traverse to Kingsway Park Close Link Road given the presence of the existing cycleway/ footpath to the east of the A38 and along the A5111.

6.4.8.2 The Presented Junction Layout with Option K2 would potentially result in a slight adverse effect on drivers and NMUs during the construction phase and for some Mackworth residents with regard to increases in journey times during the operational phase. However, the Presented Junction Layout with Option K2 operation would deliver a moderate beneficial effect by reducing congestion and delays on the A38. Appropriate provisions would be needed to enable NMUs to traverse the Option K2 link road such that they are not adversely impacted. It is considered that effects on all travellers as associated with the Presented Junction Layout with Option K2 would be similar to those that would be experienced due to the Presented Junction Layout with Option K1.

6.4.9. **Community and Private Assets (including impacts upon Land Use and Public Open Space)**

6.4.9.1 Option K2 would pass between industrial/commercial buildings and the Kingsway Retail Park, whilst residential properties back onto the northern end of the existing Kingsway Park Close. Option K2 would not require land used by the community or involve the demolition of private/commercial properties, or impact on land currently designated for development or agriculture. Option K2 would, however, result in a minor loss of land from industrial premises along Kingsway Park Close and some land to the rear of the existing retail premises. The impact of such land take losses on these businesses requires further investigation. In terms of severance, appropriate provisions would be needed to enable NMUs to traverse the Option K2 link road such that they are not adversely impacted, whilst increases of traffic along Kingsway Park Close has the potential to cause community severance.

6.4.9.2 Overall it is considered that Option K2 would have the potential to result in a slight adverse effect upon community and private assets.

6.4.9.3 Option K2 as compared to Option K1 would reduce the loss and severance of Public Open Space located to the south of Greenwich Drive South. With Option K2, losses of Public Open Space would reduce to approximately 500 m² (associated with construction of the eastern junction roundabout). As such, Option K2 has the potential to result in a slight to moderate beneficial effect as compared to Option K1 by reducing the loss/severance of local Public Open Space.

6.4.10. **Road Drainage and the Water Environment (including Flood Risk)**

Water Resources

6.4.10.1 The potential water resource impacts as associated with the Presented Junction Layout with Option K2 would be very similar to the impacts as associated with the Presented Junction Layout with Option K1. However, the following differences are noted:

- Option K2 would cross the pathway of a long culvert of Bramble Brook which takes the course of the brook eastwards; and
- Option K2 would cross a historic tip (Rowditch tip) within a cutting. Therefore, construction works within the former landfill area would have a potential to create pathways for contaminants to enter groundwater and Bramble Brook. The potential for this adverse effect would be dependent upon local groundwater conditions in the area and the depth of any excavations required in this area, and the content of the waste deposited within the historic landfill.

6.4.10.2 Due to Option K2 traversing a historic landfill site and being located over a Bramble Brook culvert, it is considered that the construction and operation of Option K2 has the potential to result in a slight adverse impact on surface water and groundwater resources (assuming that best practice measures to protect the water environment are adopted during construction activities).

6.4.10.3 It is thus considered that water resource effects of Option K2 would be slightly worse as compared to the effects associated with Option K1.

Flood Risk

6.4.10.4 Flood risk issues in the vicinity of the existing A38 at Kingsway junction are detailed in Section 6.3.10.1.

6.4.10.5 Flood risk impacts as associated with the Presented Junction Layout with Option K2 would essentially be the same as those that would result due to construction and operation of the Presented Junction Layout with Option K1 (i.e. a large adverse effect without mitigation, but a slight beneficial potential flood risk effects relative to the existing Kingsway junction following the inclusion of applicable flood compensation provisions such that local flood risks may be reduced).

6.5. Mr Jennison Option (with Option K1)

6.5.1. Air Quality

6.5.1.1 Details of air quality sensitive receptors and existing air quality conditions in the vicinity of the existing Kingsway junction are as detailed in Section 6.3.1.1.

6.5.1.2 The Mr Jennison Option has a similar layout to the Presented Junction Layout with Option K1, including local access Option K1 to Greenwich Drive South, but excluding an eastern roundabout. With this option, traffic from the A38 southbound exiting at the Kingsway junction, but wishing to turn right into Mackworth, would have to use the A5111 up to the retail park junction to double back to the Kingsway junction. Similarly traffic wishing to join the A38 southbound from Mackworth would need to divert via the A5111 retail park roundabout. Specific details on the likely volume of traffic affected by this diversion are not currently available; however, given the existing level of traffic on the A5111, the percentage increase in traffic is estimated to be in the region of 80% at worst. Due to the current congestion issues at the Kingsway Retail Park roundabout, there is the potential for traffic to attempt to avoid this diversion using minor local roads, resulting in a corresponding increase in traffic flows and adverse impacts on air quality on any such affected local roads.

6.5.1.3 Annual mean concentrations of NO₂ are anticipated to be close to, or exceed, the objective value at sensitive receptors along the A5111, close to the retail park roundabout and beyond, into the AQMA as described in Section 6.3.1.1.

6.5.1.4 The area around the Mr Jennison Option around the Kingsway junction is considered to have lower air quality risks than areas closer to the mainline to the north. Whilst traffic flows may increase on local roads in Mackworth, air quality is anticipated to be well below the air quality objective and therefore significant air quality impacts in this area are unlikely. Similarly, as receptors south of the new Kingsway junction would be set back from the mainline A38 and new junction, significant adverse air quality effects in this area are also not anticipated. The Mr Jennison Option has higher risks of significant air quality effects to the north of the junction, where sensitive receptors are in close proximity to the A38. However, it is considered that there is a risk of significant adverse effects on air quality on the A5111 and within the AQMA if large amounts of traffic re-route onto these roads. Overall, the impact of the Mr Jennison Option on air quality is anticipated to be moderate adverse.

6.5.1.5 Compared to the Presented Junction Layout with Option K1, receptors on the A5111 would likely experience a higher air quality impact with the Mr Jennison Option. Sensitive receptors on the hospital site are also likely to experience a higher air quality impact compared to the Presented Junction Layout with Option K1 as some road traffic accessing the Kingsway junction would need to travel past these properties twice. There may also be adverse air quality effects at sensitive receptors in New Zealand and the surrounding area with this option, as compared to the Presented Junction Layout with Option K1. As receptors in the A5111 and AQMA area are anticipated to be above, or close to, the air quality objective, and thus the impact is potentially significant. The air quality effects of the Mr Jennison Option are thus considered to be moderately worse than those that would be experienced with the Presented Junction Layout with Option K1.

6.5.2. **Archaeology and Cultural Heritage**

6.5.2.1 The archaeological and cultural heritage assets in the vicinity of Kingsway junction are detailed in Section 6.3.2.1.

6.5.2.2 It is considered that the archaeological and cultural heritage effects of the Mr Jennison Option would be the same as those that would be experienced with the Presented Junction Layout with Option K1.

6.5.2.3 Thus overall, the effect of the Mr Jennison Option on archaeology and cultural heritage is anticipated to be neutral, and thus not significant. The significance of archaeological and cultural heritage effects of the Mr Jennison Option and the Presented Junction Layout with Option K1 are thus considered to be comparable.

6.5.3. **Landscape and Visual Impacts**

6.5.3.1 The Mr Jennison Option covers an area which is very similar to the area required to construct the Presented Junction Layout with Option K1 (noting that both options include Option K1 and would result in the loss of approximately 2,000 m² of Public Open Space).

6.5.3.2 In terms of potential landscape and visual effects, it is considered that the effects of the Mr Jennison Option would essentially be the same as the effects associated with the Presented Junction Layout with Option K1. As such the Mr Jennison Option would result in a slight adverse effect on landscape character (specifically due to Option K1) and a slight adverse visual effect.

6.5.4. **Nature Conservation**

6.5.4.1 The Mr Jennison Option covers an area which is essentially the same as the area required to construct the Presented Junction Layout with Option K1.

6.5.4.2 In terms of potential nature conservation effects, it is considered that the effects of the Mr Jennison Option would essentially be the same as the effects associated with the Presented Junction Layout with Option K1 (as detailed in Section 6.3.4). As such, the Mr Jennison Option has the potential to result in an overall large significant adverse effect at up to the Regional level which would be comparable to that which would be experienced with the Presented Junction Layout with Option K1. However, it is considered that an appropriate ecological mitigation strategy can be developed that has the potential to reduce residual nature conservation effects to non-significant levels. This strategy will be defined following confirmation of which option is to be taken forward.

6.5.5. **Geology and Soils**

6.5.5.1 The Mr Jennison Option covers an area which is essentially the same as the area required to construct the Presented Junction Layout with Option K1.

6.5.5.2 In terms of potential geology and soils effects, it is considered that the effects of the Mr Jennison Option would essentially be the same as the effects associated with the Presented Junction Layout with Option K1 (as detailed in Section 6.3.5). As such, the Mr Jennison Option (given that standard good construction practices would be employed together with compliance with applicable land contamination and waste management legislation) has the potential to result in a slight adverse effect upon soils and geology.

6.5.6. **Materials**

6.5.6.1 The materials effects as associated with the Mr Jennison Option are considered to be comparable to those as associated with the Presented Junction Layout with Option K1.

6.5.7. **Noise and Vibration**

6.5.7.1 Details of noise sensitive receptors and receptor distances from the existing A38 are detailed in Section 6.3.7.1.

6.5.7.2 The Mr Jennison Option would relocate the mainline A38 traffic further away from receptors to both the east and west of the existing A38 as the new mainline would be constructed between the two existing carriageways. The new mainline would also be in a cutting which would provide some noise shielding to nearby receptors. The existing north/ southbound A38 carriageways would be reused as the junction slip roads, and therefore would carry considerably less traffic than in the existing situation. The new eastern slip roads at the junction would be in the vicinity of the north-west corner of the Kingsway Hospital site, industrial buildings on Kingsway Park Close and the Kingsway Retail Park. The new eastern slip roads would not substantially change the proximity of these buildings to traffic at the junction. No eastern roundabout is proposed with this option; therefore, traffic from the A38 southbound exiting at the Kingsway junction, but wishing to turn right into Mackworth, would have to use the A5111 up to the retail park junction to double back to the Kingsway junction. Similarly traffic wishing to join the A38 southbound from Mackworth would also need to divert via the A5111 retail park roundabout. Specific details on the likely volume of traffic affected by this diversion are not currently available; however, given the existing level of traffic on the A5111, the percentage increase in traffic is estimated to be not more than 80%. Such a percentage increase in traffic is likely to result in an increase in traffic noise close of around 2.5dB. In addition, due to the current congestion issues at the Kingsway Retail Park roundabout, there is the potential for traffic to attempt to avoid this diversion using minor local roads, resulting in a corresponding increase in traffic flows and traffic noise on any such affected local roads.

6.5.7.3 The proposed western roundabout would incorporate a new link onto Greenwich Drive South which would form a new access on/off the A38 into Mackworth. Greenwich Drive South is a minor residential road – therefore, a large increase in traffic flows is likely on this section of road between the new western roundabout and Brackensdale Avenue (also noting that vehicles and HGVs from commercial properties in Kingsway Industrial Park on Kingsway Park Close would need to access the A38 via Greenwich Drive South). Smaller increases are likely on other minor local roads as traffic using the new access disperses through the residential areas of Mackworth and New Zealand.

- 6.5.7.4 Based on a qualitative assessment of the Mr Jennison Option, a moderate (3.0 - 4.9dB)/major (+5dB) increase in traffic noise levels is anticipated in the opening year at the closest affected properties on Greenwich Drive South, between the new western roundabout and Brackensdale Avenue. Based on the high sensitivity of residential receptors along Greenwich Drive South, a corresponding moderate/large adverse effect is anticipated in this area. A minor (1.0 - 2.9dB) reduction in traffic noise is considered likely on Greenwich Drive South to the west of the new roundabout and the closest approach of the western side of the Kingsway Hospital site, as the existing A38 carriageway would be relocated further away and in a cutting. A corresponding slight beneficial effect is anticipated in this area. A negligible (0.1 - 0.9dB) change in traffic noise is considered likely at residential properties on Kingsway Park Close, which would be shielded from the A38 by intervening industrial/commercial buildings. The corresponding effect in this area is likely to be negligible. A minor (1.0 - 2.9dB) increase in traffic noise is considered likely at the northern edge of the Kingsway Hospital site facing onto the A5111. A corresponding slight adverse effect is anticipated in this area.
- 6.5.7.5 The Mr Jennison Option is likely to result in the same noise effects as the Presented Junction Layout with Option K1, except along the section of the A5111 which would be used as a diversion, and along any minor local roads used by traffic avoiding the congestion at the Kingsway Retail Park roundabout. The overall impact is therefore likely to be slight adverse, as compared to the Presented Junction Layout with Option K1.
- 6.5.8. Effects on All Travellers**
- 6.5.8.1 It is considered that effects on all travellers as associated with the Mr Jennison Option would be similar to those that would be experienced due to the Presented Junction Layout with Option K1. However, with the Mr Jennison Option, traffic from the A38 southbound exiting at the Kingsway junction, but wishing to turn right into Mackworth, would have to use the A5111 up to the retail park junction to double back to the Kingsway junction. Similarly traffic wishing to join the A38 southbound from Mackworth would need to divert via the A5111 retail park roundabout. Specific details on the likely volume of traffic affected by this diversion are not currently available; however, given the existing level of traffic on the A5111, the percentage increase in traffic is estimated to be in the region of 80% at worst. Due to the current congestion issues at the Kingsway Retail Park roundabout, there is the potential for traffic to attempt to avoid this diversion using minor local roads, resulting in a corresponding increase in traffic flows. This would potentially increase some journey times to and from the A38 and consequently increase driver stress due to increased queuing and congestion.
- 6.5.8.2 The Mr Jennison Option would potentially result in a slight adverse effect on drivers and NMUs during the construction phase and for some Mackworth residents with regard to increase in journey times during the operational phase. However, whilst the Mr Jennison Option would deliver a moderate beneficial effect by reducing congestion and delays on the A38, it would potentially have a moderate adverse effect on some southbound A38 drivers wishing to access Mackworth, and drivers from Mackworth wishing to access the southbound A38 and such drivers would have to use the A5111 up to the retail park junction to double back to the Kingsway junction. It is thus considered that the Mr Jennison Option would perform slightly worse than the Presented Junction Layout with either Option K1 or K2.

6.5.9. **Community and Private Assets (including impacts upon Land Use and Public Open Space)**

6.5.9.1 The Mr Jennison Option covers an area which is essentially the same as the area required to construct the Presented Junction Layout with Option K1.

6.5.9.2 In terms of potential community and private assets effects, it is considered that the effects of the Mr Jennison Option would essentially be the same as the effects associated with the Presented Junction Layout with Option K1 (as detailed in Section 6.3.9). Thus, it is considered that the Mr Jennison Option would result in a potentially moderate adverse effect with regard to the loss of Public Open Space and community severance issues. However, if appropriate exchange land can be locally sourced, effects could be reduced to non-significant levels.

6.5.10. **Road Drainage and the Water Environment (including Flood Risk)**

Water Resources

6.5.10.1 The Mr Jennison Option covers an area which is essentially the same as the area required to construct the Presented Junction Layout with Option K1. In terms of potential water resource effects, it is considered that the effects of the Mr Jennison Option would essentially be the same as the effects associated with the Presented Junction Layout with Option K1 (as detailed in Section 6.3.10).

6.5.10.2 Thus, assuming that best practice measures to protect the water environment are adopted during construction activities, it is considered that the Mr Jennison Option would have the potential to result in slight adverse effect to surface water resources, and a neutral effect on groundwater resources. Assuming that the Mr Jennison Option is provided with a suitable surface water drainage and management system, it is considered that scheme operation would have no more than a slight adverse effect upon water resources as related to surface water runoff and operational runoff contamination/ potential operational spillage risk.

Flood Risk

6.5.10.3 Flood risk issues in the vicinity of the existing A38 at Kingsway junction are detailed in Section 6.3.10.1.

6.5.10.4 Flood risk impacts as associated with the Mr Jennison Option would essentially be the same as those that would result due to construction and operation of the Presented Junction Layout with Option K1 (i.e. a large adverse effect without mitigation, but a slight beneficial potential flood risk effects relative to the existing Kingsway junction following the inclusion of applicable flood compensation provisions such that local flood risks may be reduced).

6.6. Summary and Conclusions

6.6.1. Air Quality

6.6.1.1 With regards to air quality, overall the Presented Junction Layout with Option K1 is anticipated to result in a slight adverse air quality impact. Adverse air quality impacts are anticipated at the closest sensitive receptors to the scheme, including those close to the mainline to the north of the junction and those on Greenwich Drive South (although anticipated air quality concentrations would be well below applicable air quality objectives such that significant air quality impacts in this area are unlikely).

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- 6.6.1.2 With the Presented Junction Layout with access Option K2, adverse air quality impacts at properties along Greenwich Drive South would be avoided, being replaced with adverse air quality effects along Kingsway Park Close. However, anticipated air quality concentrations at properties along Kingsway Park Close would be well below applicable air quality objectives such that significant air quality impacts in this area are unlikely. Overall, the significance of air quality effects of the Presented Junction Layout with Option K1 or K2 are considered to be comparable.
- 6.6.1.3 The Mr Jennison Option has the potential to lead to adverse impacts on air quality at properties located along the A5111 and within the New Zealand area of Derby. There is also the potential for a significant impact on air quality with this option as annual mean concentrations of NO₂ are elevated around the A5111 and within the Derby AQMA. The air quality effects of the Mr Jennison Option are thus considered to be moderately worse than those that would be experienced with the Presented Junction Layout with Option K1.
- 6.6.2. **Cultural Heritage**
- 6.6.2.1 All of the options would require the construction of a deep cutting for the main A38 alignment and the provision of new connection roads and associated infrastructure. Each option would result in a neutral effect upon potentially impacted heritage assets.
- 6.6.3. **Landscape and Visual**
- 6.6.3.1 The Presented Junction Layout with Option K1 is anticipated to have a slight adverse effect on landscape character and visual amenity due to the loss and severance of Public Open Space (loss of approximately 2,000m² Public Open Space), as well as the increased visibility of the junction due to the loss of vegetation adjacent to the existing road.
- 6.6.3.2 Option K2 is likely to result in a negligible effect landscape and visual effect as the land take required would be lower (significantly reducing the losses of Public Open Space by approximately 1,500m²), whilst the road would likely be less visible to residential receptors. Sourcing potential exchange land for Option K2 would be less problematic than for Option K1, whilst Option K2 would require less landscape mitigation.
- 6.6.4. **Nature Conservation**
- 6.6.4.1 With regard to nature conservation, the Presented Junction Layout with Option K2 is unlikely to result in any change in effects relative to the Presented Junction Layout with Option K1. The nature conservation effects of the Mr Jennison Option would essentially be the same as the effects associated with the Presented Junction Layout with Option K1.
- 6.6.4.2 The Presented Junction Layout with Option K2 and the Mr Jennison Option both have the potential to result in an overall large significant adverse effect at up to the Regional level which would be comparable to that which would be experienced due to the Presented Junction Layout with Option K1. However, it is considered that an appropriate ecological mitigation strategy can be developed that has the potential to reduce residual nature conservation effects to non-significant levels. This strategy will be defined following confirmation of which option is to be taken forward.

6.6.5. **Geology and Soils**

- 6.6.5.1 The Presented Junction Layout with Option K1 would not have a direct impact on the landfilled areas located to the east (Rowditch Tip) and adjacent to the Greenwich Drive South Option K1 (Disused Railway Cutting and Tunnel). Given that standard good construction practices would be employed together with compliance with applicable land contamination and waste management legislation, overall it is considered that the Presented Junction Layout with Option K1 has the potential to result in a slight adverse effect upon soils and geology.
- 6.6.5.2 Option K2 would cross the Rowditch Tip site within a cutting. With this option there is a risk that leachate and/or gas from the landfilled area could have a potential adverse impact upon the proposed road infrastructure, whilst contaminated materials could be encountered during the construction phase with knock on impacts upon controlled water and construction workers. In addition, the risks of generating material that is not suitable for reuse is greater with this option as compared with the Presented Junction Layout with Option K1. It is thus considered that Presented Junction Layout with Option K2 has the potential to result in a moderate adverse effect upon soils and geology due to interaction with the Rowditch Tip site. However, it is considered that an appropriate soils mitigation strategy could be developed that has the potential to reduce residual effects to non-significant levels (e.g. no worse than slight adverse and thus similar to the Presented Junction Layout with Option K1).
- 6.6.5.3 The Mr Jennison Option covers an area which is essentially the same as the area required to construct the Presented Junction Layout with Option K1. As such, it is considered that the soil and geology effects of the Mr Jennison Option would essentially be the same as the effects associated with the Presented Junction Layout with Option K1.

6.6.6. **Materials**

- 6.6.6.1 All the options would require large amounts of construction material resources that are commonly used for road projects, as well as generate waste materials.
- 6.6.6.2 With adherence to appropriate materials sourcing and usage, and adherence to local waste and planning policies that promote and seek sustainable waste management practices, it is considered that materials effects as associated with all options would be no worse than slight adverse. Option K2 would encroach upon an area of historic landfilling (Rowditch Tip site) within a cutting, thus potentially generating contaminated waste which would require off site treatment and/ or disposal.

6.6.7. **Noise and Vibration**

- 6.6.7.1 With regards to road traffic noise, the Presented Junction Layout with Option K1 is anticipated to result in a moderate/large adverse effect at the closest affected properties on Greenwich Drive South, between the proposed new western roundabout and Brackensdale Avenue. This would be due to the Option K1 off the A38 linking with Greenwich Drive South. A slight beneficial effect is anticipated at Greenwich Drive South to the south/ west of the new roundabout and the closest approach of the Kingsway Hospital site, as the existing A38 carriageway would be relocated further away and in a cutting. A negligible effect is anticipated at residential properties on Kingsway Park Close, which would be shielded from the A38 by intervening industrial/ commercial buildings.

6.6.7.2 The Presented Junction Layout with Option K2 would transfer the moderate/large adverse noise effect identified for the Presented Junction Layout with Option K1 from Greenwich Drive South onto Kingsway Park Close. Based on the number of residential properties likely to be directly affected (slightly less properties adversely affected on Kingsway Park Close), the overall noise impact is likely to be slight beneficial, as compared to the Presented Junction Layout with Option K1.

6.6.7.3 The Mr Jennison Option is likely to result in the same noise effects as the Presented Junction Layout with Option K1, except along the section of the A5111 which would be used as a diversion, and along any minor local roads used by traffic avoiding the congestion at the Kingsway Retail Park roundabout. The overall impact is therefore likely to be slight adverse, as compared to the Presented Junction Layout with Option K1.

6.6.8. **Effects on Travellers**

6.6.8.1 The Presented Junction Layout with Option K1 would potentially result in a slight adverse effect on drivers and NMUs during the construction phase and for some Mackworth residents with regard to increase in journey times during the operational phase. However, the Presented Junction Layout with Option K1 operation would deliver a moderate beneficial effect by reducing congestion and delays on the A38. Appropriate provisions would be needed to enable NMUs using the cycleway/footpath through the area of Public Open Space to the south of Greenwich Drive South to traverse the Option K1 link road such that they are not adversely impacted.

6.6.8.2 It is considered that effects on all travellers as associated with the Presented Junction Layout with Option K2 would be similar to those that would be experienced due to the Presented Junction Layout with Option K1, although this option would avoid impacts upon the cycleway/footpath through the area of Public Open Space to the south of Greenwich Drive South. However, this option would require appropriate provisions to enable NMUs to traverse the Option K2 link road such that they are not adversely impacted.

6.6.8.3 It is considered that effects on all travellers as associated with the Mr Jennison Option would be similar to those that would be experienced due to the Presented Junction Layout with Option K1, however, this option would potentially have a moderate adverse effect on some southbound A38 drivers wishing to access Mackworth, and drivers from Mackworth wishing to access the southbound A38 and such drivers would have to use the A5111 up to the retail park junction to double back to the Kingsway junction. It is thus considered that the Mr Jennison Option would perform slightly worse than the Presented Junction Layout with Option K1 or K2.

6.6.9. **Community and Private Assets**

6.6.9.1 It is considered that Option K1 would result in a potentially moderate adverse effect with regard to the loss of Public Open Space and community severance issues. However, if appropriate exchange land can be locally sourced, effects could be reduced to non-significant levels.

6.6.9.2 The potential community and private assets effects of the Mr Jennison Option would essentially be the same as the effects associated with the Presented Junction Layout with Option K1 (i.e. potential moderate adverse effect with regard to the loss of Public Open Space and community severance).

6.6.9.3 Option K2 would not require land used by the community or involve the demolition of private/commercial properties, or impact on land currently designated for development or agriculture. Option K2 would, however, result in a minor loss of land from industrial premises along Kingsway Park Close and some land to the rear of the existing retail premises. In terms of severance, appropriate provisions would be needed to enable NMUs to traverse the Option K2 link road such that they are not adversely impacted, whilst increases of traffic along Kingsway Park Close has the potential to cause community severance. Option K2 would have the potential to result in a slight adverse effect upon community and private assets. Option K2 as compared to Option K1 would reduce the loss and severance of Public Open Space located to the south of Greenwich Drive South. As such, Option K2 has the potential to result in a slight to moderate beneficial effect with as compared to Option K1 by reducing the loss/ severance of local Public Open Space.

6.6.10. Road Drainage and the Water Environment

Water Resources

6.6.10.1 Assuming that best practice measures to protect the water environment are adopted during construction activities, it is considered that the Presented Junction Layout with Option K1 would have the potential to result in slight adverse effect to surface water resources, and a neutral effect on groundwater resources. Assuming that the Presented Junction Layout with Option K1 is provided with a suitable surface water drainage and management system, it is considered that scheme operation would have no more than a slight adverse effect upon water resources as related to surface water runoff and operational runoff contamination/ potential operational spillage risk.

6.6.10.2 The potential water resource effects of the Mr Jennison Option would essentially be the same as the effects associated with the Presented Junction Layout with Option K1.

6.6.10.3 Given the Option K2 would traverse a historic landfill site and be located over Bramble Brook culvert, it is considered that Option K2 would have the potential to result in a slight adverse impact on surface water and groundwater resources (assuming that best practice measures to protect the water environment are adopted during construction activities). It is thus considered that water resource effects of Option K2 would be slightly worse as compared to the effects associated with Option K1.

Flood Risk

6.6.10.4 The main flood risk in the vicinity of the existing Kingsway junction relates to Bramble Brook which crosses the junction through an area known locally as the Grand Canyon.

6.6.10.5 Without mitigation, the Presented Junction Layout with Option K1 would have the potential to result in a large adverse effect in terms of flooding. However, a preliminary compensation strategy has been qualitatively assessed as having a slight beneficial potential flood risk effect relative to the existing Kingsway junction, in that local flood risks may be reduced as part of the new junction design. Similar benefits could also be delivered by the Presented Junction Layout with Option K1 and by the Mr Jennison Option. For all options there would thus be a need for flood storage upstream of the junction, as well as land needed for the appropriate control of surface water runoff.

6.6.11. Overview

6.6.11.1 Table 6.1 provides a summary of the findings of the qualitative environmental assessment.

6.6.11.2 This table illustrates that the Presented Junction Layout with Option K2 offers the potential to significantly reduce the loss of Public Open Space (by approximately 1,500m²) and reduce landscape and visual effects. Whilst Option K2 would result in the loss of some Public Open Space, given that losses would be significantly smaller than with Option K1, sourcing potential exchange land would be less problematic. Option K2 would also be less visible to residential receptors than Option K1, thus requiring less landscape mitigation.

6.6.11.3 The Presented Junction Layout with Option K2 would potentially perform slightly worse than the Presented Junction Layout with Option K1 in terms of (unmitigated) effects upon geology and soils, materials and water resources due to Option K2 being located over an area of former landfilling. However, with adherence to standard construction practices and appropriate design, adverse residual effects could be readily reduced to non-significant levels (such that residual effects would be similar to those that would be experienced with the Presented Junction Layout with Option K1).

6.6.11.4 Option K2 would avoid the significant traffic noise level increases along Greenwich Drive South (as associated with the Presented Junction Layout with Option K1). However, Option K2 would transfer the moderate/large adverse noise effect identified for the Presented Junction Layout with Option K1 from Greenwich Drive South onto Kingsway Park Close.

6.6.11.5 Table 6.1 illustrates that the Mr Jennison Option would potentially perform worse than the Presented Junction Layout with Option K1 in terms of effects upon air quality and noise along a section of the A5111 which would be used as a diversion, and along any minor local roads used by traffic avoiding the congestion at the Kingsway Retail Park roundabout.

Table 6/1: Comparison Matrix of the Significance of Potential Effects of the Various Options (including a comparison with the Presented Junction Layout with Option K1)

	Presented Junction Layout with Option K1	Presented Junction Layout with Option K2	Mr Jennison Option with Option K1
Air Quality	Slight adverse	Slight adverse (effects similar to Presented Junction Layout with Option K1)	Moderate adverse (moderately worse than Presented Junction Layout with Option K1 effects)
Cultural Heritage	Neutral	Neutral (not significantly different to Presented Junction Layout with Option K1 effects)	Neutral (not significantly different to Presented Junction Layout with Option K1 effects)
Landscape & Visual	Slight adverse	Negligible (slightly better than Presented Junction Layout with Option K1 effects)	Slight adverse (not significantly different to Presented Junction Layout with Option K1 effects)

Nature Conservation	Large significant adverse at up to the Regional level (unmitigated) potentially reducing to non-significant levels with mitigation	Large significant adverse at up to the Regional level (unmitigated), potentially reducing to non-significant levels with mitigation (not significantly different to Presented Junction Layout with Option K1 effects)	Large significant adverse* at up to the Regional level (unmitigated), potentially reducing to non-significant levels with mitigation (not significantly different to Presented Junction Layout with Option K1 effects)
Nature Conservation	Large adverse (unmitigated) potentially reducing to non-significant levels with mitigation	Large adverse (unmitigated), potentially reducing to non-significant levels with mitigation (not significantly different to Presented Junction Layout with Option K1 effects)	Large adverse* (unmitigated), potentially reducing to non-significant levels with mitigation (not significantly different to Presented Junction Layout with Option K1 effects)
Geology & Soils	Slight adverse	Moderate adverse (unmitigated) Slight adverse (with mitigation) (more mitigation needed than Presented Junction Layout with Option K1)	Slight adverse (not significantly different to Presented Junction Layout with Option K1 effects)
Materials	Slight adverse	Slight/ moderate adverse (unmitigated) Slight adverse (with mitigation) (more mitigation needed than Presented Junction Layout with Option K1)	Slight adverse (not significantly different to Presented Junction Layout with Option K1 effects)
Noise	Slight beneficial to large adverse	Slight beneficial to large adverse (slight beneficial as compared to the Presented Junction Layout with Option K1 effects)	Slight beneficial to large adverse (slight adverse compared to the Presented Junction Layout with Option K1 effects)
Effect on All Travellers	Slight adverse - construction (C) & slight adverse to moderate beneficial - operation (O)	Slight adverse (C) & slight adverse to moderate beneficial (O) (not significantly different to Presented Junction Layout with Option K1 effects)	Slight adverse (C) & moderate beneficial/ moderate adverse (O) (potentially worse than Presented Junction Layout with Option K1 effects)
Community & Assets	Moderate adverse	Slight adverse (slight to moderate beneficial when compared to Presented Junction Layout with Option K1 effects)	Moderate adverse (not significantly different to Presented Junction Layout with Option K1 effects)
Water Resources	Slight adverse – surface water (C); Neutral – groundwater (C) Slight adverse - surface water & groundwater (O)	Slight adverse surface water and groundwater (C & O) (slightly worse than Presented Junction Layout with Option K1 effects)	Slight adverse – surface water (C); Neutral – groundwater (C) Slight adverse - surface water & groundwater (O) (no significant change when compared to Presented Junction Layout with Option K1 effects)
Flood Risk	Slight beneficial (with flood compensation)	Slight beneficial (with flood compensation) (not significantly different to Presented Junction Layout with Option K1 effects)	Slight beneficial (with flood compensation) (not significantly different to Presented Junction Layout with Option K1 effects)

6.7. Limitations

6.7.1. The following limitations are noted with regard to the qualitative environmental assessment as presented herein:

- **Air Quality:** The assessments reported are based on professional judgement of the likely magnitude of the changes in air quality at the closest receptors based on the changes in proximity to the road with each option. It is stressed that no detailed modelling of traffic data are available, therefore it is not possible to accurately determine the magnitude of the changes in pollutant concentrations, both in the vicinity of the option and on the wider road network;
- **Cultural Heritage:** The heritage walkover for the Presented Junction Layout (with K1 and K2) was undertaken from public access points only, including public footpaths, and therefore the assessment of setting of heritage assets is based upon this initial assessment. There has been no consultation with the local planning authority (conservation officer, local planning archaeologist) with regard to heritage assets that would be impacted the scheme options. The assessment has been undertaken with regard to datasets that were collected from the historic environment record (Derbyshire County Council) and Historic England (formerly English Heritage) in September 2014;
- **Landscape and Visual:** The assessment is based upon the provided engineering drawings. A site visit was conducted during June and so a comparison of visibility of visual effects over four seasons or during a wide range of light and weather conditions was not possible. The timescale for production of this assessment precluded a winter survey with trees devoid of leaf cover. This qualitative assessment of landscape and visual impacts has taken place before the completion of the scheme Landscape and Visual Impact Assessment and thus conclusions are preliminary and potentially subject to amendment;
- **Nature Conservation:** This is a precautionary appraisal in which levels of effects are detailed 'as up to' unless it is considered that there is sufficient baseline/ detailed design information to inform a more definitive assessment. The potential adverse effects arising from construction or operation of each option are precautionary and are based on current understanding of baseline information and potential impacts upon receptors. The assessment excludes consideration of any mitigation measures;
- **Geology and Soils:** This assessment is based on professional judgement of the likely effects of the options, the provided engineering drawings and on collated desk top information. No intrusive ground investigation has been undertaken at the site at this stage;

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- **Materials:** The assessment is partly based on technical information on the types of materials resources associated with the construction of major road projects. At this stage in the design, detailed information on the types and quantities to be used for each option is unavailable; therefore, the assessment would be more comprehensive when specific details on the use of materials are known. With regards to waste, the assessment is indicative of the types of waste that could potentially be generated from road construction schemes, historic land use of the site, types of soils at the site as well as the types of material resources that would be used during construction;
 - **Noise and Vibration:** The assessments reported are based on professional judgement of the likely magnitude of the changes in traffic noise levels at the closest receptors based on the changes in proximity to the road with each option. It is stressed that no traffic noise modelling results or traffic data are available at this stage, therefore it is not possible to accurately determine the magnitude of the changes in road traffic noise levels, both in the vicinity of the each option and on the wider road network. No account of local topography or the benefit of potential noise mitigation measures has been taken in the assessment. In the absence of traffic data no account of potential changes in traffic composition or speed has been made;
 - **Effects on Travellers:** The baseline for the qualitative assessment is informed by an initial NMU (pedestrian, cyclist, equestrian or disabled user) survey carried out in August 2014. The assessment excludes consideration of any mitigation measures;
 - **Community and Private Assets:** Other than the on-going consultation with potentially affected landowners, specific land use surveys have not been undertaken at this stage. In the absence of a detailed assessment on the effects of the proposed improvements on community and private assets, this assessment should be treated as indicative. The assessment excludes consideration of any mitigation measures;
 - **Water Resources:** Surface water features beyond the Presented Junction Layout have been observed via online mapping of the area and no walkover survey has been carried out to determine the validity of this data. The drainage strategy for the proposed alternatives is not known at the time of writing. Assumptions have been made for the resulting culvert alterations/diversions; and
 - **Flood Risk:** Flood Risk Assessments (FRAs) including hydraulic modelling for Bramble Brook and highways drainage networks are in progress and have not been used to complete this assessment. For example, at this stage it is not possible to confirm the need for, scale of, or location of compensation storage areas. Additional modelling would be required for the alternative options.

7. TRAFFIC AND ECONOMIC ASSESSMENT

7.1. Introduction

- 7.1.1. This section presents a qualitative traffic assessment of various alternative scheme designs at the Kingsway junction described in Section 3.
- 7.1.2. Each option is considered qualitatively in terms of its key traffic-related features: the traffic impacts of reassignment, transport economic efficiency (TEE), road safety, and delays during construction.
- 7.1.3. In the paragraphs below the potential traffic impacts associated with the Presented Junction Layout with Option K1 (refer to Drawing No. 47041319-URS-06-DR-GD-25.035 in Appendix B) are considered. The report then examines the traffic impacts associated with the options, and how these compare with the impacts associated with the Presented Junction Layout with Option K1.
- 7.1.4. Where daily traffic flows are provided, these are based upon 12-hour manual classified turning counts undertaken in March 2015. These have been converted to annual average daily traffic (AADT) flows by multiplying by an E-factor (=1.15) and an M-factor (=394/365). These values produce an overall expansion factor of 1.241. Where opening year 2022 flows are provided, these have been calculated assuming a growth factor of 1.07 from 2015 to 2022.

7.2. Key Traffic –Related Features

7.2.1. Presented Junction Layout

- 7.2.1.1 In traffic terms the key features of the Presented Junction Layout at Kingsway would be as follows;
- The A38 would be lowered to pass underneath the existing roundabout, in a new underpass that makes use of the existing earthworks cutting;
 - Two new roundabouts and a bridge at the existing roundabout level will carry traffic over the lowered A38;
 - The A38 would be widened to three lanes in each direction between the Kingsway junction and the Kedleston Road slip roads; and
 - The existing speed limit will be increased from 40mph to 50mph.
- 7.2.1.2 The key traffic benefits of the Presented Junction Layout would be;
- The A38 traffic would be able to pass through the junction without stopping;
 - Queuing on the A5111 Kingsway ring road and on local roads would be reduced;
 - Land take would be minimised outside of the highway boundary; and
 - Existing pedestrian and cycle routes would be provided for at the junction.
- 7.2.1.3 The main traffic impacts of the Presented Junction Layout would be;
- No access to and from the A38 at the Brackensdale Avenue/Raleigh Street Junctions.
- 7.2.1.4 With the Presented Junction Layout at Kingsway Junction, the existing direct accesses from Mackworth onto the A38 would be closed. Two options are being considered regarding the future access arrangements from Mackworth onto the A38.

7.2.2. **The Presented Junction Layout with Option K1 – Local Access provided by Greenwich Drive South**

7.2.2.1 The key traffic benefits of Option K1 are;

- Maintains a direct access from the Mackworth area to the A38; and
- Some journey lengths would be reduced.

7.2.2.2 The key traffic impacts of Option K1 are;

- Traffic flows along Greenwich Drive South will increase, including the possible use of heavy vehicles;
- A few journeys using the Brackensdale Avenue/A38 northbound access would increase in length by a maximum of 0.5 miles; and
- Journeys using the Raleigh Street/A38 southbound access would increase in length between 0.3 and 1 mile.

7.2.3. **The Presented Junction Layout with Option K2 – Local Access provided by Kingsway Park Close**

7.2.3.1 The key traffic benefits of Option K2 are;

- Maintains a direct access from the Mackworth area to the A38;
- Some journey lengths would be reduced; and
- Kingsway industrial park would have a more direct access onto the A-road network.

7.2.3.2 The key traffic impacts of Option K2 are;

- A few journeys using the Brackensdale Avenue/A38 northbound access would increase in length by a maximum of 0.5 miles; and
- Journeys using the Raleigh Street/A38 southbound access would increase in length between 0.3 and 1 mile.

7.2.4. **Mr Jennison Option (with Option K1) – single roundabout plus bridge to take traffic over the A38**

7.2.4.1 This option is similar to the Presented Junction Layout except that one of the two new roundabouts is deleted; only the single roundabout on the Greenwich Drive South side of the A38 would be retained.

7.2.4.2 The main traffic benefits and impacts for the Mr Jennison Option would be similar to those of the Presented Junction Layout with Option K1. The main detrimental impact would be that trips to and from Mackworth would not be able to turn right onto the A38 without a diversion of significant length.

7.3. **Reassignment Effects**

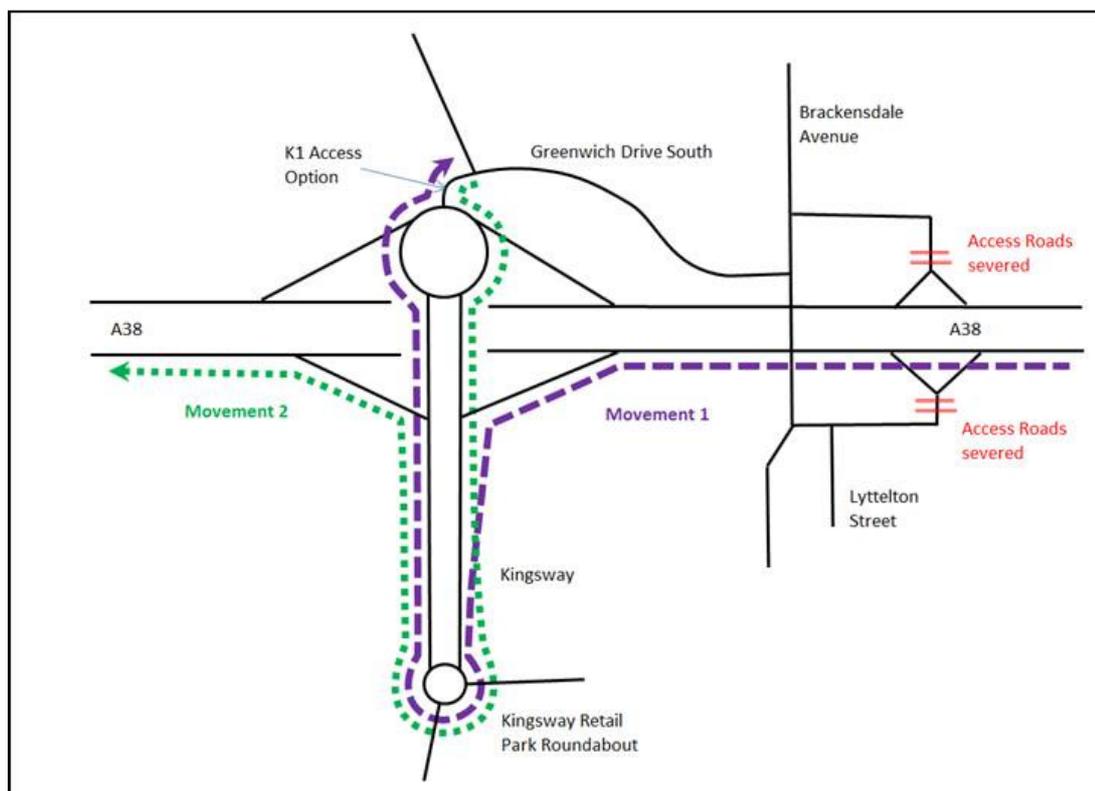
7.3.1. **Options K1 and K2**

7.3.1.1 The traffic reassignment effects for options K1 and K2 (i.e. providing a local access at either Greenwich Drive South or Kingsway Park Close) would be restricted to the three local roads of Greenwich Drive South, Brackensdale Avenue (Between Greenwich Drive South and Kingsway Park Close), and Kingsway Park Close. With Option K1 flows that were using Kingsway Park Close will transfer to Greenwich Drive South, and vice versa.

7.3.1.2 Beyond the reassignment within these three local roads, it is expected that there would be little perceivable change in traffic flows on more major routes.

- 7.3.1.3 Heavy vehicles need to access the industrial land uses on Kingsway Park Close. In the 2015 existing case, these heavy vehicles need to pass into an environmental weight restriction area (except for access) that is defined by a traffic regulation order.
- 7.3.1.4 With Option K1 these heavy vehicles would continue to pass through the environmental weight restriction area. This would require those heavy vehicles accessing land at Kingsway Park Close passing along the Greenwich Drive South.
- 7.3.1.5 With Option K2, the heavy vehicles accessing Kingsway Park Close industrial land would not need to pass into the environmental weight restriction area at all.
- 7.3.2. **Mr Jennison Option (with Option K1)**
- 7.3.2.1 The Mr Jennison Option (with Option K1) impacts on trips from Mackworth to A38 South and trips from A38 North into Mackworth as traffic would not be able to turn right without making a diversion of significant length. So access to and from Mackworth would be severely restricted.
- 7.3.2.2 The Mr Jennison Option will have the greatest impact upon traffic flows of all the options that are being considered. Local Mackworth trips that currently use the existing Brackensdale / Raleigh Street accesses onto/off of the A38 will be forced to use numerous other roads. Some of these are narrow, with parked cars, and pass through residential areas.
- 7.3.2.3 In order to assess the magnitude of additional flow that may affect the A5111 ring road using the Mr Jennison alternative, a logic based estimate was made using 2015 count data.
- 7.3.2.4 The potential re-routing of Markeaton/New Zealand traffic for both A38 southbound routes is shown diagrammatically in Figure 7/1 below;

Figure 7/1: Re-routing of Mackworth/New Zealand Traffic under Mr Jennison Option



7.3.2.5 Two movements were assessed as described below;

- Movement 1 – A38 North to Markeaton/New Zealand; March 2015 observed flow on Lyttelton Street = 3,300 vehicles. As worst case all of these trips divert to A38N-new Kingsway Junction - A5111 E/B-U-turn at Kingsway Retail Park Roundabout - A511 W/B-Option K1 – Greenwich Drive South – Continue Journey. Because traffic has to travel both ways along the A5111 the increase in 2-way flow is 3300×2 or 6,600 over 12 hours; and
- Movement 2 – Markeaton/New Zealand to A38 south. March 2015 flow on Lyttelton Street N/B is 4,600. As a worst case all of these trips divert to Brackensdale Avenue – Greenwich Drive South – Option K1 Link – new Kingsway Junction – A511 E/B – U-turn at Kingsway Retail Park roundabout – A511 westbound – A38 south – continue journey. So an increase in 2-way flow on the A5111 Kingsway is twice 4,600, or 9,200 vehicles in 12 hours.

7.3.2.6 Compared with the Presented Junction Layout with Option K1, Movement 1 would increase in length by 1.3 kilometres. Movement 2 would increase in length by 1.0 kilometre.

7.3.2.7 The combined additional 12-hour flow on the A5111 Kingsway ring road would be an upper-bound estimate (assuming no other diversion routes are used) of the order of 15,800 vehicles. Converting this 2015 flow to a 2022 AADT value gives an upper-bound AADT value of 21,000 additional vehicles per day.

7.3.2.8 The baseline AADT on the A5111 Kingsway in 2022 has been calculated using a 2015 flow value on the A5111 ring road of 19,700 which produces a 2022 flow of 26,200 vehicles per day.

7.3.2.9 Using the calculation of Diverting Trips divided by Baseline Trips, i.e. $21,000/26,200$, an increase in trips of around 80% could be observed as a worst-case value on this section of the A5111 Kingsway. However, the numerator in this equation is very much an upper bound value, and the denominator very much lower bound (in lieu of the modelled forecasts), so the increase should be less than 80%. Nevertheless this indicates the potentially significant reassignment onto the A5111 Kingsway that could be envisaged under the Mr Jennison Option with a local access to Mackworth.

7.3.2.10 In traffic terms, the Mr Jennison Option (with Option K1) would not function as well as the Presented Junction Layout with Option K1. Two of the movements to and from the A38 would become extended in length and other less suitable routes might start to be used, particularly at busy times of the day.

7.4. Transport Economic Efficiency Effects

7.4.1. A key traffic objective of any of the options is the economic benefit provided by the scheme in terms of time savings and vehicle operating costs. The following paragraphs describe, in a qualitative manner, how the options are likely to affect the transport economic efficiency (TEE) of the road network.

7.4.2. Presented Junction Layout

7.4.2.1 The main transport economic benefits resulting from the Presented Junction Layout are summarised as follows;

- The A38 strategic trips would be able to pass through the junction without stopping. This would provide an economic benefit due to the removal of delays at the existing 'at-grade' junction;

- Queuing on the local roads and A5111 Kingsway ring road will be reduced. This would provide an economic benefit because the vehicles approaching from A5111 Kingsway would no longer be in conflict with the A38 through traffic flow;
- The speed limit on the mainline A38 would be increased from 40mph to 50mph. This would provide an economic benefit in terms of journey time savings for travellers along the A38; and
- The A38 would be widened to three lanes between the Kingsway Junction and Kedleston Road. This would provide an economic benefit due to journey time savings from the reduction in congestion provided by the increased capacity.

7.4.2.2 The main transport economic disbenefits potentially resulting from the Presented Junction Layout are summarised as follows;

- No access would be provided onto the A38 from the Brackensdale Avenue and Raleigh Street Junctions. This would increase some motorists' journey lengths and hence their journey times to access either the A38 Kingsway or the A38 Markeaton junctions; and
- The increase in speed along the A38 may cause an increase in vehicle operating costs or carbon emissions.

7.4.2.3 Overall the Presented Junction Layout is highly likely to provide a positive economic benefit and represent a very high value for money scheme.

7.4.3. **The Presented Junction Layout with Option K1**

7.4.3.1 The Local Access Option K1 (Greenwich Road South option) is one of the side-road options for re-connecting the local highway network with the Presented Junction Layout. The transport economic efficiency benefits/disbenefits would be similar to those described in paras 7.4.2.1 to 7.4.2.3. If this option is the one taken forward, in terms of the journey times to the A38 it would provide most time savings to those residents adjacent to the local roads around Greenwich Road South.

7.4.3.2 Overall the Presented Junction Layout with Option K1 is highly likely to provide a positive economic benefit compared to the existing layout.

7.4.4. **The Presented Junction Layout with Option K2**

7.4.4.1 The Local Access Option K2 (Kingsway Park Close option) is one of the options for re-connecting the local highway network of Mackworth with the Presented Junction Layout. The transport economic efficiency benefits/disbenefits can be read as those described in paras 7.4.2.1 to 7.4.2.3 above. If this option is the option taken forward, in traffic journey time saving terms it would benefit the residents and employees around Kingsway Park Close; whereas the Local Access Option K1 would provide more time savings to those residents that live to the east of the A38 near to Greenwich Road South.

7.4.4.2 Heavy vehicles accessing the employment area at Kingsway Park Close would have shorter journeys compared with the existing layout and also compared with Local Access Option K1.

7.4.4.3 Overall the Presented Junction with Option K2 is highly likely to provide a positive economic benefit compared to the existing layout.

7.4.5. Mr Jennison Option (with Option K1) (compared to Presented Junction Layout with Option K1)

7.4.5.1 The Mr Jennison Option would close the Brackensdale Road and Raleigh Street accesses to the A38. It could be provided in combination with the Greenwich Road South Local Access Road Option K1.

7.4.5.2 As discussed, the single roundabout option here would mean two right turn movements (A38N-Markeaton/New Zealand and Markeaton/New Zealand to A38S) having to use the A5111 ring road and making a U-turn at the Kingsway Retail Park roundabout in order to reach their destination.

7.4.5.3 The additional length (2.3km) times the diverted flow (21,000) equals 48,300vehicle-kilometres of extra traffic potentially using the A5111 Kingsway ring road - as a worst case scenario.

7.4.5.4 This would make a proportion of local journeys longer and therefore have a negative impact on journey times and increase vehicle operating costs and increase carbon emissions. This vehicle operating cost increase might not outweigh the positive vehicle operating cost savings of grade separating the A38.

7.4.5.5 Overall the Mr Jennison Option is highly likely to provide an overall positive travel time saving, compared to the existing Kingsway layout, but it is unlikely that this time saving benefit will be as positive as the Presented Junction Layout with either of the Local Access Options K1 or K2.

7.4.5.6 The monetary value of the travel time savings are likely to provide a greater benefit than the monetary value of the increase in vehicle operating costs; however this conclusion is a subjective judgement and would need to be confirmed by computational analysis.

7.4.6. Road Safety

7.4.7. Presented Junction Layout with Option K1

7.4.7.1 The trips that access the A38 via the Brackensdale Avenue and the Raleigh Street connections onto the A38 would need to divert to the Kingsway Junction via Greenwich Drive South. This will increase the volume of flows on Greenwich Drive South.

7.4.7.2 The types of vehicle using Greenwich Drive South would also change because heavy vehicles delivering goods and services to businesses in Mackworth would be permitted to travel through the existing environmental weight restriction.

7.4.7.3 The change in flow and vehicle composition on Greenwich Drive South would increase the hazards for pedestrians and cyclists that wish to cross this road. There is an existing pedestrian desire line between the houses on the west side of Greenwich Drive South and Public Open space on the east side of Greenwich Drive South.

7.4.7.4 The Local Access Option K1 would cross the national cycle route. Provision would be made to accommodate this movement safely; however, a residual risk of collisions between heavy vehicles and cyclists would remain.

7.4.7.5 Turning movement manoeuvres at the Lyttelton Street/Greenwich Drive South junction would increase compared with the 2015 baseline. This would increase the number of conflicts between vehicle movements and the likelihood of road traffic collisions. However, the existing vehicle manoeuvres at both ends of the Brackensdale Avenue Connector Road would be removed as a result of this road closure. Also the existing vehicle manoeuvres at both ends of the Raleigh Street Connector Road would also be removed as a result of the road closure. Without undertaking detailed numerical analysis, it is difficult to conclude whether the impact of this option is an improvement or a reduction in the network-wide road safety.

7.4.8. **Presented Junction Layout with Option K2**

7.4.8.1 The trips that access the A38 via the Brackensdale Avenue and the Raleigh Street connections onto the A38 would need to divert to the Kingsway Junction via Kingsway Park Close. This will increase the volume of flows on Kingsway Park Close.

7.4.8.2 The types of vehicle using Kingsway Park Close would change because light vehicles originating from Mackworth housing estate would travel through this employment area. There are no clear pedestrian desire lines within Kingsway Park Close but employees would walk to and from the industrial units on either side of the Close.

7.4.8.3 The new link road that would connect between Kingsway Park Close and the A38 Kingsway junction would cross a footway/cycleway that follows alongside the A38/A5111 routes. This link road would introduce a new hazard for those pedestrians and cyclists using this route.

7.4.8.4 Turning movement manoeuvres at the Lyttelton Street/Kingsway Park Close junction would increase with this combination of options compared with the 2015 baseline. This would increase the number of conflicts between vehicle movements and the likelihood of road traffic collisions. Provision would also need to be made to for the pedestrians and cyclists travelling along Lyttelton Street and rationalise their movements through the junction.

7.4.8.5 However, the existing vehicle manoeuvres at both ends of the Brackensdale Avenue connector road would be removed as a result of this road closure. Also the existing vehicle manoeuvres at both ends of the Raleigh Street Connector Road would also be removed as a result of this road closure. Without undertaking detailed numerical analysis, it is difficult to conclude whether the impact of this Option is an improvement or a reduction in the network-wide road safety.

7.4.9. **Mr Jennison Option (with Option K1)**

7.4.9.1 The Mr Jennison Option (with Option K1) would result in road safety implications similar to those described for the Presented Junction Layout with Option K1.

7.4.9.2 Because trips with local origins and destinations would need to use the Kingsway Retail Park roundabout to make a U-turn, these road users would be exposed to additional manoeuvres and conflicts with other road users. These would be new hazards that would be likely to deteriorate the road safety record of the A5111 Kingsway route. The Mr Jennison Option is thus likely to be worse for road safety than the Presented Junction Layout with Option K1.

7.5. Construction Sequencing / Buildability

7.5.1. In traffic terms the process of constructing a new junction is almost always neutral or detrimental to the travelling public, in terms of the queues and delays it creates whilst the road network is being reconfigured. This is because it is difficult to maintain a level of service equivalent to the existing layout whilst road works are being undertaken. Also vehicle speeds will be reduced by temporary speed limits where there is construction staff working in vulnerable positions adjacent to the carriageway.

7.5.2. It is, therefore, desirable to minimise the durations and phases of construction required to upgrade the junctions at Kingsway if at all possible. No definitive durations for the upgrade of the junction have been provided, although Highways England has an objective to complete the improvement as quickly as possible.

7.5.3. Presented Junction Layout with Option K1

7.5.3.1 Construction of this option would be undertaken in 3 phases. The first phase would encompass the construction of the two roundabouts and Greenwich Drive South, and retain the side roads connections to the A38 at Brackensdale Avenue and at Raleigh Street in operation. The second phase would close the Brackensdale Avenue and Raleigh Street connections to the A38 and would switch traffic onto the new junction. The third phase would encompass the minor works needed to complete outstanding work; this phase would see traffic running on the new alignment.

7.5.3.2 In terms of effects on traffic, Phase 1 would have minimal disruption to existing traffic, as operationally it would act in a similar manner to the existing junction arrangement. Phase 2 would experience localised queuing at the Greenwich Drive South side road tie-in. Phase 3 would produce minimal disruption because the junction would be operating as envisaged post-construction.

7.5.4. Presented Junction Layout with Option K2

7.5.4.1 As with the Presented Junction Layout with Option K1, the construction of this option would be undertaken in 3 phases. The first phase would encompass the construction of the two roundabouts and the link to Kingsway Park Close; the side roads at Brackensdale Avenue and Raleigh Street would remain in operation. The second phase would close the Brackensdale Avenue and Raleigh Street access roads onto the A38 and would switch traffic to use the new junction. The third phase would encompass the minor completion of outstanding work. This phase would see traffic running on the new alignment.

7.5.4.2 In terms of effects on traffic, Phase 1 would have minimal disruption to existing traffic, as operationally it would act in a similar manner to the 2015 existing junction arrangement. Phase 2 would experience localised queuing at the Kingsway Park Close side road tie-in. Phase 3 would produce minimal disruption as the junction would be operating as envisaged post-construction.

7.5.5. Mr Jennison Option (with Option K1)

7.5.5.1 For this option a construction sequence with four phases has been envisaged, which would better handle traffic through the works. Phase 1 would encompass construction of the junction overbridge with the west roundabout partially constructed. Temporary traffic signalled junctions would be constructed at each end of the new bridge. The link to Greenwich Drive South would be completed but would remain closed to traffic.

-
- 7.5.5.2 For Phase 2, the existing traffic will remain on the existing A38 and continue using the existing accesses to Brackensdale Avenue and Lyttelton Street. Temporary signals could operate across the bridge to permit traffic from A5111 to turn toward A38 northbound. The right turn from A38 South (northbound) to A5111 Kingsway (eastbound) might be prohibited, which is a low flow turning movement because the A516 provides a similar function. Construction would complete the mainline in the areas of the existing junction either side of the new bridge.
- 7.5.5.3 Phase 3 would see the new A38 mainline opened to traffic, with works to complete the roundabout and fully open the Greenwich Drive South link. The A38 local accesses to Brackensdale Avenue and Lyttelton Street would then be permanently closed. Work would next be undertaken to convert the existing A38/A5111 into a slip road merge and diverge. The junction overbridge would remain closed to avoid traffic conflict.
- 7.5.5.4 Phase 4 sees traffic able to travel along the new layout with minor completion of outstanding work.
- 7.5.5.5 In terms of effects on traffic, the Mr Jennison construction sequence adds an extra phase to that of the Presented Junction Layout with either of the Local Access Options K1 or K2. This is to allow for an extra phase of works during which temporary signals would be in operation on the junction overbridge. These traffic signals would be necessary because the east side of the junction, under the Mr Jennison Option, has no roundabout pavement in its ultimate layout and so would need temporary pavement as part of a priority junction.
- 7.5.5.6 Despite the extra construction phase for traffic, the construction period for the Mr Jennison Option is not likely to be any longer than for the Presented Junction Layout with K1 or K2. However, there would be extra traffic management costs incurred due to the setting up and maintenance of the temporary traffic signals.
- 7.5.5.7 There would also likely be more queues and delays experienced during this phase during the traffic signal operation, despite the restricted right turn movements. The relatively short length of the overbridge will mean that the traffic signals will need testing carefully to ensure sufficient green time is given to the right turn from A5111 Kingsway (east) to A38 (north); the risk is that traffic could block-back on the overbridge possibly as far as the traffic signals at the eastern end of the junction.

7.6. Traffic Assessment Summary & Conclusions

- 7.6.1. The traffic impacts of the options have been summarised above in a qualitative manner using engineering and transport planning judgement.
- 7.6.2. The main four traffic objectives affected by the upgrading of the Kingsway junction are reassignment, transport economic effects, delays during construction and road safety.

Table 7/1: Traffic Impacts Comparison Matrix

Traffic Objective	Option		
	Presented Junction Layout with Option K1	Presented Junction Layout with Option K2	Mr Jennison Option (with Option K1)
Reassignment Effects	2	1	3
	The Presented Junction Layout with Option K1 and Presented Junction Layout with Option K2 would have similar reassignment effects restricted to a small number of local roads. The Presented Option Layout with Option K1 would require heavy vehicles to pass through the environmental weight restriction area. With Option K2, heavy vehicles associated with the Kingsway Park Close employment area would not need to pass through the weight restricted area. With the Mr Jennison Option, trips from Mackworth to A38 South or trips from A38 North into Mackworth would not be able to turn right without making a diversion of significant length, of about 1.0 to 1.3km.		
TEE (post-construction)	1	1	2
	The Presented Junction Layout with Option K1 and the Presented Junction Layout with Option K2 would provide similar travel times to local residents. Residents near Greenwich Road South would have reduced travel times with Option K1 and residents near Lyttelton Street would have reduced travel time with Option K2. Heavy vehicles accessing the employment area at Kingsway Park Close would have shorter journeys with Option K2. The Mr Jennison Option (with Option K1) would have a small reduction in vehicle delay due to the removal of one roundabout compared with the Presented Junction Layouts. However there would be a large increase of local trip journey lengths and an increase in carbon emissions.		
Road Safety	2	1	3
	The Presented Junction Layout with Option K1 and Presented Junction Layout with Option K2 options would move trips from Brackensdale Avenue/Raleigh Street to either Greenwich Road South or to Kingsway Park Close respectively. It is unclear without numerical analysis whether this switching of traffic would provide a net safety benefit or not. The Presented Junction Layout with Option K1 would require some heavy vehicles to pass through an environmental weight restriction area that the Presented Junction Layout with Option K2 would not. The Mr Jennison Option (with Option K1) would provide a similar safety outcome to the Presented Junction Layout with Option K1, but also cause additional safety hazards associated with the extra traffic diverting onto the A5111 ring road resulting from the right turn diversion.		
Delays during construction	1	1	2
	The Presented Junction Layout with Option K1 and Presented Junction Layout with Option K2 construction processes would be similar in terms of construction durations and the number of phases. The construction of the Mr Jennison Option (with Option K1) would incur one extra construction phase, involving the operation of temporary traffic signals, which would increase the cost and impact of works but not the duration.		

Note: The table shows how each option has been ranked for each of the assessment sub-headings. The options are ranked in order of performance 1 to 3. A score of 1 is given to the highest performing option.

7.6.3. The matrix suggests that the Presented Junction Layout combined with Option K2 would be the most beneficial option in terms of the transport objectives.

7.6.4. The Mr Jennison Option (with Option K1) is ranked the worst for all traffic objectives.

7.7. Limitations to Traffic Assessment

7.7.1. The following limitations are noted with regard to the qualitative traffic assessment as presented herein:

- **Reassignment Effects:** The assessments reported are based on professional judgement of the likely magnitude of the changes in traffic flows and routes taken. Use has been made of traffic flow survey results undertaken up to March 2015. No mathematical nor traffic model analysis has been undertaken to determine the reassignment impacts; but logical deduction combined with a basic understanding of the traffic patterns has been used. A qualitative assessment of the traffic increases has been made;
- **Travel Benefits:** The assessments of potential changes to transport economic efficiency (TEE) of the highway network are based upon the layouts indicated and knowledge of the flows in March 2015 where these were available. A traffic model has not been used; therefore it has not been possible to undertake TEE analysis using the methods described in the DfT's Transport Analysis Guidance;
- **Road Safety:** The assessments reported are based on professional judgement of the likely impacts of each layout. It is usual that Stage 1 Road Safety Audits are carried out at later stages of option development. A qualitative assessment has been made; and
- **Delays During Construction:** A construction phasing sequence and a construction programme has been developed for the Presented Junction Layout with either Option K1 or K2 applied. For the Mr Jennison Option an assessment has been made of the likely changes that would be required when compared with the sequencing and programme developed for the Presented Junction Layout. Traffic models have not been used for this option assessment stage.

8. SUMMARY OF CONCLUSIONS

8.1. Methodology

- 8.1.1. In sections 4, 5, 6 and 7, the options have been assessed and ranked by sub-category in terms of Cost, Engineering, Environmental and Traffic & Economics. The outcome of each of these assessments is shown in Tables 8/1 to 8/5 which present the findings shown in the summary tables at the end of each of the sections listed above.

Table 8/1: Overall Assessment Results (Cost)

Cost Sub-Category	Presented Junction Layout with Option K1	Presented Junction Layout with Option K2	Mr Jennison Option (with Option K1)
Total Outturn Cost	1	2	1

Table 8/2: Overall Assessment Results (Engineering)

Engineering Sub-Category	Presented Junction Layout with Option K1	Presented Junction Layout with Option K2	Mr Jennison Option (with Option K1)
Geometry	2	1	3
Public Utilities	1	2	1
NMU Provision	2	1	3
Drainage	1	1	1
Geotechnics	1	2	1
Departures from Standards	2	1	3
Construction Phasing	1	1	2

Table 8/3: Overall Assessment Results (Environment)

Environment Sub-Category	Presented Junction Layout with Option K1	Presented Junction Layout with Option K2	Mr Jennison Option (with Option K1)
Air Quality	1	1	2
Cultural Heritage	1	1	1
Landscape and Visual	2	1	2
Nature Conservation	1	1	1
Geology & Soils	1	2	1
Materials	1	2	1
Noise	2	1	3
Effect on All Travellers	1	1	2
Community & Private Assets	2	1	2
Water Resources	1	2	1
Flood Risk	1	1	1

Table 8/4: Overall Assessment Results (Traffic & Economics)

Traffic & Economics Sub-Category	Presented Junction Layout with Option K1	Presented Junction Layout with Option K2	Mr Jennison Option (with Option K1)
Reassignment Effects	2	1	3
(TEE post-construction)	1	1	2
Road Safety	2	1	3
Delay during construction	1	1	2

Table 8/5: Overall Assessment Results (Overall Summary)

Summary of Results	Presented Junction Layout with Option K1	Presented Junction Layout with Option K2	Mr Jennison Option (with Option K1)
Cost	1	2	1
Engineering	2	1	3
Environment	1	1	2
Traffic	2	1	3
Overall Ranking	2	1	3

Note: The cost element is not the deciding factor in influencing option choice.

8.1.2. Cost

8.1.2.1 From Table 8/1 it can be seen that Option K2 is ranked higher for cost. However, as these options are only part of the proposed Kingsway junction, any variations in the estimated costs between these options are in the order of 1 to 3.5% of the overall delivery costs for this junction. As such the cost element has a low weighting in influencing option consideration and has therefore been excluded from the overall ranking.

8.1.3. Engineering

8.1.3.1 From Table 8/2, it can be seen that all options have been ranked equally for drainage.

8.1.3.2 The Presented Junction Layout with Option K2 has a bigger impact on public utilities than the other two options; this is due to the route taken by the service providers' equipment which the K2 connector road must cross. This option also ranks lowest for the geotechnical element of the works, as the link road cuts across the land fill site by the disused rail line additional work is required to remove the deposited materials safely and reinstate control measure within the site.

8.1.3.3 The Presented Junction Layout with Option K2 has been ranked highest for highway geometry and Departures from Standard as the design does not rely on departures but utilises relaxations from standards to achieve a suitable route. The Mr Jennison Option ranks lowest in these respects due to the tight curves on the slip roads and the restrictions on some of the turning movements.

8.1.3.4 The provision for non-motorised users of the Presented Junction Layout with Option K2 impacts the least on existing routes and where conflict occurs suitable safe solutions can be provided. The Presented Junction Layout with Option K1 and the Mr Jennison Option both impact the National Cycle Route on the west side of the junction and the Mr Jennison Option has additional impacts on NMUs crossing the A5111 on the east side of the junction so ranks worst.

8.1.3.5 Overall the differences are relatively small in engineering terms. However, Option K2 is ranked highest for the greatest number of sub-categories and is consequently preferred in engineering terms.

8.1.4. **Environment**

8.1.4.1 From Table 8/3, it can be seen that all options have been ranked equally for cultural heritage, nature conservation and flood risk.

8.1.4.2 The Presented Junction Layout with Option K1 ranks highest or equal to Option K2 for all categories except landscape and visual and community & private assets, and noise. These lower rankings are due to the severance to public open space caused by the link and increased traffic on Greenwich Drive South. With regard to noise, the overall noise impact of Option K2 would be slight beneficial as compared to the Presented Junction Layout with Option K1.

8.1.4.3 Option K2 ranks lowest for the categories geology & soils, materials and water resources, this is due to the associated work to cross the landfill site. This will generate contaminated waste and makes use of additional materials to restabilise the site.

8.1.4.4 Option K1 and K2 rank equally for environment. Where Option K2 ranks lower than Option K1, this is caused by Option K2 crossing a former landfilled area, where with appropriate management strategies, effects can be reduced to non-significant levels. Option K2 ranks higher than Option K1 as it would avoid long term impacts upon public open space and the prevailing landscape.

8.1.4.5 The Mr Jennison Option ranks the same as or worse than the Presented Junction Layout with Option K1 in every aspect.

8.1.5. **Traffic and Economics**

8.1.5.1 From Table 8/4, it can be seen that Option K1 ranks equally with Option K2 for transport economic effects (post-construction) and delay during construction. Option K2 ranks the highest in all categories, providing better road safety and reassigns traffic more efficiently. The Mr Jennison Option ranks as the worst option in each of the Traffic and Economics assessment categories.

8.1.6. **Conclusion**

8.1.6.1 Option K2 is preferred as it performs better in terms of engineering and traffic and economics, whilst it avoids long terms impacts upon an area of public open space. The Mr Jennison Option ranks worst in each category.

8.1.6.2 Development of the scheme will include further work to ensure the associated cost increases of Option K2 are managed and reduced.

9. RECOMMENDATIONS

9.1. Summary

- 9.1.1. This report sets out the alternative options considered for Kingsway junction, provides cost estimates and assesses the options in terms of engineering, environmental and traffic/economic considerations.
- 9.1.2. Each of the options has been compared with each other as described in Section 8. This comparison shows that, in overall terms, the Presented Junction Layout with Option K2 performs the best.

9.2. Recommendations

- 9.2.1. Based on this assessment of the options, it is recommended that Option K2 is progressed with the Presented Junction Layout as the preferred option for grade separation of the Kingsway junction.
- 9.2.2. In order to minimise the impact of the Presented Junction Layout with Option K2, particularly in terms of Public Utilities, geotechnics, materials and water resources, it is important that appropriate mitigation measures are considered as part of the ongoing scheme assessment and incorporated into the final designs.

Appendix A

Initial Sifting Summary

		Option Details				Assesment against Identified Objectives								Deliverability Assessment		Feasibility Assessment		Sumamry of Initial Assessment						
Option Ref No	Submitted by	Alternative option for:				Option Description	Objective 1	Objective 2	Objective 3	Objective 4	Objective 5	Objective 6	Objective 7	Objective 8	Total	Assessment	Assessment	A	B	C	Does the Option warrant further assessment?	Comments		
		Kingsway Junction	Markeaton Junction	Little Eaton Junction	Overall project																			
Options for Whole Scheme																								
1	Whole scheme					4	2	3	3	3	4	4	5	3.5	3	Likely to be deliverable, with some challenges	3	Likely to be feasible, with some challenges	✓	✓	✓	✓		
15	Mr Peake				X	Bypass from south of Derby to North of Little Eaton	5	5	1	1	2	4	3	2	2.875	1	Unlikely to be deliverable	2	Feasible with major challenges	✗	✗	✗	✗	No further assessment required.
Options for Little Eaton Junction																								
3	Option published for consultation			X		Little Eaton (excluding Ford Lane link to B6179)	4	3	4	2	3	4	4	4	3.5	3	Likely to be deliverable, with some challenges	3	Likely to be feasible, with some challenges	✓	✓	✓	✓	Provides baseline for assessment of alternative options
4	Option 1 (published as Rejected)				X	Option shown on the consultation brochure as rejected Option 1. (2004 Options report = Option 9). Goes through Mobile Home Park.	4	4	3	2	3	3	3	3	3.125	2	Deliverable with major challenges	3	Likely to be feasible, with some challenges	✓	✗	✓	✗	No further assessment required.
5	Option 2 (published as Rejected)				X	Option shown on the consultation brochure as rejected Option 2. (2004 Options report = Option 7). Retains Mobile Home Park.	4	4	3	2	3	3	3	4	3.25	3	Likely to be deliverable, with some challenges	3	Likely to be feasible, with some challenges	✓	✓	✓	✓	Further assessment required.
6	Breadsall Parish Council				X	Option 3A	4	2	3	2	3	4	4	4	3.25	3	Likely to be deliverable, with some challenges	3	Likely to be feasible, with some challenges	✓	✓	✓	✓	Further assessment required, particularly with regards to design/engineering assessment.
7	Breadsall Parish Council				X	Option 4	4	2	3	2	3	4	4	4	3.25	2	Deliverable with major challenges	3	Likely to be feasible, with some challenges	✓	✗	✓	✗	No further assessment required.
8	Cllr Stevenson				X	A38 to follow existing alignment adjacent to Breadsall and extend floodplain to south of Little Eaton jcn.	4	3	2	1	3	4	4	3	3	2	Deliverable with major challenges	3	Likely to be feasible, with some challenges	✓	✗	✓	✗	Exact details to be confirmed with the respondee to confirm result of this assessment. This option has been superseded by option 18
9	Campaign for Better Transport				X	Flyover from A61 to A38 North	1	4	4	2	3	3	4	2	2.875	2	Deliverable with major challenges	3	Likely to be feasible, with some challenges	✗	✗	✓	✗	No further assessment required.
17	Mr Bradwell				X	Roundabout to north of A38 on landfill site. Layout does not permit Little Eaton traffic onto A38 southbound.	2	2	4	2	3	2	4	2	2.625	2	Deliverable with major challenges	2	Feasible with major challenges	✗	✗	✗	✗	No further assessment required.
18	BAAG				X	A38 to follow existing alignment adjacent to Breadsall and extend floodplain to south of Little Eaton jcn.	4	2	3	2	3	4	4	4	3.25	3	Likely to be deliverable, with some challenges	3	Likely to be feasible, with some challenges	✓	✓	✓	✓	Further assessment required, particularly with regards to design/engineering assessment.
Options for Markeaton																								
NO ALTERNATIVE OPTIONS RECEIVED																								

		Option Details				Assesment against Identified Objectives								Deliverability Assessment		Feasibility Assessment		Sumamry of Initial Assessment						
Option Ref No	Submitted by	Alternative option for:				Option Description	Objective 1	Objective 2	Objective 3	Objective 4	Objective 5	Objective 6	Objective 7	Objective 8	Total	Assessment	Assessment	A	B	C	Does the Option warrant further assessment?	Comments		
		Kingsway Junction	Markeaton Junction	Little Eaton Junction	Overall project																			
Options for Kingsway																								
2	Option published for consultation	X				Kingsway Includes local access option K1.	4	3	4	3	2	3	2	3	3	3	Likely to be deliverable, with some challenges	3	Likely to be feasible, with some challenges	✓	✓	✓	✓	Provides baseline for assessment of alternative options
10	John Buttress	X				2-overbridge roundabout at Kingsway	4	3	2	3	2	3	2	3	2.75	3	Likely to be deliverable, with some challenges	3	Likely to be feasible, with some challenges	✗	✓	✓	✗	The scores reflect the use of Greenwich Drive South for local access. The design requires further review to confirm whether acces via Kingsway Park Close can be achieved.
11	Mark Jennison	X				Alternative roundabout layout at Kingsway. No access to Mackworth.	4	3	4	3	3	2	4	3	3.25	2	Deliverable with major challenges	3	Likely to be feasible, with some challenges	✓	✗	✓	✗	Traffic figures to be reviewed to confirm operational assesemnt of the single overbridge.
12	Mark Jennison (project team variation)	X				Variation on Option Ref 11 to include link to Greenwich Drive South.	4	3	4	3	2	3	2	3	3	3	Likely to be deliverable, with some challenges	3	Likely to be feasible, with some challenges	✓	✓	✓	✓	Scores similar to Option K1. Further assessment required unless viability of option K1 is confirmed in comparison to option K2.
13	Campaign for Better Transport	X				Arrangement to keep existing Mackworth access roads open.	4	3	4	1	4	1	3	3	2.875	3	Likely to be deliverable, with some challenges	2	Feasible with major challenges	✗	✓	✗	✗	No further assessment required.
14	Mr Peake	X				Service roads between Kingsway & Markeaton to keep Mackworth accesses open.	3	4	3	1	2	3	3	2	2.625	2	Deliverable with major challenges	3	Likely to be feasible, with some challenges	✗	✗	✓	✗	No further assessment required.
Alternative Options for Kingsway & Markeaton combined																								
2a	Option published for consultation	X	X			Markeaton/Kingsway combined.	4	2	3	3	3	4	4	5	3.5	3	Likely to be deliverable, with some challenges	3	Likely to be feasible, with some challenges	✓	✓	✓	✓	Provides baseline for assessment of alternative options
16	Mr Bradwell	X	X			Tunnel from south of Kingsway to north of Kedleston Road	5	2	1	3	4	4	4	1	3	1	Unlikely to be deliverable	2	Feasible with major challenges	✓	✗	✗	✗	No further assessment required.
Compare Local Access Road Options at Kingsway																								
see Option 2	Option published for consultation	X				Existing access roads closed. Link to Greenwich Drive South (Option K1)	4	3	4	3	2	3	2	4	3.125	3	Likely to be deliverable	3	Likely to be feasible	✓	✓	✓	✓	
K2	Option published for consultation	X				Existing access roads closed. Link to Kingsway Park Drive (Option K2)	4	3	4	3	3	4	3	4	3.5	3	Likely to be deliverable	3	Likely to be feasible	✓	✓	✓	✓	
K3	Option published for consultation	X				Existing access roads closed. No new local accesses provided . (Option K3)	4	2	4	4	3	4	3	4	3.5	2	Likely to be deliverable (with challenges)	3	Likely to be feasible	✓	✗	✓	✗	

Qualitative assessment against identified 'must deliver' objectives		
1	Poor fit	There is significant conflict with other policies/options affecting the study area which needs to be resolved. Possibly also conflicts with other modes.
2	Low fit	There is some conflict with other policies/options or modes.
3	Reasonable fit	Overall the option fits well with other policies affecting the study area.
4	Good fit	The option fits very well with other policies affecting the study area.
5	Excellent fit	Option complements other policies/proposals affecting study area, has no negative impacts on other modes or outcomes and demonstrates 'doing more with less'.

Qualitative assessment of deliverability (e.g. political, planning, timescale or third party issues) considering the overall project	
1	Unlikely to be deliverable
2	Deliverable with major challenges
3	Likely to be deliverable, with some challenges

Qualitative assessment of feasibility (e.g. physical constraint, land availability and design standards) considering the overall project	
1	Unlikely to be feasible
2	Feasible with major challenges
3	Likely to be feasible, with some challenges

PASS criteria for alternative option to proceed to next level of assessment		
A	Objectives	Overall reasonable fit with identified objectives (assessment score > 3)
B	Deliverability	Must be likely to be deliverable (assessment score = 3)
C	Feasibility	Must be likely to be feasible (assessment score = 3)

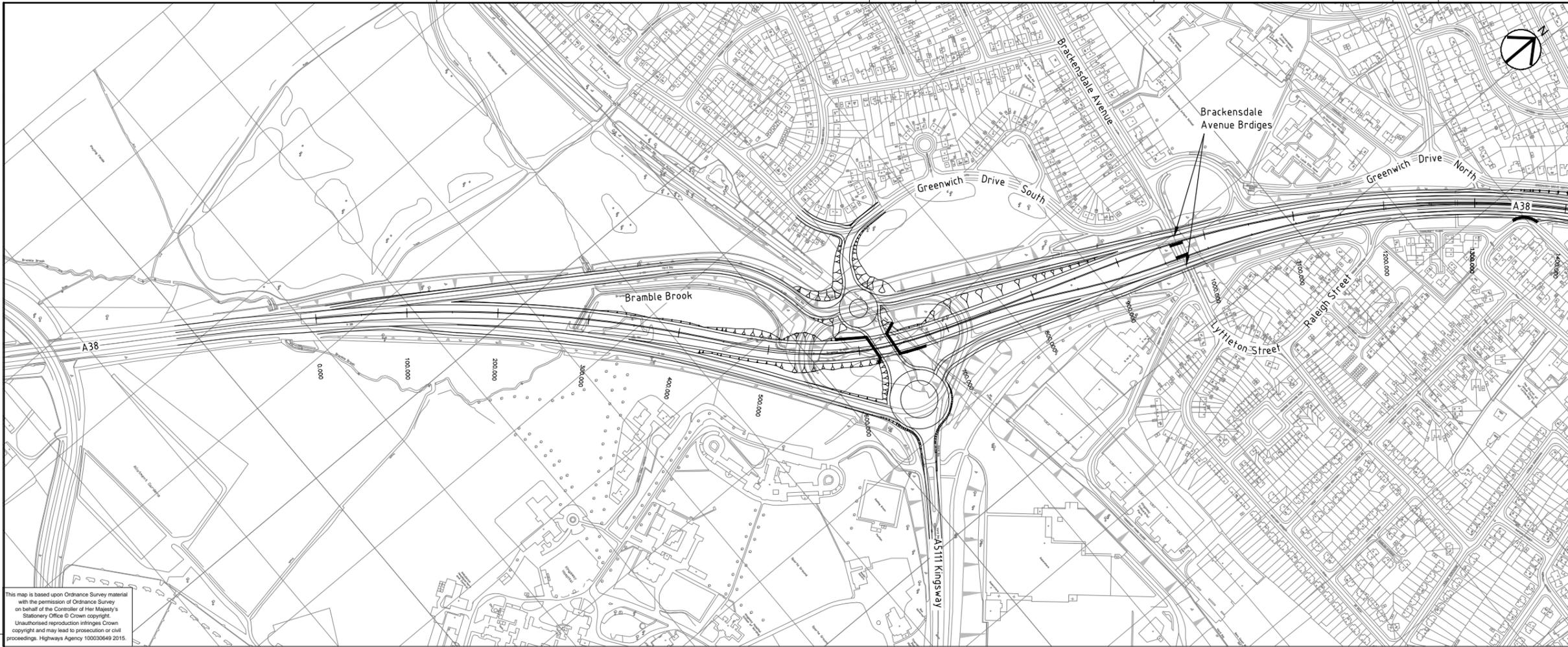
Appendix B

Option Layout Drawings

Option K1 – HA514503-URS-06-GD-25.035

Option K2 - HA514503-URS-06-GD-25.010

Mr Jennison Option (with Option K1) - HA514503-URS-06-GD-25.033



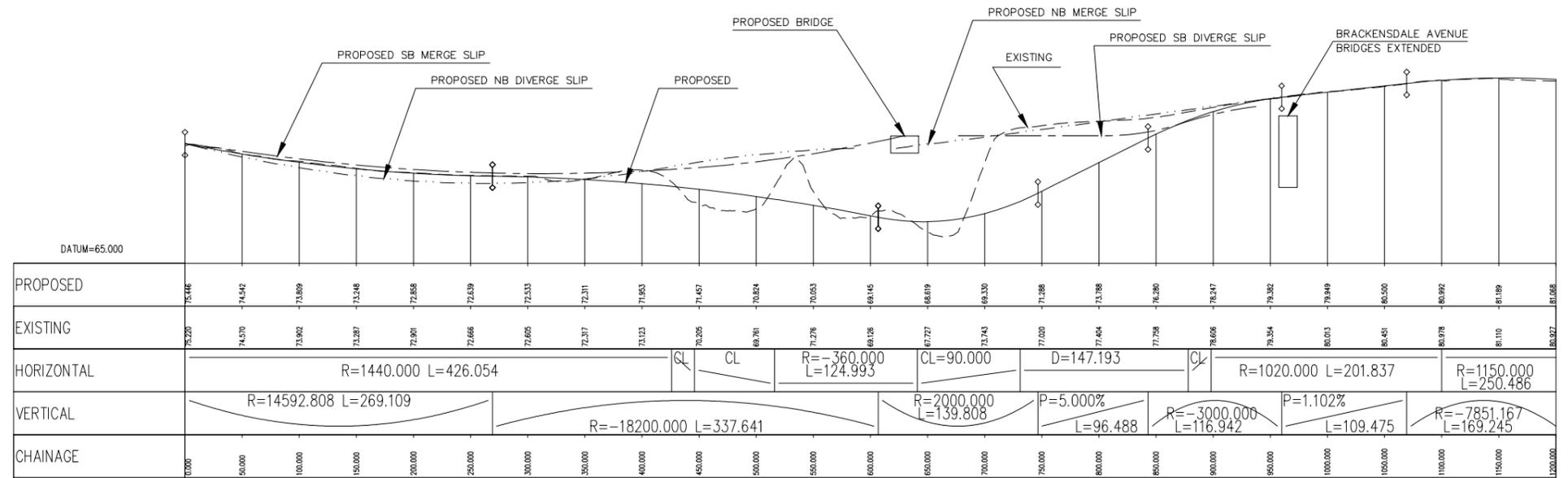
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LE	14/09/15					
Revision Details						
Rev #	Drawn By	Date	Checked By	Date	Approved By	Date
0	DRAFT					14/09/15
Job Title						

**A38
DERBY JUNCTIONS
IMPROVEMENTS**

Drawing Title
**KINGSWAY JUNCTION
PLAN AND SECTION
OPTION K1**

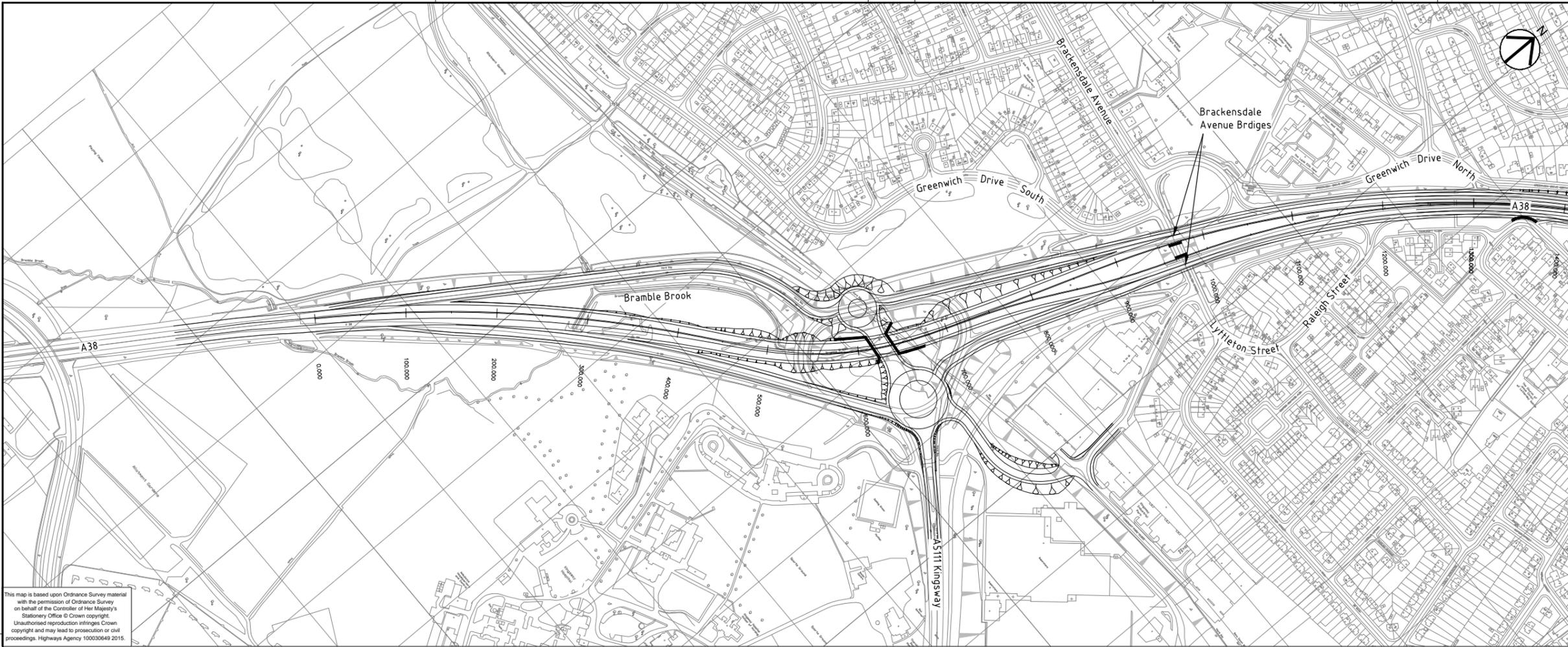
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Designed	Drawn	Stage 1 check	Stage 2 check	Approved
LE				
Scale at A1	Originated	Date		
1:2500	CH-ROADS			

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Drawing Number
HA514503-URS-06-DR-GD-25.035-0D

Plot Date: 14/09/2015 10:44:40 Rev: 0 Job: E:\proj\47071319\K1\A38\DRY\A38 MAINLINE.dwg
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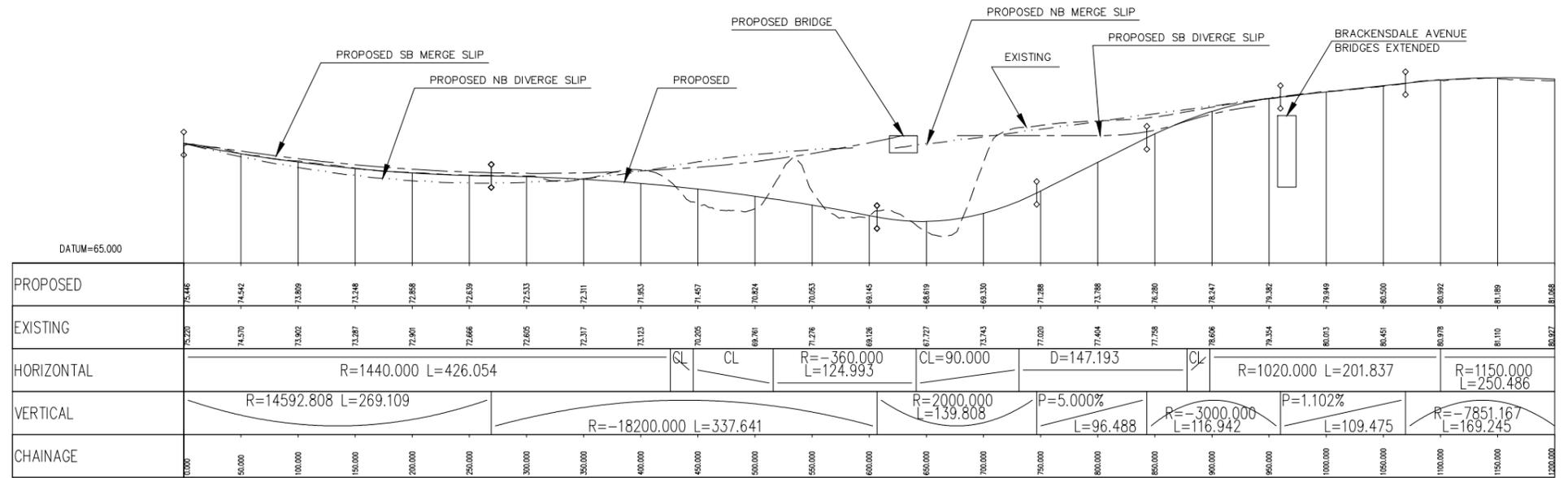
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4	KINGSWAY PARK CLOSE LINK ADDED, GREENWICH DRIVE SOUTH LINK DELETED	JRH	13/05/15	AW	13/05/15	AW	13/05/15
	DRAFT NOTE ADDED						
3	ANNOTATION ADDED TO PLAN	JRH	18/02/15	SLS	18/02/15	AW	18/02/15
	SLIP ROAD ALIGNMENTS ADDED TO SECTION	JRH	26/01/15	IWM	26/01/15	SLS	27/01/15
2	SLIP ROAD ALIGNMENTS ADDED TO SECTION	JRH	03/12/14	IWM	03/12/14	AW	03/12/14
1	DRAWING CREATED FROM SCOTT WILSON DRAWING D114946/GD/001 REV A WITHOUT FURTHER AMENDMENT	JRH	11/09/14	AW	12/09/14		
0	Revision Details						
Rev #	Drawn By	Date	Checked By	Date	Approved By	Date	
P	PRELIMINARY					27/01/15	SLS

A38 DERBY JUNCTIONS IMPROVEMENTS

KINGSWAY JUNCTION PLAN AND SECTION K2 OPTION

AECOM Internal Project Number	Zone / Mileage	Suitability		
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JRH	AW	AW	AW	SS
Scale at A1	Originated	Date		
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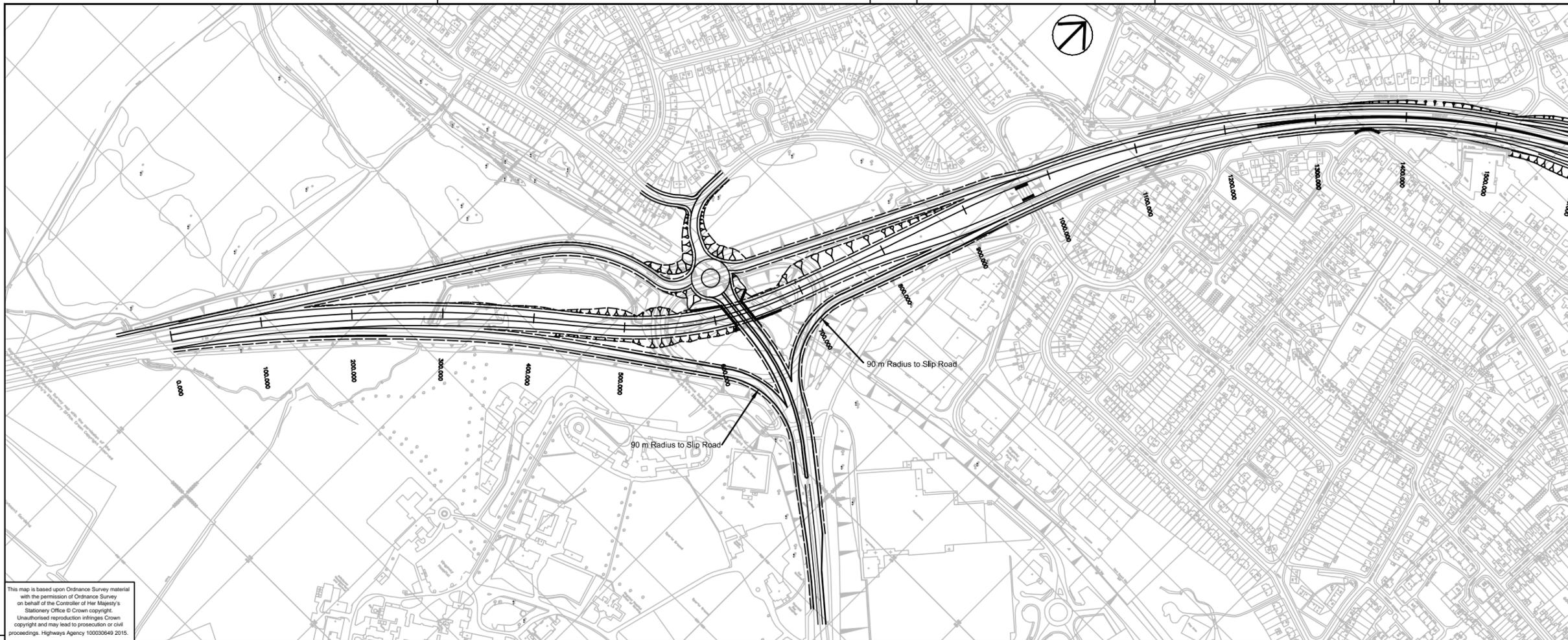
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Drawing Number
HA514503-URS-06-DR-GD-25.010-4P

Plot Date: 18/02/2015 11:18 AM By: Luke Evans
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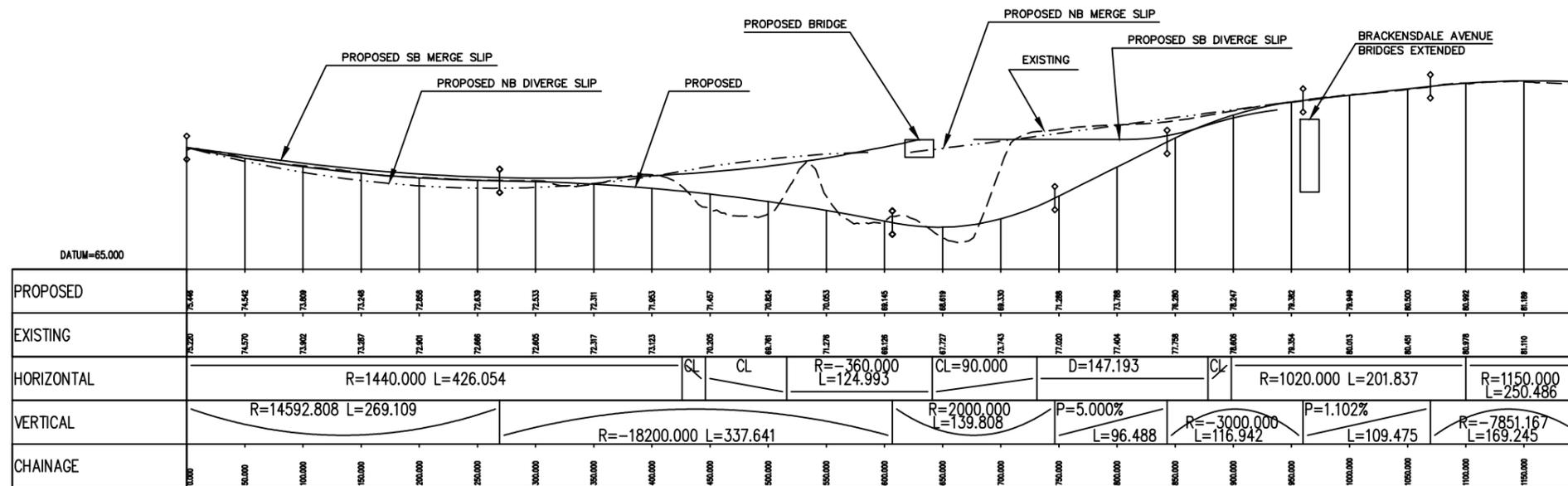
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GREENWICH DRIVE DESIGN AMENDED						
1	LE	08/09/15				
DRAFT ISSUE						
0	SB	30/07/15				
Revision Details						
Rev #	Drawn By	Date	Checked By	Date	Approved By	Date
Job Title						
A38 DERBY JUNCTIONS IMPROVEMENTS						
Drawing Title						
KINGSWAY JUNCTION M JENNISON ALTERNATIVE WITH LOCAL ACCESS OPTION K1						
AECOM Internal Project Number		Zone / Mileage		Suitability		
47071319						
Designed	Drawn	Stage 1 check	Stage 2 check	Approved		
SB	SB	GJS		AW		
Scale at A1		Originated		Date		
1:2500				30/07/15		
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HA514503-URS-06-DR-GD-25.033-1D						

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Associated Xrefs: | A38 BASEMAP
DBVva

Appendix C

Public Submitted Sketches

Mr Jennison Option



Mackworth

A38

closed

closed

Brackensdale Avenue

Lyttelton St

DERBY

Cheviot Street

Greenwich Drive South

Local access
Option K1

Kingsway Park C

Local access
Option K2

Sainburys

New road
layout

Kingsway

Kingsway
Hospital

A51

A38

Appendix D

Environmental Figures 6/1 to 6/6

Figure 6/1 – Heritage Baseline

Figure 6/2 – Desk Study – Designated Sites

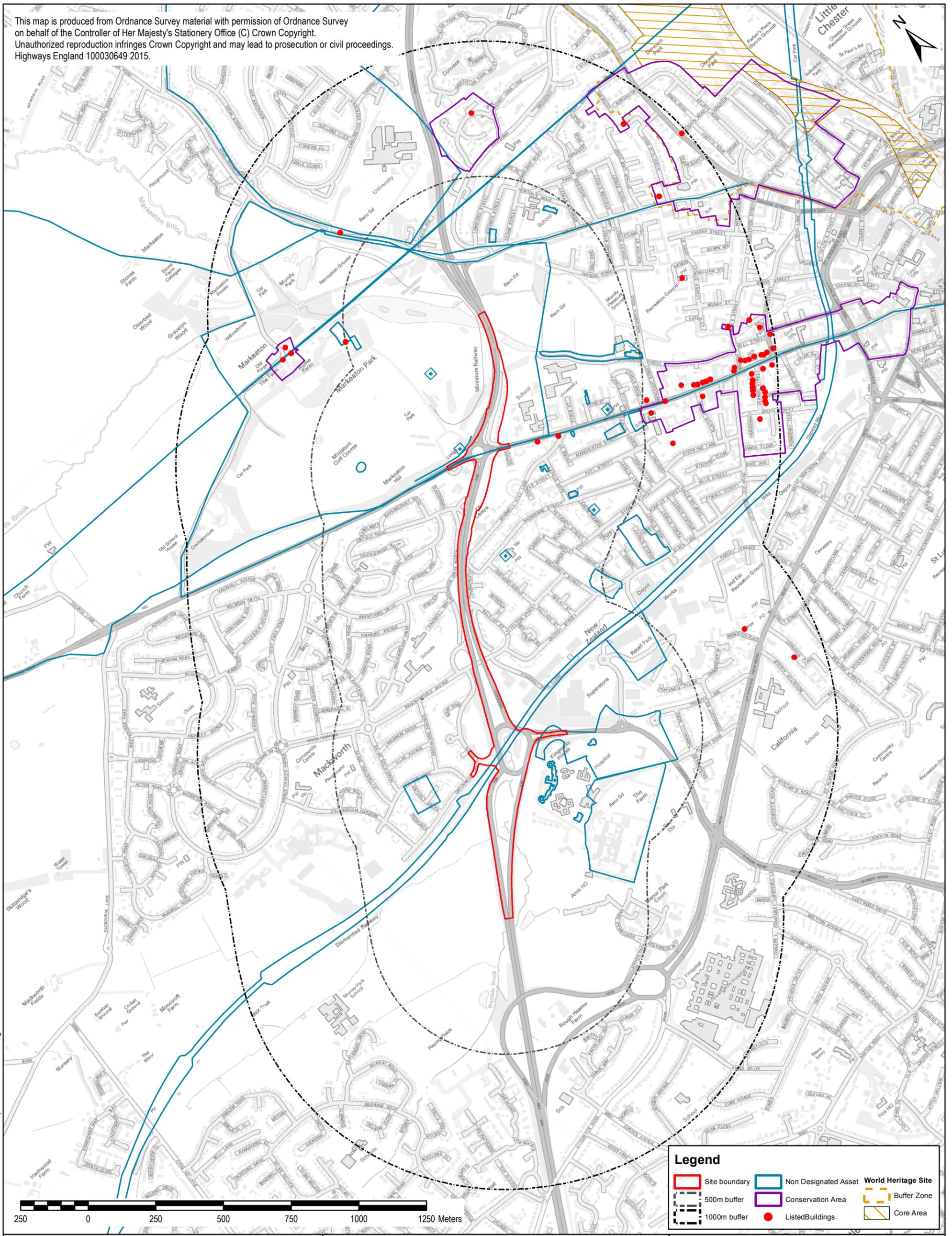
Figure 6/3 – Phase 1 Habitat Survey

Figure 6/4 – Water Bodies

Figure 6/5 – Bat Roost potential in Trees and Buildings

Figure 6/6 – Invasive Non-Native Species

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Legend

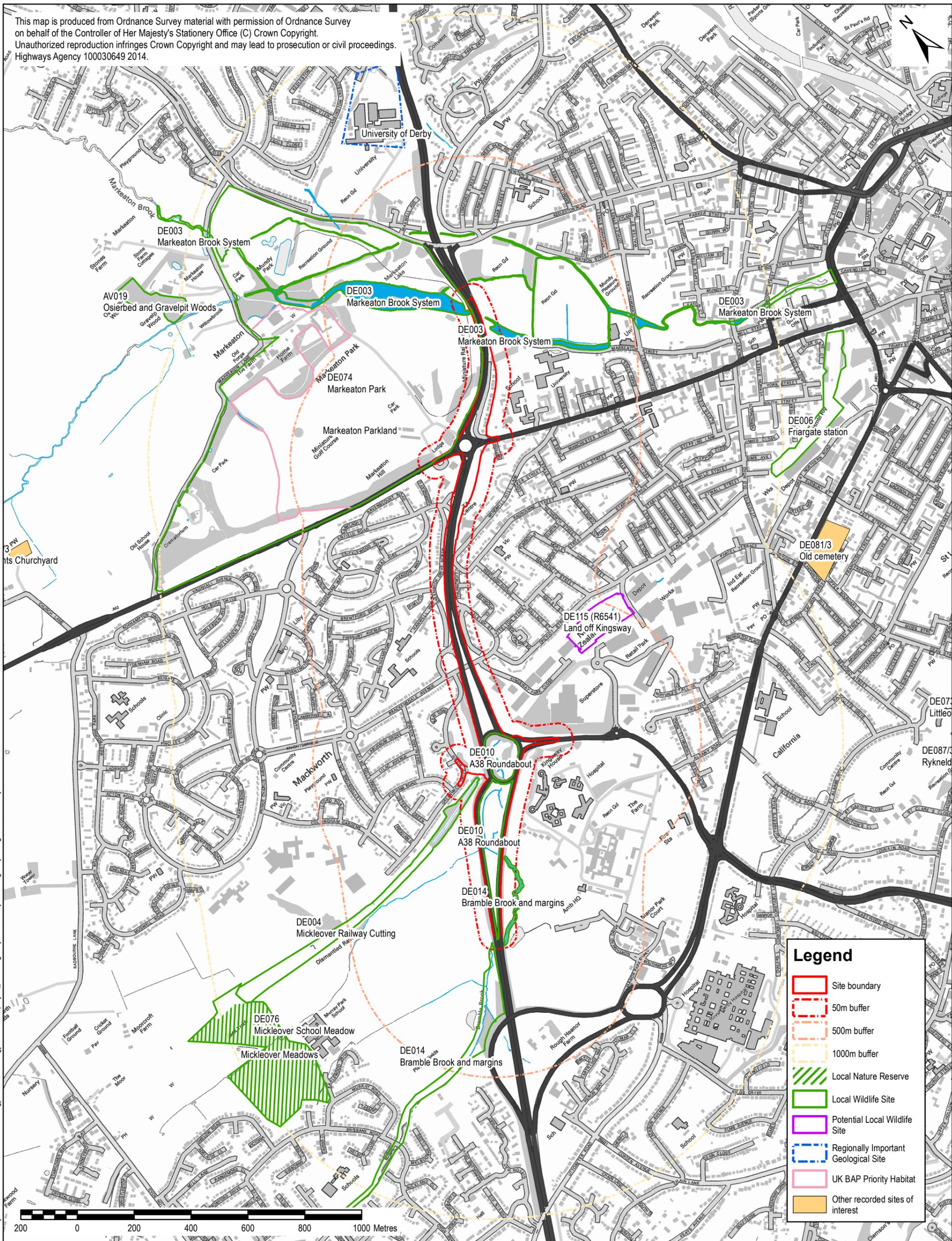
- Site boundary
- 500m buffer
- 1000m buffer
- Non Designated Asset
- Conservation Area
- Listed Buildings
- World Heritage Site
- Buffer Zone
- Core Area

File Name: R:\A38 Derby Jns - PO1339112 CAD\12.1 WIP\Little Eaton Alternative Options Assessment GIS Figures\FIGURE 7.1 - KINGSWAY HERITAGE BASELINE.mxd

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Drawn GB	Checked AC	Approved AC			
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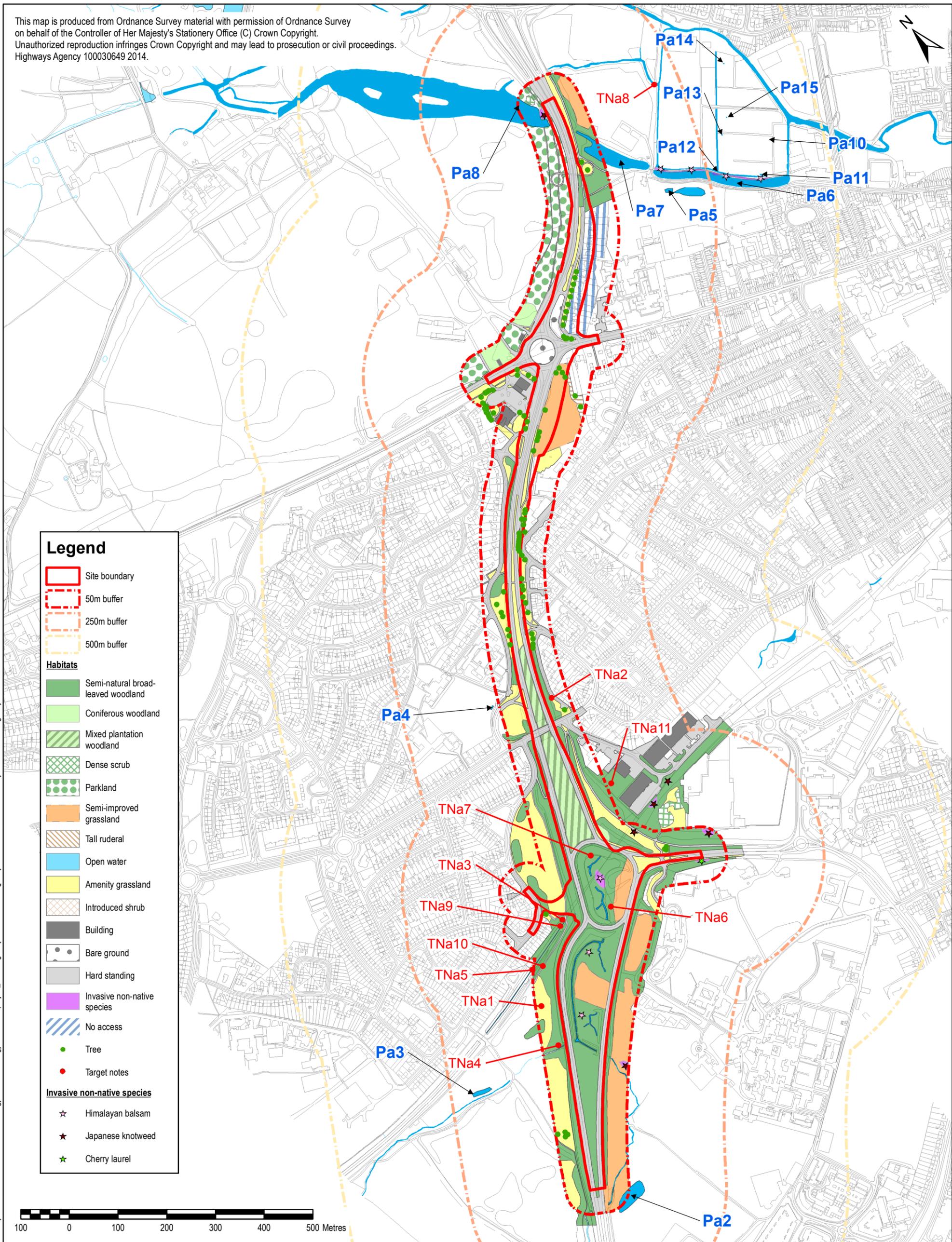


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Project Title/Drawing Title A38 DERBY JUNCTIONS IMPROVEMENT MARKEATON AND KINGSWAY DESK STUDY DESIGNATED SITES		AECOM Internal Project Number 47071319		Highways England Major projects Piccadilly Gate Store Street Manchester M1 2WD	
Drawn GSB	Checked SR	Approved OB	 		
Date 18/08/2015	Scale @ A3 1:12,000	Purpose of issue FINAL			
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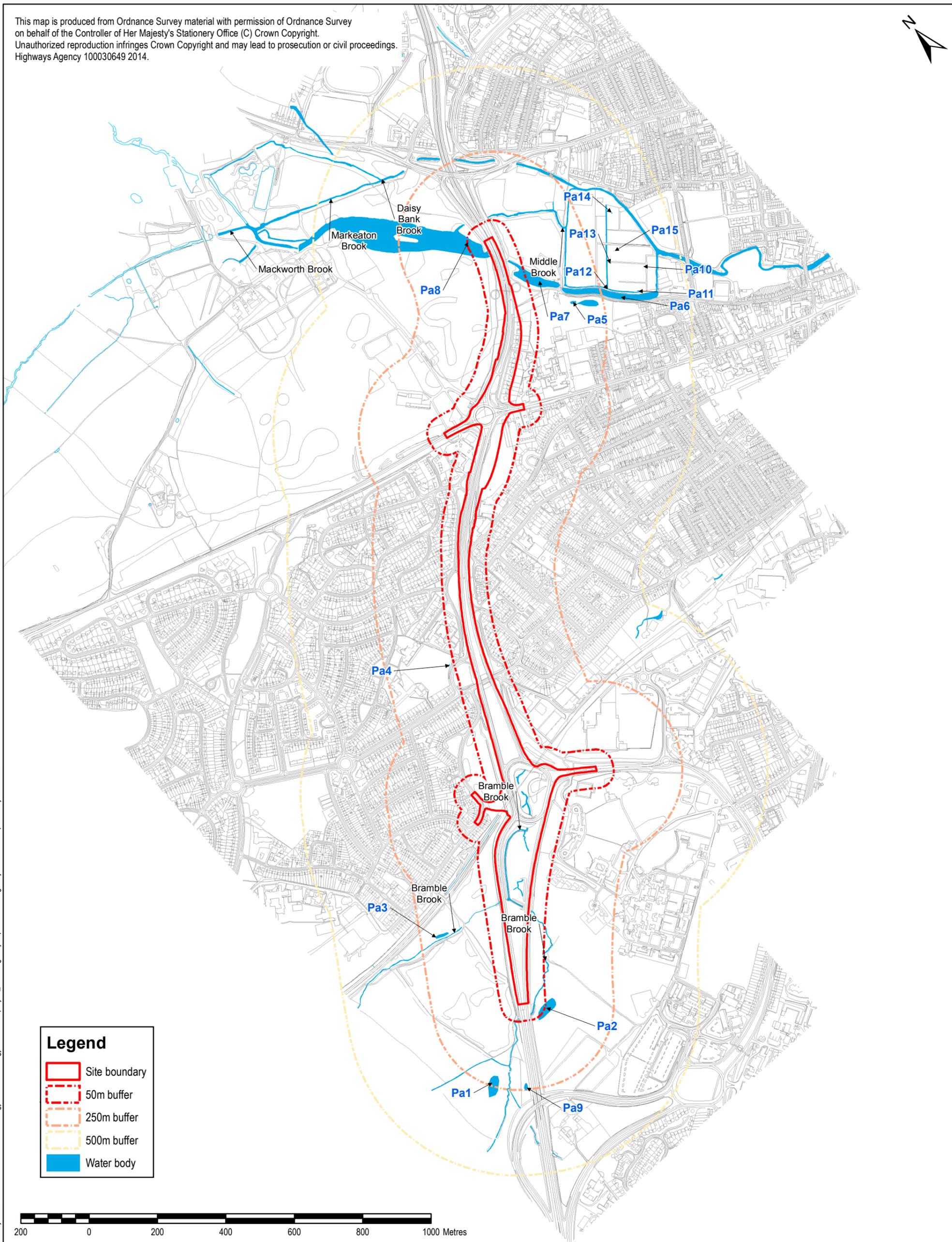
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Drawn GSB	Checked SR	Approved OB	AECOM Royal Court Basil Close, Chesterfield Derbyshire, S41 7SL +44 (0) 1246 209221 +44 (0) 1246 209229 www.aecom.com		
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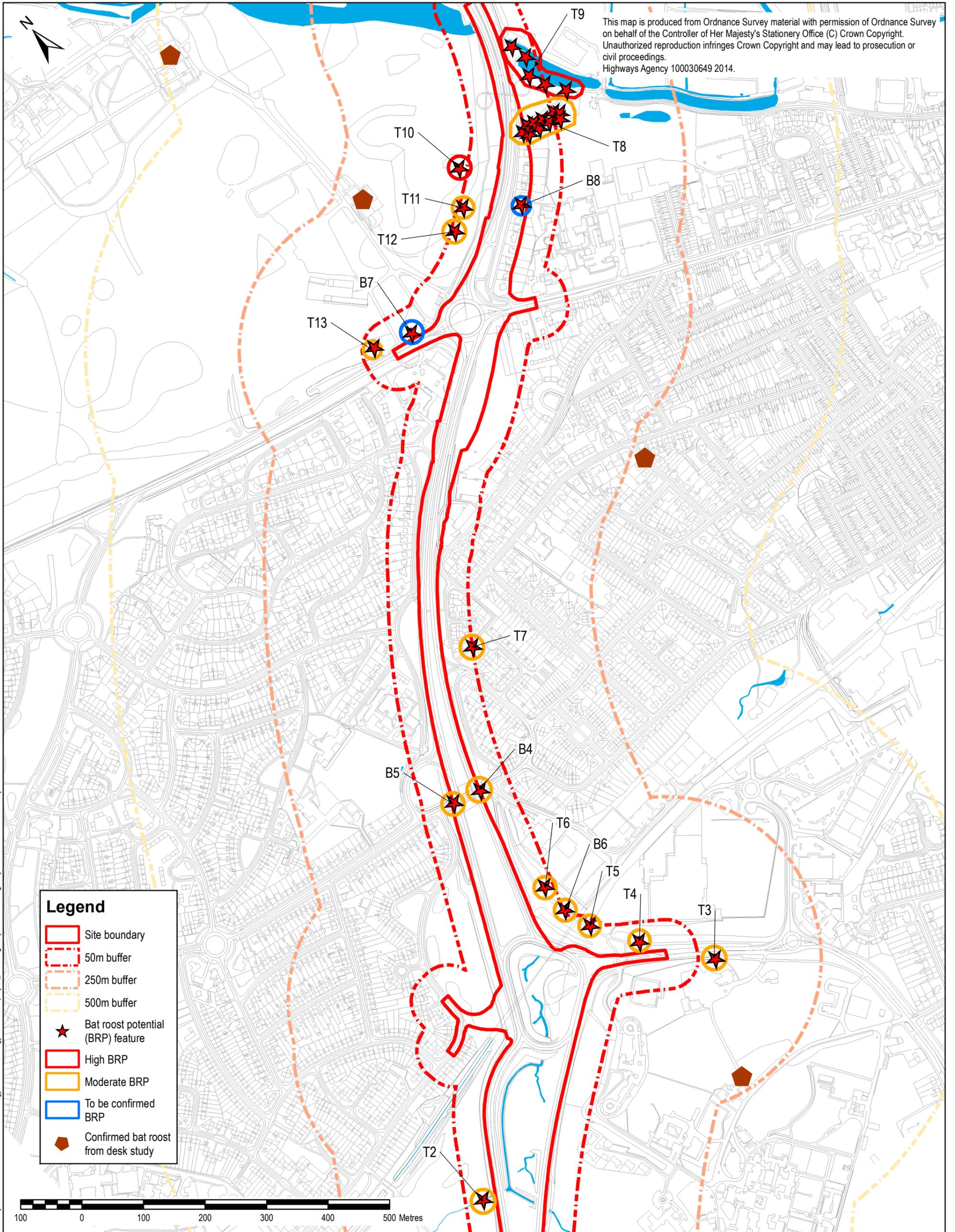
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- 250m buffer
- 500m buffer
- Water body



Project Title/Drawing Title A38 DERBY JUNCTIONS IMPROVEMENT MARKEATON AND KINGSWAY WATER BODIES		AECOM Internal Project Number 47071319		Highways England Major projects Piccadilly Gate Store Street Manchester M1 2WD 
Drawn GSB	Checked SR	Approved OB		
Date 18/08/2015	Scale @ A3 1:10,000	Purpose of issue FINAL		AECOM Royal Court Basil Close, Chesterfield Derbyshire, S41 7SL +44 (0) 1246 209221 +44 (0) 1246 209229 www.aecom.com
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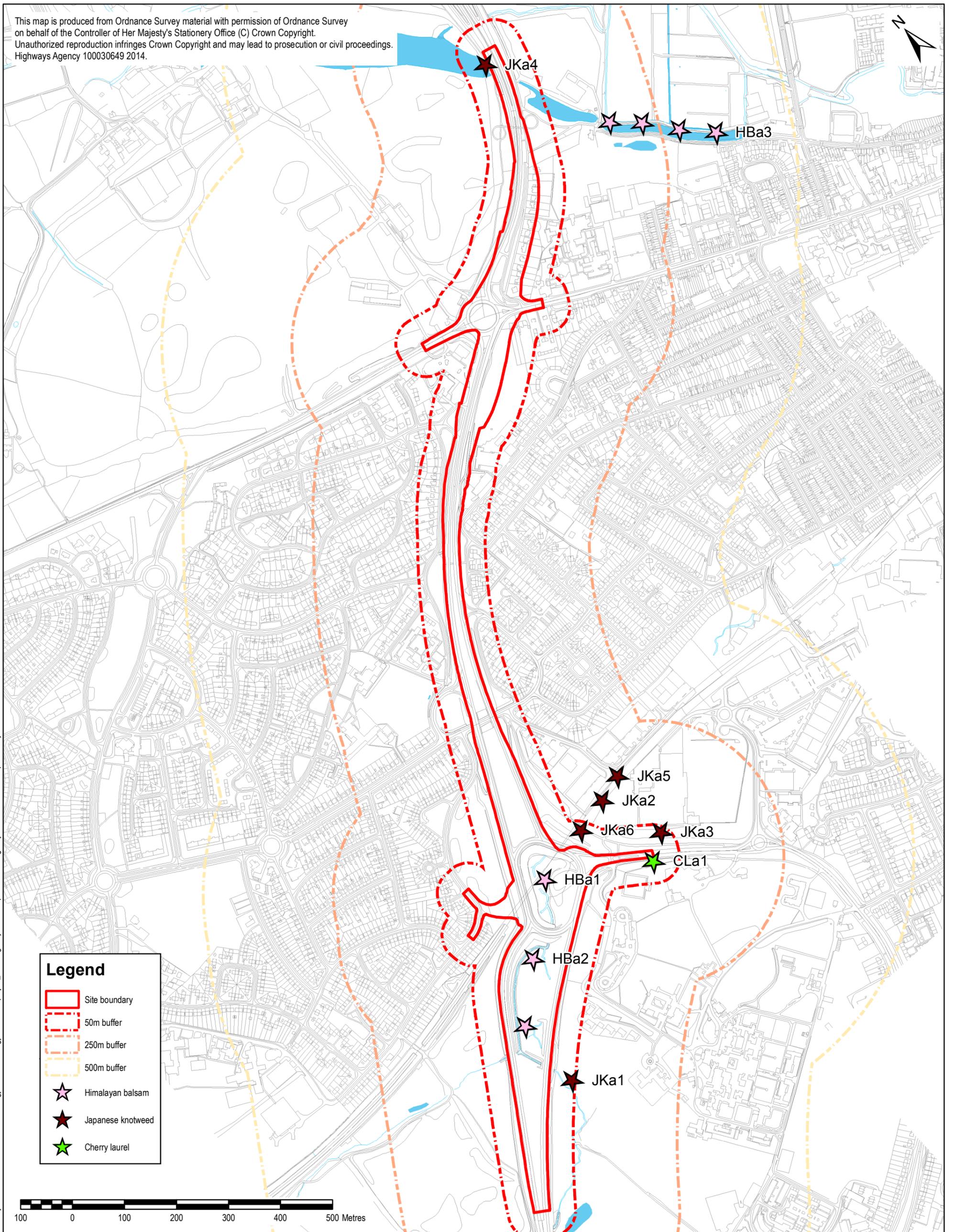
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- High BRP
- Moderate BRP
- To be confirmed BRP
- ▮ Confirmed bat roost from desk study



File Name: J:\Highways Agency\47071390_A38 Derby Jcns - Environment\Technical\Ecology\2014-15 Ecology Folder\GIS\project_files\Kingsway\Bats\A38 Kingsway Markeaton BRP 2015 July 2015.mxd

<p>Project Title/Drawing Title</p> <p>A38 DERBY JUNCTIONS IMPROVEMENT MARKEATON AND KINGSWAY BAT ROOST POTENTIAL (BRP) IN TREES AND BUILDINGS</p>			<p>AECOM Internal Project Number 47071319</p>			<p>Highways England Major projects Piccadilly Gate Store Street Manchester M1 2WD</p>		
<p>Drawn GSB</p>		<p>Checked SR</p>		<p>Approved OB</p>		<p>AECOM Royal Court Basil Close, Chesterfield Derbyshire, S41 7SL +44 (0) 1246 209221 +44 (0) 1246 209229 www.aecom.com</p>		
<p>Date 18/08/2015</p>		<p>Scale @ A3 1:5,500</p>		<p>Purpose of issue FINAL</p>		<p>Rev 0</p>		
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Legend

- Site boundary
- 50m buffer
- 250m buffer
- 500m buffer
- ☆ Himalayan balsam
- ☆ Japanese knotweed
- ☆ Cherry laurel



Project Title/Drawing Title		AECOM Internal Project Number		
A38 DERBY JUNCTIONS IMPROVEMENT MARKEATON AND KINGSWAY INVASIVE NON-NATIVE SPECIES		47071319		
Drawn	Checked	Approved		
GSB	SR	OB		
Date	Scale @ A3	Purpose of issue	AECOM Royal Court Basil Close, Chesterfield Derbyshire, S41 7SL +44 (0) 1246 209221 +44 (0) 1246 209229 www.aecom.com	
18/08/2015	1:6,500	FINAL		
Drawing Number		Rev		
Figure 6.6		0		

File Name: J:\Highways Agency\47071390_A38 Derby Jcns - Environment\Technical\Ecology\2014-15 Ecology Folder\GIS\project_files\Kingsway\Invasive species\A38 Kingsway Markeaton Invasive species July2015.mxd