M42 Junction 6 Improvement Scheme

Technical Appraisal Report (SGAR1)

West Midlands Autumn Statement 2014 (AS14)

This page is left intentionally blank

Table of Contents

Appendices

Executive Summary

Background

In December 2014 the Department for Transport (DfT) published the Road Investment Strategy (RIS) for 2015-2020. The RIS sets out the list of schemes that are to be delivered by Highways England over the five year period The RIS identified improvements to M42 Junction 6 Interchange as one of the key investments in the Strategic Road Network (SRN) for the Midlands region. The RIS stated that the proposed improvements should deliver: "..comprehensive upgrade of the M42 Junction 6 near Birmingham Airport, allowing better movement of traffic on and off the A45, supporting access to the airport and preparing capacity for the new HS2 station".

The need for intervention

M42 Junction 6 is on SRN and sits within the section of M42 which forms the southern and eastern arms of the Birmingham Box area on the SRN. It is an essential interchange in an economically growing region. It serves a number of key strategic economic assets for both the local and wider community. These assets include Birmingham Airport, the National Exhibition Centre (NEC), Resorts World, Jaguar Land Rover (JLR), Birmingham International Railway Station, the National Motorcycle Museum & Conference Centre (NMM) and Birmingham Business Park. In addition to these major assets the area adjacent to M42 Junction 6 (immediately north-east of junction) is earmarked for development by Solihull Metropolitan Borough Council (SMBC) as a proposed UK Central development which will also contain the proposed HS2 station.

Previous studies have identified the following persistent problems at the interchange:

- At Junction 6, the M42 and A45 carry some 130,000 vehicles/day and 70,000 vehicles/day respectively with some 50,000 turning movements and 7000-7500 vehicles at peak hours, operating at near capacity.
- Local stakeholders can increase traffic levels substantially due to increased passengers at the airport, more commuting journeys using the railway station and major events at the NEC combined with an increasing number of events at the NMM and visitors to Resort World. This has led to regular 'lock-ups' at the junction in recent years which can take several hours to clear.
- There is substantial growth planned both with the existing assets – airport, JLR, NEC (Resorts World) and with aspirational planned growth of the UK Central development and the HS2 station – leading to a further strain on the road network.
- A PinchPoint improvement scheme carried out in late 2014/early 2015 resulted in a partial widening of the circulatory carriageway and eastbound approach slip road but was due to provide temporary relief to queue lengths until 2019 only.
- The location of M42 J6 is heavily constrained to the north by the proximity of M42 J7 (with M6 J4), to the west by A45 Clock Interchange (to airport), and to

the east by the A452 Junction, all in close proximity. The roundabout itself is also constrained by having accesses on the circulatory to the NEC and NMM

- Until fairly recently, there has been limited coordination with other developments within the region and project development which would result in major changes to the road network. While separate studies have focused on delivering improved network conditions based on the specific development, there is a requirement to take all published development into account for this project.

Constraints

A number of planning factors and related constraints have been identified and considered which impact on the development and choice of preferred options.

The study area around Junction 6 encompasses major developments and infrastructure such as the M42, A45, M6 Junction 4, a mainline railway, overhead high-voltage power pylons, the NEC, Birmingham Airport and the NMM. It is however comprised of green belt in a generally quality rural landscape and is particularly environmentally sensitive. The area includes:

- Four nationally designated sites and eight non-designated sites which include Bickenhill SSSI, the River Blythe SSSI catchment area and Asbury's Coppice Ancient Woodland.
- Bickenhill Village is in close proximity to the scheme and has heritage, amenity, accessibility, visual, noise and air quality receptors plus a number of rights of way and footpaths.

Option Development

Forty options were initially identified which would meet the objectives for the scheme and in order to better identify them and provide an initial high-level assessment, they were collated into five general themes.

THEME 1	THEME 2	THEME 3	THEME 4	THEME 5
North & South Junction	**Southern Junction**	**Interchange**	**Northern Junction**	**Do Something/ Do Minimum**
(Options 1 to 1E)	(*Options 2 to 2M)*	*(Options 3 to 3D)*	*(Options 4 to 4B)*	*(Options 5, 5A, 6, 6A and 7 to 15)*
6 OPTIONS	**13 OPTIONS**	**5 OPTIONS**	**3 OPTIONS**	**13 OPTIONS**

A high level assessment process was carried out, reducing the number of options down to 18 and a further detailed EAST assessment (Early Assessment Sifting Tool) helped to further reduce the options down to a shortlist of 6 – though all five themes were still represented.

The 6 options were assessed in more detail in order to identify the most viable options to take to Public Consultation. The detailed assessments were carried out on environmental, highways geometry, buildability and safety impacts, traffic benefits, cost estimates and stakeholder engagement.

A series of stakeholder engagement meetings were held at this point and again prior to public consultation to ensure their views were taken into account in the final sifting of options.

Options were discounted on the basis of high cost and low value for money, safety impact of insufficient weaving lengths to a new junction, environmental impact to an existing SSSI, low traffic benefits and major disruption to the network.

Theme 1	Theme 2	Theme 2	Theme 3	Theme 4	Theme 5
North & South Junction	Southern Junction	Southern Junction alternative	Interchange	Northern Junction	Do Something Free-Flow Left turns
DISCOUNTED	**PROGRESS**	**DISCOUNTED**	**DISCOUNTED**	**DISCOUNTED**	**PROGRESS**

Options taken to Consultation

The schemes taken forward for further development to Public Consultation were therefore all variants of the southern junction theme with an additional option of one or all free-flow links:

- Option 1 – Southern Junction 2km south of Junction 6 with a link road to A45 Clock Interchange west of Bickenhill village.
- Option 2 – Southern Junction 2km south of Junction 6 with a link road to A45 at Clock Interchange via an additional roundabout east of Bickenhill village.
- Option 3 – Southern Junction 1km south of Junction 6 with NB exit and SB entry only and link road to A45 at Clock Interchange via an additional roundabout.

These options had sufficient traffic benefits, no major safety and geometric concerns, could largely be built offline, provided good value for money and had stakeholder support.

1 Introduction

1.1 Scheme background

The Department for Transport (DfT) Road Investment Strategy (RIS) sets out a list of schemes that are to be developed by Highways England over the RIS period (2015-2020), including the M42 Junction 6 Improvement.

M42 Junction 6 is a crucial junction on the strategic road network (SRN) and sits within the section of M42 which forms the southern and eastern arms of the Birmingham Box area on the SRN. M42 Junction 6 provides a link between the M42 Motorway and A45 Coventry Road and also serves a number of key strategic economic assets for both the local and wider community. These assets include Birmingham Airport, the NEC, JLR, Birmingham International Railway Station, the NMM and Birmingham Business Park.

The scheme limits cover the A45 in an east-west direction from Clock Interchange (junction with the B4438) in the west to the A452 junction at Stonebridge Island to the east. In the north-south direction, the scheme limits are generally located at the midpoint between Junctions 5-6 in the south and mid-point between Junctions 6-7 in the north; though some information has been gathered outside of these limits more towards Junction 5 in the south and up to Junction 7 (junction with M6 Junction 4) in the north.

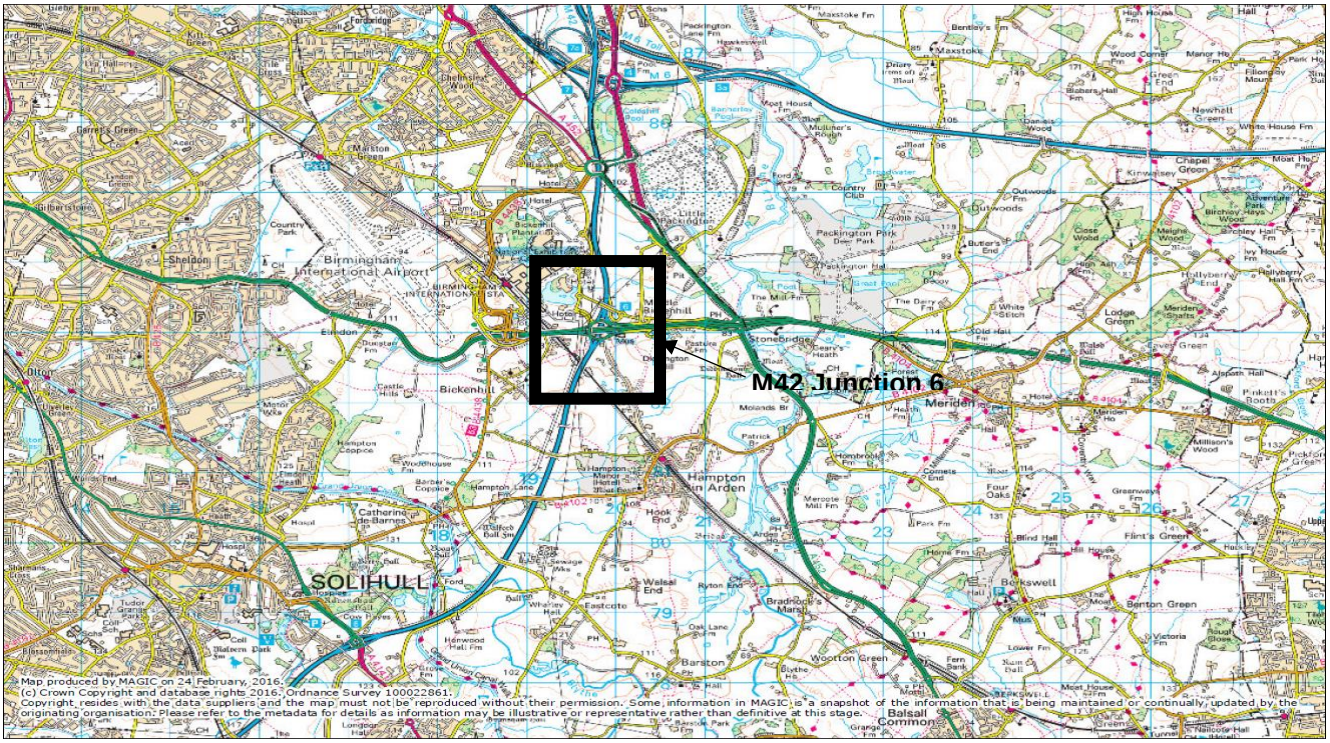


Figure 1-1 - M42 Junction 6 Location Overview

1.2 Purpose

The purpose of this Technical Appraisal Report (TAR) is to bring together the traffic, economic, safety, operations, technical, maintenance and environmental assessments and form the basis for deciding which option(s) should be included in the Public Consultation. This product is a key feed to the Scheme Assessment Report (SAR) which is produced during Stage 2 Option Selection.

Within the development of the scheme during Project Control Framework (PCF) Stage 1 Option Identification, the most updated version of the regional traffic model (PRISM) was not available. As a result of this, and with agreement with Highways England (TAME), the previous version of PRISM was used to carry out an assessment of journey time benefits (AM) on each of the options. This resulted in the same impact for all options and the assessment was consistent with all options considered.

1.3 Constraints

A number of planning factors and related constraints have been identified and considered which severely impact the development and route of preferred options.

Road infrastructure is heavily constrained by the close proximity of adjacent junctions in three out of the four directions from the centre of Junction 6 – M42 Junction 7 is just over 2km to the north, A45/B4438 Clock Interchange is 1km to the west and A45/A452 Stonebridge Island is 1.5km to the east of Junction 6.

The area around Junction 6 also encompasses major developments such as the West Coast Mainline railway, overhead high-voltage power pylons, the NEC, Birmingham Airport and the NMM. Further commercial/residential development is proposed by SMBC to the north-east of Junction 6 along with the location of the proposed HS2 station.

To the south of Junction 6 lies the small local communities of Bickenhill, Catherine-de-Barnes and Hampton-in-Arden, all situated within green belt and a generally rural landscape.

1.4 Stakeholder Engagement

A series of meetings were held at an early stage of option development with around 15-20 identified stakeholders between April and July 2016 in order to take their views on board. At these meetings an initial set of six options which had been developed at that time were presented. Stakeholders included the local communities of Hampton-in-Arden and Bickenhill/Marston Green as well as local businesses like JLR, NEC, Birmingham Airport and the NMM. Local authorities and the local MP were also consulted. Their feedback on the options presented was utilized within the development of the options towards a shortlist to be taken to public consultation.

Further stakeholder meetings were arranged between November and December 2016 to provide a progress update - including the latest options - and invite further comment, prior to the public consultation period.

The proposed HS2 project was planned to the immediate north-east of Junction 6. In addition to the main track alignment and station there is also a set of enabling works proposed on the local road network. Early consultation was held with HS2 in order to

obtain information on the proposed alignment, enabling works and expected traffic figures to assess their impact on the M42 Junction 6 project.

1.5 Status boxes

Status boxes have been introduced for sections where further work is required and they explain what remains to be completed in the subsequent PCF Stages.

Status: Example status box.

1.6 Document structure

Chapter	Description
1	**Introduction –** scheme background and purpose of product
2	**Planning brief –** details of the planning requirements e.g. DCO Process
3	**Existing conditions –** highway network, traffic, accidents, structures, climate, geology, accessibility, integration, environmental status, etc.
4	**Description of route option –** detailed proposed option design and associated engineering impacts
5	**Planning factors –** planning constraints
6	**Traffic and junction assessment –** traffic model data, analysis, conclusions
7	**Economic assessment –** appraisal, individual impacts, wider impacts, key results
8	**Safety assessment** – detailed accident analysis, GD04 assessment
9	**Operational assessment** – operating regime and capacity requirements
10	**Technology assessment** – technology requirements
11	**Environmental assessment –** noise, air quality, landscape, water assessment, etc.
12	**Appraisal summary** – summary tables, consultation with public bodies
13	**Programme and costs** – high level programme for scheme delivery
14	**Conclusions** – options for public consultation, preferred option

2 Planning brief

2.1 Introduction

M42 J6 is a crucial junction on the strategic road network, at the heart of an area of dynamic growth, surrounded by a unique mix of major assets that serve both the local and wider community. It provides the link between the M42 and the A45 Coventry Road which serves a number of key strategic economic assets that are currently expanding including: Birmingham Airport, the National Exhibition Centre, Jaguar Land Rover, Birmingham International railway station and Birmingham Business Park.

The M42 J6 will also be used by additional traffic heading generated by the proposed HS2 Interchange Station and the proposed UK Central development to the immediate north-east of the junction being promoted by SMBC with central Government funding. There is also a planning proposal for a new MSA on the M42, which may need to be incorporated into the scheme, if it obtains planning approval.

Current congestion and journey reliability issues at Junction 6 are constraining investment and economic growth. Without infrastructure investment to improve the junction a major investment opportunity of national significance could be lost.

The M42 J6 improvement scheme will be developed taking into account an overall programme of works planned for the area by a number of 3rd party organisations (HS2, SMBC, NEC, Birmingham Airport, etc.). This will allow for expected benefits with each individual scheme can be maximised; and to address the significant congestion issues and constraints in the area.

The brief for the scheme as set out in Highways England's Road Investment Strategy (RIS) 2015-20 is to provide "…*a comprehensive upgrade of the M42 Junction 6 near Birmingham Airport, allowing better movement of traffic on and off the A45, supporting access to the airport and preparing capacity for the new HS2 station*."

2.2 Scheme Objectives

Following the issue of the RIS document, the Client Scheme Requirements (Appendix K) subsequently defined the main transport objectives of the scheme (also stated in the Strategic Outline Business Case) as follows (see overpage):

Objective	How it aligns with strategic aims	Measures for success of objective
Objective 1: Increase capacity	• support and facilitates economic growth through providing adequate capacity on the network	• improved journey time reliability and reduced congestion at Junction 6 and on the M42 adjacent to it • annual monitoring reports
Objective 2: Provide access to key assets	• supports and facilitates economic growth • balances the needs of individuals and businesses who rely on it.	• delivery of adjacent development site (UKC) • journey time reliability to B'ham Airport, NEC and HS2 not compromised.
Objective 3: Promote reliable and safe operation of the wider corridor	• supports and facilitates economic growth • balances the needs of individuals and businesses who rely on it.	• average speed and reliability of journey on the M42 adjacent to Junction 6 • smart motorway monitoring
Objective 4: Increase resilience and reliability of network	• supports and facilitates economic growth • is maintained to a safe and serviceable condition	• safety/ number of incidents • assessment of how the network copes with incidents at the junction and on the surrounding network.
Objective 5: Unlock the potential for economic growth in the area	• supports the development and implementation of the long-term Midlands Transport Strategy	• approval of new corporate, commercial and/or residential developments • continued investment in the local economy by existing stakeholders

It should be noted that although the objectives include a measure of safety and number of incidents, the level and severity of accidents at M42 Junction 6 is generally lower than the national average. However, by removing some of the traffic from the existing Junction 6 and with the provision of free-flow links with improved merge/diverge arrangements, an improvement in safety is expected.

2.3 Client Scheme Requirements

The Client Scheme Requirements (CSR) sets out the requirements for the project, covering a high-level definition of the transport challenges and issues, objectives, project outputs and costs. A copy of the CSR is included in Appendix K.

In response to direct questions from the Secretary of State, the Highways Agency commissioned the UK Central Study 1 Report: Identifying the need for Intervention & Developing Options August 2014. This study assessed the current and forecast conditions with and without the inclusion of the proposed UK Central development; and identified Junction 6 as a current and future congestion hot spot. The study promoted an initial solution that would promote future growth and maintain the safe operation of the strategic road network.

2.4 DCO Process

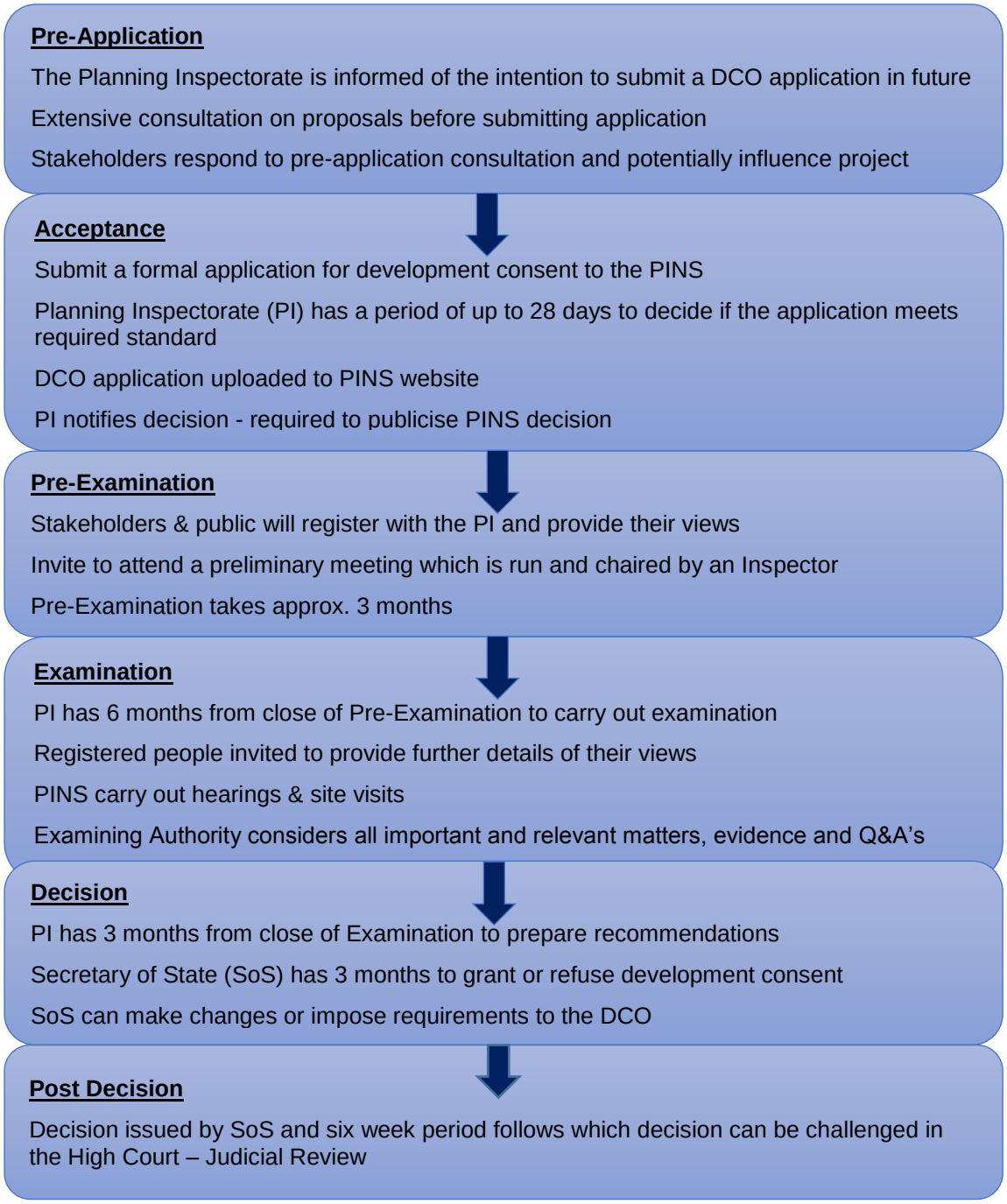
It is anticipated that the land take and the sensitive nature of environmental impacts of this scheme will make this a Nationally Significant Infrastructure Project (NSIP) and will require use of the Planning Act 2008 to gain consent through the DCO process. The DCO will occur during PCF Stage 4 of the project, after Preliminary Design of the Preferred Route.

NSIPs are major infrastructure developments in England and Wales. These include projects such as power plants, large renewable energy projects, new airports, airport extensions and major road projects. The NSIP process comprises six key stages, covering pre-application, acceptance, pre-examination, examination, decision and post-decision stages. Prior to the pre-application stage and preferred route announcement a public consultation will be held to demonstrate the options considered, discounted and taken forward and will give members of the public the opportunity to comment on the options.

A Development Consent Order (DCO) application for consent to undertake an NSIP is made to the Planning Inspectorate who will consider the application and make a recommendation to the Secretary of State, who will decide on whether a DCO should be made for the proposed scheme. A further opportunity to consult with stakeholders and the local community is during the pre-application stage, and the Planning Act requires the applicant to take account of consultation responses ahead of submission of the DCO application.

Under the DCO process there is no public inquiry, however a mechanism exists for stakeholders and the public to provide comments during the examination period. The Examination is mainly a written process, although in certain circumstances hearings may be held, at the discretion of the Planning Inspectorate. Once a DCO is made, it provides consent for the applicant to construct the Scheme. The DCO also provides powers for the compulsory purchase of required third party land.

The 6 stages of the development consent regime



3 Existing conditions

3.1 Description of locality

M42 Junction 6 is part of the Strategic Road Network (SRN) which is referred to as the Birmingham Box (M5 on the west side, M6 on the north side, M42 east and south side). Figure 3-1 below presents the M42 in context with other surrounding motorways and trunk roads.

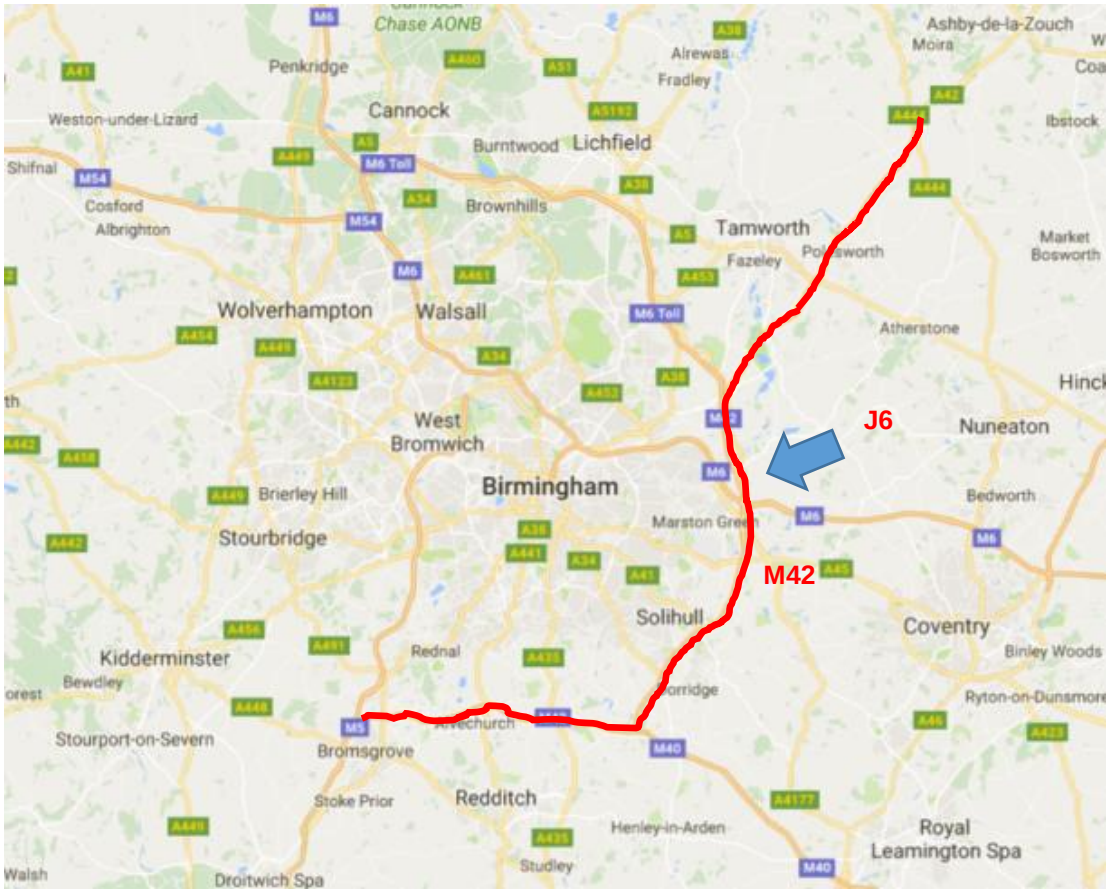


Figure 3-1 – Location in a broader perspective (Google Maps © 2016)

The M42 is a dual 3-lane carriageway motorway which runs from the south-west of Birmingham near Bromsgrove, where it connects to the M5, to the north-east of Tamworth where it turns into the A42 at A42/A444 Junction. The M42 is 40 miles in length and passes to the south and east of Birmingham, Solihull, Tamworth and various smaller towns; it connects with the M40, M6, M6 (toll) and M5 along its length as well as a number of trunk roads such as the A45 and A41. The M42 forms an important connection between the East and West Midlands.

The circulatory island at M42 Junction 6 provides both direct and indirect access to a number of major businesses/stakeholders in the area which contribute to the traffic levels at the junction. Access to the NEC and NMM is contained directly on the Junction 6 circulatory – NEC access is controlled by traffic signals, NMM access is uncontrolled. NEC in particular attracts large traffic volumes on event days which add

significantly to the daily traffic levels and potential for congestion at the island. This often leads to lock-ups which can take several hours to clear. HE have an emergency response plan prepared for these type of situations but the potential for lock-ups can be unpredictable.

In addition, there is indirect access on the north-west quadrant to Junction 6 with Birmingham Airport, Birmingham International Railway Station and a number of other businesses/commercial properties nearby. The existing highway along the A45 and approach to Junction 6 towards the NEC access is often subject to congestion not only at NEC events but with commuter traffic combined from Birmingham, the airport, railway station and Business Park.

To the east of the M42 and north of the A45 the current green belt area has proposed development allotted to it within the SMBC Local Plan known as UK Central development. It also has the location of the proposed HS2 station. South east of Junction 6, beyond the NMM and conference centre lies the village of Hampton-in-Arden and large areas of green belt. The alignment of the proposed HS2 tracks would also run through this area crossing the A45 between Junction 6 and Stonebridge Island.

To the south-west of Junction 6 the area is predominantly green belt with the local communities of Bickenhill and further south Catherine-de-Barnes connected by the B4438. This area also includes a section of the West Coast Mainline railway which runs in a north-west-south east direction in close proximity to Junction 6.

The existing highway network between M42 Junction 5 and Junction 7 has been resurfaced by the incumbent Asset Support Contractor (ASC) for Area 9 in recent years. This resurfacing also involved removal of traffic detection loops and replacement with a radar system for counting traffic.

A controlled motorway system operates along a section of the M42, between Junction 9 and a point approximately 2 miles east of Junction 3. Dynamic Hard Shoulder (DHS) running with emergency refuge areas is currently in operation between Junctions 3A and 7 (constructed as the pilot controlled motorway project in 2006).

The A45 is a combination of rural and urban all-purpose road which connects Birmingham to the A14 trunk road in the East Midlands. The A45, in the vicinity of M42 Junction 6, lies between Clock Interchange (B4438) and A452 Stonebridge Island (highlighted in Figure 3-2). The A45 from the M42 Junction 6 to A452 Stonebridge Island is part of the SRN, and the remaining section is the responsibility of SMBC. Access to Birmingham Airport and Birmingham International Railway Station is in the near proximity of this junction.

It should be noted that a section of the A45 on the westbound carriageway between M42 Junction 6 and Clock Interchange has recently been widened (August 2016). This was part of a local network improvement scheme which provides a segregated lane to Birmingham Airport, Birmingham International Station and the B4438 for vehicles travelling on the M42 northbound leaving at Junction 6.

On the eastern section of the A45 to M42 Junction 6, there is an additional parallel connecting road which runs in a westerly direction from A452 northbound exit slip road at Stonebridge and joins onto the A45 westbound exit slip road to M42 Junction 6. Along this connecting road, there are several business including a waste transfer site, and also a looped connection which goes under the A45 onto East Way, which

in turn leads into an eastern access to the NEC and back onto the A45 eastbound towards Stonebridge Island.

Other important features within close proximity of the scheme include a number of water courses - namely River Blythe, Shadow Brook and Holywell Brook; the West Coast (Rail) Mainline - Birmingham to Euston Line; and a number of local roads connecting local communities – for example Solihull Road and Shadow Brook Lane.

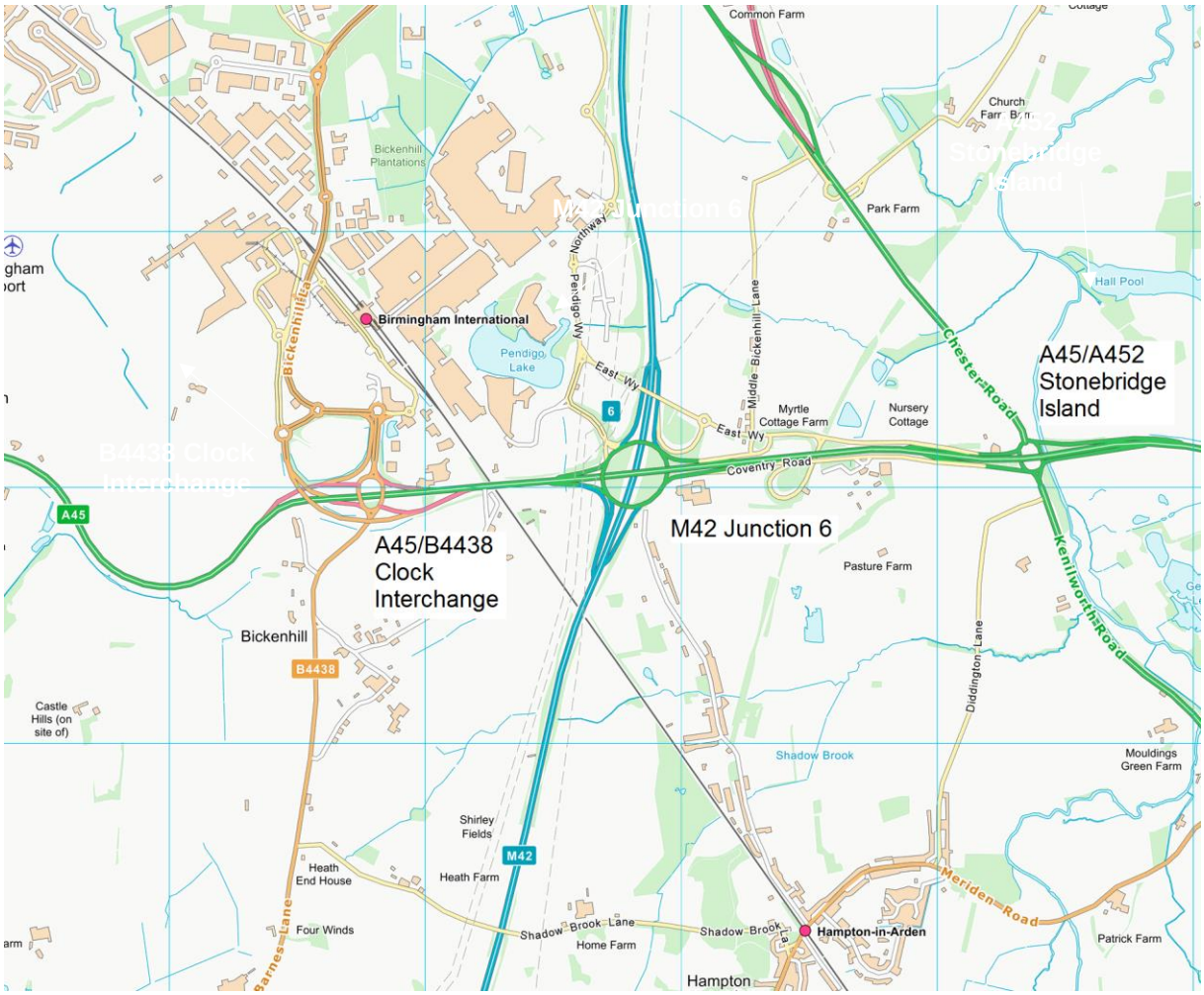


Figure 3-2 – View of M42 Junction 6 and A45 © Ordnance Survey

3.2 Existing highway network

3.2.1 Highway cross section

The existing highway cross section of the M42 from Junction 5 to Junction 7 was originally built as a dual 3-lane motorway (D3M as per TD 27/05 [Ref 1]). However, this section of the M42 was changed to a controlled motorway in November 2006 and the lane widths were modified - described in section 3.2.5. However, within the controlled motorway cross-section, through-junction running (TJR) is not provided at Junction 6. TJR is constrained by hard-shoulder widths and structural abutments at Junction 6 and some modifications could be required if the hard shoulder was to be used as a running lane. TJR is not within the scope of this improvement project.

The A45 between the M42 and Clock Interchange (junction with the B4438) is typical of a non-trunk urban 2 lane all-purpose dual carriageway with a hard shoulder (with an additional lane gain/lane drop). A highway improvement was recently carried out along this section of the A45 and was overseen by SMBC which changed the cross-

section by extending the merge from the M42 free-flow link into an additional segregated lane westbound between the junctions and a replacement bridge over the West Coast Mainline. In the eastbound direction, there are accesses onto the A45 to a garage, hotel and private property between junctions.

The A45 between Junction 6 and the A45/A452 Stonebridge Island junction is typical of a rural all-purpose 2-lane dual carriageway with a hard strip (with an additional lane gain/lane drop). This section of road is within the SRN. Running parallel with the road in the westbound direction is a connector/service road which extends from the A452 northbound merge at Stonebridge Island and merges back onto the A45 slip road as it approaches Junction 6. This connector road serves a number of businesses including a waste collection site and a quarry. There is also a connecting loop which turns under the A45 and links into Eastway – a road that connects the NEC with the A45 eastbound.

3.2.2 Alignment and super-elevation

An assessment of the existing alignment and super-elevation has been undertaken using topographical (LIDAR) survey data. The study area starts approximately 3km south of the centre of Junction 6 and terminates approximately 1.4km north of Junction 6. On the A45, the survey covers a section from west of Clock Interchange through to (and including) the A452 Stonebridge junction.

The horizontal alignment meets the requirements of the UK DMRB TD 9/93 [Ref 2] as the horizontal curvature measurements are greater than the desirable minimum for a 120kph design speed (1020m radius with a 5% super-elevation). The assessment has also identified that there are no areas/locations of adverse camber on the hard shoulder.

The vertical alignment meets the requirements of the UK DMRB TD 9/93 as all of the vertical curves measured are greater than the desirable minimum crest curve (K=182) and absolute minimum sag curve (K=37) for a 120kph design speed. However, in some localised areas a one-step relaxation has been identified.

The stopping sight distance (SSD) has also been assessed. There are areas/locations where the SSD falls below the desirable minimum (295m) for a 120kph design speed. Of particular concern is the intra-Junction 6 section travelling northbound. If the hard shoulder was to become a running lane in the future with All-Lanes Running (ALR), the SSD falls six steps below the desirable minimum (achieved SSD 61m). This is due to the location of the existing abutment of the Junction 6 structure and the horizontal alignment on a left hand radius curve of approximately 1800m. It is worth noting that the current DHS is not operational intra-Junction 6.

There is no current requirement for providing Through Junction Running (TJR) at Junction 6. TJR allows uninterrupted use of the hard shoulder as a running lane through the junction. It is the preferred operating regime for ALR and avoids the need for lane changes by through traffic.

3.2.3 Earthworks

The sections of M42 within the study area (see Geohazard Plan in Appendix E) are largely in cutting or at grade with some areas of embankment to the south of a bridge that takes the M42 over the Birmingham to Euston railway line. The cuttings are generally between 2m and 4m deep, reaching up to around 6m in places. The embankments are generally between 2m and 4m high. Earthwork inspections contained on Highways England's geotechnical data management system (HAGDMS) notes one Class 1D Minor Defect on the northbound embankment immediately prior to the rail crossing - described as 'apparent poor construction with concave slope face'. A subsequent inspection of this defect noted no deterioration. No other defects are noted on the earthworks within the study area.

The A45 is largely at grade or on low embankment between Clock and Stonebridge Interchanges. No earthwork defects have been recorded on this section of road.

Embankment construction material comprises both granular and cohesive materials. Granular material is generally described as dense gravelly sand with some areas of the Eastway embankment described as loose. The cohesive material is described as largely firm or stiff sandy gravelly clay.

The M42 and A45 within the study area are largely underlain by Mercia Mudstone and hence the embankments are formed on and cutting formed through this material. North of MP33/4 the M42 is underlain by Glaciofluvial Deposits. Small areas of Alluvium associated with watercourses that pass beneath the M42 underlies short sections of the motorway. A full discussion of the ground conditions and underlying geology in the study area and a discussion its implications on the scheme options is given in Section 3.8.

3.2.4 Existing structures and condition

There are various structures comprising bridges, retaining walls, culverts and drainage structures along the M42 within the extents of the study area (see Existing Structures Location Plan within Appendix C) - 10no. bridges, 19no. retaining walls and 3no. culverts. Additionally, there are also a number of masts and sign/signal gantries present. Along the A45 section between Clock Interchange and Stonebridge Island, including the Junction 6 circulatory interchange area, there are 6 bridges overall.

Details of the existing structure conditions can be found in Section 3.2.4.1 for bridge structures, Section 3.2.4.2 for retaining walls, Section 3.2.4.3 for culverts and Section 3.2.4.4 for other structures. Section 3.2.4.5 concluded constrains of each structure and Section 3.2.4.6 summarised the effect of existing structures.

3.2.4.1 Existing bridge structures

Basic details of the bridge structures are summarised in Table 3-1 below. The existing structure locations are shown on drawing HE551485-MOU-GEN-M42_J6-SK-CB-0001 in Appendix C.

Generally, all the structures are in FAIR to GOOD condition. Minor defects have been reported in the inspection reports which include map cracking, shrinkage cracking and appearance of water staining. Maintenance works have recently been carried out and confirmed in the latest general and principal inspection reports. However, the condition of the structures along with potential constraints and load carrying capacity

should be investigated and assessed in more detail once the preferred option is selected.

Bridge Name (Structure Key)	Number of Spans	Structure Span	Structure Width
Solihull Road (4909)	2	17.8m skew span	14.6m
Bickenhill Lane (3588)	2	18.55m	12.68m
Shirley Fields Accommodation (4910)	3	36.1m Centre Span 15.5m Side Spans	5.4m
Hampton Railway (13096)	2	15.61m & 13.06m	51m
M42 Interchange South (3590)	2	39.5m overall span	15.1m
A45 Interchange Central (3591)	2	42m overall span	TBC
M42 Interchange North (3592)	2	39.5m overall span	15.1m
NEC Access (3593)	3	42.5m Centre Span 30m Side Spans	
The Inbound Access A45 Overbridge (50229)	3	91.1m overall span	14m
Outbound Access A45 Overbridge	1	24m overall span	13m
The Clock Junction West Overbridge (50109)	2	29m overall span	14.9m
The Clock Junction East Overbridge (50111)	2	29m overall span	14.9m
The Inbound Access Catherine De Barnes Overbridge (50228)	1	29m overall span	13.23m
A45 South Bridge (Replaced Structure)	1	22.7m clear span	28.2m
M42 I/C East (12977)	1	14.6m span	
M42 I/C West (12978)	2	28m overall span	

Table 3-1: List of existing bridge structures within the general scheme limits

Information from the available general and principal inspection reports suggests that the structures are either in fair or good condition. Typical defects stated within the inspection reports include cracking, seepage, spalling, exposed reinforcement/delamination and bearing corrosion.

3.2.4.2 Existing retaining walls

There are approximately 19no. retaining walls situated along the M42 corridor within the general scheme limits. Eight of these walls are 'major' structures. A 'major' retaining wall, for the purposes of this report, is defined as a wall having an overall length greater than 10m or retained height is greater than 2m. They are often built to protect the emergency refuge areas (ERAs) for the Active Traffic Management (SMART Motorway) system. The remaining walls are considered as small structures which generally retain minor structures like electrical cabinets. The major retaining walls are listed in Table 3-2.

Structure Name (Structure Key.)	Length (m)	Height (m)	Description
P29A (24902)	140.0	2.80	A sheet pile retaining wall which retains the embankment above the emergency refuge area adjacent to the North bound carriageway of the M42 Motorway
RW For MS3 6410B (C09) SB (22235)	15.5	2.35	Brick faced insitu reinforced concrete retaining wall situated adjacent to the southbound carriageway of the motorway between Junctions 5 and 6
P33A (24903)	135.0	1.80	A reinforced concrete retaining wall which retains the embankment above the emergency refuge area constructed as part of the M42 ATM
P34A (24904)	6.0	2.50	A sheet pile retaining wall which retains the embankment below an emergency refuge area adjacent to the North bound carriageway of the M42 Motorway
P38B (24905)	12.3	2.00	A sheet pile retaining wall which supports part of the M42 ATM Portal Gantry adjacent to the South bound carriageway
RW For MS3 6427B (C08) SB (22237)	15.5	1.0	Retaining wall located adjacent to the southbound carriageway of the motorway at the demolished signal gantry 6427B, at Junction 6. The wall is a low brick faced retaining wall with a concrete capping beam and tubular steel handrail
P43B (24908)	11.0	Not known	A sheet pile retaining wall which retains the embankment above a portal gantry and adjacent electrical cabinet, constructed as part of the M42 ATM
P43A (24907)	81.5	2.0	A steel sheet pile wall retaining the embankment adjacent to a northbound carriageway emergency refuge area constructed as part of the M42 ATM

Table 3-2: List of existing major retaining wall structures within the general scheme limits

Table 3-2 also summarises the length, height and description of the 'major' retaining wall structures. The major retaining walls are generally in GOOD condition with only minor cracking, spalling and corrosion defects reported. As well as providing general protection in areas of cuttings, several retaining walls have been positioned in the areas of refuges as part of the original Active Traffic Management pilot scheme.

3.2.4.3 Existing culverts

3no. small span culverts were identified within the general scheme limits, as listed in Table 3-3. The dimensions and description of the culverts are shown in Table 3-3. The structures are all in GOOD condition. Some minor defects were reported including the presence of vegetation. The defects to Outfall No.16 were addressed in 2014. Works included clearing of vegetation and silt and repair of minor cracking. No information regarding the planned routine maintenance for the other culverts was found.

Structure Name	Length (m)	Width (m)	Description
Outfall No. 16 (24375)	38.12	1.20	A 1200mm diameter corrugated steel pipe that carries a watercourse under the M42 motorway approximately 3.5 km south of Junction 6. The culvert has reinforced concrete headwalls at each end and is approximately 1 foot below carriageway level. There is a wooden pedestrian guardrail around the headwalls of the structure
Outfall No. 19 (24376)	68.13	1.40	A 1408mm diameter corrugated steel culvert carrying a minor watercourse under the M42 Motorway, approximately 1 km south of Junction 6. The culvert has reinforced concrete headwalls and wooden pedestrian guardrails at each end
Culvert 11 Hollywell Brook (24377)	62.62	2.42	A corrugated steel pipe culvert which carries Hollywell Brook under the M42 Motorway, approximately 0.6 km North of Junction 6. The culvert does not have headwalls, but has paved revetments/training walls at either end

Table 3-3: List of existing culverts within the general scheme limits

3.2.4.4 Other existing structures

In addition to the above structures, there are some masts and sign/signal gantries which are also affected by the scheme. Gantries are maintained by the Road Traffic Maintenance Corporation and there are no known improvement programmes planned on the mainline in this area. However, signs on the gantry at the M42 Junction 6 northbound slip road exit were changed as a result of improvement works on the A45 by SMBC.

3.2.4.5 Constraints of existing structures

In this section, the potential constraints and impacts of any improvements or changes to existing structures have been listed below:

- **Disruption to the West Coast Mainline** – This would require approval of railway possessions from Network Rail. Opportunities for possessions can be very limited in terms on construction programmes
- **Network disruption to M42** – Any structures over the M42 mainline would be very disruptive to the network and will often require complete carriageway closures with diversion routes for motorway traffic

- **Disruption at Clock interchange Improvement** - Improvement and widening required to Clock Interchange will have a large impact on traffic using Birmingham Airport, the railway station and local businesses
- **Gantries/Signs modification** – Existing gantries or signs may require modification subject to structure widening
- **Parapet upgrades** - Parapet upgrades or vehicle restraint systems may require modification to meet future traffic demands
- **Existing services** - Existing services nearby/on structure may require diversion or re-routed
- **Geotechnical constraints** - Structural widening or new construction may be founded on soft ground and require substantial foundations
- **Environment and sustainability** - Widening or new construction can impact the local environment and sustainable development.

3.2.5 Motorway Lane widths

As referenced in 3.2.1 and following a review of the topographical survey, the lane widths generally meet the requirements of IAN 111/09 [Ref 3] for a managed motorway cross section, which vary from 3.4m to 3.7m depending on the lane designation.

For the majority of the M42 an offside hard-strip does not exist. This is replaced with an edge line to demarcate the offside carriageway/central reserve.

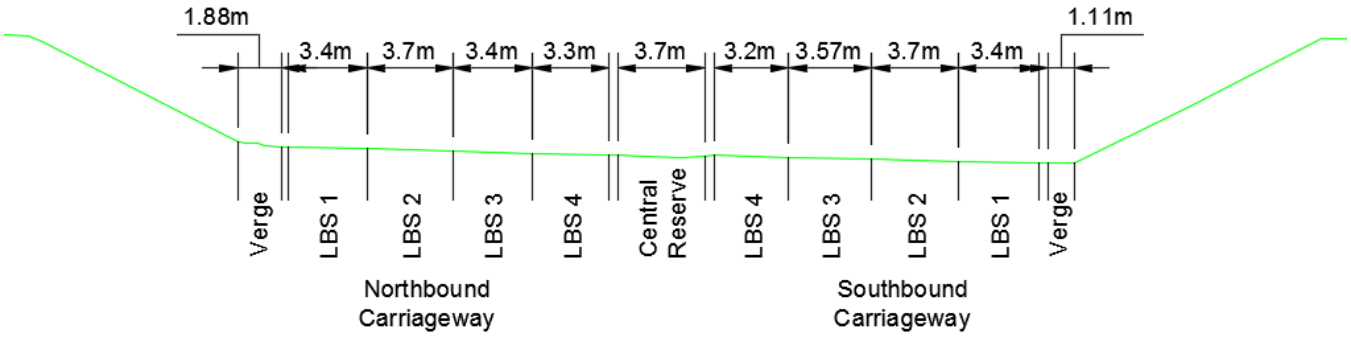


Figure 3-6 – Example M42 cross section from topographical survey

Following a review of the topographical survey information and as referenced in section 3.2.1 the lane widths on the A45 generally are in line with the requirements of TD 27/05 [Ref 1].

Over the area of interest both sections of the A45 are two lanes (with an additional lane gain/lane drop), except for the westbound section between M42 Junction 6 and Clock interchange which has recently been widened to provide an additional segregated lane directly to Birmingham Airport.

3.2.6 Junctions

The existing M42 Junction 6 consists of a signalised roundabout forming part of grade separated junction with the M42/A45. Signals are located at each of the four

main approaches and also at the access to the NEC. There are also ramp meter signals on the M42 northbound and southbound entry slip roads.

M42 Junction 6 circulatory carriageway also provides access to two major stakeholders: the NMM and the NEC who both have access and egress points directly onto the circulatory carriageway – though the NEC accesses are signal controlled. The junction currently links to Birmingham Airport and Birmingham International Railway Station via the A45 westbound including a dedicated free-flow link from the M42 Northbound Exit slip road - which leads into a segregated lane on the A45 Westbound carriageway. Widening of the A45 Westbound was carried out in 2016 by SMBC. Figure 3.7 below provides an aerial image of the junction.

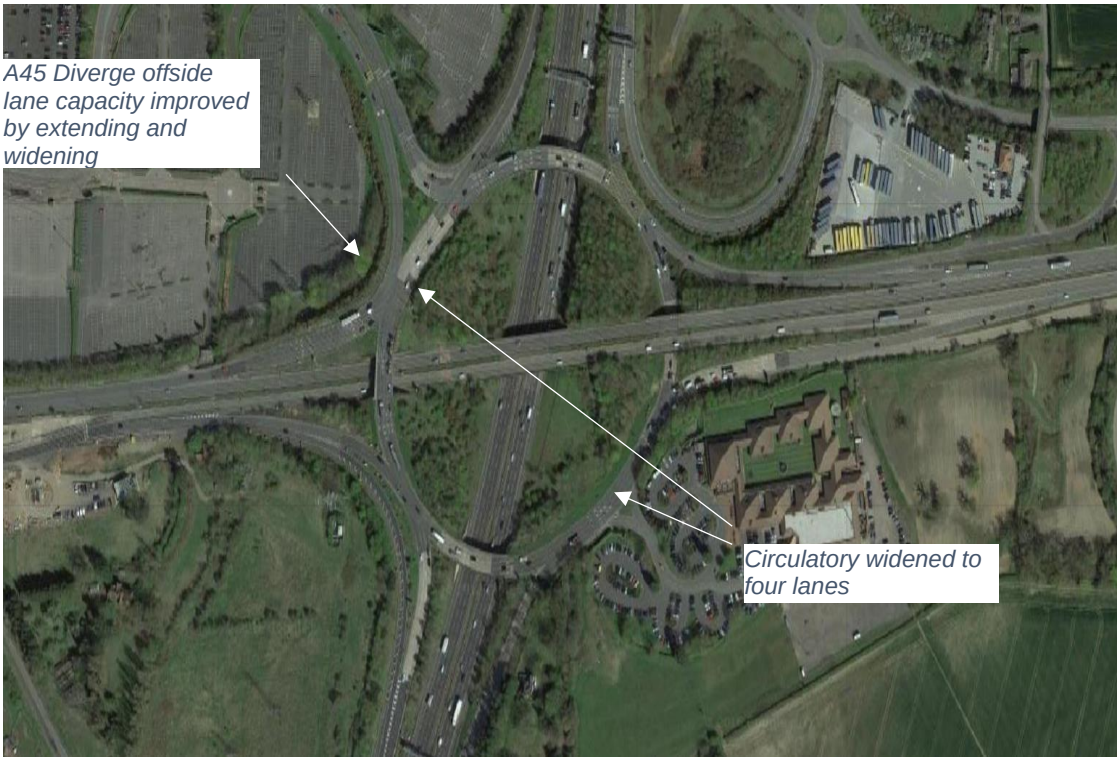


Figure 3-7 – Aerial view of M42 Junction 6

A Pinch Point Programme (PPP) scheme was completed in December 2014 with additional re-surfacing works completed in March 2015, and included areas of new high friction surfacing, safety barriers & parapets, signs, lines and traffic signals. The PPP scheme widened the circulatory carriageway to four lanes opposite the NMM and over the western bridge between the A45 WB entry and A45 EB exit slip roads. The A45 Eastbound Slip road to Junction 6 was widened on the offside to increase right turn capacity. This was done to provide some initial relief to congestion problems. An existing footway is located on Junction 6 eastern and southern side of the junction linking existing footpath/cycleway on the westbound side of the A45 on the west side of Junction 6 to the A45 east of Junction 6 on the eastbound side of the carriageway. This footway can be used to link the local communities of Bickenhill and Hampton-in-Arden and can also be used by pedestrians using the local bus service.

Clock Interchange is situated in the A45 towards Birmingham and is a junction with the B4438. As well as access to Bickenhill Lane to the north and to the communities of Bickenhill and Catherine-de-Barnes to the south this junction also serves traffic using Birmingham Airport, Birmingham International Railway Station and the local business park. There is a separate flyover link from the A45 westbound exit slip road onto Airport Way. This junction can be heavily trafficked, particularly at PM peak times and when there are large numbers of passengers using the airport and railway station.

Stonebridge Island is the junction between the A45 towards Coventry and the A452 Chester Road. On the eastern side of the junction the westbound slip road splits into a merge onto the A45 and also forms a service road running parallel with the A45 and merging back onto the A45 slip road approaching Junction 6. This road provides a separate access to the NEC via Eastway and also serves a number of small businesses to the south of the A45.

3.2.7 Lighting

The M42, Junction 6 and A45 are illuminated for the full length of the sections under consideration. On the M42, verge lighting was installed in 2005 with high-wattage sodium lighting. At the ERAs, there are lighting columns with double-header lanterns. A number of older lighting columns exist near Junction 6 which are near to the end of their design life and need replacement. Significant repairs and cable faults have occurred over recent years and replacement of some columns due to conflict with structures and overhead power cables. An LED Replacement Programme is in development.

Lighting on the A45 is also present along the full length under consideration both in verges or centre reserve and also at the proposed links into Clock Interchange and Airport Way (access to Birmingham International Railway Station and Birmingham Airport). Responsibility for the lighting to the west of Junction 6 is with SMBC.

3.2.8 Vehicle restraint systems

Vehicle restraint systems (VRS) are present throughout the existing M42 central reserve and in verges where existing gantry, bridge abutments, retaining walls, ERAs, cabinets, traffic signs and lighting columns, etc are present.

The majority of the VRS within the central reserve is tension corrugated beam (TCB) which changes on the approach to Junction 7 and at structures to open box beam (OBB). The VRS in verges is generally OBB with double rail open box beam (DROBB) around gantry bases. VRS along the A45 is also generally TCB with OBB protection at structures.

The M42 VRS is generally in poor to moderate condition with some minor defects and varying levels of corrosion. However there are some sections of new VRS on the circulatory carriageway at Junction 6 and on the A45 where recent highways improvements have taken place. Recent maintenance has included bi-annual inspections, re-tensioning and minor find and fix replacement of corroded sections. There is a programme of renewal of the VRS or replacement on the M42 centre reserve in years 2018-20, subject to funding – with a potential of replacement with vertical concrete barrier in the longer term. Due to the revisions to the list of EN1317 Compliant Road Restraint Systems (current revision January 2016) [Ref 4] the

barriers listed above can only be used on Highways England's trunk road network for repair schemes unless a case can be made for a Departure from Standard.

3.2.9 Emergency Refuge Areas

There are a number of emergency refuge areas (ERAs) on the M42 between Junction 5 and 7 of the M42 as part of the controlled motorway system. These are typically located immediately downstream of gantries. These are for emergency use only and provide a safe area for vehicles to stop at times when traffic is running on the hard shoulder. Under the original M42 ATM Pilot scheme, the spacing of these ERA's was nominally 500m. ERAs along the M42 are generally in moderate condition but were not re-surfaced within recent mainline carriageway resurfacing schemes. Linear drainage kerbs are used for drainage purposes.

3.2.10 Environmental barriers

There are no environmental barriers in the vicinity of the proposed improvement works. However, on the Junction 6 southbound merge to the M42 a closed boarded fence is located at the top of the cutting adjacent to a property on Old Station Road, it is not clear whether this fence has acoustic properties or is part of the property boundary.

3.3 Traffic

The London to Scotland West Route Strategy Evidence Report April 2014 and Technical Annex April 2014 [Ref 5] provides a ranking for the Annual Average Daily Flow (AADF) of traffic for each designated link road of which there are 2475 in total. The majority of the M42 links are within the top 120 of this total, some examples are given below:

1. M42 between M42 J7 and M42 J6, AADF = 67,079, Ranking = 86/2475
2. M42 between M42 J6 and M42 J5, AADF = 65,796, Ranking = 99/2475
3. M42 between M42 J6 and M42 J7, AADF = 65,057, Ranking = 105/2475
4. M42 between M42 J5 and M42 J6, AADF = 64,694, Ranking = 109/2475

It also provides a number of headline figures which are listed below:

- It experiences peak hour speeds of 41 to 50mph on this 70mph motorway (note ATM peak speeds are defined as 60mph)
- It is in the top 10% for vehicle-hour delay

The traffic figures show that the M42 is running close to capacity and may require future widening and/or conversion of the DHS running to ALR in the near future should traffic growth levels continue to rise.

The M42 forms the south and eastern arms of the motorway box around Birmingham. On the eastern arm around M42 Junction 6, the M42 carries around 130,000 vehicles a day. The A45 is a major arterial route for Birmingham, linking it with Coventry and carries around 70,000 vehicles a day with some 50,000 turning movements a day at Junction 6.

Following the implementation of the pinch-point scheme to improve capacity at Junction 6, the junction frequently operates within capacity and is anticipated to continue to do so until 2019 when capacity is expected to be reached resulting in a

high degree of saturation. However, when there are motorway incidents, major events at the NEC or severe weather conditions, the capacity is exceeded leading to significant congestion. Some emergency plans are in place to deal with the severe congestion events however the increased levels of traffic and anticipated growth of the local developments will lead to increased congestion unless improvements are made to the junction.

Due to the proximity to the NEC, Birmingham Airport and Birmingham International rail station, significant congestion can occur during the morning and evening peak periods. The NEC and Highways England have identified major events held at the NEC which have the potential to contribute to a high or medium impact on the network and have the potential for severe or moderate delays to the SRN. This is due to the substantial increased levels of traffic that are attracted to these events. In order to mitigate the potential impact, intervention measures have been identified and are implemented if required. These events can occur up to 1 in 6 days per year in particular during AM and PM peak times.

In addition, there can be incidents on the A45 and the SRN on the M42, M6 or M40 that have the potential to impact the operation of M42 Junction 6 - depending on the severity of the incident e.g. major traffic accidents, breakdowns, statutory undertaker works/repairs, technology faults, etc. Therefore, the number of days per year in which the junction operates within capacity are affected and Junction 6 needs improvement in order to provide better journey time reliability.

Ramp metering is in place on the Northbound and Southbound Entry slip roads at Junction 6 and operates on a regular basis. However, there are also frequent occasions when the 'Queue Over-ride' function is triggered on the ramps to an extent where the signals cannot operate as they were intended. This can lead to traffic backing up onto the Junction 6 circulatory and can contribute to the frequent congestion issues experienced at the junction.

Traffic surveys were carried out in February 2012 to provide reliable turning movement counts at the M42 Junction 6 roundabout. These were undertaken on a day when there was no major event on at the NEC, and then one week later during the occurrence of a major event, the Spring Fair, at the NEC. The mainline flow on both the A45 and M42 were excluded as these flows do not enter the junction. The 12 hour period was between 07:00 and 19:00. The flows show a significant increase when there was an event on at the NEC, particularly at PM peak time exiting the NEC. The flows are given in the Tables 3-6 and 3-7 below.

Arm Entry Traffic Flows (PCU) – No Major Event at NEC, February 2012							
	07:00 to 08:00	08:00 to 09:00	09:00 to 10:00	16:00 to 17:00	17:00 to 18:00	18:00 to 19:00	12 hour flow
M42 North	1694	1759	1201	1073	1183	955	13127
A45 East	1405	1521	918	1616	1767	1030	13748
NMM	8	13	12	35	11	22	205
M42 South	1908	2277	1475	1121	1242	931	14614

A45 West	1328	1313	969	2030	1911	1354	15468
NEC	140	249	172	476	542	470	3338
Total	6483	7132	4747	6351	6656	4762	53975

Table 3-6: M42 Junction 6 entry flows on a NEC no major event day

Arm Entry Traffic Flows (PCU) – Major Event at NEC, February 2012							
	07:00 to 08:00	**08:00 to 09:00**	**09:00 to 10:00**	**16:00 to 17:00**	**17:00 to 18:00**	**18:00 to 19:00**	**12 hour flow**
M42 North	1737	1685	1342	1029	1343	1362	14024
A45 East	1351	1712	1034	1805	1881	1112	17327
NMM	7	14	20	32	17	12	319
M42 South	1925	2826	1855	1398	1224	1009	17327
A45 West	1413	1555	1161	1789	1805	1532	16973
NEC	135	194	211	1115	1035	848	5717
Total	6568	7986	5623	7168	7305	5875	69139

Table 3-7: M42 Junction 6 entry flows on a NEC major event day

An extensive programme of traffic surveys was undertaken in February and March 2016 to supplement existing count data and information supplied from the PRISM model. Taken together, these various data sources provided a comprehensive understanding of current traffic conditions. Full details of the traffic data are described in the Traffic Data Collection Report.

3.4 Accidents

3.4.1 Existing Collision Record

The analysis of collision and casualty rates suggests that this section of the M42 has significantly lower casualty rates per 100m vehicle miles and lower casualties per mile than the average rates on an English Motorway in 2014.

	Number of PICs	**Number of Casualties**
Fatal	1	1
Serious	10	12
Killed or Seriously Injured (KSI)	11	13

Slight	78	119
Total (KSI and Slight)	89	132
FWI Casualties per year		**0.7**
FWI rate per Billion Vehicle Mile		**0.5**
No of PICs occurring with no lighting present		1%
No of PICs occurring on a wet road surface		38%
Length of section miles (km)		11
Billion Vehicle Mile per Year		5.50
100 Million Vehicle Mile per day		0.15606
Number of years in data set, up to end of 2014		5

Table 3.4.1 Personal Injury Collisions and Casualties for the M42 scheme for 2010-2014

	Annual number of casualties per 100 million vehicle miles	
	M42 scheme average 2010-2014	**Motorway 2014**
Fatal rate	0.0036	0.1475
Serious rate	0.0437	1.1170
KSI rate	0.0473	1.2645
Slight rate	0.4330	13.1208
Total rate	0.4803	14.3853

Table 3.4.2 - Casualties per 100 million vehicle miles for scheme links per year and comparisons (2010 to 2014)

	Annual number of casualties per mile	
	M42 scheme average 2010 - 2014	**Motorway average 2014**
Fatal rate	0.0182	0.0450
Serious rate	0.2182	0.3407
KSI rate	0.2364	0.3856
Slight rate	2.1636	4.0016
Total rate	2.4000	4.3873

Table 3.4.3 - Casualties per mile for scheme links per year and comparisons (2010 to 2014)

There have been 1 fatal, 10 serious and 78 slight collisions resulting in 1 fatal, 12 serious and 119 slight casualties. The severity ratio (KSI) of 11% is lower than Road Casualties Great Britain 2015 (RCGB15) average of 13%.

Collisions occurring on a wet road surface amount to 38% which is above the national average for motorways which is recorded at 30% (RCGB15). This suggests that road surface or drainage maybe an issue. The total number of collisions occurring in the hours of darkness is recorded as below the national average, however, collisions occurring where street lighting is present (17%) is above the national average (14%) and therefore as part of this scheme, the street lighting levels may require further investigation. Both flooding hot spots and lighting renewals have been identified for future maintenance improvements within the current Area 9 programme.

Out of the analysis it can been seen that the typical three peak time frames, morning, lunch and afternoon peak hours are where the highest number of collisions are recorded. In this case, whilst all three typical peak time frames have the highest number of vehicles, the morning peak hour between 8am and 9am is the highest.

Analysing the whole of the peak hour periods it can be seen that:

- 6am – 9am resulted in 20% of the total collisions
- 12pm - 2pm resulted in 17% of the total collisions
- 4pm – 7pm resulted in 22% of the total collisions.

With regards to the type of incidents occurring within the scheme extents, it can been seen that

- Rear end shunt type incidents make up 61% of the total collisions with the collisions occurring in typical peak hour time slots which lead to an assumption that there are congestion issues on the links and junctions.
- 22% of side swipe collisions on the main line, these collisions could be occurring due to congestion and drivers cutting in at the last minute to exit at the junction. With regards to this type of collisions on the roundabout, especially at junction 6, this could be again due to congestion or due to motorists being unfamiliar with the roundabout, the lanes and required exits off the roundabout.

All four collisions at Junction 7 are loss of control collisions with 2 of the 4 occurring on a wet road surface, this should be investigated further.

Congestion on the M42 main line between junctions 4-7 was the subject of a technical note submitted to Highways England by Mouchel (Appendix F2). It suggests that there are periods when the capacity of the M42 exceeds its practical capacity of 1800 vehicles/hour/lane for much of the working day and often during NEC events. It could be construed that this amount of congestion could be a contributory factor to the rear shunt and side swipe accidents described above.

The recorded accidents on the M42 and A45 over a five year period are included in Appendix I. There are clusters of accidents associated with the main junctions on the A45 to the east and west of Junction 6 – B4438 Clock Interchange and A452 Stonebridge Island.

3.4.2 Summary of Collision Data

Through-out the scheme length 85% of the total collisions can be attributed to slight injury collisions. The Killed and Seriously Injured (KSI) collision percentage (KSI%) for the M42 is around the same for the national average – though the only fatality recorded was at the Junction 5 Northbound entry slip road. The KSI for the A45 is slightly lower than the national average

However the issue and consequences are concerned with the impact of incidents and the implications on the disruption across the wider highway network as well as harm and injury.

All options include measures to reduce congestion by way of additional lane space, free flow lanes and new link roads. The impact of each option is to reduce traffic throughput using the existing roundabout, therefore reducing the number of accidents occurring on the roundabout. As a result, it can be assumed that a percentage of the rear end shunt collisions and side swipe incidents would be saved due to the reduced number of stop start and late lane change manoeuvres taking place in the proposed M42 J6 Improvement scheme extents.

The impact of each option is to reduce traffic throughput using the existing roundabout, therefore reducing the number of accidents occurring on the roundabout. However, this benefit is offset by traffic using the new link and the expected number of accidents forecast to occur on the new link in each option.

Due to the fairly low level of collisions on the M42 and the KSI percentages on each route, this scheme is not expected to contribute significantly to Highways England's KPI of reducing KSI collisions. However, the reduced congestion will lessen the potential for shunt and weaving related incidents.

3.5 Topography, land use, property and industry

The M42 within the area of interest/study area is in a mixture of cutting and embankment. Land adjacent to M42 has varying topography but not considered undulating and the majority of the area is fairly flat.

Although the area around M42 Junction 6 is generally rural in nature there is a mixture of land-use that results in a set of constraints which have a significant impact future road improvements to the M42 Junction 6.

A large section of land to the immediate west of the M42 and north of the A45 is taken up by the NEC. The NEC holds major events throughout the year attracting six million visitors and a further major attraction – Resorts World has recently opened and is expected to reach around three million visitors in its first year. The main access to the NEC is via M42 Junction 6 but other accesses are available on the north side of the development onto the B4438 Bickenhill Lane and also on the east side on Eastway, which can be used by traffic exiting the M42 southbound and also leads onto the A45 towards Coventry. Beyond the NEC lies the residential area of Marston Green within Solihull Metropolitan Borough with Birmingham Business Park further north. Further west along the A45, Birmingham Airport is expected to attract around 10-11million passengers during 2016 with a projected rise of up to 19 million passengers by 2020. With Birmingham International Railway Station and further local businesses located around the airport and NEC, the land-use and local road network will come under increasing pressure with expected growth in the area. This results in additional demand for an improved strategic road network.

On the north-eastern side of Junction 6 there is significant development planned by SMBC. The UK Central development promoted by the Urban Growth Company is planned for the triangular section of land between the M42, A45 and A452 with a mixture of residential and commercial development. This area is also planning to host the proposed HS2 station which is due to open in 2026 and could provide up to 3,500 new jobs. Increased access and capacity will be required for this development from the strategic road network. .

South of Junction 6 and the A45 is predominantly a rural area but includes local communities of Hampton-in-Arden, Bickenhill and Catherine-de-Barnes within green-belt land. However, there are a number of small businesses located on the south side of the A45 east of Junction 6 which are served by a connecting road which runs parallel with the A45.The National Motorcycle Museum incorporating the National Conference Centre is located immediately to the south-east of the junction with access onto the circulatory carriageway which hosts an increasing number of events each year. Access into and out of the NMM is direct from M42 Junction 6 without any signal control. Potential alternative arrangements for exiting the NMM will be investigated during Stage 2 of the project. Further east of the junction, the proposed route of the HS2 alignment crosses the A45 at the mid-point between Junction 6 and Stonebridge Island.

Rural farmland dominates the area around the villages of Bickenhill and Catherine-de-Barnes to the south-west of Junction 6. Other features in this area include a number of football fields owned by the National Gaelic Athletics Association, Bickenhill Meadows SSSI and a recently built Birmingham Dogs Home. The West Coast Mainline railway runs in a north-west/south east direction close to Junction 6 and any impact on this track would be severely restrictive with railway possessions only available at limited times throughout the year. A number of public utilities are located to the south-west of Junction 6 and include high-voltage overhead electricity pylons (also run parallel to the east of the M42), high-pressure gas mains, a water aqueduct and an oil pipeline which serves Birmingham Airport. All of these services would have significant costs and require careful programme planning if impacted by any of the improvement works to Junction 6. Further west towards north Solihull, is the Lode Lane Jaguar Land Rover plant which currently employs a workforce of 5,000 but has plans for expansion in the near future.

A further potential constraint on the south side of the junction is a proposed new Motorway Service Area. This is planned to be located about 2.4km south of Junction 6 and will require a new junction to the services with buildings adjacent to the motorway. This application has been submitted to SMBC in 2015 and is still under consideration in early 2017. If approved, the junction and access to the services could have a direct impact on any improvements planned to the M42 mainline south of Junction 6.

3.6 Climate

As with the rest the Midlands, Solihull experiences a maritime climate with cool summers and mild winters (Met Office 2016). Data from the Coleshill Station (nearest climate station to Solihull area) follows:

- Average annual max temperature = 13.1°C
- Average annual Min temperature = 6.1°C

- Annual average rainfall = 59.4mm;
- Mean wind speed =7.0 knots; and
- Days of air frost = 49.8.

3.7 Road drainage

Our drainage study has established that the study area covers some of the River Blythe tributaries and other smaller watercourses. The whole catchment drains to the existing stream network and those tributaries and watercourses around the River Blyth already present some severe flooding issues and a significant amount of flood events have been recorded between Junction 5 and 7 of the M42. There are known filter drain issues within the Area 9 Maintenance contract and there is a programme of filter drain cleaning/replacement in place.

The new infrastructure will affect the hydrological regime and catchment of the river basin so a hydrological and hydraulic assessment will need to be carried out in order to assess potential flood impacts.

3.8 Geology and soils

A Preliminary Sources Summary Report (PSSR) has been produced for the scheme with a full discussion of the scheme geology, together with relevant extracts of the source mapping. The following paragraphs are a summary of the data presented in the PSSR, with a specific focus on the options being taken to public consultation. Information on the geology has been obtained from the British Geological Survey (BGS) 1:50,000 scale and 1:10,000 scale geological maps. A geohazard plan was developed on the basis of the findings of the PSSR and this is reproduced in Appendix E of this report.

3.8.1 Anthropogenic Deposits

Three types of anthropogenic deposits exist within the study area as defined on the 10,000 mapping, these are worked ground (defined as ‘Disused sand and gravel or brick clay pits’), infilled ground (defined as ‘Excavations partly or wholly backfilled with domestic refuse, spoil and fly ash’) and made ground (defined as ‘Mainly domestic refuse and spoil’).

An area of made ground associated with the construction the NEC and associated infrastructure is located to the immediate northwest of Junction 6, occupying the part of the study area west of the M42 north of the A45. There are no available records which provide a description of this material but it is likely to comprise insitu material disturbed during construction or imported fill used to remodel of the ground.

An area of made ground, approximately 15m by 40m, associated with a former landfill is located to the immediate west of the Gaelic Football Grounds.

Areas of potential Made Ground associated with deposition of excess material from original M42 construction have been identified in the areas within the Junction 6 roundabout and on land to the immediate north of Eastway and east of the M42.

Discrete areas of infilled ground associated with historic landfills and very localised former ponds are located in the study area. Worked ground is located where the ground has been cut away but not infilled, including the M42 earthworks cuttings.

A significant area of infilled ground is located to the immediate south of the A45, approximately 600m east of Junction 6 and is associated with a former brickworks (Arden / Jacksons Brick Works) and former railway line. There is no existing information on this material.

Made ground and infilled ground are generally heterogeneous in nature and are often unsuitable as a founding material for structures/earthworks without treatment due to its weak and/or compressible nature.

3.8.2 Superficial Deposits

A review of published geological information indicates pockets of glaciofluvial deposits and alluvium are located within the study area and their distribution is shown on the Geohazard Plan in Appendix E.

Due to variety of source rocks within the catchment and alluvial depositional environments present within the study area, the alluvium will be of variable composition. However, the published information describes the alluvium to generally comprise “soft to stiff grey or reddish brown fine-grained sandy or silty clay with impersistent horizons of sand and gravel and rare lenses of amorphous peat”. The published information describes the glaciofluvial deposits to comprise generally orangey brown, sometimes clayey, sand and gravel.

A small area of Alluvium is shown as underlying the Clock Interchange and the tie in of all the southern junction options to the interchange part overlie this area. There are other areas of Alluvium located to the south-west of Junction 6 which would impact improvements to the southern junction theme options. This would have to be considered in particular for foundations to proposed structures. . These areas of Alluvium then extend to the east of the M42 along the line of the associated watercourses. An area of Alluvium associated with an unnamed tributary of Low Brook runs roughly north-south generally around 300m to the west of the B4438.

Alluvium is often weak and all compressible and is unlikely to be suitable as a founding material for embankments or structures. If the deposits are thin (likely given the minor nature of the associated watercourses) then they could be excavated out and replaced with engineered fill. If the Alluvial reaches significant depths then structures may need piling.

The pockets of Glaciofluvial Deposits are largely located to the west of the M42 although a pocket underlies the A45 just to the area between Eastway and the Motorcycle Museum. North of MP33/4, most of the study area is underlain by Glaciofluvial Deposits. These deposits also underlie Shadow Brook Lane the western end of Church Lane. Small areas Glaciofluvial Deposits underlie further south at Catherine De Barnes Lane and midway between the proposed new southern junction with the M42 and Catherine De Barnes Lane.

Glaciofluvial Deposits are not generally a problematic however they can be variable in nature and may contain soft clay bands which would need removal or treatment if found beneath areas of proposed embankment widening.

3.8.3 Solid Geology

A review of published geological information indicates the study area is underlain by the Mercia Mudstone Group. It is further split into undifferentiated deposits of “interbedded red-brown, locally gypsiferous mudstones with thin green-grey siltstones” and the Arden Sandstone Formation comprising “interbedded grey-green siltstone, mudstone and cross-bedded sandstone”.

The Mercia Mudstone Group is indicated to be approximately 365m thick with the Arden Sandstone member generally between 1m and 10m thick. Depth to rockhead within the study area varies between 0m below ground level (BGL) and approximately 10m BGL. The geological mapping indicates the Arden Sandstone outcrops around Junction 6 and the A45 directly west of Junction 6.

Generally the Mercia Mudstone has well-developed weathering zones due to its susceptibility to weathering processes. In its completely weathered state it is described as a “Reddish brown very soft to hard silty Clay”. The published geological information indicates that the weathering profile typically extends to depths between 10m and 15m, with some localised areas extending to depth in excess of 30m.

The Mercia Mudstone is likely to be a suitable founding material for structures and embankments.

3.8.4 Structural Geology

The geological mapping indicates several geological faults cross Junction 6. One fault is located broadly perpendicular to the M42 at approximate marker post MP 29/9 +70m.

3.9 Mining

A review of the Mining and Instability West Midlands Report produced by Arup indicates no significant mining has taken place in the study area. Moreover the underlying strata are not coal bearing.

3.10 Public utilities

Enquiries have been made with the utility companies to establish the location of existing apparatus in the vicinity M42 Junction 6 and the study area/area of interest.

Enquiries with statutory undertakers have highlighted a significant amount of apparatus around Junction 6, as well as a number of high risk apparatus within the study area/area of interest, these are listed below:

- 400kV National Grid (NG) Overhead Cables and associated pylons
- 132kV Western Power Distribution (WPD) cables and associated pylons
- Severn Trent Water Aqueduct
- Esso Pipeline

The location of the statutory apparatus is shown on drawing HE551485-MOU-VUT-M42_J6-SK-D-0001 which can be found in Appendix D.

Further notices have been submitted to statutory undertakers to obtain a budget cost for any diversions for the current options to be taken to public consultation. Early discussions have been held with National Grid and Western Power Distribution due

to the potential major impact of relocation/removal of pylons affected by the proposed improvement.

Gas main repairs were carried out in Autumn 2016 at the location of A45 Westbound approach and the circulatory carriageway at Junction 6 next to the NMM.

3.11 Technology

3.11.1 General

M42 Junction 6 is located within the M42 Junctions 3a to 7 Advanced Traffic Management (ATM) Pilot scheme, the first Smart Motorway – Hard shoulder Running (SM-HSR) scheme to be constructed on the motorway network and opened in 2006. As a pilot scheme designed to test the concept of part time hard shoulder running and establish appropriate levels of technology provision to achieve its safe operation, the level of technology provision on this section of motorway is significantly higher than that installed under subsequent SM-HSR on the Birmingham Box and the wider motorway network.

The locations of existing technology assets within the proposed scheme extents have been determined from the Motorway Communications Record Drawings obtained from a number of sources including GeneSYS, the National Roads Telecommunications Service (NRTS) contractor, as-constructed drawings for the M42 Junction 3a – Junction 7 ATM pilot scheme and the Highways England Technology Performance Management System (TPMS), a live database of all Technology assets on the SRN.

3.11.2 Motorway Signals and Message signs

Advanced Motorway Indicators (AMI), which are used to display variable mandatory speed limits (VMSL) and lane closure information associated with operation of SM-HSR are located over each lane of the M42 main carriageways on super-span portal gantries at intervals of approximately 500m. MS4 message signs, which are used to display messages and pictograms associated with operation of SM-HSR and also tactical messages set by West Midlands Regional Control Centre (WMRCC) operators are located on the same super-span portal gantries as the AMI signs. Post-mounted AMI are also located on either side of the carriageway at the start of the existing Junction 6 entry slip roads (Note: there is an additional pair of post mounted AMI at the start of the Junction 6 northbound entry slip road to provide information to vehicles approaching from A45 eastbound in advance of the start of the dedicated left turn lanes to the northbound on-slip road).

MS3 message signs, which are used to display strategic messages comprising up to three lines of eighteen characters set by either WMRCC or National Traffic Operations Centre (NTOC) operators are located in pairs upstream of strategic junctions on the Highways England network. There are three pairs of strategic 3x18 MS3 within the vicinity of M42 Junction 6, one pair on the M42 northbound approach to Junction 6, one pair on the M42 southbound approach to Junction 6, and a third pair to the north of Junction 6 on the M42 northbound approach to Junction 7 (M42/M6 interchange).

Advance Direction Signs (ADS) located on portal and cantilever gantries over the northbound and southbound off-slip roads at M42 Junction 6 incorporate small

rotating prism Fixed Text Message Sign (FTMS) panels. The FTMS allow traffic accessing the NEC to be directed via different routes, depending on traffic conditions and car park status. These signs are often used when there are major events on at the NEC under an agreed Emergency Response Plan between the NEC and Highways England.

3.11.3 Closed Circuit Television (CCTV) monitoring

There are two Pan/Tilt/Zoom (PTZ) CCTV cameras mounted on 15m masts within M42 Junction 6, providing general surveillance of traffic conditions at the junction. PTZ CCTV cameras mounted over the verge on stub masts fixed to super-span portal gantries are also located at regular intervals along the M42, providing surveillance of the main M42 carriageways.

Fixed CCTV cameras are located on masts in the verge or super-span portal gantries along sections of main carriageway between Junction 5 and Junction 7 that are subject to SM-HSR operation, i.e. the hard shoulder can be opened to traffic. These fixed hard shoulder CCTV cameras provide full coverage of the sections of hard shoulder that can be opened to traffic, allowing WMRCC operators to carry out checks to confirm that there are no obstructions on the hard shoulder during the opening sequence. An example of the CCTV coverage is shown below in Figure 3-9.

Figure 3-9: Traffic queuing along A45 EB and approach to M42 Junction 6 Circulatory

Fixed CCTV cameras also provide coverage of Emergency Refuge Areas (ERA) that are located adjacent to super-span portal gantries on the M42 main carriageway.

3.11.4 Vehicle Detection

Radar Motorway Incident Detection and Automatic Signalling (MIDAS) detectors have recently been installed along the M42 main carriageways and the Junction 6 slip roads to replace previously installed inductive loops. These detectors provide data that allows motorway signals to be set automatically for queue protection or congestion management purposes, as well as providing input to the Ramp Metering installations on the northbound and southbound on-slip roads at Junction 6 and also categorised traffic counting data. Concerns have been raised by various parties regarding the quality of data being provided by the new Radar detectors and the

potential impacts on the various other systems that the data feeds into; ASC9 is currently undertaking a review of the standard of installation of the Radar detectors to determine what measures can be taken to improve the quality of the output data to an acceptable standard. Meetings were held between TAME and Highways England Operational Directorate in order to monitor and assess the impact of the change in system.

Pairs of inductive loops connected to the MIDAS subsystem are located in ERAs. Traffic entering or stopping in the ERA that passes over either of these loops generate an alert to operators in the WMRCC.

There are no dedicated traffic counting loops on the M42 in the vicinity of Junction 6. Provision of categorised traffic counting data to the National Traffic Information Service (NTIS) is understood to be achieved through the MIDAS system and associated radar detectors as described above. There are NTIS journey time automatic number plate recognition (ANPR) cameras mounted on the parapet of the north overbridge at Junction 6 and associated cabinets in the offside verge of the junction gyratory.

A separate ANPR system and associated traffic counting loops were installed throughout the M42 ATM Pilot project, including on the slip roads and M42 main carriageways at Junction 6, to allow post-opening operational monitoring of the project to be undertaken. This system is no longer used for operational monitoring purposes however it is unclear at this stage whether the system remains in use for other purposes, for example by the police.

3.11.5 Speed Enforcement

The latest generation of HADECS3 speed enforcement equipment comprising Radar units and cameras mounted over the verge that provide coverage of the whole carriageway width, and an External Aspect Verification (EAV) cameras located upstream of the associated signal gantry have recently been installed throughout the M42 ATM Pilot scheme area. The original lane based HADECS equipment installed by the M42 ATM Pilot scheme is now redundant and will be removed, together with associated mock and dummy units, by ASC9 in due course.

3.11.6 Emergency Roadside Telephones

Emergency Telephones (ERT) are located in ERAs only.

3.11.7 Equipment cabinets

Electronic and power isolation equipment associated with Technology systems is predominantly housed in non-standard Combined Equipment Cabinets located at super-span portal gantries that were installed by the M42 ATM Pilot scheme, and which have subsequently been modified by the National Roads Telecommunications Service (NRTS) Contractor to incorporate a separate NRTS equipment bay. At Technology equipment sites on the M42 main carriageways that are remote from portal gantries and on slip roads, standard Type 609 and Type 600 cabinets are utilised for housing power isolation and electronic equipment respectively.

Power isolation and electronic equipment associated with the NTIS ANPR cameras at Junction 6 (see above) is housed in non-standard cabinets.

Power connection points provided by the Distribution Network Operator (DNO) for Technology equipment are housed in Standard Type 609 Electricity Interface (EI) cabinets. Power connection points for motorway lighting are provided in non-standard proprietary feeder pillar cabinets.

3.11.8 Communications Network

Junctions 3a to 7 of the M42 is a key section of the National Roads Transmission Service (NRTS) network. Longitudinal 40-pair copper and 96-fibre Optical Fibre communications cables that provide connections to roadside Technology equipment from the WMRCC and also long distance transmission services were installed along this section of the M42 by the ATM Pilot scheme, and a supplementary longitudinal 144-fibre Optical Fibre cable has been installed by the NRTS Contractor. The longitudinal 40-pair copper cable is jointed in CECs, with copper quad cables providing connections to local equipment. The longitudinal Optical Fibre cables are terminated in Cable Joint Enclosures (CJE) that are housed in duct chambers at CEC locations, with 24-fibre Optical Fibre cables providing connections to CECs. Longitudinal communications cables are located in the northbound verge of the M42 and are installed predominantly in precast concrete cable trough, which interfaces to short sections of underground ducting connecting into duct chambers at CEC locations, and through cross-carriageway ducts at slip road crossings. Local communications cables providing connections to equipment in the southbound verge of the M42 are routed in cable tray over super-span gantries.

NTIS ANPR equipment located at Junction 6 does not utilise the NRTS longitudinal cable network and is connected back to the NTOC via General Packet Radio Service (GPRS) wireless data circuits that are leased from mobile network operator(s).

3.11.9 Power supply

Type 609 EI cabinets providing single phase electricity connection points for roadside Technology equipment are located at the motorway boundary fence, close to portal gantry locations. Power is distributed to equipment in the same verge as the Type EI cabinets via cables installed in precast concrete cable trough, short sections of underground ducting connecting to chambers at CEC locations, and cross-carriageway ducts at slip road crossings as described above for longitudinal communications cables. Power is distributed to equipment in the opposite verge to the EI cabinets via cables installed in cable tray over super-span gantries.

Feeder pillar cabinets providing three-phase electricity connection points for motorway lighting are installed at the motorway boundary fence and are generally located adjacent to Type 609 EI cabinets. Power is distributed to lighting columns in both verges by buried armoured cables in the verge and armoured cables installed in cross-carriageway ducts at slip road and main carriageway crossings.

Status: Liaison will be undertaken with Solihull MBC during subsequent stages of the project to obtain details of the Junction 6 gyratory road lighting and to determine any impacts arising from the proposed Junction 6 improvement scheme.

3.11.10 Signalling

There is an existing MOVA traffic signal system providing control of all traffic movements on the Junction 6 gyratory.

There are existing Ramp Metering (RM) installations on both the northbound and southbound on-slip roads at Junction 6 providing control of traffic joining the motorway in order to reduce flow breakdown on the main carriageway caused by merging traffic during periods of high traffic flow.

3.12 Environmental Status

Environmental status has been produced in accordance with both Web Based Transport Analysis Guidance (WebTAG) and DMRB Vol. 11 Guidance. The following sections provide a summary of the detailed baseline environment of the environmental appraisal and assessment of the options.

For a detailed description please refer to the submitted WebTAG Worksheets / ASTs, the Environmental Study Report (ESR) (Report No. HE551485-MOU-00-XX-PC-EN-0007), the Environmental / Ecological Constraints Plans (Drawing Number: HE551485-MOU-EGN-M42 J6-DR-EN-0004, 5, 6, 7) (example included in Appendix E for Option 2R East) and the Appraisal Summary Table in Section 12 and Appendix H.

Status: Further survey work is required to develop the baseline environment for assessment during PCF Stages 2 and 3.

3.12.1 Noise

There are four Defra noise important areas (NIA's) within 1km of all the proposed options. Defra has published strategic noise map data that give a snapshot of the estimated noise from major road and rail sources across England in 2012. The data was developed as part of implementing the Environmental Noise Directive. This data helps transport authorities to better identify and prioritize relevant local action on noise. It will also be useful for planners, academics and others working to assess noise and its impacts. The four NIAs are:

- NIA number 2830 is located on the A45 at Elmdon in the vicinity of Old Damson Lane to the south of Birmingham International Airport;
- NIA 2831 is also on the A45 immediately to the West of the M42 Junction 6 interchange in the vicinity of the Lodge at Wyckhams Close;
- NIA 7481 is on the M42 immediately to the south of the Junction 6 interchange in the vicinity of dwellings on Old Station Road; and
- NIA 7482 is to the West of the M42 northbound carriageway, south of Junction 6 in the vicinity of 'Shirley Fields'.

The residential areas in closest proximity to Junction 6 of the M42 are to the south east of the junction on Old Station Road. There are also a number of isolated dwellings and farms to the north east of the junction and north of the A45.

For the options incorporating a new southern junction with the proposed new link to Airport Way through either on/off slips or a new junction, there are noise sensitive

receptors at Bickenhill on either the eastern or western side of the village depending on which link road option is under consideration.

3.12.2 Local air quality

Local air quality management

The proposed options are located within SMBC boundary but within the Coleshill Air Quality Management Area (AQMA). Air Quality could be impacted although further assessment is required.

Relevant sensitive receptors

See relevant sensitive receptors in Section 3.12.1 above. Ecological Designations

Bickenhill SSSI is an ecologically designated site located north of Solihull Road to the west of the M42 and is located within the study area. The SSSI is considered sensitive to nitrogen / acid deposition and ambient levels of oxides of nitrogen (NOx).

Coleshill and Bannerly SSSI is situated 2km to the north of the proposed options directly to the east of the M42. This site has been considered in the assessment and could be adversely impacted by an increase in nitrogen deposition as a result of all of the proposed options.

Pollution Climate Mapping (PCM) Links

There are three PCM links located within 200m of the proposed options on the A45 Coventry Road to the south of Birmingham Airport.

Greenhouse gases

Status: No assessment of greenhouse gases for the baseline and future scenarios has been undertaken; this is due to be undertaken during PCF Stage 3.

3.12.3 Landscape

Landscape character

Overall the study area is comprised of green belt in a quality rural landscape which continues to resist, but remains vulnerable to, the pressures of the urban fringe and the numerous and recent major development projects around Birmingham.

The landscape is a settled rural landscape surrounded and dissected by major development and transport corridors. However, despite these pressures it remains functional and intact with relatively limited areas where the components of this landscape breakdown or shift towards more diverse and discordant land uses typical of urban fringe landscapes.

Agricultural expansion and modern farming practices have resulted in an erosion of the parkland landscapes and the smaller more defined field patterns. However, the villages of Bickenhill and Hampton-in-Arden and their outlying fields still support areas with tree growth and an intimate pattern in the landscape. These islands of mature vegetation and remnant field layouts are an important feature in the study area.

Overall the study area is comprised of a good quality rural landscape which remains vulnerable to, the pressures of the urban fringe and the numerous and recent major development projects around Birmingham.

Visual Context

The visual context of the study area is largely defined by the settled rural character of the landscape. The combination of gentle topography, a broad network of lanes and strong vegetation framework results in a sense of enclosure from within the lower lying areas or from the local road network which is frequently lined by roadside vegetation. Yet, there remains an awareness of the motorway which is furthered by the presence of overhead power lines that broadly follow the motorway alignment.

3.12.4 Heritage and historic resources

The following designated heritage assets exist within 1km of the study area:

- Two scheduled monuments;
- 19 Listed Buildings; and
- Two Conservation Areas.

Archaeology

There are known archaeological remains within 1km of the study area.

Historic landscapes

There are no registered parks and gardens within the study area. Although the current landscape is broadly defined as a mixture of fieldscapes, the landscape to the north of the study area is divided into industrial, civic and commercial, and transport.

3.12.5 Biodiversity

Designated sites considered include:

- Bickenhill SSSI;
- Coleshill and Bannerly Pool SSSI; and
- River Blythe SSSI.

Non-designated sites considered include:

- Castle Hill Farm Meadows LWS
- Asbury's Coppice Ancient Woodland /LWS/Ecosite
- Roadside Hedge LWS/Ecosite
- Greens Ward Piece LWS/Ecosite
- Holywell Brook LWS/Ecosite
- Main Birmingham to London Railway line Ecosite
- Clock Lane Meadows Ecosite (Part of Castle Hill Farm LWS)
- Wayside Cottages Meadow LWS/Ecosite

UK Biodiversity Action Plan (BAP) Species

The ecological desk study and 'Walk Over Survey' indicated suitable habitat within the study area for the following species:

- Bats - Buildings and mature trees may have features suitable to support roosting bats. Linear features and grassland areas may provide commuting and foraging habitat.

- Great Crested Newts and other Amphibians – Over 40 ponds are within 500m of the proposed options. Habitats such as hedgerows, dense scrub, grassland and woodland provide suitable foraging and sheltering habitat for these animals.
- Otter – Otters are likely to use the River Blythe and its component watercourses.
- Dormice – Woodland and hedgerows may provide suitable habitat for these animals.
- Water Vole - Component watercourses of the River Blythe SSSI such as Holywell Brook and Shadow Brook may provide suitable habitat for this species.
- Reptiles - Linear features such as roadside verges, field edges and railway lines provide habitat opportunities for reptiles.
- Fish - Suitable BAP species habitat is found within the study area.
- Birds - Study data suggests assemblages of common and widespread breeding birds on farmland and woodland habitats.
- Invertebrates - Habitat within the option footprint such as roadside verge, grasslands, local wildlife sites, field margin, hedgerow and the built environment offer opportunities for invertebrates.
- Hedgehog – Habitat suitable for foraging hedgehogs such as scrub, grasslands and woodland is present within the foot print of the proposed options.

UK BAP Habitats

The ecological desk study and walk-over study indicated that the following suitable habitats were recorded:

- Rivers and Streams;
- Pools;
- Brooks;
- Meadows;
- Woodland;
- Coppice;
- Ancient Woodland; and
- Hedgerows.

3.12.6 Surface water

The River Blythe falls within the Humber management catchment area and is the only river considered, although a number of unclassified waterbodies are also located within the scheme area.

South of the scheme area, the Blythe from Source to Cuttle Brook (Waterbody ID GB104028042400) flows east under the M42 then flows south at Eastcote at SP

18604 79490. It then meanders south to the convergence of Cuttle Brook at SP 20553 76244.

North of Patrick Bridge, the Blythe from Patrick Bridge to River Tame (Waterbody ID GB104028042572) flows north under the A45 at Stonebridge, continuing north for approximately 10km where it meets with River Tame at Coleshill at SP 21292 91613.

The Shadow Brook (unclassified) flows north from Heath Farm, then east underneath the existing M42 south of Shadow Brook farm at SP 19195 80931. Another unnamed tributary of the Shadow Brook flows north then east under the M42 at SP 19490 82104. These two watercourses meet at SP 20636 82238 and flow east where it flows into the River Blythe at SP 21618 82531.

East of Bickenhill, there are a number of unclassified field drains and streams which form the headwaters of the Low Brook, which is in turn an unclassified tributary of the Hatchford-Kingshurt Brook from Source to River Cole (Waterbody ID GB104028042490).

Groundwater

The scheme area falls entirely within the Tame Anker Mease Secondary Combined groundwater body (Waterbody ID GB40402G990800), which holds an overall status, a quantitative status and a chemical quality status of 'Good'.

Flood risk

Areas of fluvial flood risk within the study area are generally confined to the immediate vicinity of the larger streams, however there are several areas of more extensive flooding in the surrounding area. Flood zone 3 allocations have been attributed to a series of brooks in the study area including Shadow Brook, Holywell Brook, Low Brook and also include areas upstream and downstream of these locations. Other areas of high risk include along the unnamed drain at Wyckhams Close under the A45 west of the junction, east of the junction beside the NMM, at various ponds and drains along the proposed options, as well as areas of the M42 carriageway both north and south of the junction.

3.12.7 Physical fitness

The physical fitness impact relates to the change in physical activity (e.g. walking and cycling) (WebTAG Unit 4.1, S3). There is no access available to pedestrians or cyclists on the M42 but there is some access on the A45, through the circulatory of Junction 6 and within the green belt area to the south of the A45. A Gaelic Football Club is situated to the south-west of Junction 6 and adjacent to the B4438 Catherine-de-Barnes Road. These accesses/facilities will be maintained and/or improved within scheme design if they are severed as a result of the proposed options.

3.12.8 Journey ambience

Journey ambience impact particularly relates to journey stress (WebTAG Unit A.1). At present, there is some distance to the nearest motorway service area (MSA) on the M42 which can add to driver stress. There are currently planning applications for a new MSA between Junctions 5 and 6 of the M42 and at J4 of the M42 which would provide a potential mitigation to driver stress.

3.13 Accessibility

3.13.1 Option values

An option value is the willingness-to-pay to preserve the option of using a transport service for trips not yet anticipated or currently undertaken by other modes, over and above the expected value of any such future use (i.e. placing value on using the M42 Junction 6 even if currently an individual doesn't use it as a matter of course).

Non-use values are the values that are placed on the continued existence of a service (i.e. transport facility), regardless of any possibility of future use by the individual in question. (For example, individuals may value a transport facility for altruistic reasons, reasons of indirect use or because it has some existence, bequest or intrinsic value - WebTAG Unit A4.1, S7).

The issue of option values generally arises following the introduction of a new or removal of an existing (usually public transport) service. Changes to existing roads do not usually provide users with a new option to undertake their journey. Clearly, significant option values could be expected to arise as a consequence of the building of HS2 or the introduction of new air links as part of airport expansion. However, the option values of these new services will be captured as part of the respective appraisals of those services. In the case of improvements to M42 Junction 6, one of the primary objectives for the scheme is to prepare capacity to the proposed new HS2 Station.

As such, it can be argued that improvements to M42 Junction 6 provide an indirect contribution to the achievement of the option value enhancements arising from HS2 but in themselves are considered to have a neutral Option Values / Non-Use Values impact for the scheme assessment.

3.13.2 Severance

The severance here mainly concerns those using non-motorised modes, particularly pedestrians (WebTAG Unit A4.1, S5). The NMU provision in the vicinity of M42 Junction 6 are shown in Appendix E (Constraint Plans). Currently there are no signalised pedestrian crossing facilities at Junction 6. However, there are pedestrian footways along the southern and eastern sides of the junction and along the A45. There is also access onto Junction 6 from Hampton-in-Arden via Old Station Road. The scheme may induce more traffic in total to use the combined interchange replacing the existing single Junction 6 and thus have a severance impact, some of which may be positive and some negative, depending on location. There are a number of public rights of way and footpaths in the Bickenhill and Clock Interchange areas which could be subject to severance. Where there is an impact, it will be mitigated to provide a feasible alternative.

Status: This issue will be reassessed when future forecast traffic flows are finalised in PCF Stage 2.

Personal affordability

The personal affordability impact is concerned with changes in the monetary costs of travel that can be a barrier to mobility for certain groups of people (WebTAG Unit A4.1, S9).

The scheme is unlikely to result in significant rerouting or an overall increase in vehicle operating costs due to increase in journey speed or time that in turn would have a material impact on people's ability to afford their planned journeys. As such, it has been assessed that the scheme would have a neutral personal affordability impact.

Security

The measures included in the assessment of the impact on security include the following:

- Changes to public transport waiting facilities / interchange facilities
- Changes to pedestrian access
- Changes to provision of lighting and visibility
- Changes to landscaping
- Changes to formal or informal surveillance

3.13.3 Access to Transport System

The principal focus of the assessment of access to the transport system is to identify how the scheme helps overcome barriers to travel that might have resulted in social exclusion. The assessment is particularly focused on changes to the ability to access affordable public transport. In addition to the airport and railway station north of the A45 to the east of Junction 6, there are a number of bus services that travel along the A45. In this context, improvements to M42 Junction 6 have been assessed as having a neutral impact on access to the transport system.

Clearly, the scheme is intended to address congestion related problems that affect people's ability to access other key transport services (air and rail) in time to make their planned onward journey. These benefits are captured in the appraisal under journey time reliability.

3.14 Integration

3.14.1 Transport interchange

Located in the vicinity of M42 Junction 6 is Birmingham Airport and Birmingham International rail station. They are reliant on the efficient operation of Junction 6.

There are proposals to locate the Birmingham Interchange HS2 rail station on a triangle of land in the north-eastern quadrant of Junction 6, bounded by the M42, A45 and A452.

A people mover is proposed to link the HS2 station to the NEC, Birmingham International rail station and Birmingham Airport. This journey is expected to take approximately 6 minutes.

In July 2014 Government announced funding for the Metro extension within the Greater Birmingham and Solihull Local Growth Deal. It promised to work with Centro and the city council to deliver funding for the wider regeneration package around the HS2 station of which Birmingham Eastside Metro Extension forms a key part. In 2014 the Government also announced funding for a Sprint route (a bus based rapid transit system) serving the Airport/NEC via the A45.

The proposed M42 Junction 6 improvements will facilitate access to these transport interchange locations. The context of the proposed HS2 interchange with the existing network and the proposed Metro and Sprint links is illustrated in the West Midland public transport network in Figure 3.13.

Figure 3.13 – Existing and Proposed Public Transport Network within the WM Metropolitan Area

3.14.2 Land-use policy

The proposed scheme is located within a wider context of established and evolving national, regional, and local policies relating to transportation, environmental and land-based development commitments. Relevant local authorities are:

- West Midlands Combined Authority,
- Solihull Metropolitan Borough Council,
- North Warwickshire Borough Council, and
- Warwickshire County Council.

West Midlands Combined Authority

The Leaders of the West Midlands Metropolitan Area have set a new vision for transport. The have stated that they:

> *"…will make great progress for a Midlands economic 'Engine for Growth', clean air, improved heath and quality of life for the people of the West Midlands. We will do this by creating a transport system befitting a*

sustainable, attractive and economically vibrant conurbation in the world's sixth largest economy.

In support of this vision we will:

• Introduce a fully integrated rail and rapid transit network that connects their main centres with quick, frequent services, and which is connected into wider local bus networks through high quality multi-modal interchanges

• Increase the number of people that are within 45 minutes travel time by public transport to a minimum of three main centres and the two HS2 stations in central Birmingham and the UK Central Hub

• Reduce transport's impact on the environment – improving air quality, reducing carbon emissions and improving road safety

• Use transport improvements to enhance the public realm and attractiveness of their centres

• Ensure that walking and cycling are a safe and attractive option for many journeys especially short journeys, by delivering a strategic cycle network and enhancing local conditions for active travel.

• Facilitate the efficient movement of people on our transport networks to enable access to education and employment opportunities and health and leisure services.

• Enable businesses to connect to supply chains, key markets and strategic gateways, including Birmingham Airport, through improved strategic connections by road and rail.

• Maintain and develop our transport infrastructure and services to ensure they are efficient, resilient, safe and easily accessible for all."

When assessing the various options, the vision laid out by the West Midlands Combined Authority has been taken into account. The three options currently under consideration align favourably with their vision.

Solihull Metropolitan Borough Council.

The Solihull Local Plan, adopted in December 2013 for the period 2011 to 2028, sets out Solihull MBC's policies. The most relevant policies, aims and aspirations have been summarised below:

- Solihull has the most productive economy in the Midlands. It is an international gateway, as the location for Birmingham Airport and the adjacent NEC, and has other regionally important assets: JLR, Birmingham and Blythe Valley Business Parks and Solihull Town Centre. The presence of these key assets combined with Solihull's central location on the national motorway and rail networks and the quality of its environment, have been key to its success in attracting investment, particularly in high value-added sectors that include automotive manufacturing, ICT, business and professional services, creative industries and construction.

- Birmingham Airport, the NEC, JLR, Birmingham and Blythe Valley Business Parks and Solihull Town Centre offer significant potential for economic growth and job creation. Their plans and aspirations and any associated infrastructure needs have helped to frame this strategy and the more detailed policy development which will follow to facilitate their growth, whilst ensuring that any environmental concerns are avoided, minimised or mitigated, with appropriate compensation if necessary.

- These key assets are estimated to contribute around 100,000 jobs and £5 billion to the regional economy. This could be increased significantly via a managed plan for growth in the 'M42 Economic Gateway' area where they are located (between Junctions 4 and 6 of the M42), which also encompasses the proposed High Speed 2 railway station. Sustainable economic growth in Solihull is an important driver of economic recovery and employment in the Greater Birmingham and Solihull Local Enterprise Partnership area and West Midlands. Achieving further sustainable economic growth in Solihull will depend on the continued competitiveness of its key economic assets and safeguarding and enhancing the Borough's attractiveness as a place to live, study, visit and invest.

- Realising the potential of the M42 Economic Gateway for job and wealth creation can be achieved by facilitating the plans and aspirations of the Borough's key economic assets, whilst addressing any infrastructure or environmental concerns.

- The M42 Economic Gateway can contribute to economic growth by:

    - *Expanding Birmingham Business Park to encourage its continued attractiveness and success and improve access to jobs*
    - *Diversifying the range of uses at Blythe Valley Business Park to facilitate employment development and create a more sustainable place*
    - *Facilitating development within the Airport boundary to maximise the economic benefits and support the runway extension*
    - *Enabling the diversification of use of the NEC to ensure its continued success and better linkage to economic activity across the Borough*
    - *Supporting and encouraging a broad range of development at Jaguar Land Rover to facilitate its function as a major vehicle manufacturer and providing opportunities for the location of supply chain businesses within the Borough*
    - *Recognising and facilitating the potential of other businesses within the Corridor to contribute to economic growth and employment*
    - *Ensuring that economic and job growth of the key economic assets contributes to regeneration of North Solihull*

- Exploiting the role of transport in promoting and managing growth, whilst ensuring opportunities to access key destinations by a choice of transport modes, and that new development does not exacerbate congestion.

Solihull Metropolitan Borough Council have recently issued a new Local Plan Review (November 2016).

Status: The first draft of Solihull's Local Plan was issued in November 2016 for comment with a second draft planned for June/July 2017 and final adoption is planned for early 2018. The project team are working closely with SMBC to ensure that the future preferred option supports their draft local plan, and a detailed assessment will be undertaken in stage 3 prior to the DCO application.

Solihull MBC is a key stakeholder. M42 Junction 6 lies within its boundary and the A45 is a major route to access the Borough. Therefore, the policies, aims and aspirations set out by Solihull MBC in their Local Plan have been a key consideration for assessing the appropriateness of M42 Junction 6 improvement options.

Warwickshire County Council

The transport policies for North Warwickshire Borough Council are contained within the Warwickshire County Council Local Transport Plan (LTP). The current Warwickshire LTP sets out the transport strategy and policies for the County from 2011 to 2026. Warwickshire's LTP Objectives are:

- *To promote greater equality of opportunity for all citizens in order to promote a fairer, more inclusive society*
- *To seek reliable and efficient transport networks which will help promote full employment and a strong, sustainable local and sub-regional economy*
- *To reduce the impact of transport on people and the [built and natural] environment and improve the journey experience of transport users*
- *To improve the safety, security and health of people by reducing the risk of death, injury or illness arising from transport, and by promoting travel modes that are beneficial to health*
- *To encourage integration of transport, both in terms of policy planning and the physical interchange of modes*
- *To reduce transport emissions of carbon dioxide and other greenhouse gases, and address the need to adapt to climate change*

Airport Accessibility Strategy - Warwickshire County Council will work with airport owners, air operators (passenger and freight), adjoining Transport Authorities, the five District/Borough Councils in Warwickshire, the Highways Agency and other stakeholders to improve sustainable surface access provision to Birmingham International Airport and Coventry Airport (if appropriate).

The proposals for improvements to M42 Junction 6 are in line with the policies and aspirations of Warwickshire County Council and North Warwickshire Borough Council

3.14.3 Other Government Policies

National Policy Statement for National Networks (NPSNN) published December 2014, sets out the need for, and Government's policies to deliver, development of nationally significant infrastructure projects (NSIPs) on the national road and rail networks in England. It provides planning guidance for promoters of NSIPs on the

road and rail networks, and the basis for the examination by the Examining Authority and decisions by the Secretary of State.

Section 2 of the NPSNN deals with the need for the development of the national networks and Government's policy. Relevant parts of this section are given below:

"Government's vision and strategic objectives for the national networks

The Government will deliver national networks that meet the country's long-term needs; supporting a prosperous and competitive economy and improving overall quality of life, as part of a wider transport system. This means:

- *Networks with the capacity and connectivity and resilience to support national and local economic activity and facilitate growth and create jobs.*
- *Networks which support and improve journey quality, reliability and safety.*
- *Networks which support the delivery of environmental goals and the move to a low carbon economy.*
- *Networks which join up our communities and link effectively to each other.*

The national road and rail networks that connect our cities, regions and international gateways play a significant part in supporting economic growth, as well as existing economic activity and productivity and in facilitating passenger, business and leisure journeys across the country. Well-connected and high-performing networks with sufficient capacity are vital to meet the country's long-term needs and support a prosperous economy.

There is a critical need to improve the national networks to address road congestion and crowding on the railways to provide safe, expeditious and resilient networks that better support social and economic activity; and to provide a transport network that is capable of stimulating and supporting economic growth. Improvements may also be required to address the impact of the national networks on quality of life and environmental factors.

There is also a need for development on the national networks to support national and local economic growth and regeneration, particularly in the most disadvantaged areas. Improved and new transport links can facilitate economic growth by bringing businesses closer to their workers, their markets and each other. This can help rebalance the economy.

There is also a need to improve the integration between the transport modes, including the linkages to ports and airports. Improved integration can reduce end-to-end journey times and provide users of the networks with a wider range of transport choices."

***"*Drivers of need for development of the national road network**

Traffic congestion constrains the economy and impacts negatively on quality of life by:

- *constraining existing economic activity as well as economic growth, by increasing costs to businesses, damaging their competitiveness and making it harder for*

them to access export markets. Businesses regularly consider access to good roads and other transport connections as key criteria in making decisions about where to locate

- *leading to a marked deterioration in the experience of road users. For some, particularly those with time-pressured journeys, congestion can cause frustration and stress, as well as inconvenience, reducing quality of life*
- *constraining job opportunities as workers have more difficulty accessing labour markets*
- *causing more environmental problems, with more emissions per vehicle and greater problems of blight and intrusion for people nearby. This is especially true where traffic is routed through small communities or sensitive environmental areas*

The national road network is already under significant pressure. It is estimated that around 16% of all travel time in 2010 was spent delayed in traffic, and that congestion has significant economic costs: in 2010 the direct costs of congestion on the Strategic Road Network in England were estimated at £1.9 billion per annum.

Without improving the road network, including its performance, it will be difficult to support further economic development, employment and housing and this will impede economic growth and reduce people's quality of life. The Government has therefore concluded that at a strategic level there is a compelling need for development of the national road network.

The Government's wider policy is to bring forward improvements and enhancements to the existing Strategic Road Network to address the needs set out earlier. Enhancements to the existing national road network will include:

- *junction improvements, new slip roads and upgraded technology to address congestion and improve performance and resilience at junctions, which are a major source of congestion*
- *implementing smart motorways (also known as managed motorways") to increase capacity and improve performance"*

For this scheme, compliance with these policies means that it needs to:

- Recognise the strategic importance of the M42 as it forms part of the Trans-European road network
- Provide capacity for HS2
- Provide better access on and off the A45 (which would also assist in reducing congestion at NEC events)
- Facilitate access to Birmingham Airport

DfT's Early Assessment and Sifting Tool (EAST), has been used during the option assessment stage to ensure that the policies in NPSNN have been taken into account EAST assesses each option against a number of criteria. In this case, each option was assessed against strategic and economic factors, including the fit with

wider transport and government objectives. Options which did not fit were not taken forward for further development or assessment.

Further assessment of the remaining options is still required against proposed options. However, as stated above, the proposed M42 Junction 6 improvements will facilitate access to the nearby transport interchange locations.

4 Option Development

4.1 PCF Stage 0

Prior to the work undertaken in Stage 1, a number of options had been developed which would address the transport problems at the junction and future growth planned for the area. These options consisted of:

1. New junctions to the north and south of the existing junction 6 with links to the A45 from the new southern junction. The existing junction would serve the A45 and the NEC/NMM (Options 1 and 1A)
2. A new southern junction whilst retaining the existing junction, again with links to the A45 (Options 2 and 2A)
3. *A* multi-level interchange solution including the incorporation of a number of free-flow connections to the M42 and A45 to replace the existing Junction 6. (Option 3)

This work concluded with Option 2A emerging as the highest ranking solution for solving the transport problems. Compared with the other options, it provided additional capacity and resilience, removed traffic from the existing Junction 6, maintained access to local assets, minimised disruption to the existing network and did not have safety issues of limited weaving length. An initial cost estimate was then prepared for the project based on this emerging option.

4.2 Options Development

4.2.1 Options Development (Part 1a)

In the early stages of PCF Stage 1 Options Identification options were developed that would seek to relieve congestion from the existing Junction 6. A total of some 40 options were considered and in order to better identify them and provide an initial high-level assessment, they were collated into five general themes as indicated below:

THEME 1	THEME 2	THEME 3	THEME 4	THEME 5
North & South Junction	**Southern Junction**	**Interchange**	**Northern Junction**	**Do Something/ Do Minimum**
(Options 1 to 1E)	(*Options 2 to 2M)*	*(Options 3 to 3D)*	*(Options 4 to 4B)*	*(Options 5, 5A, 6, 6A and 7 to 15)*
6 OPTIONS	**13 OPTIONS**	**5 OPTIONS**	**3 OPTIONS**	**13 OPTIONS**

Table 4.1 – Collation of Options into Themes

The five themes were developed based on the nature of the junction improvement. This was instigated on the basis of improving the junction by the following principles:

1. adding an additional junction either north, south or both north and south of the existing Junction 6
2. reconstructing Junction 6 with improved geometry to allow better free-flow movements
3. a collection of individual do minimum or do something type improvements – either individually or combined - that could provide some relief to the traffic

A detailed assessment of the options is provided in Appendix F but a summary of the high-;level ;assessment is shown below:

:OPTION	LAYOUT	DEVELOPMENT	COMMENT	PROGRESS
1	New north & south junction	Original layout from UK Central study 2014	Significant weaving issues to north junction	**NO**
1A	New north & south junction	Weaving length increased from Option 1 but still has south facing	Weaving still below desirable minimum	**NO**
1B-1C	New north & south junction	Western link road from south junction moved to avoid landfill	Limited traffic connectivity. 1C has MSA link added.	**NO**
1D-1E	New north & south junction	Parallel link roads added from new junctions to J6 to improve connectivity	Improved connectivity. 1E has MSA link added	**YES**
2	New South junction	Original layout from UK Central study 2014 with parallel links	Weaving & major sever-ance to communities	**NO**
2A	New South junction	Junction re-positioned and severance greatly removed	Emerging option from Stage 0	**YES**
2B & 2D	New South junction	Further severance removed to Hampton-in-Arden.	Less impact on ancient woodland	**YES**
2C, 2E &2F	New South junction	South junction with merge & diverge onto M42 mainline	Major departure for weaving to J6	**NO**
2G, 2H & 2J	New South junction	All similar layouts but with varied east/west links to A45	Parallel links from new junction to J6	**YES**
2K-2M	New South junction	All similar layouts but with eastern link variations	Links to A45 Eastway, Stonebridge or HS2	**YES**
3-3A	Interchange	Clover-leaf type junction arrangement	Significant geometric issues	**NO**
3B-3C	Interchange	Hybrid option with links to Stonebridge Island	Severe impact on local business land usage	**NO**
3D	Interchange	Improved geometry	No direct access to NEC & NMM	**YES**
4-4A	North Junction	To provide links to development areas. 4A has MSA added	Significant weaving issues to north junction	**NO**
4B	North Junction	Improved weaving length	Includes MSA link	**YES**
5-5A	Do Nothing	Assess impact of PinchPoint scheme		**YES** *(MSA*
6-6A	Do Minimum	Review PinchPoint scheme with initial traffic figures	Limited information from traffic model – Not Used	**NO**
7	Do Something	Low cost option with PinchPoint scheme and free-flow left turns	May need to combine with other variants	**YES**
8-10	Do Minimum	Adjustments to A452 island to BBP within HS2 enabling works	HS2 track geometry would not facilitate changes	**NO**
11	Do Something	5 lanes ALR with free-flow links on M42 J6 south facing side	Extent of M42 widening to be reviewed	**YES**
12	Do Minimum	Relocation of HS2 proposed island over M42 with link to BBP	No benefit in reducing traffic at J6	**NO**
13	Do Minimum variant	Review network signage to reduce traffic flow to M42 J6	Not used	**NO**
14	Do Minimum variant	Right-turn hook movements from M42 to A45	May need combined with other variants	**YES**
15	Do Minimum variant	Free-flow link under NEC access	May need combined with other variants	**YES**

Table 4.2 – Initial high-level assessment of options

The assessment sifted out a number of options but options from each theme were still represented within the 18 options that progressed to the next level of

assessment. To summarise, the main reasons for the options that were discounted were:

i) Options were duplicated with an MSA link added in (a sample 1D and 1E were taken forward but other options went with MSA link on the basis that it could be removed if MSA application not granted) – 1no discounted
ii) Some Do minimum options were dependent on obtaining early traffic figures but not supplied due to late delivery of PRISM model – 3no discounted
iii) Geometric alignment of Do Minimum options would not be possible with proposed HS2 track alignment or had major departures/land issues – 8no discounted
iv) A number of options had significant weaving issues and were superseded by other options that were developed with increased available weaving lengths - 10no discounted

4.2.2 Options Development (Part 1b)

The reduced options list (18no) was then subjected to an EAST (Early Assessment Sifting Tool). EAST is a decision support tool that enables options to be summarised quickly and in a clear and consistent format to provide high-level information on how options perform and compare – but does not provide a recommendation. At this early stage of assessment only the strategic and economic categories of EAST were used in the assessment of options.

Whilst there were a large number of sub-categories within EAST that provided a neutral outcome there were other sub-categories that could be used to compare options – particularly within each theme. These included their scale of impact against the identified problem and objectives, fitting with government transport objectives and other wider objectives. The Southern Junction and Do Minimum/Do Something themes contained the largest number of options so were easiest to compare.

Details of the EAST assessment are provided in Appendix F but a synopsis of the output is provided in table 4.3 below.

.

OPTION	COMMENTS	RATING
1D-1E	Can solve the identified problems but has some undesirable impacts due to the scale of the footprint affecting the environment and properties. Good fit, facilitates growth, improves connectivity and strengthens resilience.	2 & 4
2A	Can solve the identified problems but has some undesirable impacts due to the footprint affecting the environment and properties. Good fit, facilitates growth, improves connectivity and strengthens resilience.	3 & 4
2B & 2D	Can solve the identified problems but has some undesirable impacts due to the footprint affecting the environment and properties. Good fit, facilitates growth, improves connectivity and strengthens resilience.	3 & 4
2G, 2H,2J	Can solve the identified problems but has some undesirable impacts due to the footprint affecting the environment and properties. Good fit, facilitates growth, improves connectivity and strengthens resilience.	2 & 4
2K-2M	Can solve the identified problems but has some undesirable impacts due to the footprint affecting the environment and properties. Good fit, facilitates growth, improves connectivity and strengthens resilience.	3 & 4
3D	Can solve the identified problems but has some undesirable impacts on properties. Good fit, facilitates growth, improves connectivity and strengthens resilience.	4 & 4
4B	Can partially solve the identified problems with low impact on the environment. Reasonable fit, facilitates growth but does not improve connectivity. Small benefit to optimise assets and resilience	2 & 3
5-5A	Will solve the short term growth problem only. Unlikely to be able to offer a high level of service. Poor fit, does not facilitate growth, does not improves connectivity, does not optimise assets and does not strengthens resilience.	2 & 1
7	Will solve the short term growth problem only. Unlikely to be able to offer a high level of service. Poor fit, does not facilitate growth, does not improves connectivity, does not optimise assets and does not strengthens resilience. .	2 & 1
11	Alleviates problems along M42. Marginally improvement to performance of junction. Reasonable fit, facilitates growth but does not improve connectivity. Small benefit to optimise assets and resilience	4 & 3
14	Will solve the short term growth problem only. Unlikely to be able to offer a high level of service. Poor fit, does not facilitate growth, does not improves connectivity, does not optimise assets and does not strengthens resilience.	2 & 1
15	Will solve the short term growth problem only. Unlikely to be able to offer a high level of service. Poor fit, does not facilitate growth, does not improves connectivity, does not optimise assets and does not strengthens resilience.	2 & 1

Table 4.3 EAST Assessment

The overall assessment using EAST demonstrated a number of factors that could be considered in progression of options:-

- there were options within all five themes that could be considered as suitable solutions;
- there was a wider variation of options within the Southern Junction and Do Minimum/Something themes as they contained a larger number of variations;
- the do minimum/do something options would not solve the problem individually but may perform better if combined;
- a number of southern junction options performed slightly better than others so some could be discounted; and
- the better elements of individual southern junction options could be combined to produce a more viable solution.

As there were potential solutions within all five themes, it was assessed that at least one option from each theme was taken forward for additional testing and assessment. It was further proposed that two options for the southern junction - with some modifications as detailed above - were taken forward to represent the variety of connecting links. For the Do Minimum/Do Something theme, options were combined into a single option for further testing.

The following options were progressed for further assessment and modelling testing prior to selecting the options for public consultation (see Appendix J):

- *Option 1E (North + South Junction)*
- *Option 2A (South Junction)**
- *Option 2K (South Junction alternative)*
- *Option 3D (Interchange)*
- *Option 4B (North Junction)*
- *Option 11 (Do Minimum/Do Something incorporating options 7/15 Free-flow links at Junction 6 and localised widening)*

*(*Incorporating a slight modification from Option 2B)* The 6 options were assessed in more detail in order to identify the most viable options to take to Public Consultation

4.3 Options Development Part 2 - Appraisal of six shortlisted options

The further appraisal of these options took the form of a WebTAG appraisal based on the following factors:

- Environmental
- Highways Design/Geometry
- Safety (GD04 Assessment)
- Stakeholder Consultation
- Buildability Assessment
- Cost Estimates
- Traffic Assessment

4.3.1 Stakeholder Engagement

At this stage, a series of early engagement meetings were held with a number of identified stakeholders. Stakeholders included were from a variety of interested parties including local parish councils/authorities, local enterprise partnerships, local businesses (JLR, NEC, NMM), developers and the local MP. The meetings took the form of a PowerPoint presentation detailing the scheme background, describing the need for the scheme and some of the challenges encountered, proposed timeline, scheme constraints and plans of each of the six shortlisted options. The presentations took place generally over the period from April to July 2016 and feedback/opinion was invited from the stakeholders either at the meeting or with subsequent correspondence. There was a mixture of responses with a number having a particular view on which would be their preferred option but quite a number

had no particular comments to make. A summary of this consultation is shown below. Their comments and feedback were considered in the ongoing options assessment process.

A number of the stakeholders chose to provide more detailed feedback subsequent to the presentations in order to substantiate their initial views. The proposed timelines indicated that further presentations would take place prior to a public consultation later in the year.

All identified stakeholders are listed on the M42 Junction 6 Action Focussed Communications Planning Report which encapsulates all the elements of stakeholder management for Highways England major project schemes. The report includes a tracker and project plan which records and plans stakeholder engagement. Engagement covers all types of stakeholder categories affected by the improvement scheme including political, community, business, traffic generators, emergency services, statutory bodies, and media. Identified stakeholders are mapped according to their interest and influence in the scheme.

Additional technical meetings were held with the HS2 team and the MSA developer as progression with these projects could have an impact on the M42 Junction 6 options.

Best Option(s) – Options 2A and 2K
Worst Option(s) – Options 3D and 11
Neutral – Option 1E and 4B

.

✓ X NC preferred option not supported no specific comments	N & S Junction	Southern Junctions Only		Interchange	North Junction Only	Do Min/Do Something	Stakeholder Comments
	1E	2A	2K	3D	4B	11	
Solihull MBC	NC	NC	NC	NC	X	NC	**North Junction** - not supported as would impact on UKC
Birmingham Airport	NC	✓	✓	X	X	NC	**Southern options** – preferred options; **Interchange option** - No support for this option **North Junction** – no benefit to airport. BA Masterplan may include additional runway therefore northern junction would add extra difficulty
Greater Birmingham & Solihull LEP	NC	NC	NC	NC	X	X	**North Junction** - issues with loss of development land for NEC/UKC **Do minimum/do something** – concern that this may get support but not solve local problems
NEC	X	✓	✓	X	X	X	**Southern options** – preferred options with least impact on businesses around NEC. Localised widening and introduction of segregated lanes on M42 NB/ SB approaches to J6 are supported **North Junction** – this would impact on NEC land and traffic movements on site **Do minimum/do something** – some support but concern over impact during construction **Interchange** – concern over impact to business during construction
National Motorcycle Museum	✓	✓	✓	X	NC	X	**Interchange** – no support; concerned about impact during construction **Do Min/Do something** – least effective option as doesn't solve problem **N&S Junction** - expressed preference for this option: **Southern options**– support for this
Caroline Spelman – Meriden MP	X	X	X	NC	✓	NC	**North Junction** – supports this option **Southern options** - Stated that locals don't want development south of J6
Hampton in Arden PC	X	X	X	NC	✓	NC	**North Junction** – support this option
Jaguar Land Rover	NC	✓	✓	X	X	NC	**Southern options** – present operational issues can be met through development of these options **North Junction** – no practical benefit; **I/C** – detrimental impact on business during construction
Network Rail	NC	NC	NC	NC	NC	NC	
Birmingham CC	NC	NC	NC	NC	NC	NC	
Coventry City Council	NC	NC	NC	NC	NC	NC	
Arden Cross Consrtm	NC	✓	✓	NC	NC	NC	**Southern options** – preferred options as least impact on Arden Cross / UKC development
WM Combined Auth.	NC	NC	NC	NC	NC	NC	
HS2	NC	NC	NC	NC	NC	NC	
Bickenhill & Marston Green Parish Council	NC	NC	NC	NC	NC	NC	
Warwickshire CC	NC	NC	NC	NC	NC	NC	

Table 4.2 Summary of Stakeholder feedback from early consultations

4.3.2 Environmental Assessment

The environmental assessment of the six options took account of a number of different factors that would impact the environment. These included Ecology, Heritage, Noise, Road Drainage and Water, Landscape and Air Quality.

The Key environmental constraints were as follows:

Air Quality Impact – the impact of the options on air quality with resulting traffic levels and emissions with their proximity to sensitive receptors. Final results won't be known until traffic modelling is completed;

Noise Impact – the change in traffic levels also has the potential to increase noise levels at the noise receptors which are within 1km of the proposed options;

Ecology Impact – there are three Sites of Special Scientific Importance (SSSI) identified within 1km of the M42 Corridor; and

Heritage Impact – there are a number of cultural heritage assets which may affect a number of the options.

The assessment concluded that all the six options had either a moderate or a moderate-to-large overall environmental impact. However, the most significant impact was deemed to be the direct effect on an SSSI near M6 J4 for Options 1E and 4B (those options which include a northern junction). Other significant impacts were the impact to the ancient woodland with a southern junction position in the vicinity of the proposed MSA and a noise impact with most of the options near noise important areas. There is a potential for mitigation of these impacts including landscaping, planting, the use of barriers and low-noise surfacing.

The option with the biggest environmental impact was Option 1E – which also had the biggest environmental footprint. Options with the least impact were Option 3D and Option 11 as a large part of these options are contained within or very close to the existing highway boundary. (See Appendix F for Environmental assessment summary)

Best Option(s) – None
Worst Option(s) – Options 1E and 4B
Neutral – Option 2A, 2K, 3D and 11

4.3.3 Highways Design Assessment

This took into account the impact of each option on current design standards, impact on land/properties and local road network and also conflict with existing utilities. Options 2A, 2K, 3D and 11 contained a number of minor departures, clashed with a number of high voltage pylons and had some impact on local communities/properties. However the most significant impact related to reduced weaving lengths for the northern junction options.

The reduced weaving length was a major factor in considering the operational safety issues of the northern junction and potential departures from standard. Whilst the proposed use of a ghost island helped to mitigate the weaving issue, this arrangement could lead to poor driver behaviour, particularly when drivers not familiar with the area (i.e. from NEC events) had selected the wrong lane. This type of issue was previously assessed within a Transport Research Laboratory trial on driver behaviour in response to non-physical segregation of the M60 Manchester

outer ring road. The trial demonstrated that a significant proportion of drivers crossed the non-physical segregation and a gantry sign directing traffic appeared to confuse drivers, resulting in non-compliance of the road layout arrangement. Reduced weaving had the biggest impact on Options 1E and 4B and to a lesser extent 3D..

Following a subsequent technical meeting with the HS2 Project Team, it was discovered that HS2 had designed a number of structures across the M42 mainline between J6-7 which conflicted with the northern junction options due to the restricted cross-section included in the hybrid bill design. The HS2 cross-section had allowed for an additional lane on the M42 as a typical D4M layout in accordance with TD 27/05; whereas Options 1E and 4B required an additional lane plus a hard shoulder and lane segregation with a chevron.

In order to overcome the safety issue due to weaving and conflict with HS2 structures, substantial changes to the design would be required for the northern junction options to be progressed further.

Best Option(s) – Options 2A, 2K and 11
Worst Option(s) – Options 1E and 4B
Neutral – Option 3D

4.3.4 Safety Assessment

A high-level safety assessment was carried out using the GD04 Assessment method – Standard for Safety Risk assessment on the Strategic Road Network – from the Design Manual for Roads and Bridges. Although the project is only at optioneering stage, the GD04 assessment can still provide a general overview of safety issues and risks that would impact road users and road workers. The assessment considered that the main safety issues related to the reduced weaving length in Options 1E and 4B (and to a lesser extent 3D). There were maintenance issues relating to Option 3D with reduced visibility and increased exposure to workforce with the widened lanes and free-flow links on Option 11. Option 2A had a safety issue with slip roads in quick succession for road users. They concluded that only Options 2K and 11 were potentially viable to alleviate the current congestion and journey reliability issues whilst not impacting on road safety, and mitigation with Option 11 would be required.

.

Best Option(s) – Options 2K and 11
Worst Option(s) – Options 1E, 2A, 3D and 4B
Neutral – None

4.3.5 Buildability (Construction) Assessment

Skanska were procured by Highways England to provide buildability advice on the options proposed. Their assessment took into account buildability factors including earthworks, utilities and structures but more significantly disruption to the strategic and local road network. Impact on the local transport stakeholders where substantial changes to structures would be required (Birmingham Airport, Network Rail, HS2, NEC, NMM and the proposed MSA) was also a major factor.

Options 11 and 2K provided the more optimum conditions for construction with the least land-take, less impact by utilities, minimal impact on stakeholders and less impact on the network. Options 1E and 4B had more standard construction challenges but with significant impact on the proposed HS2 project with clashes on HS2 structures north of Junction 6. Option 2A had some significant challenges including disruption to the mainline with the added diverges, impact on the A45 with tie-in to existing structures and potential temporary road closures due to demolition of existing structures.

Skanska's assessment found Option 3D (Interchange) resulted in very significant construction challenges and significant delays to users due to demolition of existing Junction 6 structures and subsequent major disruption to the network and NEC/NMM accesses. This in turn would result in complex construction phasing with a large impact on A45 traffic and emergency services. (A summary of the Buildability Assessment is included in Appendix F2)

Best Option(s) – Options 2K and 11
Worst Option(s) – Options 3D
Neutral – Option 1E, 2A and 4B

4.3.6 Cost Estimates

Prior to the Order of Magnitude Estimate (OME) carried out by Highways England's commercial team, an initial cost estimate was prepared by Mouchel's QS team. It should be noted that Mouchel's estimate was not calculated in the same format and is not necessarily directly comparable to the OME, it gives an indication of the likely relative scale of costs. The estimate includes an optimism bias figure of 45%.

The results of these estimates indicated that whilst Options 2K, 4B and 11 were below the RIS approved budget of £282m, Option 2A fell just outside of the budget, and Options 1E and 3D were significantly above the budget.

However, as the OME estimate process takes into account additional contingencies including portfolio risk, these values could increase resulting in Option 2K falling outside the £282 budget and options 3D and 1E exceeding the £282m budget. Table 4-3 below shows the cost estimates for the options.

Option	Description	Cost Estimate (Mouchel)*
4B	North Junction	£128m
11	Do Minimum/Do Something option	£138m
2K	Southern Junction alternative	£272m
2A	Southern Junction	£307m
3D	Interchange option	£441m
1E	North and South Junction	£454m

Table 4-3: Cost Estimates *(*Base year for Mouchel estimates is 2016)*

Best Option(s) – Options 2K, 4B and 11
Worst Option(s) – Options 1E and 3D
Neutral – Option 2A

4.3.7 Traffic Assessment

An assessment of the options was carried out using an interim PRISM model (version 4.1 to a 2011 baseline). This model covered the immediate area around J6 of the M42 including J5-7 mainline, A45 Damson Parkway to Maxstoke Lane, M6 J4 and a section of the A452.This provided an indicative TUBA (Transport Users Benefit Appraisal) assessment of benefits – net consumer commuting benefits and net business impact - to assist with a ranking of the performance of the options, given that data was only available for a single year AM peak period at that stage.

The testing did show a number of results:

1. A new north junction (1E and 4B) had limited impact in removing traffic from the existing circulatory at Junction 6 as there is no direct route to the A45 either eastbound or westbound – traffic will have to use a parallel link to the existing Junction 6 before travelling onto the A45 . Traffic directed to the NEC has limited stacking space so may back-up onto the new junction circulatory
2. The Interchange option (3D) provided good journey time benefits for traffic using the M42 and A45 in all directions but will significantly impact traffic accessing the NEC/NMM
3. Option 11 provided journey time benefits though not as significant as the southern junction. Benefits of the free-flow links was recognised but were not as substantial as a direct western link to the airport.
4. The Southern Junction options (2A and 2K) offered clear operational benefits by removing traffic from the circulatory towards the A45 and by providing resilience to the network in the event of congestion. Larger benefits were found with the direct link to Airport Way rather than through Clock

Interchange. However the parallel links between the new southern junction and the existing Junction 6 did not attract traffic from the new junction and would not provide value for money. Traffic would either use the new southern link to A45 or continue on the M42 to existing Junction 6 - although the diverges off the M42 mainline did provide traffic with the additional option of getting to Junction 6. . Traffic benefits in using a new eastern link was limited, particularly if additional roundabouts were negotiated (2K) – as access to the proposed HS2 car park is positioned on the A452. Option 2A performed substantially better than option 2K.

Best Option(s) – Options 2A, 3D and 11
Worst Option(s) – Options 1E and 2K
Neutral – Option 4B

4.4 Options Development Part 2 – Final Sifting

In order to progress the project towards Stage 2 (Options Selection) a further assessment and workshop were held with the wider project team to review the status of the options and information obtained from the assessment to date.

The results of this workshop were as follows:

- North and South Junction (1E) – Has a safety issue in the GD04 and highway assessments with limited weaving length between the new northern junction and M42 Junction 7; has a large environmental footprint with 3 NIAs affected and a direct impact on Coleshill and Bannerly SSSI; provides limited benefit in removing traffic from the circulatory travelling from the north; significantly exceeds budget thus providing low value for money **=> DISCOUNT**
- South Junction (2A and 2K) – Provides good traffic benefits by removing a significant level of traffic off the Junction 6 circulatory but parallel links and HS2 link had limited traffic benefits; was supported by a number of stakeholders but not by communities and the local MP; 2K was assessed as a safe option to progress from the GD04 safety assessment; 2K within budget but 2A was slightly over budget **=> PROGRESS**
- Interchange (3D) – Provides good journey time benefits for traffic travelling in all directions but will impact traffic attending the NEC & NMM; has significant buildability impact with considerable disruption to road users during construction; significantly exceeds budget thus providing limited return in value for money; some safety issues from GD04 assessment regarding impact to road workers **=> DISCOUNT**
- North Junction (4B) – Has similar issues as 1E with a safety issue on limited weaving length; has a direct impact on the Coleshill and Bannerly SSSI though has a smaller environmental footprint with a reduced number of NIAs affected; provides limited benefit in removing traffic from the Junction 6 circulatory; within budget but limited traffic benefits resulting in low value for money **=>DISCOUNT**
- Do Minimum/Do Something (11) – Provides traffic benefits for removing traffic from the Junction 6 circulatory; free-flow links will result is some disruption to NEC/NMM; falls within budget; viable option to progress from the GD04 safety assessment **=> PROGRESS**

Additional TUBA testing confirmed that there were sufficient benefits on a southern junction option without the parallel links to Junction 6 and link to HS2 but with more direct links to Clock Interchange and Airport Way to substantiate progression towards public consultation.

Assessing the benefits of the free-flow links did not provide sufficient benefits to justify progressing as a unique option. However, it was recognised that there were significant operational issues with congestion at Junction 6 that the provision of free-flow links would help to address. It was considered that the free-flow links should remain as a potential 'bolt-on' option to the southern junction pending completion and evaluation of the LAM and Operational traffic models.

The results of the assessment and workshop are shown in Table 4-6 below.

OPTION	ASSESSMENT							PROGRESS
	Env	Hwys	Safety	Stkhdr.	B'dability	Cost	Traffic	
1E N+S Junction	N	N	N	=	=	X	=	NO
2A South Junction	=	Y	N	Y	=	=	Y	YES
2K South Junction	=	Y	Y	Y	Y	Y	=	YES
3D Interchange	=	=	N	N	N	N	Y	NO
4B North Junction	=	N	N	=	=	Y	N	NO
11 Do Something	=	Y	Y	N	Y	Y	Y	YES

Table 4-6: General Assessment of Six Options

1. Y demonstrates that the option provides a positive benefit
2. N demonstrates that the options has a minimal benefit
3. = demonstrates a neutral benefit

4.4.1 Post-Workshop Option Development

Taking forward the southern junction and free-flow elements of Option 11, further work was required to optimize the options to be taken to further consultation. This included:-

- Further consultation with stakeholders
- Removal of the parallel links from the southern junction
- Removal of the eastern link to HS2 due to insufficient traffic flows
- Modifications to the western link to the A45/Airport Way
- Further TUBA testing of options
- Additional OME costings of options

This further work on variations on the southern junction from the assessment resulted in the development of Options 2P and 2R:

2P – a southern junction with restricted movements enabling traffic to join the M42 in a southbound direction or exit the M42 from a northbound direction. A new 1.2km link is provided to Clock Interchange via a new roundabout north of Bickenhill

2R – a southern junction with a new 2.4km link west of Bickenhill direct to Clock Interchange (access to A45 westbound) and spur to Airport Way

Ongoing stakeholder consultation had indicated concerns over impact to green belt and so a variation on Option 2R was developed. This was named Option **2R East** with the southern junction but with a new 2.3km link east of Bickenhill and closer to the M42 corridor to Clock Interchange via a new roundabout. North of Bickenhill.

The dedicated free-flow links from Option 11 were also developed into a new Option 11A as a potential addition to the three options. Their inclusion was subject to the completion of additional traffic modelling tasks and economic assessment to determine if they have sufficient benefits.

A further GD04 assessment was carried out on the new options and all were considered viable to alleviate the current congestion and journey reliability issues whilst not impacting on road user or road worker safety.

The final result of this post-workshop option development was that the options to be taken to public consultation were as follows:

- Option 2P
- Option 2R
- Option 2R East

General arrangement plans of these options can be found in Appendix C and design narratives are included in Appendix G.

5 Planning factors

5.1 Option constraints

5.1.1 Geotechnical

Geotechnical constraints for the proposed options are relatively minor and it is considered that they can be overcome with commonly used design/construction practices.

Where new embankments overlie deposits of alluvium and/or compressible anthropogenic deposits, it is likely these will need to be either excavated or improved prior to construction. Given an area of alluvium underlies the area of the proposed junction for Option 2R (and 2R East), these options would be most affected by this constraint.

Anthropogenic deposits associated with a historic landfill may underlie the tie in with the Clock Interchange for all options. In addition Option 2R East passes through a small former landfill and Option 2R impinges slightly onto an a strip of land identified of former landfill where both routes are in cutting. Should contaminated former landfill material be encountered and require removal to off-site landfill, additional disposal cost may be incurred.

It is envisaged that alluvium will not provide a suitable foundation material for structures due to its variable and compressible nature. Therefore any foundations would likely need to be taken below the Alluvium, either by over-excavation where feasible or by the use of piled foundations shoulder deep deposits of alluvium be encountered. Again, this would be more of an issue for Option 2R given the alluvium underlying the area of the proposed Junction 6.

Option 2P will require earthwork modification in the area of the Minor Defect (on the northbound embankment, as described in paragraph 3.2.3) and it will likely be necessary to remove any failed/unsuitable existing earthwork material as part of construction.

Areas of proposed cuttings may sever unknown existing land drains and an allowance for incorporating these into new highways drainage will need to be considered.

On the basis of the above, from a geotechnical perspective, the preferred option is one that avoids areas of Alluvium and Made Ground which favours Option 2P

5.1.2 Traffic

The National Planning Policy Framework sets out the Government's planning policies for England and how these are expected to be applied. It sets out the Government's requirements for the planning system only to the extent that it is relevant, proportionate and necessary to do so. It provides a framework within which local people and their accountable councils can produce their own distinctive local and neighbourhood plans, which reflect the needs and priorities of their communities.

The scheme options have been developed in accordance with the aims set out in the relevant Local Authority policy documents and with the involvement of these key stakeholders.

With regard to the national road network, the Government's vision and strategy objectives are set out in the National Policy Statement for National Networks. The document summarises the Government's four main aims that it will deliver so that there are national networks that meet the country's long-term needs, supporting a prosperous and competitive economy and improving overall quality of life, as part of a wider transport system. These are:

- Networks with the capacity and connectivity and resilience to support national and local economic activity and facilitate growth and create jobs.
- Networks which support and improve journey quality, reliability and safety.
- Networks which support the delivery of environmental goals and the move to a low carbon economy.
- Networks which join up our communities and link effectively to each other.

The options being developed for the M42 Junction 6 are being assessed against each of these aims. At this stage, the assessments undertaken, with albeit limited traffic data, show that these aims are being met. As the scheme progresses, further, more detailed assessments will be undertaken with the benefit of enhanced traffic forecast data.

5.1.3 Environmental

There are a number of environmental factors for which there is uncertainty in relation to likely significant effects:

- Air Quality;
- Cultural Heritage;
- Noise;
- Road Drainage and the Water Environment;
- Visual Receptors
- Nature Conservation;
- Communities and People

Status: However, further survey work will be carried out in Stage 2 order to mitigate these factors.

5.1.4 Development

The proposed HS2 station and new railway bridge over the M42 is expected to start advanced construction in 2017, and be complete by 2026, and these works will have a significant effect on the SRN and local road networks.

The UK Central Development includes significant change to the local road network, including additional structures over the M42, just north of Junction 6. There are no confirmed dates for this development, but the scheme will need to interact with these works.

It is proposed that the M42 Junction 6 Improvement works are completed prior to HS2 opening to the public, and prior to the use of the UK Central development.

A new Motorway Service Area is proposed between Junctions 5-6 of the M42. A planning application has been submitted to SMBC and a final decision has still to be made.

There is substantial land-take outside the highway boundary and within the green belt which will impact local communities and land-owners and require a DCO Process.

6 Traffic and junction assessment

A key aspect of the development of options is an assessment of how each performs in terms of its ability to handle the traffic flows and provide an improvement over the existing operation.

Accordingly, a number of tests were carried out to provide an initial assessment of how the emerging options would perform. In view of the delay in receiving traffic forecast data from the updated version of the PRISM model, the tests were carried out using a cut down area of an earlier version of the PRISM model (v4.1) for the AM peak period in 2031 only. This sub-model covered the immediate area around J6 of the M42 including J5-7 mainline, A45 Damson Parkway to Maxstoke Lane, M6 J4 and a section of the A452.

The tests included checking for time and distance impacts both at J6 and for the local wider network as well as access to local stakeholders. To provide some quantification to the assessment, the mean delay per vehicle incurred at each of the key junctions across the model area was collated from the traffic model outputs. The mean delays were categorised into one of 6 'level of service' time bands, A to F, ranging from a delay of 0-10 seconds (A) through to over 50 seconds (F). In addition, the statistic representing the total travel time spent by all vehicles using the sub-model network area (vehicle-hours) was collated to assess whether reduced delays at the option junctions were being achieved at the expense of travel times across the wider area.

The test results showed that converting the existing junction to a full interchange unsurprisingly provided the highest level of service at Junction 6. However, the provision of an additional junction to the south of Junction 6 working in conjunction with the existing junction had strong potential to provide a good overall level of service. The addition of a junction to the north of Junction 6 did not perform as well on its own as one to the south and also did not appear to provide additional benefits when combined with one to the south.

Within the Do Minimum solutions tested, there are a number of options which would only partially solve the congestion problem. Of these, the provision of free-flow links to the remaining three arms of the existing Junction 6 provided the best level of service at the junction. Whilst not providing an overall solution on their own, it was concluded that they could be combined in whole or in part with other options to provide an improved overall solution.

Within the principle of a Southern junction, there is a variety of potential connecting links and precise locations of the new junction but not always within the same option as tested. Accordingly, it was concluded that the test results could be used to develop hybrid southern junction solutions that could be taken forward, adopting the best combination of connecting links and new junction positions.

6.1 Traffic Data and Analysis

Traffic count data for the M42 is currently being collected via a radar system. However, due to this being a new technology the calibration of this is incomplete and the accuracy of the historical data is poor. Therefore, TRADS data and commissioned traffic counts have been used to provide the basis for the traffic analysis.

Several studies have been conducted in recent years from which historical survey data is available. The most appropriate study in terms of Junction 6 was carried out for Highways England by Amey, who conducted a study of the traffic operations of the M42 Junction 6 roundabout in 2012 as part of the Pinch Point Programme. This included undertaking traffic surveys to provide reliable turning counts at the M42 Junction 6 roundabout. Classified counts were undertaken in order to take account of both (pre- Pinch Point) major event and non-major event performance as follows:

- 12-hour classified turning movement count at M42 Junction 6 roundabout (Thursday 2 February 2012). There were no events being held at the National Exhibition Centre (NEC) on this day;
- 12-hour classified turning movement count at M42 Junction 6 roundabout (Thursday 9 February 2012) during occurrence of major event (the Spring Show) being held at the NEC;

While this data was available, their historical nature in relation to the Junction 6 pinch point scheme, completed in March 2015, limit their relevance to the proposed 2015 base year models which include the pinch point network upgrades.

The Solihull Core Strategy Transport and Infrastructure Assessment was developed in 2011 and traffic flows used for assessment were obtained from PRISM rather than from observed count data.

A gap analysis exercise was carried out in order to identify current data shortcomings and the need for further data collection to be undertaken. A particular issue that the data collection sought to address concerned the shortcomings in the accuracy of traffic counts on the mainline M42 resulting from the change from loop-based equipment to radar installation mounted to the side of the carriageway. It has subsequently been found that the accuracy of traffic counts from the radar equipment is to a lesser standard than the former loops and, pending resolution of this issue, alternative sources of data were required. As a result of this, a further traffic survey was carried out.

The data counts commissioned in February 2016 were as follows:

- *Manual Classified Turning Counts (MCTCs) – classified traffic turn counts*
- *Manual Classified Counts (MCCs) – classified one or two way counts*
- *Automatic Traffic Counts (ATCs) – classified traffic volume link counts*
- *Saturation Flows*
- *Automatic Number Plate Recognition (ANPR)*

For all MCTC, MCC, ATC and ANPR data collection, vehicle categories were recorded. For use in analysis and modelling these have been categorised into cars, Light Goods Vehicles (LGVs) and Heavy Goods Vehicles (HGVs).

All data collected were recorded in fifteen minute intervals. For analysis, the hours between 08:00-09:00 and 17:00-18:00 were used as the AM and PM peak hours respectively. A copy of these flows are included in Appendix L.

Scheme appraisal requires up to date traffic models to be developed so that the economic benefits may be derived and that the operational validity of any scheme can be tested in advance of its final design. Outputs from these models will also provide inputs into the environmental assessment for the study.

6.2 Traffic Modelling Approach

6.2.1 Introduction

Traffic modelling is required in order to understand the impact of the proposed options in alleviating forecast congestion on the network related to growth of existing and proposed development in the area around M42 Junction 6. The traffic modelling is required to inform option development, economic appraisal, environmental assessment and the associated value for money (VfM) statement.

The environmental assessment will be largely concerned with changes in traffic volumes and speeds and how these impact on receptors. Hence, traffic reassignment is important, as are the effects of additional traffic 'induced' by an improvement scheme.

The VfM statement is largely concerned with changes in travel and accident costs, and will reflect the relative efficiency, or level of service, offered by the old and new road networks. Induced traffic is again an important component of the value for money appraisal.

M42 Junction 6 is a key junction in the SRN, an important local connector, access point for key regional attractors such as Birmingham Airport, the NEC, etc., while also being an important junction in the context of the future development of HS2 and UKC.

Considering the complexity and significance of this junction, traffic modelling for this study area included a three-pronged approach:

i. a strategic assessment covering the impact of the options on the regional movements,
ii. a cordoned local area model (LAM) used to interpret assignment and economic appraisal and
iii. a micro-simulation model to assess the impacts proposed scenarios at an operational level.

Delays in the completion of updates to the PRISM model (originally scheduled for autumn 2015) have resulted in an 8 month delay in the receipt of cordon data essential to the development of the LAM. This, in turn, gave rise to challenges for the assessment of emerging options during Stage 1. An ‘interim’ version of the local

area model has been developed, based solely on Do-Minimum cordons from PRISM and this has been used to assess the emerging options.

6.2.2 Description of existing transport models

Work carried out at PCF Stage 0 included identifying two models which cover the study area, and have previously been used to appraise schemes in and around the junction

- Policy Responsive Integrated Strategy Model (PRISM) – Multimodal discrete-choice strategic model for the West Midlands; and
- M42 Junction 6 micro-simulation detailed operational level model.

In agreement with Highways England's Traffic Appraisal, Modelling and Economics (TAME) Advisor, the existing models were considered to be suitable for the PCF Stage 1 operational analysis and area-wide strategic impacts. They were adjudged to have adequate spatial coverage developed (or updated) with data within the permissible 6 year time period.

However; these models did have some constraints/issues in their original form and needed some modifications. These are identified below.

6.2.3 PRISM Model

PRISM is a suitable tool to assess the area-wide traffic impacts of regional growth and transport interventions that may affect the future traffic patterns around M42 Junction 6. In particular, it has the functionality to forecast the impact of the Smart Motorway Programme (SMP) (M6 J2-4a), M1 J19 (Catthorpe Interchange) and forecast changes in development related growth at the National Exhibition Centre (NEC), Birmingham Airport, UKC and HS2 which will result in changing traffic patterns across the Midlands.

It also has the ability to capture the impact of public transport interventions including the proposals for the local heavy rail, Metro and Bus Rapid Transit (BRT) schemes. The model has been used to model these area-wide impacts, including that of the M42 Junction 6 scheme itself. These impacts are subsequently reflected in the local area (assignment) model by developing a model interface through a cordoning process.

6.2.4 Local Area Model (LAM)

A new local area assignment model was developed for this stage of assessment with an appropriate level of network detail and zone density. This was based on the strategic model (PRISM), which is a detailed multi-modal model, and which was used to model the mode, time-of-the-day choice, and trip redistribution in the option testing.

A summary of the key characteristics and capabilities of the local area mode is provided below:

- The model network was developed by updating the PRISM 2015 network where necessary
- An assessment was undertaken of the observed and modelled flows in the study area to assess the quality of link flow representation
- The model did not require a demand or forecasting component, as it takes these inputs from the wider PRISM model.

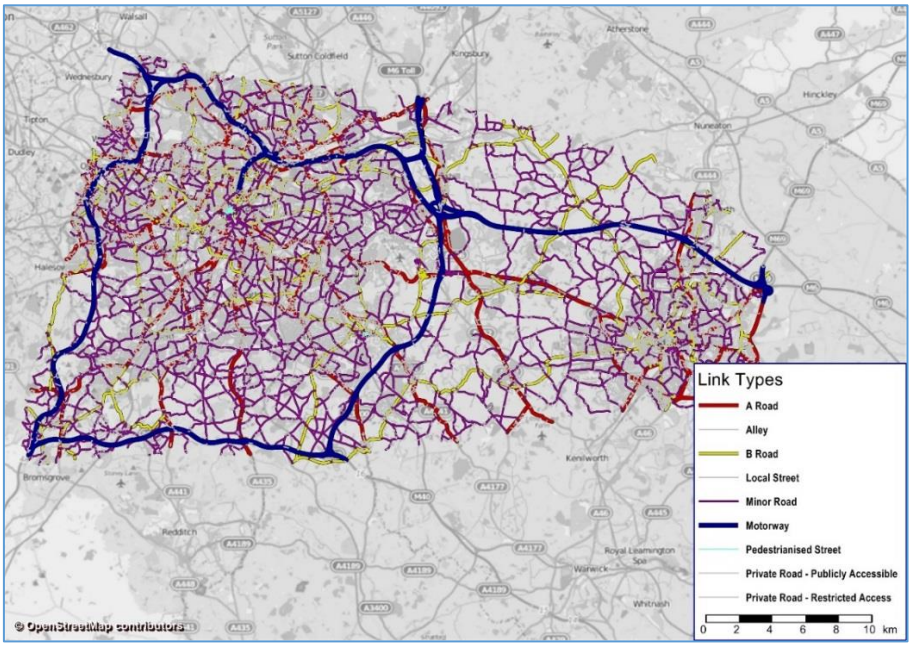


Figure 9-1 – Network covered by LAM

PRISM demand for the forecast years were taken from the 'assignment matrices' rather than the 'demand matrices' to incorporate the congestion impact from PRISM at the edges during the cordoning process for input into the LAM.

The demand segments in the PRISM network were retained in the LAM. These include:

- Car-Business
- Car-Others
- HGV
- LGV

PRISM was used to assess the impacts of the scheme on the demand using public transport. The modelling time periods from PRISM were maintained in the LAM (AM peak hour, inter-peak average hour and PM peak hour) for the purposes of highway assignment. An initial set of future year traffic forecasts has been developed for each of the forecast years for a Do-Minimum- and Do-Something scenario.

The scheme opening year is 2023. Since the PRISM model has standard sets of forecasts for the years 2021 and 2031, 2023 flows were produced by linear interpolation of demand between these two modelled years. Results were generated for future years of 2031 and 2041 from which the scheme design year of 2038 (15 years after opening) can be assessed.

Economic and environmental assessments are based on the outputs from the LAM. Detailed network impacts assessment have been undertaken using the highway LAM.

The demand for the operational model was obtained by cordoning from the LAM. The operational model, developed by updating and extending the existing model, was calibrated and validated using updated information obtained from the traffic survey programme. The operational impact analysis has been undertaken using this model; with the matrix growth coming from the LAM.

6.2.5 M42 Junction 6 operational model

The current model developed for the earlier stage assessment covered the network around M42 Junction 6. Since some options include a further junction between the existing Junction 5 and Junction 6, the model was extended south to Junction 5 to adequately assess the operational impacts of the options being considered.

Status: Completion of the Operational Model (junction assessment) will be carried out in PCF Stage 2

6.3 2038 Design Flows

PRISM will be used to determine the forecast flows for 2021, 2031 and 2041. Using National Trip End Model (NTEM) factors, these flows will be interpolated to provide the 2038 design year flows.

6.4 Summary and Conclusions

Pending the completion of an updated version of the PRISM model and the completion of a local area and operational models, the emerging scheme options have been assessed using an interim traffic model.

Based on the interim traffic assessment, better-performing options have been identified drawing on statistics for junction level of service and the impact on travel times across the wider highway network. The better-performing options included an upgrade to a full interchange, the addition of a junction to the south of Junction 6 with the potential for further improvements via the inclusion of additional free-flow links at Junction 6.

The traffic assessment results will form part of a wider, framework –based assessment, described in subsequent chapters, from which a final option selection will be recommended, recognising the uncertainty associated with the level of assurance available at this stage.

7 Economic assessment

7.1 Introduction

The methodology for the economic assessment of a scheme is defined within WebTAG and supporting documents such as DMRB Volumes 12, 13 and 14, and the TUBA manual and user guide.

To meet the requirements of the above-listed documents, it was recognised that the economic appraisal would need to be undertaken using the LAM. Therefore, the network coverage for the LAM was determined using the PRISM model to define an area of coverage that would account for changes in traffic patterns resulting from changes that are linked to the development of the local area. These included Birmingham Airport, the NEC, and the proposed HS2 station and UKC. The cumulative effects of these associated developments could then be accounted for in defining the study area. This will also ensure that the network coverage extends to include all links required for the accident analysis.

7.2 Summary of Appraisal Methodology

The proposed methodology has been developed in line with guidance contained in WebTAG and is proportionate for PCF Stages 1 and 2 appraisal. Within the appraisal and wherever practicable, the impacts are assessed and monetised using bespoke software. A number of aspects within the appraisal cannot be attributed with a monetary value and instead, a qualitative assessment is undertaken.

Key components of the appraisal are the benefits attributable to users of the proposed scheme (for example journey time savings and improvements in the reliability of those journeys) which are set against the investment and operating costs of the scheme. The Transport Users Benefit Appraisal (TUBA) software is used to calculate the present value of benefits (PVB) that are derived over the life of the scheme. Similarly, the investment and operating costs are converted to the equivalent present value of costs (PVC) and from this an initial Benefit Cost Ratio (BCR) is derived.

The outputs from the economic appraisal have been used to populate an Appraisal Summary Table (AST) (see Appendix H). This is based on quantitative values where available and supplemented by qualitative analysis, including outputs that are made available from the environmental analyses.

7.3 Individual Impacts

Individual impacts considered within the economic appraisal are:

- Changes in travel time and vehicle operating costs incurred by users of the road network
- Delays incurred by users during construction and subsequent maintenance of the proposed scheme

- Changes in the costs of accidents across the road network
- Journey time reliability
- The costs associated with various environmental impacts, essentially air quality, noise and greenhouse gas emissions

Delays in the completion of updates to the PRISM model (originally scheduled for autumn 2015) have resulted in an 8 month delay in the receipt of cordon data essential to the development of the LAM. This, in turn, gave rise to challenges for the assessment of emerging options during Stage 1. An 'interim' version of the local area model has been developed, based solely on Do-Minimum cordons from PRISM and this has been used to assess the emerging options using the TUBA economic assessment program.

Status: As a result of the delays, it has not been possible to advance the assessment as far as was anticipated at the commencement of Stage 1 and the option ASTs therefore contain more qualitative assessments than planned.

7.4 Wider Impacts

Wider impacts is the term used to describe the economic impacts of transport that are additional to transport user benefits. Transport schemes are expected to have impacts in markets other than transport (such as the labour market, product market and land market). The types of wider impacts that need to be considered in transport appraisals cover agglomeration (essentially the grouping together of businesses with complementary skills), the output change in imperfectly competitive markets and the tax revenues arising from changes in labour supply or arising from the move to more or less productive jobs. However, to undertake the assessment of these various impacts, the transport model is required. In view of the delays in receiving essential components of the LAM as reported above, the wider impact assessment has not been carried out at this stage.

Status: Clearly in the context of the wide-scale planning aspirations envisaged for the area surrounding M42 Junction 6, consideration of these wider impacts is expected to provide a significant contribution to the business case for the proposed scheme. Accordingly, the scale of these wider impacts will be assessed during Stage 2.

7.5 Key Results

Given the delay reported above for the completion of the LAM, it has not been possible to undertake a complete set of economic assessments. The 'interim' model has been used to derive the inputs required for the TUBA program from which an assessment of anticipated user benefits has been derived. It should be noted that

the ‘interim’ model covers a smaller area than the LAM and, as such, the user benefits can only be taken as indicative of the potential level of benefits.

Given that the user benefits derived from the application of the TUBA program to the limited extent of highway network contained within the ‘interim’ model, the above tabulated benefits are expected to represent a significant under-estimate of the final total. Accordingly, use has been made of experience on other similar project assessments to provide an estimate of the likely overall level of benefits.

Estimates for the likely scale of benefits or impacts have been made for the following aspects of the appraisal: accidents (neutral impact); construction delays (reduction of 10-20% of user benefits), uplift for benefits realised during periods not covered by the traffic model i.e. evenings and weekends (around 20% additional user benefits) together with days when there are major events at the NEC (around +5% of effect of known planned changes in Transport Analysis Guidance as advised by the DfT (changes to housing and employment forecasts (minor negative impact) and changes to the values of time used for appraisal (reduction of around 10% in the value of user benefits)). Consideration of wider impacts and journey time reliability could be expected to add some 30% and 10% respectively to the assessed level of user benefits. When these additional items are taken into account in the form of a Value for Money statement, the result is an ‘Adjusted BCR’. Depending on the assessed value of the Adjusted BCR, the scheme is attributed a Value for Money ranking, as illustrated in Table 10.1 below.

Adjusted BCR range	Value for Money Band
Less than 1	Poor
Between 1 and 1.5	Low
Between 1.5 and 2	Medium
Between 2 and 4	High
Greater than 4	Very High

Table 7.1 – Value for Money Bands

The results of the (limited) economic assessment are summarised in Table 10.2 below. The values for the BCRs presented in Table 10.2 represent the ‘core’ or most likely outcome; indicators of the potential level of benefit that could be realised should the significant levels of development understood to be envisaged in the area materialise are provided as commentary.

Option	Initial BCR	Adjusted BCR	Comments
2P	Poor	Medium	With aspirational levels of growth, this option has the potential to achieve a medium VfM initial and adjusted BCR.

2R	Medium	Medium	With aspirational levels of growth, this option has the potential to achieve a high VfM initial and adjusted BCR.
2R East	Medium	Medium	With aspirational levels of growth, this option has the potential to achieve a high VfM initial and adjusted BCR.

Table 7.2 – Summary of Economic Appraisal

(NOTE: Free-flow links are providing poor benefits to the options but will be re-assessed at completion of traffic modelling)

7.6 Conclusions

The approach to the economic appraisal of the options has been defined in accordance with Transport Analysis Guidance. At this initial stage of the scheme's development and due to the limited state of development of the traffic model, it has not been possible to complete all aspects of the economic appraisal. Instead use has been made of an interim model that has enabled an initial estimate of potential user benefits to be derived. Based on this initial estimate, the full scale of potential benefits has been estimated, drawing on experience from similar project assessments. Based on these estimates it is considered that the shortlisted options have the potential to deliver a robust business case in support of their implementation. However, it is recognised that the assessment has a low level of assurance at this stage of the scheme's development.

Status: A full economic assessment will be carried out in PCF Stage 2 when the Local Area Model has been completed.

8 Safety assessment

8.1 Scheme impact on road user safety objective

Currently the M42 in the vicinity of junction 6 is demonstrating a collision trend of rear end shunt type collisions. These collisions make up 61% of the total scheme collisions with the majority of the collisions occurring in typical peak hour time slots which lead to an assumption that there are congestion issues on the links and junctions.

Also within the scheme extents, the collision data is demonstrating that 22% of the total collisions are caused by side swipe collisions on the main line. These collisions could be occurring due to congestion and drivers performing late lane change manoeuvres to cut into the queues at the last minute to exit at the junction.

Side-swipe collisions that are occurring on the circulatory carriageway of the roundabouts, especially at junction 6, could be also be due to congestion or due to motorists being unfamiliar with the roundabout, the lanes and required exits off the roundabout.

Typically when looking at implementing a safety scheme, the safety engineer would look to gain a realistic collision saving of a third of the trend of collisions that are historically occurring. The realistic one third savings comes from a study that was undertaken by Highways England, the SSR team of the then Highways Agency, where it looked at a multitude of safety schemes, looking at the before and after collision data, also taking into account the MOLLASSES database (local authority schemes) and it was concluded that one third was the average collision saving from any one safety scheme.

As the options for the junction all include measures to reduce congestion by way of additional lane space, free flow lanes and new link roads, it can be assumed that a third of the rear end shunt collisions would be saved due to the reduced number of stop start manoeuvres taking place in the scheme extents.

Again due to the reduced congestions, the number of vehicles that perform late lane change manoeuvres to cut into the queues may also be reduced by up to a third of the total side swipe incidents.

Stonebridge Island roundabout has recently undergone safety improvement measures implemented by the local Area team in the last year which should have a positive impact on the historical incidents – final analysis will be determined after RSA4 (Road Safety Audit 4, one year after opening). It was noted in the safety risk assessment that without improvement works, the number of collisions at Stonebridge Island roundabout could rise. It is believed that now these works have taken place, the implementation of any of the 3 proposed options would not have a detrimental effect-on collision numbers at this location.

8.2 Impact assessment of options during construction

The objective of the CDM Regulations 2015 is to ensure the systematic management of projects from conception through to completion; hazards must be identified and

eliminated where possible, and the remaining risks reduced where possible and controlled. The M42 J6 hazard elimination and residual risk register (HERRR) has been reviewed on a reoccurring basis during PCF Stage 1. Five of the top hazards during construction currently identified are displayed in the table below. The table also identified the principals of prevention to reduce the listed risks to as low as reasonably practicable.

Activity	Hazard	Summary of planned action
Works adjacent to a River/Stream/Brook/Pond/ Lake	Risk of drowning of construction workers	Consider off site/off line construction of the bridge structures to minimise working over water exposure
Construction over the M42 Motorway	Working adjacent to existing motorway, Construction and maintenance workers - falls from height	Undertake buildability reviews to consider the reduction of working at height i.e. specify fixings for parapets before installation Review if structure can be built off line and lifted into place to reduce the need to work at height Permanent formwork which provides a safe working platform to be incorporated into the design
Traffic management	Increased exposure of workforce due to extended TM layouts	Engage with ASC and agree TM layouts to be included in H&S file. Consider as part of Maintenance Repair and Strategy Statement
Presence of services (for both buried and overhead services)	Electrocution - striking services leading to injury	Establish impact of services in relation to structures work
Construction work	Being struck by mobile plant	Provide sufficient working space available to allow the contractor to manage plant / pedestrian movement safely

Table 8-1 – Top five construction hazards identified within M42 J6 HERRR

Designers will continue to identify hazards and put in place principals of prevention to reduce risks to as low as reasonable practicable which will be recorded within the M42 J6 HERR. The measures detailed below will be undertaken to ensure robust management of all hazards is undertaken throughout all stages of the M42 J6 project:

- optimisation of the proposed traffic management regime, to minimise disruption, whilst ensuring the safety of the workforce
- consideration of the impact on the road user of the works, which will include programming
- appropriate measures for working adjacent to residential areas
- liaison with other potential adjacent schemes, particularly HS2 and the development of the railway station in the local vicinity
- due consideration to the location of the contractor's compound
- assessing and monitoring hazards associated with construction materials and processes

- liaison with planning and environmental bodies
- management of / liaison with utility providers with regard to diversion and/ or protection works

8.3 Impact assessment of options during operation

A safety risk assessment was undertaken during option identification stage to assist in determining the most appropriate options to take forward to the M42 J6 public information events. This approach as detailed in GD04/12(Standard for Safety Risk Assessment on the Strategic Road Network) “allows safety risk tolerance, balancing judgments, and benefits versus costs to be examined, while taking account of available budgets and other duties when considering safety measures.”

8.3.1 Summary of the GD04 assessment carried out on the scheme proposals

The proposed improvement scheme is required to alleviate the current congestion and journey reliability issues associated with the M42 Junction 6. “Modelling has shown that even without proposed local development that by 2019 the M42 J6 will be expected to suffer from significant congestion during peak hours and operate at an unacceptable level of service.” (Transport Summary Report - 2015)

The scope of the safety risk assessment covered the options that were currently being proposed for the M42 Junction 6 to address the congestion and future growth of the junction. The section of M42 likely to be affected by these improvement works is from J5 in the south to J7 in the north. The A45 (which joins with J6) will also be affected by any changes and some of the options also affect the A452.

There are several large businesses also likely to be affected which include the NEC (adjacent to the north-western quadrant of J6), National Motorcycle Museum (adjacent to the south-eastern quadrant of the J6), Birmingham International Railway Station to the west, Birmingham Airport to the west, and the proposed route for HS2 to the east of J6.

The safety risk assessment of options to improve congestion at and around the M42 junction 6 was assessed in accordance with GD04/12 and has been categorised as a ‘Type B’ decision - decisions that could have some significant operational implications.

Safety risk assessment requirements - Twelve improvement options developed during the Options Identification Stage were initially proposed for M42 J6 and the safety implications of these improvement options were assessed. A number of options were subsequently discounted as described in Chapter 5 and included aspects of the safety assessment. Details of the assessment of the options to be taken to public consultation are given below:

- Option 2P adds a new half-junction to the south of the existing junction 6 and a new link road to Birmingham Airport and Birmingham International Railway Station. The circulatory of the existing junction 6 will be widened;
- Option 11A includes widening of the circulatory of the existing junction 6 in the form of free-flow links;

- Option 2R adds a new junction to the south of the existing junction 6 and a new link road to Birmingham Airport and Birmingham International Railway Station. There will be new free flow interchange links included at J6.
- Option 2R East adds a new junction to the south of the existing junction 6 and a new link road to Birmingham Airport and Birmingham International Railway Station. There will be new free flow interchange links included at J6. The alignment of the new link road is the difference between this option and Option 2R.

GD04/12 guidance states that hazard identification must identify all reasonably foreseeable hazards to all relevant populations collectively and individually, and for all modes of operation, using methods appropriate to the complexity of the issues. For this assessment the affected populations are identified as including road workers (traffic officers and maintenance operatives) and road users (with motorcycle users given specific attention due to the National Motorcycle Museum located at M42 J6, recovery agents and emergency services).

8.3.2 Road Workers

The two most relevant road worker groups are:

- Traffic officers;
- Maintainers

The first population affected are traffic officers. General hazards for traffic officers associated with all or some of the proposed options include:

- incident management may be more difficult due to increased numbers of lanes (and dedicated lanes in some options);
- increase in number of lanes would require more than one vehicle to be able to carry out a rolling road block safely;
- an option may require alternative turn-around points due to lack of opportunity within the option proposed.

The second affected population is road workers (maintenance operatives). General hazards for maintenance workers associated with all or some of the options include:

- increased difficulty in carrying out routine maintenance work such as grass cutting, vegetation trimming or litter picking due to ‘islands’ being created by the proposed additional link roads in some of the options,
- the structures associated with the West Coast Mainline railway line passing through the scheme to the south of J6;
- Traffic management issues involving working next to live traffic caused during the construction of any of the proposed schemes;
- maintenance hardstanding required at all proposed Variable Message Signs (VMS) or Matrix signs to mitigate the need for live lane closures when carrying out maintenance works.

8.3.3 Road Users

The third population affected are road users. The following road users groups were considered in the assessment:

- Cars and vans;
- Heavy Goods Vehicles (HGVs) and buses/coaches;
- Motorcyclists;
- Emergency services;
- Recovery operators;
- Non-motorised users (NMUs).

General hazards for road users resulting from all or some of the options include:

- additional junctions on the M42 reduces the weaving lengths therefore increasing the risk of lane change collisions;
- increase in junction complexity could lead to driver confusion leading to late lane change manoeuvres resulting in side swipe type collisions;
- drivers following sat-navs (satellite navigation) are likely to become confused and risk of late lane change manoeuvres on approach to, and on, the new junction;
- increase in number of running lanes on the M42 may increase weaving along with the risk of side swipe collisions.
- Potential changes to NMU routes – to be mitigated during design,
- Removal of slip roads is likely to increase response times for emergency services and traffic officers.

8.3.4 Conclusion and recommendation

The assessment demonstrated that the options were potentially viable to alleviate the current congestion and journey reliability issues whilst not impacting on road user or road worker safety, though some with mitigation measures. These are noted as:

- Option 2P The assessment demonstrated that this option would be potentially viable with suitable signing and adequate road super-elevation provided
- Option 2R with mitigation such as lane gain/lane drop layouts and suitable signing measures to minimise the potential risk of weaving collisions between the proposed southern junction and J6
- Option 2R East with mitigation such as lane gain/lane drop layouts and suitable signing measures to minimise the potential risk of weaving collisions between the proposed southern junction and J6
- Option 11A (Free-flow Links) with mitigation measures such as high mounted traffic signals, appropriate signing and lane segregation on the J6 circulatory

9 Operational assessment

9.1 Operating requirement based on capacity needs

This section assesses the impact of the operating regimes across the M42 between Junction 5 to Junction 7. It is currently anticipated that each link within the scheme will operate to the existing DHS operational procedure as instigated in the original ATM Pilot scheme in 2006. The impact of this regime on maintenance access will be covered by the maintenance and repair strategy statement (MRSS), to be developed during PCF Stage 2. A safety plan will accompany the scheme operational concept and will also be undertaken during PCF Stage 2.

Status: PCF stage 2 will involve production of a MRSS and a safety plan to accompany development of operational concept proposals for M42 Junction 6 junction improvements.

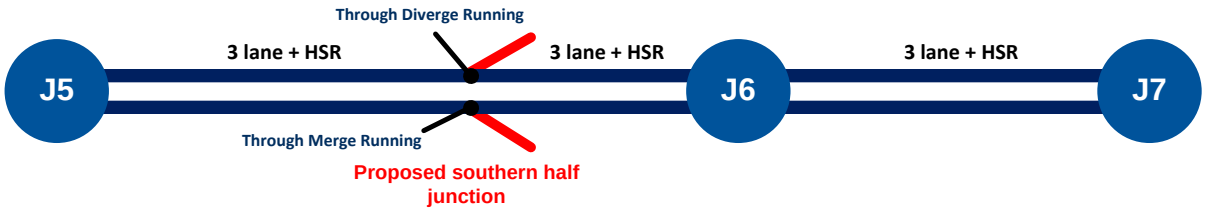
9.1.1 Capacity Requirements

The capacity of each link can be reviewed against the requirements of TD 22/06 [Ref 14] Chapter 3 – which defines the maximum peak hourly flow per lane on motorways as 1800 vph, Flows greater than these will result in decreasing levels of service and safety. Mouchel's technical note on the 'Review of mainline capacity Junctions 4 to 7' (Appendix F2) concluded that the M42 often reaches this maximum peak hourly flow and suggested that the corridor should be considered for additional capacity between J3A-7. Aspirational growth in this corridor is also likely to increase substantially with the proposed new HS2 station and major new development at UK Central – to the north-east of the junction.

Status: Updated traffic model expected to be available in early 2017 and could impact upon the proposed junction layouts. This will be considered further in PCF Stage 2 of the scheme development where tasks such as peak hour merge and diverge flows and TD22 merge and diverge traffic capacity requirements will be required.

9.2 Dynamic hard shoulder (DHS) operational regime impacts

9.2.1 Option 2P



The proposed southern junction will be a half junction layout, this will remove the ability to include a lane drop / lane gain layout during HSR operation due to no inclusion of an intra-junction. As a result, the implementation of through diverge running (TDR) and through merge running (TMR) at the merge (southbound) and diverge (northbound) locations will have to be assessed to retain the dynamic hard shoulder running (HSR) operational regime.

Proposed junction improvements at M42 Junction 6 may result in the movement of merge and diverge datum points for and as a result may impact the operation of DHS on M42 mainline.

Other key operational considerations are as follows:

- **Driver information provision** – advanced directional signing (i.e. fixed text message signs and fixed plate signing) will carefully need to be considered to avoid driver confusion due to the quick proximity of the new southern junction and existing M42 Junction 6
- **Emergency Diversion Routes (EDRs)** – a full review of emergency diversion routes associated to the M42 mainline at M42 Junction 6 will be required to be undertaken
- **NEC emergency response plan** – NEC and Highways England have an agreed plan to redirect traffic during peak times on large event days so that Junction 6 avoids severe congestion. Traffic is re-directed from M6 J4 onto the A446 rather than M42 J7 SB and uses the north entrance of the NEC.
- **Ramp metering** – an operational assessment on existing ramp metering sites will need to be carried out, including the proposed southbound merge

Status: Liaison with Highways England and ASC will continue in Stage 2 to review operational issues for all key items listed above.

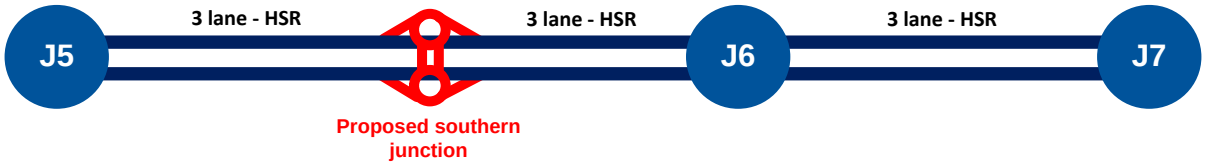
9.2.2 Option 11A (Free-flow Links)

A provision of through junction running (TJR) at M42 Junction 6 will need to be considered following the operational concept assessment during the subsequent PCF stages.

Proposed junction improvements at M42 Junction 6 may result in the movement of merge and diverge datum points and as a result may impact the operation of DHS on M42 mainline.

- **Driver information provision** – advanced directional signing (i.e. fixed text message signs and fixed plate signing) will carefully need to be considered to avoid driver confusion due to the quick proximity of the new southern junction and existing M42 J6
- **Emergency Diversion Routes (EDRs)** – a full review of emergency diversion routes associated to the M42 mainline at M42 J6 will be required to be undertaken
- **NEC emergency response plan** – NEC and Highways England have an agreed plan to redirect traffic during peak times on large event days so that J6 avoids severe congestion. Traffic is re-directed from M6 J4 onto the A446 rather than M42 J7 SB and uses the north entrance of the NEC.
- **Ramp metering** – an operational assessment on existing ramp metering sites will need to be carried out, including the proposed southbound merge

9.2.3 Option 2R and 2R East



A provision of through junction running (TJR) at M42 Junction 6 and the proposed southern junction will need to be considered following the operational concept assessment during the subsequent PCF stages.

Proposed junction improvements at M42 Junction 6 may result in the movement of merge and diverge datum points and as a result may impact the operation of DHS on M42 mainline

9.3 All lanes running (ALR) operational regime impacts

All lanes running (ALR) makes use of the existing hard shoulder to provide the additional lane capacity. This is achieved by using a system of gantry mounted electronic signs and signals. ALR has been considered as a potential operational regime to support identified issues or proposals as follows:

Motorway Service Area (MSA) application – the planning application of the MSA between M42 J5 to J6 outlines the requirement for ALR on the mainline on both links each side of the proposed MSA junction.

M42 J4 to J7 capacity issues - A technical note (included in Appendix F - June 2016) summarised capacity issues between M42 J4 to J7 to investigate the case for the provision of additional mainline capacity on the M42 motorway. It concluded the potential requirement of a corridor approach to traffic issues identified and suggested the need for additional capacity.

9.3.1 Key ALR impacts

The additional mainline capacity issues are not within the scope of this project. However, if the application for the MSA between Junction 5 to 6 is approved, and ALR is adopted for this section of the M42, then the following items would need to be considered:

- The relocation of Emergency Refuge Areas (ERAs) and gantries will have to be undertaken - potential not to have sufficient capacity to revert to 5 lanes plus the extra width to accommodate ERAs throughout the proposed arrangement.
- Roadworker safety implications - The removal of hard shoulder will require the implementation of fixed taper points and of remote control temporary traffic management (RCTTM) signs
    - RCTTM signs will be required in the central reservation and verge. The potential size of signs may be too large (5 lanes) to be accommodated within the central reserve.
- chance of fault occurrences due to the high frequency of technology infrastructure (lane based signals) compared to other ALR environments across the SRN therefore having impacts of road worker safety
- Gantry re-location will have to avoid issues with obscuration of HADECS cameras or any detrimental effect on radar performance. The carriageway and verge must be free of other infrastructure (such as over bridges, CCTV masts, radar detector masts and lighting columns but excluding equipment cabinets and barrier) for a distance of 50m downstream of the HADECS3 mounting position
- Significant site data changes and software / hardware amendments to reflect the changes to on road infrastructure and operational approach including 'link linking' and message lists

9.4 Maintenance and repair strategy statement

Status: PCF stage 2 will involve production of an MRSS to inform the operational concept proposals for M42 Junction 6 improvements.

The Maintenance Repair Strategy Statement (MRSS) will address issues concerned with the safety of road workers with respect to maintenance and repairs relating to the infrastructure being provided as part of this project. The MRSS will also demonstrate that the design for maintenance approach (IAN 69 [Ref 15]) has been

taken during the design and construction of the roadside assets and associated technology.

The objective of the MRSS is to ensure compliance with CDM Regulations 2015 in respect of designing for maintenance. The subjects of the document include anticipated maintenance tasks, assumed means of safe access, traffic management measures, assumed safe methods of working, provision of welfare facilities, specific safety measures and risks.

9.5 ALR key impacts to maintenance strategy

The potential introduction of ALR introduces new challenges associated with the loss of the hard shoulder. With respect to maintenance the following activities would no longer be viable:

- Make short duration stops on the hard shoulder to gain access to cabinets and other features.
- Leave warning signs and traffic cones out during peak periods in the verge in readiness for night time lane closures.
- Carry out hard shoulder mobile closures to perform some routine maintenance activities.
- Cone off the hard shoulder for linear operations including routine grass cutting and litter clearance.

9.6 Summary

The assessment demonstrates that options 11A, 2P, 2R and 2R East are all viable options to be taken forward to the next stage of design due to no identified significant impact upon the current operational concept (dynamic hard shoulder running). There are however specific operational considerations that need to be taken into account for the chosen preferred option going forwards into the subsequent PCF stages enabling minimal impact on the M42 mainline.

Due to the delay of the updated traffic model flows it is worth caveating that capacity and junction type requirements cannot be clarified at PCF Stage 1 however this will be assessed and clarified when the delivery of the LAM and Operational model become available in Stage 2.

10 Technology assessment

10.1 Introduction

This section identifies how the current provision of technology components on the M42 in the vicinity of Junction 6 will be affected by the scheme options currently under consideration. The scheme is currently working towards SGAR1 and as such the design of specific technology components is currently limited at this stage.

Further work will be required in subsequent stages to identify the detailed technology requirements to support the operating regime of the scheme and where there are opportunities to bring about enhancements and benefits to the scheme through the use of technology. Area 9 ASC technology proposals have also been identified which are detailed within this chapter.

10.2 Impact on Technology Features

Table 10.1 below provides a summary of the likely impact of the various scheme options under consideration on Technology features. This assessment has been based primarily on the current SM-HSR operational regime on the M42 main carriageways being retained however it is noted that introduction of a SMART Motorways – All Lane Running (SM-ALR) operational regime may be considered as part of the M42 Junction 6 Improvement scheme, therefore additional impacts that would arise as a result of SM-ALR being introduced have also been identified.

Table 10.1: - Impact of Scheme Options on Technology Features

Technology feature	Impact on technology features
Option 2P	
Motorway Signals and Message Signs	Potential replacement/relocation of several existing gantries on M42 main carriageway impacted by construction of new southern junction and by altered merge/diverge layouts at existing Junction 6 (in particular positioning of gantries located at the start of SM-HSR links that provide information on the status of the downstream hard shoulder is critical). Potential requirement to replace ADS gantries on existing Junction 6 southbound off-slip, including FTMS elements, to reflect reconfigured slip road/free flow link to A45 south. Potential requirement for additional strategic 3x18 character MS3s on northbound approach to new southern junction if this is considered to be a strategic node. Additional post mounted AMIs required at start of southbound on-slip road at new southern junction, plus potential requirement for supplementary post mounting speed conditioning signal(s) due to length of slip road. No impact anticipated on the existing small post-mounted message sign in the eastbound verge of the A45 on the approach to M42 Junction 6.

Technology feature	Impact on technology features
Closed Circuit Television	Additional PTZ CCTV cameras required to provide surveillance of new southern junction and slip roads. Relocation of or additional fixed hard shoulder CCTV cameras required due to reconfiguration of SM-HSR links Potential reduced requirement for fixed hard shoulder cameras (not required on any links that are converted to SM-ALR operation). Increased requirement for PTZ CCTV cameras on any links that are converted to SM-ALR operation (100% coverage required).
Vehicle Detection	Main carriageway loops/radar will need to be relocated/reconfigured to reflect revised signal positioning (see above). New loops/radar required on new southern junction slip roads. Existing Junction 6 slip road loops/radar will need to be reconfigured to reflect revised slip road layouts
Speed Enforcement	Existing HADECS3 provision will need to be reviewed for suitability in relation to the new southern junction, alterations to the existing Junction 6 slip road merges and diverges, and potential visibility issues due to other proposed new infrastructure such as overbridges. Relocation of existing HADECS3 equipment potentially required.
Emergency Roadside Telephones	Potential relocation of existing ERTs if ERAs are relocated with relocated gantries (see above) Potential deletion of ERA(s) if link between new southern junction and existing Junction 6 incorporates a permanent hard shoulder – ERTs will be relocated to back of hard shoulder.
Traffic Signals	Review of existing ramp metering installations on the Junction 6 on-slip roads required. If retention of RM is required, existing installations will require reconfiguration to reflect altered slip road layouts. Potential requirement to provide RM on new southern junction on-slip road. No impact anticipated on the existing ramp metering installations on the Junction 5 on-slip roads. Existing traffic signal system on Junction 6 gyratory will require reconfiguration to reflect revised junction layout. No impact anticipated on the existing traffic signal system on the A45 Stonebridge junction gyratory.
Equipment Cabinets	New or relocation of existing CEC cabinets required to reflect new/relocated gantries (see above) New or relocation of existing standard Type 609 and Type 600 cabinets required to reflect new or relocated equipment on slip roads. New Type 609 cabinets required for any new electricity supply points required for Technology equipment. New feeder pillar cabinets required for any new electricity supply points required for motorway lighting

Technology feature	Impact on technology features
Communications Network	Bypass cables for longitudinal NRTS cables and associated infrastructure such as temporary ducting will be required during the construction period. Installation and maintenance of Bypass cables and associated infrastructure will need to be installed and maintained throughout construction in a manner that ensures that the integrity of the cables is not compromised by the construction works, e.g. bypass cables routed in central reserve. The scheme will also need to provide suitable infrastructure, e.g. ducting and chambers, to accommodate the reinstated permanent NRTS longitudinal cables. There may be a requirement for strategic 3x18 character MS3s within the scheme to remain operational during construction, which will require connection(s) to the NRTS bypass cable or provision of alternative temporary communications link(s), e.g. SPICE
Power Supplies	Potential new electricity connection points required for new/relocated Technology equipment. Potential new electricity connection points required for reconfigured motorway lighting
Lighting	A TA 49 lighting assessment will need to be carried out for the proposed scheme, the details and outcomes will be detailed during the subsequent PCF Stage. If retention of lighting is confirmed by TA 49 assessment, new or relocation of existing lighting infrastructure will be required to reflect revised slip road layouts at Junction 6 and the new southern junction including associated links to the existing road network.
Remotely Controlled Temporary Traffic Management (RCTTM) Signs	Provision of RCTTM signs and associated power and communications infrastructure will be required for any links which are converted to an SM-ALR operational regime. SM-ALR links of five or more lanes will require provision of RCTTM signs in bath the verge and the central reserve.
Temporary Systems During Construction	Majority of permanent Technology equipment will be disabled during construction therefore temporary systems will need to be put in place, e.g. average speed enforcement camera, temporary VMS/journey time information system. There may be a requirement for strategic 3x18 character MS3s within the scheme to remain operational during construction, which will require connection(s) to the NRTS bypass cable or provision of alternative temporary communications links, e.g. SPICE
Technology Systems	Updates required to HATMS site data (message signs, signals, and MIDAS & HSM subsystems), CCTV instation site data and HE Gazetteer data to reflect new/revised on-road equipment provision. Reconfiguration of the existing ASC9 RCTTM sign control system will also be required if SM-ALR is introduced on any links by the scheme.

Technology feature	Impact on technology features
Option 2R (East & West sub-options)	
Motorway Signals and Message Signs	Potential replacement/relocation of several existing gantries on M42 main carriageway impacted by construction of new southern junction and by altered merge/diverge layouts at existing Junction 6 (in particular positioning of gantries located at the start of SM-HSR links that provide information on the status of the downstream hard shoulder is critical). Potential requirement to replace ADS gantries on existing Junction 6 southbound off-slip, including FTMS elements, to reflect reconfigured slip road/free flow link to A45 south. Potential requirement for additional strategic 3x18 character MS3s on northbound approach to new southern junction if this is considered to be a strategic node. Additional post mounted AMIs required at start of on-slip roads at new southern junction. No impact anticipated on the existing small post-mounted message sign in the eastbound verge of the A45 on the approach to M42 Junction 6.
Closed Circuit Television	Additional PTZ CCTV cameras required to provide surveillance of new southern junction and slip roads. Relocation of or additional fixed hard shoulder CCTV cameras required due to reconfiguration of SM-HSR links Potential reduced requirement for fixed hard shoulder cameras (not required on any links that are converted to SM-ALR operation). Increased requirement for PTZ CCTV cameras on any links that are converted to SM-ALR operation (100% coverage required).
Vehicle Detection	Main carriageway loops/radar will need to be relocated/reconfigured to reflect revised signal positioning (see above). New loops/radar required on new southern junction slip roads. Existing Junction 6 slip road loops/radar will need to be reconfigured to reflect revised slip road layouts
Speed Enforcement	Existing HADECS3 provision will need to be reviewed for suitability in relation to the new southern junction, alterations to the existing Junction 6 slip road merges and diverges, and potential visibility issues due to other proposed new infrastructure such as overbridges. Relocation of existing HADECS3 equipment potentially required.
Emergency Roadside Telephones	Potential relocation of existing ERTs if ERAs are relocated with relocated gantries (see above) Potential deletion of ERA(s) if link between new southern junction and existing Junction 6 incorporates a permanent hard shoulder – ERTs will be relocated to back of hard shoulder.
Traffic Signals	Review of existing ramp metering installations on the Junction 6 on-slip roads required. If retention of RM is required, existing installations will require reconfiguration to reflect altered slip road layouts. Potential requirement to provide RM on new southern junction on-slip roads. No impact anticipated on the existing ramp metering installations on the Junction 5 on-slip roads. Existing traffic signal system on Junction 6 gyratory will require reconfiguration to reflect revised junction layout. No impact anticipated on the existing traffic signal system on the A45 Stonebridge junction gyratory.

Technology feature	Impact on technology features
Equipment Cabinets	New or relocation of existing CEC cabinets required to reflect new/relocated gantries (see above) New or relocation of existing standard Type 609 and Type 600 cabinets required to reflect new or relocated equipment on slip roads. New Type 609 cabinets required for any new electricity supply points required for Technology equipment. New feeder pillar cabinets required for any new electricity supply points required for motorway lighting
Communications Network	Bypass cables for longitudinal NRTS cables and associated infrastructure such as temporary ducting will be required during the construction period. Installation and maintenance of Bypass cables and associated infrastructure will need to be installed and maintained throughout construction in a manner that ensures that the integrity of the cables is not compromised by the construction works, e.g. bypass cables routed in central reserve. The scheme will also need to provide suitable infrastructure, e.g. ducting and chambers, to accommodate the reinstated permanent NRTS longitudinal cables. There may be a requirement for strategic 3x18 character MS3s within the scheme to remain operational during construction, which will require connection(s) to the NRTS bypass cable or provision of alternative temporary communications link(s), e.g. SPICE
Power Supplies	Potential new electricity connection points required for new/relocated Technology equipment. Potential new electricity connection points required for reconfigured motorway lighting
Lighting	A TA 49 lighting assessment will need to be carried out for the proposed scheme, the details and outcomes will be detailed during the subsequent PCF Stage. If retention of lighting is confirmed by TA 49 assessment, new or relocation of existing lighting infrastructure will be required to reflect revised slip road layouts at Junction 6 and the new southern junction including associated links to the existing road network.
Remotely Controlled Temporary Traffic Management (RCTTM) Signs	Provision of RCTTM signs and associated power and communications infrastructure will be required for any links which are converted to an SM-ALR operational regime. SM-ALR links of five or more lanes will require provision of RCTTM signs in bath the verge and the central reserve.
Temporary Systems During Construction	Majority of permanent Technology equipment will be disabled during construction therefore temporary systems will need to be put in place, e.g. average speed enforcement camera, temporary VMS/journey time information system. There may be a requirement for strategic 3x18 character MS3s within the scheme to remain operational during construction, which will require connection(s) to the NRTS bypass cable or provision of alternative temporary communications links, e.g. SPICE
Technology Systems	Updates required to HATMS site data (message signs, signals, and MIDAS & HSM subsystems), CCTV instation site data and HE Gazetteer data to reflect new/revised on-road equipment provision. Reconfiguration of the existing ASC9 RCTTM sign control system will also be required if SM-ALR is introduced on any links by the scheme.

Technology feature	Impact on technology features
Option 11A	
Motorway Signals and Message Signs	Potential replacement/relocation of existing gantries on M42 main carriageway impacted by altered merge/diverge layouts at existing Junction 6 (in particular positioning of gantries located at the start of SM-HSR links that provide information on the status of the downstream hard shoulder is critical). Potential requirement to replace ADS gantries on existing Junction 6 southbound off-slip, including FTMS elements, to reflect reconfigured slip road/free flow link to A45 south. No impact anticipated on the existing small post-mounted message sign in the eastbound verge of the A45 on the approach to M42 Junction 6.
Closed Circuit Television	Relocation of or additional fixed hard shoulder CCTV cameras required due to reconfiguration of SM-HSR links to reflect altered merge/diverge layouts at Junction 6 Potential reduced requirement for fixed hard shoulder cameras (not required on any links that are converted to SM-ALR operation). Increased requirement for PTZ CCTV cameras on any links that are converted to SM-ALR operation (100% coverage required).
Vehicle Detection	Main carriageway loops/radar will need to be relocated/reconfigured to reflect revised signal positioning (see above) Existing Junction 6 slip road loops/radar will need to be reconfigured to reflect revised slip road layouts
Speed Enforcement	No impact anticipated
Emergency Roadside Telephones	Potential relocation of existing ERTs if ERAs are relocated with relocated gantries (see above)
Traffic Signals	Review of existing ramp metering installations on Junction 6 on-slip roads required. If retention of RM is required, existing installations will require reconfiguration to reflect altered slip road layouts. No impact anticipated on the existing ramp metering installations on the Junction 5 on-slip roads. Existing traffic signal system on Junction 6 gyratory will require reconfiguration to reflect revised junction layout. No impact anticipated on the existing traffic signal system on the A45 Stonebridge junction gyratory.
Equipment Cabinets	New or relocation of existing CEC cabinets required to reflect new/relocated gantries (see above) New or relocation of existing standard Type 609 and Type 600 cabinets required to reflect new or relocated equipment on slip roads. New Type 609 cabinets required for any new electricity supply points required for Technology equipment. New feeder pillar cabinets required for any new electricity supply points required for motorway lighting

Technology feature	Impact on technology features
Communications Network	Bypass cables for longitudinal NRTS cables and associated infrastructure such as temporary ducting will be required during the construction period. Installation and maintenance of Bypass cables and associated infrastructure will need to be installed and maintained throughout construction in a manner that ensures that the integrity of the cables is not compromised by the construction works, e.g. bypass cables routed in central reserve. The scheme will also need to provide suitable infrastructure, e.g. ducting and chambers, to accommodate the reinstated permanent NRTS longitudinal cables. There may be a requirement for strategic 3x18 character MS3s within the scheme to remain operational during construction, which will require connection(s) to the NRTS bypass cable or provision of alternative temporary communications link(s), e.g. SPICE
Power Supplies	Potential new electricity connection points required for new/relocated Technology equipment. Potential new electricity connection points required for reconfigured motorway lighting
Lighting	A TA 49 lighting assessment will need to be carried out for the proposed scheme, the details and outcomes will be detailed during the subsequent PCF Stage. If retention of lighting is confirmed by TA 49 assessment, new or relocation of existing lighting infrastructure will be required to reflect revised slip road layouts at Junction 6
Remotely Controlled Temporary Traffic Management (RCTTM) Signs	Provision of RCTTM signs and associated power and communications infrastructure will be required for any links which are converted to an SM-ALR operational regime. SM-ALR links of five or more lanes will require provision of RCTTM signs in bath the verge and the central reserve.
Temporary Systems During Construction	Majority of permanent Technology equipment will be disabled during construction therefore temporary systems will need to be put in place, e.g. average speed enforcement camera, temporary VMS/journey time information system. There may be a requirement for strategic 3x18 character MS3s within the scheme to remain operational during construction, which will require connection(s) to the NRTS bypass cable or provision of alternative temporary communications links, e.g. SPICE
Technology Systems	Updates required to HATMS site data (message signs, signals, and MIDAS & HSM subsystems), CCTV instation site data and HE Gazetteer data to reflect new/revised on-road equipment provision. Reconfiguration of the existing ASC9 RCTTM sign control system will also be required if SM-ALR is introduced on any links by the scheme.

10.3 Other technology schemes

Area 9 ASC has provided details of other technology schemes that are being planned that may have an impact on the proposed M42 Junction 6 Improvement scheme; these are described below. Further technology assessments will be undertaken in the next stages to identify where technology can support and enhance the scheme operation and efficiencies can be achieved, working collaboratively together with Area 9 ASC.

Status: Further liaison will be undertaken with Area 9 ASC to coordinate design and implementation of the proposed technology schemes identified below with the Junction 6 improvement scheme, and to ensure that opportunities to provide a common approach between the schemes and achieve efficiencies are realised.

10.3.1 Birmingham Box Strategic MS3 Replacement

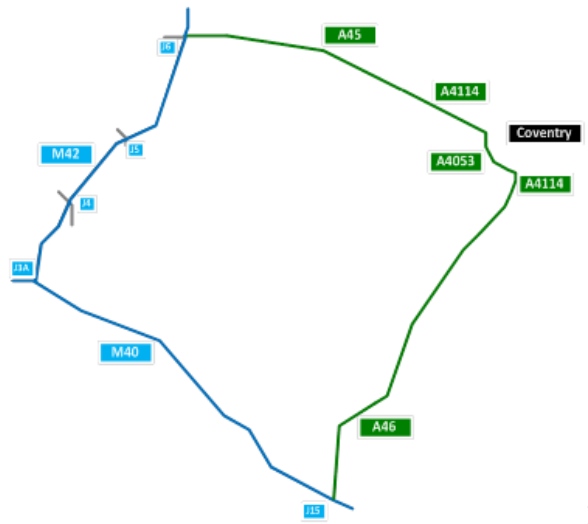
Replacement of life-expired strategic MS3s located at key nodes on the Birmingham Box motorway network, including M42 J3a-7, is planned to be undertaken during 2017/2018.

10.3.2 M42 Infill CCTV

Provision of additional infill PTZ CCTV surveillance cameras at locations identified through liaison with WMRCC operators, plus relocating existing gantry mounted PTZ CCTV cameras to masts located in the verge. Delivery of this scheme is currently planned for 2017/2018.

10.3.3 Connected Intelligent Transport Environment (CITE)

CITE is a collaborative project between a number of organisations to provide an on-road test site for the connected information environment. This will allow the testing of wireless technology for Vehicle to Vehicle (V2V) communications and Vehicle to Infrastructure (V2I), collectively known as V2X. The extent of the CITE project is shown in Figure 13.1 below



. **Figure 13.1: - Extent of CITE Project**

The route will take in both Motorways and A-roads with a hand over between the Highways England network and the Coventry MBC local road network. ASC9 has appointed Mouchel to produce detailed designs for installation of a mast and cabinet

at each of the 35 CITE locations covering the A45, A46, M40 and M42. The ring road around Coventry is being designed by Coventry Council.

Two wireless technologies are being trialled, DSRC (Dedicated Short Range Communications) and LTE-V (Long Term Evolutions - Vehicle). Organisations within the consortium would like to identify the characteristics of both systems so that Highways England can produce specifications for the future of wireless communications on their road network.

The ASC9 element of the project has now reached a key milestone, with delivery of the Preliminary Design Report incorporating site constraints identified by the Highways, Environmental, Geotechnical, Structures and ITS teams. The next phase will be to take all the site constraints and produce detailed designs for each site. Construction is currently planned to commence in early 2017.

11 Environmental Assessment

The M42 Junction 6 Environmental Study Report (ESR), which has been completed in accordance with DMRB Vol. 11 and IAN 125/15 [Ref 16], is being submitted separately to Highways England as a PCF Stage 1 deliverable. The findings of this ESR are summarised below. The following sections can be read in conjunction with the ESR, WebTAG Appraisal Summary Table and the Environmental and Ecological Constraints Plans as it provides an overview of the environmental assessment, potential for significant effects and recommendations for further work.

An initial high-level environmental assessment was carried out as detailed in Chapter 4 with the assessment table in Appendix F. This chapter will concentrate on the options to be taken to public consultation. Note that for the purposes of this assessment, the Free-Flow Links are considered as a separate option – Option 11A.

11.1 Air Quality

During construction there is the potential for fugitive dust and particulate emissions from activities such as material loading and transfer onsite, earthworks, and trackout associated with heavy vehicles leaving the site with exposed disaggregate material. In addition, construction vehicles accessing the site and non-road mobile machinery (NRMM) have the potential to contribute to local ambient concentrations of NO2 and PM10.

An assessment of the potential air quality impacts with regard to the operation of the proposed options has been undertaken, in the absence of traffic data, by identifying the number of sensitive receptors within 200m of the proposed options. A summary of the number of sensitive receptors are presented in Table 11-1 below.

	Option 2P	Option 2R	Option 11A	Option 2R East
Banding Zone	No. of Receptors	No. of Receptors	No. of Receptors	No. of Receptors
0m – 50m	3	17	3	9
50m – 100m	35	23	3	42
100m – 200m	33	56	18	19

Table 11-1: Sensitive Receptors within 200m of the Proposed Options

11.1.1 Summary of Potential Effects

The proposed options may have detrimental impacts on the AQMA and result in localised exceedances of air pollutant limits which could be difficult to mitigate. Until further traffic data and modelling has been conducted to determine the change in air quality resulting from the scheme, it is also likely that exceedances in air pollution will have detrimental impacts to the health of people within 200m of the project centre line. However, the magnitude of potential impacts experienced by relevant sensitive receptors is uncertain until the results of an air quality dispersion model are considered in line with DMRB significance criteria. In addition, there uncertainty in relation likely significant effects as a result of NOx deposition at the Bickenhill Meadows SSSI and the Coleshill and Bannerly Pools SSSI.

11.1.2 Recommendations for Further Works

Assessment should be undertaken to identify and consider relevant sensitive receptors that are within 200m of the affected road network to ascertain the magnitude and significance of any impacts to local air quality, either adverse or beneficial. This will be determined through further simple and detailed air quality assessment.

Status: Further assessment will be undertaken in Stage 3 prior to DCO application including a screening exercise to understand how changes in traffic could impact relevant sensitive receptors and detailed quantitative assessment of operational air quality impacts.

11.2 Cultural Heritage

There is uncertainty regarding likely significant effects on cultural heritage resources relating to the construction and operation of the proposed options. The requirement for a detailed assessment of potential impacts to cultural heritage resources has been confirmed through previous stages. The scoping exercise identified anticipated potential impacts on the three specific areas of interest under the overarching aspect of cultural heritage:

- archaeological remains;
- the built heritage; and
- historic landscapes.

11.2.1 Summary of Potential Effects

Assessment of the proposed options identifies the potential to impact upon both known and unknown elements of the historic environment. The proposed options will result in undesignated heritage assets being directly impacted upon, and designated heritage assets may be visually impacted upon.

The majority of the impacts would be moderate to major removing most if not all of the subsurface deposits at the sites, and the heritage assets have been assessed to be of medium to negligible value. In addition, there exists a risk to previously unidentified archaeological remains. Mitigation measures are available which could reduce the magnitude of impacts to Cultural Heritage assets. However, uncertainty remains regarding likely significant adverse effects as the impacts identified in Table 5.6 of the ESR are based on the proposed options without a site survey and mitigation measures. This highlights the need for further survey and assessment work during PCF Stages 2 and 3 to resolve this.

11.2.2 Recommendations for Further Works

A detailed desk based assessment and walk over survey is proposed once the preferred option has been selected. The detailed assessment will be carried out in accordance with DMRB guidance and will include a staged methodology for identifying impacts of the preferred option and measures required to mitigate likely significant adverse effects.

Status: A detailed desk based assessment and walk over survey of the proposed scheme area will be undertaken in Stages 2 & 3 prior to DCO application.

11.3 Landscape and Visual

As the proposed options introduce new infrastructure outside of the highways boundary and into a generally flat landscape and in close proximity to visual receptors, the initial assessment indicates that a detailed assessment will be required to understand and address potential impacts.

11.3.1 Summary of Potential Effects

The landscape effects for each option can be summarised as follows:

- Option 11A would likely result in neutral effects to Landscape Character Area (LCA) 1 and LCA 2.
- Option 2P would likely result in an adverse effect to LCA 1 due to the offline link road and a neutral effect to LCA 2.
- Option 2R would likely result in a potentially significant adverse effect to LCA 1 due to the new junction, offline link road and a neutral effect to LCA 2.
- Option 2R East would likely result in an adverse effect to LCA 1 due to the new junction and the offline link road and a neutral effect to LCA 2.

The visual effects for each option can be summarised as follows:

- Option 11A would potentially result in adverse effects to approximately thirty six properties and users of one footpath.
- Option 2P would potentially result in adverse effects to approximately ninety properties and users of two footpaths.
- Option 2R would potentially result in adverse effects to approximately one hundred and fifteen properties and users of four footpaths.
- Option 2R East would potentially result in adverse effects to approximately one hundred and fifty-two properties and users of three footpaths.

11.3.2 Recommendations for Further Works

A detailed visual impact assessment would be required to fully understand the potential visual effects of any preferred option. A simple landscape assessment would be sufficient to understand the effects on landscape character for Option 11A, while a detailed landscape assessment would be required for Option 2P, 2R, or 2R East.

Status: A detailed visual impact assessment will be undertaken in Stages 2 & 3 prior to DCO application.

11.4 Nature Conservation

Given the relatively rural nature of the surrounding environment, there is strong likelihood that the proposed development will affect sensitive ecological receptors.

The significance of these effects will depend on the proposed options and on its interaction with the ecological receptors (see Table 11-2, below).

Table 11-2: Sensitive Ecological Receptors

Options	Sensitive Receptors
All Options	Coleshill and Bannerly Pools SSSI
	Bickenhill Meadows SSSI
	River Blythe SSSI
	Hollywell Brook LWS / Ecosite
	Bats
	Invertebrates
	White clawed crayfish
Option 2R	Aspbury's Coppice Ancient Woodland/LWS/Ecosite
	Castle Hill Farm Meadows LWS
	Greens Ward Piece Ecosite
	Bickenhill Churchyard Ecosite
	Meadows to the east of the Jungle Ecosite
	Clock Lane Meadows Ecosite
	Wayside Cottage Meadows Ecosite
	Roadside Hedge LWS
	Bickenhill Churchyard Ecosite
Option 2P	Clock Lane Meadows Ecosite
	Bickenhill Churchyard Ecosite
	Castle Hill Farm Meadows LWS
Option 2R East	Clock Lane meadows Ecosite
	Castle Hill Farm Meadows LWS
	Bickenhill Churchyard Ecosite
	Roadside Hedge LWS

11.4.1 Summary of Potential Effects

Without appropriate ecological design measures and specific construction methodology there could be significant adverse effects from the construction and operation of the proposed options on the following ecological receptors:

- Main Birmingham to London Railway line Ecosite;
- Otter;
- Dormice;
- Water vole;
- Reptiles;

- Fish;
- Birds (including barn owl);
- Badger;
- Hedgehog; and
- Local BAP Habitat – field margins, roadside verge, grassland, hedgerows and the built environment.

11.4.2 Recommendations for Further Works

An Extended Phase 1 Habitat survey is required for all of the habitats within the study area incorporating the highways and landscape design, the drainage strategy and more detailed construction information. The impact of the proposed development on designated sites remains unknown. This will be informed by conducting botanical surveys (such as NVC). This information will further support potential indirect and direct impacts of the proposed options to these areas. Further analysis of the preferred option design (in particular the drainage designs and proposed construction methodology) will be undertaken to determine the impacts' likely significance.

Status: Further analysis of detailed scheme design and working methods will be undertaken in Stages 2 & 3 prior to DCO application.

11.5 Noise and Vibration

Whilst there remains uncertainty with regards to the extent of the works, the types of plant and equipment, phasing, working times, traffic management measures, method of piling and plant set up/combination, it is assumed that receptors within 200m the construction areas may experience temporary adverse impacts as a result of a change in the noise environment during construction.

A proximity count exercise has been undertaken using geographic information system (GIS) software to provide an indication of the potential for the number of sensitive receptors which may experience operational noise impacts. The number of dwellings and other relevant sensitive receptors (e.g. hospitals, schools) within distance bands of each of the proposed options are presented in Tables 11-3and Table 11-4.

Table 11-3: Dwelling Receptor Counts

Proposed Options	Banding Zone				
	0 – 50m	50 – 100m	100 – 200m	200 – 300m	300 – 600m
Option 2P	3	35	32	22	82
Option 2R	17	23	55	31	81
Option 11A	3	3	14	9	36
Option 2R East	9	42	19	26	35

Table 11-4: Other Relevant Sensitive Receptor Counts

Proposed Options	Banding Zone

	0 – 50m	50 – 100m	100 – 200m	200 – 300m	300 – 600m
Option 2P	0	0	1	1	1
Option 2R	0	0	1	1	1
Option 11A	0	0	0	1	0
Option 2R East	0	0	1	1	1

11.5.1 Summary of Potential Effects

There will be changes in vertical and horizontal alignment of the carriageways and the introduction of new junctions and link roads. This is likely to lead to increased noise levels at the relevant sensitive receptors although there remains uncertainty with regards to the magnitude of these impacts. Further assessment will be required once detailed design and traffic data are available.

11.5.2 Recommendations for Further Works

It is recommended that noise surveys are undertaken at sensitive receptors along the length of the proposed options in order to inform a more detailed noise assessment. This will be completed in accordance with BS 5228 and include setting noise thresholds to limit impacts during the works.

It is recommended that during PCF Stage 2 a screening exercise is undertaken to understand how changes in traffic, as a result of the proposed options, will impact relevant sensitive receptors. The screening exercise should also inform discussions in relation to the potential inclusion of mitigation measures (such as acoustic fencing or low noise surfacing) in areas of particular concern if the potential for adverse impacts is identified.

Furthermore, it is recommended that a detailed quantitative assessment of the operational noise impacts is undertaken in accordance with the DMRB methodology and in agreement with the Environmental Health Officer (EHO) at SMBC.

Status: Further assessment including noise surveys; screening exercise to understand how changes in traffic could impact relevant sensitive receptors; and detailed quantitative assessment of operational noise impacts will be undertaken in Stages 2 & 3 prior to DCO application.

11.6 Geology and Soils

Superficial Geology

The proposed options are likely to have permanent adverse impacts due to the removal of superficial geology outside of the highways boundary. The magnitude of impact will be influenced by the depth of cut required to install new infrastructure.

Bedrock Geology

The proposed options could have adverse impacts on bedrock geology if intrusive construction measures such as piling or percussive drilling is required to install new structures or infrastructure.

Soils

The proposed options are likely to have permanent adverse impacts on soils and agricultural land due to land take outside of the highways boundary.

Contaminated Land

Disturbance of up to 15 potentially contaminated sites could result in adverse impacts due to the exposure of receptors to potentially harmful material. It is not possible to determine which option poses the greatest risk to receptors without a targeted ground investigation.

11.6.1 Summary of Potential Effects

The influence of the impacts of the proposed options on drift / solid geology and soils are considered to have a low likelihood of resulting in significant adverse effects due to the local / regional abundance of these resources.

Option 2R and Option 2R East could include significant cuttings within the solid geology, potentially to depths greater than the regional groundwater level and therefore there is the potential for local drawdown of water levels/piezometric levels in the vicinity of the cutting. This will be investigated in detail in PCF Stage 3 once the highway arrangement has been finalised and ground investigation has been undertaken. Risks associated with the cutting such as interruption of local water supplies (none currently identified; see Section 11.9) or induced local settlement will be assessed and reported in the Ground investigation Report (GIR) though it is currently anticipated that given the likely highly over consolidated nature of the underlying Mercia Mudstone, ground movement is unlikely to be a major risk.

A ground investigation will be undertaken during PCF Stage 3 as there is the potential for contaminants to be mobilised or displaced during construction or operation of the proposed options.

11.6.2 Recommendations for Further Works

A simple level assessment should be undertaken during PCF Stage 2 or 3 including gathering further details on construction techniques and the results of any further geotechnical investigation (GI).

A detailed GI is recommended as there is potential for contaminants to be mobilised or displaced during construction or operation of the proposed options.

Consultation with SMBC and local geological groups is also recommended to identify any local sites of geological interest.

Status: Further assessment including ground investigation; and consultation with local geological groups will be undertaken in Stages 2 & 3 prior to DCO application.

11.7 Materials

The key potential impacts associated with materials are expected to arise from:

- the transportation of materials to and from site (import and export);
- the storage of materials on site;
- decommissioning of existing infrastructure e.g. gantries, cabinets etc;

- excavation of materials at major infrastructure locations; and
- disposal of surplus or hazardous materials

11.7.1 Summary of Potential Effects

Given the scale of the proposed works outside of the highways boundary, the range of potential mitigation measures / the potential capacity of waste treatment options there is a low likelihood of significant adverse effects on materials resource or waste capacity in SMBC.

11.7.2 Recommendations for Further Works

A simple level assessment in accordance with IAN 153/11 [Ref 17] will be undertaken at PCF Stage 3 once an outline cut and fill balance and a book of quantities are developed for the proposed options. A simple level assessment should be undertaken to identify potential waste streams and suitable sites to ensure there is appropriate waste capacity within SMBC.

Status: Simple assessment in accordance with IAN 153/11 required at PCF stage 2.

11.8 People and Communities

This section has been based on a desk study and provides:

- an assessment of anticipated impacts on NMUs of public rights of way (PRoW) (including footways) and motorists using the SRN and local roads, in relation to changes in journey distance and time as an indicator of severance and on the amenity value of the rights of way and local roads to users;
- an evaluation of driver stress relative to the existing road network and the proposed options using initial traffic data;
- an assessment of the drivers' experience in terms of views from the road which would be available for users of the proposed options; and an assessment of the impacts on Commercial, Community, Residential, Agricultural and Development land using significance criteria

11.8.1 Summary of Potential Effects

Non-motorised Users

The assessment identified a series of interconnected footpaths radiating from Bickenhill and Shadowbrook Lane. The network of footpaths appear to navigate around farmland and residential property provides access beyond the A45 into the Birmingham Business Park area.

The construction of Option 2P and 2R East would intersect three Public Rights of Way (PRoW), whereas the construction of Option 2R would intersect seven PRoW.

Vehicle Users

Motorised users are anticipated to receive beneficial impacts from the proposed options as average speeds will increase and average journey times will decrease, this is likely to result in less frustrating driving conditions.

Commercial, Community, Residential and Agricultural Land

At this stage of options development and assessment no impact to community land will occur as a result of Options 11A, 2P, and 2R East.

Community playing fields, used for Gaelic Football, located adjacent to Catherine-de-Barnes Lane is likely to be subject to significant adverse impacts as a result of Option 2R without suitable mitigation. Without mitigation the proposed option is likely to preclude continued operation of this recreational area for its existing and intended use.

Without mitigation, permanent moderate to substantial adverse impacts to agricultural, residential and commercial land is anticipated as a result of Options 2P, 2R and 2R East.

11.8.2 Recommendations for Further Works

During PCF Stage 2 or 3 consultations should be undertaken with affected asset owners in order to develop a detailed assessment of potential effects. The consultations should adhere to following process:

- identification of community, agricultural and commercial holdings based on landholding information from SMBC
- an initial screening exercise to identify the likely level of impact on the agricultural and commercial businesses to recognise any requirements for additional information or site visits
- consultation with land owners / tenants or / and land agents who were identified as likely to be moderately or substantially affected by the proposed options or for whom there was insufficient information to complete the assessment
- evaluation of a preferred option to establish the potential impact on landowners' agricultural businesses and identify appropriate design and mitigation measures
- assessment of the significance of residual impacts on landowners' / tenants agricultural and commercial businesses and
- assessment of the significance of residual impacts on community land and facilities

Status: Consultations with affected asset owners and further searches to identify planning issues will be undertaken in Stages 2 & 3 prior to DCO application

11.9 Road Drainage and the Water Environment

This section assesses the potential impacts on the water environment and takes into account surface hydrology, flood risk, hydrogeology and water quality. A desk study of the hydrological and hydrogeological features associated with the proposed options has been undertaken to support the assessment.

11.9.1 Summary of Potential Effects

Assessment of the proposed options indicates that there is uncertainty over whether significant effects are likely in relation to pollution from routine runoff and flood risk,

due to the complexity of the proposed options and the absence of a drainage design and flood risk strategy. In relation to all other potential impacts there is a high degree of certainty that there is a low likelihood of significant effects, assuming that good practice design measures as outlined in the mitigation section are embedded within the scheme design.

11.9.2 Recommendations for Further Works

Further design and assessment work at PCF Stage 2 will include development of a preliminary drainage design to determine the location of outfalls in relation to local watercourses and impacts of any potential discharges to groundwater, with identification and evaluation of appropriate treatment techniques. This will comprise of a DMRB HD 45/09 'Method A' assessment to assess the impact of routine runoff on local watercourses, and a DMRB HD 45/09 'Method C' groundwater assessment for any potential groundwater discharges. The potential for accidental spillages within drainage networks to cause an impact on receiving waterbodies will be assessed following DMRB HD 45/09 'Method D'.

Given the increase in impermeable areas for all proposed options and the potential impacts from increased flood risk it is recommended that assessment, in accordance with DMRB, is undertaken to understand the potential issues in relation to, and the need for, attenuation. It is recommended that a Flood Risk Assessment is undertaken during PCF Stage 2 or 3.

For assessments relevant to Road Drainage and the Water Environment, and once a traffic forecast is available, the DMRB screening process will be applied to determine the actual affected road network which may increase the number of potential receptors. Further data on local abstractions and private water supplies within the proposed options area should be sought to determine the level of impact on these supplies.

Consultation with both the local authority and EA for further data on both private and public water supplies within the area which will allow a more detailed assessment to take place. There is an opportunity to address any existing water quality or flooding issues for this section of the strategic and local road network or bring it to a higher standard.

Status: Further design and assessment work will be undertaken in PCF stage 2 and further data on local abstractions and private water supplies within the proposed scheme area will be undertaken in Stages 2 & 3 prior to DCO application.

12 Appraisal summary

12.1 Appraisal summary tables (ASTs)

The assessments (see Appendix H) have been undertaken to determine if there are significant differences between the three proposed options and the additional sub-option of the free-flow links (Option 11A).

The assessment concluded that Option 11A would result in fewer impacts and be is less likely to result in significant adverse effects than Options 2P, 2R and 2R East.

The differences between the three offline options, in relation to the determination of likely significant effects are primarily concerned with the impacts to Nature Conservation and the community of Bickenhill. Option 2R will require land take from three local wildlife sites, two of which may link to the Bickenhill Meadows SSSI. Option 2R also requires land take from community playing fields which host National Gaelic Football events. Option 2P and 2R East both run through Bickenhill and result in adverse impacts to residents and potentially businesses through a loss of land and amenity.

In addition, the three offline options would result in a new section of road being constructed in close proximity to sensitive receptors and cultural heritage assets. It is anticipated that Option 2P and 2R East will result in visual and setting impacts of a greater magnitude in comparison to Option 2R. However, all three options will require detailed landscape and visual mitigation proposals.

For all four options there is uncertainty in relation to likely significant effects in relation to:

- Air Quality;
- Cultural Heritage;
- Noise;
- Road Drainage and the Water Environment;
- Visual Receptors.

In addition, there is uncertainty regarding the likely significant effects of Options 2P, 2R and 2R East in relation to:

- Nature Conservation;
- Communities and People.

13 Programme and costs estimates

13.1 Key milestones

The programme has been prepared in accordance with Highways England's PCF requirements. The current programme has been developed based on the scheme following the DCO Process with significant works outside the highways boundary. A summary of the key dates and milestones is presented in Table 13-1 below.

The RIS commitment is a start of works by March 2020, which the RIS spend profile is based on.

Delivery Item	Estimated project delivery date
Independent Assurance Review 1	November 2016
Stage Gate 1 Review (SGAR 1)	March 2017
Commence Public Consultation	December 2016
Independent Assurance Review 2	April 2017
Stage Gate 2 Review (SGAR 2)	April 2017
Recommendation of Preferred Route Announcement (PRA)	June 2017
Stage Gate 3 Review (SGAR 3)	June 2018
Independent Assurance Review 3a	June2018
Submit DCO Application	June 2018
Stage Gate 4 Review (SGAR 4)	October 2019
Receive Secretary of State (SoS) Decision Letter	October 2019
Orders Made	December 2019
Development Consent Order Made	December 2019
Stage Gate 5 Review (SGAR 5)	December 2019
Independent Assurance Review 3b	December 2019
Start of Works	March 2020
Open for Traffic	March 2023
Independent Assurance Review 4	March 2023
Stage Gate 6 Review (SGAR 6)	February 2023
Handover to Maintenance	April 2023
Stage Gate 7 Review (SGAR 7)	April 2023
Independent Assurance Review 5a	May 2023

Table 13-1: M42 Junction 6 key milestones

13.2 Order of Magnitude Estimate (OME)

The PCF Stage 0 OME was produced and signed off by Highways England commercial team for Option 2A (emerging option). The Most Likely Cost is an average cost taken within a minimum and maximum range.

The OME process has not yet been completed for all the options but where they are not yet complete an indicative cost estimate has been included. The cost of Option 2R East has still to be confirmed but as it is very similar to Option 2R in terms of length of alignment, it is expected to be of a similar value. Interim costs were carried out by Mouchel quantity surveyor team prior to the completed OME costs being available.

Option	PCF Stage	Most Likely Cost	Status
2A	Pre Stage 0	**£282m**	Strategic Outline Business Case **RIS Budget**
2P	Stage 1	**£269m this includes free flow lefts at J6**	Signed Off Order of Magnitude Estimate
2R	Stage 1	**£339m this includes free flow lefts at J6**	Indicative Stage 1 estimate
2R East	Stage 1	**TBC***	Under Preparation
11A	Stage 1	**£148m**	Indicative Stage 1 estimate

Table 13-2: M42 OME history *** expected to be similar cost to Option 2R**

14 Conclusions and recommendations

14.1 Need for the junction improvement

Junction 6 is on the SRN and sits within the section of M42 which forms the southern and eastern arms of the Birmingham Box area. It is one of the busiest interchanges in the country providing a link between the M42 Motorway and A45 Coventry Road. The junction has been noted as currently operating at near capacity on most days. Event days at the NEC generate additional event based demand which contributes to significant congestion. This in turn affects both the M42 mainline and the LRN impacting on journey times, resilience and safety.

The Stage 1 assessment has indicated that the overall study area for the junction has a relatively good accident record compared to the wider SRN due to the safe operational regime on the M42. Initial accident data from 2015/16 indicates that this accident record is likely to have improved during the study period due to localised improvements on the Junction 6 gyratory and Stonebridge Roundabout. However, the complexity and rapidly changing nature of the SRN in this area, the impact of Ramp Metering plus the size, complexity and potential for large differential circulatory speeds on the gyratory produce a highly complex operational regime that requires intensive further survey and assessment during Stage 2.

Junction 6 is an essential interchange in a growing region. It serves a number of key strategic economic assets for both the local and wider community. These assets include Birmingham Airport, the NEC, JLR, Birmingham International Railway Station, the NMM and Birmingham Business Park. Future economic growth and development is forecast across the study area and the West Midlands. Existing plans for housing, employment and commercial growth imply a period of traffic growth which will be captured in the regional strategic traffic model PRISM. Whilst some modal shift and rerouting is anticipated, the car will continue to be a dominant mode and that traffic conditions will deteriorate considerably.

The study established that there are a number of strategic and local developments within varying stages of the planning system, such as HS2, the proposed MSA to the South of the junction and the proposed UK Central Development - promoted by SMBC, which will have an impact on this scheme. The project provides an opportunity to take a coordinated and collaborative approach to the development of the junction and the surrounding area to ensure that long term strategic and regional objectives are achieved.

The traffic modelling tasks were hindered by the delay in obtaining the required cordon data for the LAM from PRISM, but an interim version was developed to

forecast traffic growth and to assess the emerging options. The outputs from the model have been used for a relatively high level TUBA economic assessment and appraisal, but given the small area of the cordon it may not capture all benefits and disbenefits on the network. Although, the appraisal framework is relatively robust for Stage 1 it does result in a Low level of assurance. Core Benefit Cost Ratios for Options 2P and 2R are within the range of 1.4 – 2.0 but with the inclusion of proposed development at HS2 and UKC and aspirational growth, the BCRs are expected to increase considerably beyond these levels. PCF Stage 2 will allow this assessment to be completed and the higher BCRs will lead to a medium to high level of assurance.

Without the intervention to improve Junction 6, congestion on the approaches to, and through the junction is shown to continue and conditions will deteriorate further with future traffic growth. Increased delays, reduced reliability and reduced safety would serve to discourage new development and economic growth in the immediate surrounding areas within Solihull, Birmingham and the West Midlands.

14.2 Recommendation of options for progression to Stage 2

This TAR sets out the current conditions and performance of M42 Junction 6 highlighting the need for improving the junction. The TAR summarises the traffic and safety issues with the current highway arrangement and confirms the case for improvements at this junction with a set of project specific objectives. The surrounding environment and key issues and constraints have also been identified, including environmental, technical and operational issues.

A number of options have been identified to address the problems and achieve the project specific objectives. The extent to which these achieve the objectives, and offer value for money has been discussed earlier in previous chapters, based on the traffic, environmental, deliverability and economic assessments. This value assessment forms a good basis to identify the strongest options in terms of value against the desired objectives and outcomes, for taking forward to PCF Stage 2. In summary, it is recommended that the following options, which all provide similar levels of additional capacity and direct relief to the existing Junction 6, are taken forward to the PCF Stage 2 Option Selection:

Option 2P: A new southern junction about 1km south of the existing Junction 6 but only a half-junction type – northbound exit and southbound entry. There is a new 1.6km link road to Airport Way and the A45 leading to Birmingham Airport and A45 westbound to Birmingham/Birmingham International Railway Station respectively. The new link would be to the east of Bickenhill and pass beneath Church Lane before rising on an embankment to cross the M42 on a large bridge. The alignment would minimise the effect on the Green Belt as it is closer to the existing M42 corridor through the area. Connection onto the local roads would be via a new roundabout north of Bickenhill. This roundabout would be at existing ground level

with link roads to the Clock Interchange, Catherine de Barnes Lane and Airport Way. This option provides limited resilience due to the limited movements provided at the southern M42 junction.

Option 2R: A new southern junction in a dumb-bell type layout approximately 2km south of the existing Junction 6 allowing both north and south access to the M42 north of Solihull Road. This option would provide a new 2.4km dual carriageway link between the Clock Interchange. Clock Interchange would be improved to accommodate the additional flows and a free flow link would be provided to give improved access to Birmingham Airport and A45 west. The new link would be to the west of Bickenhill and generally be below ground level crossing underneath B4438 (Catherine de Barnes Lane), near Bickenhill and towards the M42. The alignment would tie closely into the existing local road corridor to minimise effect on the Green Belt. Connection onto the local roads could be designed to minimise long distance traffic use of local roads whilst enabling access to the Clock Interchange. This option provides for all movements at the southern junction and the direct link to the airport, railway station and B4438 makes this the best performing option for overall network resilience.

Option 2R East: A new southern junction in a similar position to that of Option 2R with a dumb-bell type layout approximately 2km south of the existing Junction 6 allowing both north and south access to the M42 north of Solihull Road. A new link road is aligned to the east of Bickenhill and pass beneath Church Lane before returning to existing levels north of Shadowbrook Lane. The alignment would minimise the effect on the Green Belt as it is closer to the existing M42 corridor through the area. Connection onto the local roads would be via a new roundabout north of Bickenhill. This roundabout would be at the existing ground level with link roads to the Clock Interchange, Catherine de Barnes Lane and Airport Way. Clock Interchange would be improved to accommodate the additional flows of traffic and a free flow link would be provided to improve access to Birmingham Airport and A45 west. This option provides for all movements at the southern junction, resulting in higher resilience than Option 2P.

Free-flow Left Turns: Whichever option is taken forward, there is the potential to maximise the improvement at Junction 6 further by providing dedicated free flow left turns, as included within Option 11A. These links could effectively remove traffic from the roundabout by providing dedicated left turn links at the NEC, National Motorcycle Museum and North East quadrant of the roundabout and could increase benefits and reduce future congestion. Further design, discussion and more detailed traffic modelling is required to determine the benefits of each link before they could be included.

14.3 Preferred option

A preferred option was not determined due to the aforementioned low level of assurance of the BCRs produced during Stage 1 and uncertainty of traffic,

operational and environmental assessment. Traffic modelling will progress during the early part of Stage 2 and will enable a more robust economic assessment with a higher level of assurance to be carried out using a completed LAM with forecast year traffic figures and updated development growth with the result of the HS2 Hybrid Bill - which is expected in December 2016.

Results of the stakeholder consultation at the public information events in December 2016 and January 2017 will also be taken into account to enable a preferred option to be assessed.

14.4 Consideration of options for Stage 2 public consultation

A total of six options within the five themes (North and South Junction, South Junction, Full Interchange, North Junction and Do Minimum/Do Something) have been identified and assessed during PCF Stage 1. The southern junction option variants along with the added potential of free-flow links proved to have the highest benefits in solving the congestion problem at Junction 6, it is recommended that the three options identified above for Stage 2 are taken forward to Public Consultation. Information on the discounted options will also be available at the Public Consultation in order to demonstrate the other options considered, and with justification as to why they have been discounted at this stage.

.

Appendices

Appendix A – References

Appendix B – Glossary

Appendix C – General Arrangement Drawings

Appendix D – Existing Utilities Drawing

Appendix E – Constraint Plans

Appendix F – Assessments and Technical Notes

Appendix F1 – Options Assessments

Appendix F2 – Technical Notes

Appendix G – Design Narratives

Appendix H – Appraisal Summary Table

Appendix I – Personal Injury Collision Locations

Appendix J – Option Themes Considered

Appendix K – Client Scheme Requirements

Appendix L – Traffic Flow Schematic

Appendices

List of documents:

Appendix A – References

Appendix B – Glossary

Appendix C – General Arrangement Drawings

Option 2P General Arrangement Drawing - HE551485-MOU-GEN-M42_J6-DR-CH-0001
Option 2R General Arrangement Drawing - HE551485-MOU-GEN-M42_J6-DR-CH-0004
Option 2R East General Arrangement Drawing - HE551485-MOU-GEN-M42_J6-DR-CH-0008
Existing Structures Location Plan - HE551485-MOU-GEN-M42_J6-SK-CB-0001

Appendix D – Existing Utilities Drawing

Existing Statutory Undertakers Apparatus Plan - HE551485-MOU-VUT-M42_J6-SK-D-0001

Appendix E – Constraint Plans

Stakeholder Plan Key Areas/Developments - HE551485-MOU-GEN-M42_J6-SK-D-0100
Non-Motorised Users Plan - HE551485-MOU-ENM-M42_J6-SK-D-0001
Area 9 Roadworks Plan - HE551485-MOU-HGN-AREA 9-SK-D-0001
Geohazard Plan - HE551485-MOU-HGT-M42_J6-DR-GE-0001
Environmental Constraints Plan Sheet 1 of 2 (example Option 2R East shown) - HE551485-MOU-EGN-M42 J6-DR-EN-0012
Environmental Constraints Plan Sheet 2 of 2 (example Option 2R East shown) - HE551485-MOU-EGN-M42 J6-DR-EN-0013
Ecological Plan Sheet 1 of 2 (example Option 2R East shown) - HE551485-MOU-EGN-M42 J6-DR-EN-0009
Ecological Plan Sheet 2 of 2 (example Option 2R East shown) - HE551485-MOU-EGN-M42 J6-DR-EN-0010

Appendix F

Appendix F1 – Options Assessments

Options Assessment

East Assessment

Skanska M42 Buildability Options Assessment Detailed Review

Environmental Assessment

Appendix F2 – Technical Notes

Technical Note on Viability of BHX/A45 Link - HE551485-MOU-GEN-M42_J6-FN-CH-0002

Technical Note on Viability of HS2/UKC Link - HE551485-MOU-GEN-M42_J6-FN-CH-0003

Review of mainline capacity Junction 4 to 7 - HE551485-MOU-GEN-M42_J6-FN-TR-0006

Alternative NMM Access/Egress (Drawing and Technical Note) - HE551485-MOU-GEN-M42_J6-SK-CH-0037

Appendix G – Design Narratives

Option 2P - HE551485-MOU-GEN-M42_J6-FN-CH-0055

Option 11A - HE551485-MOU-GEN-M42_J6-FN-CH-0057

Option 2R - HE551485-MOU-GEN-M42_J6-FN-CH-0059

Option 2R East - HE551485-MOU-GEN-M42_J6-FN-CH-0060

Appendix H – Appraisal Summary Table

Appraisal Summary Table Option 2P - HE551485-MOU-00-XX-PC-TR-0002

Appraisal Summary Table Option 11A - HE551485-MOU-00-XX-PC-TR-0004

Appraisal Summary Table Option 2R - HE551485-MOU-00-XX-PC-TR-0006

Appraisal Summary Table Option 2R East - HE551485-MOU-00-XX-PC-TR-0007

Appendix I – Personal Injury Collision Locations

Personal Injury Collision Locations Overview - HE551485-MOU-GEN-M42_J6-SK-CH-0042

Appendix J – Option Themes Considered

North & South Junction (Option 1E Schematic) - HE551485-MOU-GEN-M42 J6-SK-D-0150
South Junction (Option 2A Schematic) - HE551485-MOU-GEN-M42 J6-SK-D-0151
South Junction (Option 2K Schematic) - HE551485-MOU-GEN-M42 J6-SK-D-0155
Interchange (Option 3D Schematic) - HE551485-MOU-GEN-M42 J6-SK-D-0152
North Junction (Option 4B Schematic) - HE551485-MOU-GEN-M42 J6-SK-D-0153
Free flow left turns (Option 11 Schematic) - HE551485-MOU-GEN-M42 J6-SK-D-0154

Appendix K – Client Scheme Requirements

M42 J6 Client Scheme Requirements SGAR 1 - HE551485-MOU-00-XX-Z-0003

Appendix L – Traffic Flow Schematic

Traffic Flow Schematic AM & PM Peaks - HE551485-MOU-VTR-M42_J6-SK-CH-0003

Appendix A – References

1. Design Manual for Roads and Bridges TD 27/05 – Cross Sections and Headroom
2. Design Manual for Roads and Bridges TD 9/93 – Highway Link Design
3. Interim Advice Note IAN 111/09 – Managed Motorways Implementation Guidance Hard Shoulder Running
4. Highways England List of EN1317 Compliant Road Restraint Systems (current revision January 2016)
5. Highways Agency London to Scotland West Route Strategy Evidence Report Technical Annex April 2014
6. Highways Agency London to Scotland West Route Strategy Evidence Report April 2014
7. Highways Agency Route Strategies: Strategic Outline Business Case (SOBC) for M42 Junction 6 (2014)
8. Highways Agency Options Assessment Report (OAR) for M42 Junction 6 (2014)
9. HE551485-MOU-GEN-M42 J6-REP-Z-0001 M42 Junction 6 Improvement Transport Summary Report 22 June 2015
10. HE551485-MOU-GEN-M42 J6-REP-Z-0002 M42 Junction 6 Solutions Summary Report July 2015
11. HE551485-MOU-GEN-M42 J6-REP-Z-005 M42 Junction 6 Scheme Review Report September 2015
12. Department for Transport Early Assessment and Sifting Tool (EAST) January 2014
13. Department for Transport Reported Road Casualties on the Strategic Network 2014
14. Design Manual for Roads and Bridges TD 22/06 – Layout of Grade Separated Junctions
15. Interim Advice Note IAN 69/15 – Designing for Maintenance
16. Interim Advice Note IAN 125/15 – Environmental Assessment Update
17. Interim Advice Note IAN 153/11 – Guidance on the Environmental Assessment of Material Resources

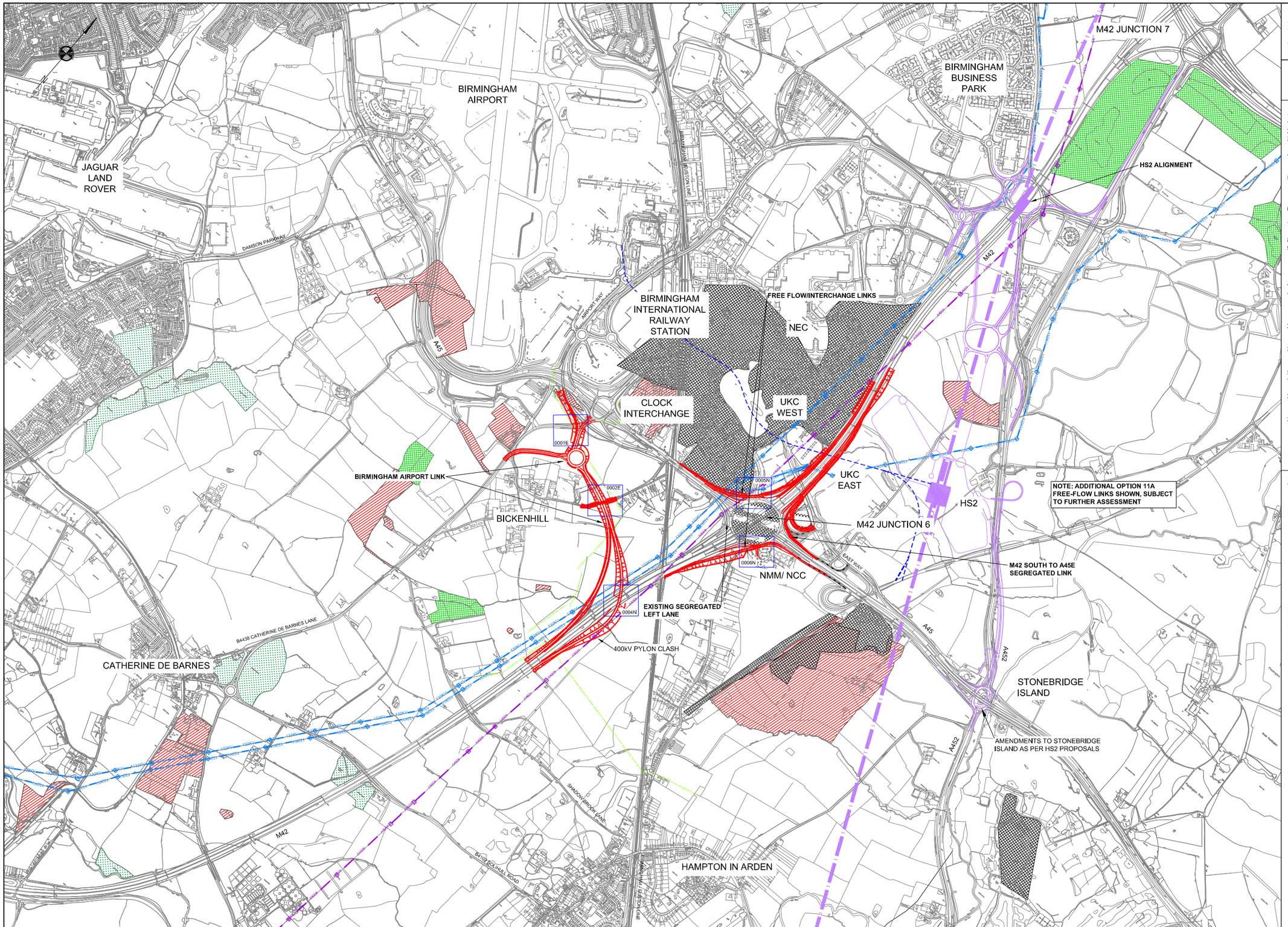
Appendix B – Glossary of Terms and Abbreviations

AADF	Annual Average Daily Flow
ALB	Abnormal Load Bays
ALL	Assessment Live Loading
ALR	All Lanes Running
AMI	Advance Motorway Indicators
ANPR	Automatic Number Plate Recognition
ASR	Alkali-Silica Reaction
AST	Appraisal Summary Tables
ATC	Automatic Traffic Counts
ATM	Active Traffic Management
BA	Birmingham Aiport
BAP	Biodiversity Action Plan
BCR	Benefit Cost Ratio
BGL	Below Ground Level
BGS	British Geological Survey
BRT	Bus Rapid Transit
CCTV	Closed-Circuit Television
CJE	Cable Joint Enclosures
CSR	Client Scheme Requirements
DCO	Development Consent Order
DfT	Department for Transport
DHS	Dynamic Hard Shoulder
DMRB	Design Manual of Roads and Bridges
DNO	Distribution Network Operator
DROBB	Double Rail Open Box Beam
DSRC	Dedicated Short Range Communications
EAV	External Aspect Verification
EDR	Emergency Diversion Routes
EI	Electricity Interface
ERA	Emergency Refuge Areas
ERT	Emergency Telephones
ESR	Environmental Study Report
FWI	Fatal and Weighted Injury
FTMS	Fixed Text Message Sign
GIS	Geographic Information System
GPRS	General Packet Radio Service
HGV	Heavy Goods Vehicles
HSI	Habitat Suitability Index
HSR	Hard Shoulder Running
HS2	High Speed Two
HAGDMS	Highway England's Geotechnical Data Management System

HERRR	Hazard Elimination and Residual Risk Register
JLR	Jaguar Land Rover
KSI	Killed or Seriously Injured
LAM	Local Area Model
LGV	Light Goods Vehicles
LRN	Local Road Network
LTE-V	Long Term Evolutions- Vehicle
LTP	Local Transport Plan
MCC	Manual Classified Counts
MCTC	Manual Classified Turning Counts
MIDAS	Motorway Incident Detection And Signalling
MRSS	Maintenance and Repair Strategy Statement
MSA	Motorway Service Area
NEC	National Exhibition Centre
NG	National Grid
NIA	Noise Important Areas
NMM	National Motorcycle Museum
NMU	Non-Motorised Users
NPS	National Policy Statement for National Networks
NRMM	Non-Road Mobile Machinery
NRTS	National Roads Telecommunications Service
NSIP	Nationally Significant Infrastructure Projects
NTEM	National Trip End Model
NTIS	National Traffic Information Service
NTOC	National Traffic Operations Centre
OAR	Options Assessment Report
OBB	Open Box Beam
OAF	Option Assessment Framework
OME	Order of Magnitude Estimate
PCF	Project Control Framework
PIC	Personal Injury Collisions
PPP	Pinch Point Programme
PSSR	Preliminary Sources Summary Report
PTS	Professional & Technical Services
PTZ	Pan/Tilt/Zoom
PVB	Present Value of Benefits
PVC	Present Value of Costs
RC	Reinforced Concrete
RCGB	Road Casualties Great Britain
RCTTM	Remote Control Temporary Traffic Management
RM	Ramp Metering
RIS	Road Investment Strategy
RIS2	Roads Investment Strategy 2

SM-HSR	Smart Motorway – Hard Shoulder Running
SMBC	Solihull Metropolitan Borough Council
SMP	Smart Motorway Programme
SRN	Strategic Road Network
SSD	Stopping Sight Distance
TAG	Transport Analysis Guidance
TAME	Traffic Appraisal Modelling & Economics
TAR	Technical Appraisal Report
TCB	Tension Corrugated Beam
TDR	Through Diverge Running
TMR	Through Merge Running
TPMS	Technology Performance Management System
TJR	Through Junction Running
TUBA	Transport Users Benefit Appraisal
UKC	UK Central
VfM	Value for Money
VMSL	Variable Mandatory Speed Limits
VRS	Vehicle Restraint Systems
WebTAG	Web Based Transport Analysis Guidance
WMRCC	West Midlands Regional Control Centre
WPD	Western Power Distribution

Appendix C – General Arrangement Drawings



NOTES

1. DO NOT SCALE FROM THIS DRAWING.
2. HS2 ALIGNMENT BASED ON AN XREF RECEIVED FROM ARUP.
3. HS2 PEOPLE MOVER BASED ON INTERPRETATION OF THE HYBRID BILL DRAWINGS.
4. NMU PROVISIONS ARE NOT SHOWN AND ANY INDICATIVE PROPOSED STRUCTURES DO NOT MAKE ALLOWANCES FOR THESE.
5. EXISTING PROW ARE NOT SHOWN. FOR DETAILS REFER TO DRAWING HE551485-MOU-ENM-M42 J6-SK-D-0001. PROPOSED INDICATIVE STRUCTURES DO NOT INCLUDE STRUCTURES FOR NMU DIVERSIONS.
6. FOR DETAILS OF ENVIRONMENTAL CONSTRAINTS REFER TO DRAWINGS HE551485-MOU-EGN-M42 J6-DR-EN-0001 AND 0002.
7. FOR DETAILS OF GEOHAZARDS REFER TO DRAWING HE551485-MOU-HGT-M42 J6-DR-GE-0001.
8. SIZES ARE INDICATIVE FOR ALL ROUNDABOUTS SHOWN.
9. THE A45 AND ASSOCIATED SLIP ROADS ARE CONSIDERED AS URBAN, THE M42 AND ASSOCIATED SLIP ROADS ARE CONSIDERED AS RURAL. THESE WILL BOTH IMPACT THE GEOMETRY OF PROPOSALS INCLUDING CROSS SECTIONS.

TRAFFIC MODELLING NOTES:

1. AN APPROVED TRAFFIC MODEL WITH OPENING AND DESIGN YEAR FLOWS IS REQUIRED, CONFIRMATION OF THE GROWTH AND DEVELOPMENTS FOR THE DESIGN YEAR 2038 TO REVIEW IMPACT ON DESIGN OPTIONS.
2. FUTURE WIDENING/FUTURE PROOFING TO BE CONFIRMED ON COMPLETION OF RESPECTIVE TRAFFIC MODELLING (FUTURE FLOWS).
3. AMENDMENTS TO A45 ON WESTSIDE OF THE M42 TO BE AGREED WITH SMBC.

STATUTORY UNDERTAKER APPARATUS NOTES:

1. NATIONAL GRID 400kV OUTAGE BOOKED BY HS2 FOR 2019. NEXT AVAILABLE OUTAGE IS 2023.
2. WESTERN POWER NEED TO DIVERT IN ADVANCE OF NATIONAL GRID, PLANNED DATE IS 2017/EARLY 2018. WORKS REQUIRE EASEMENT (UNDER OUR DCO)
3. ESSENTIAL TO AVOID IMPACT TO 400kV DUE TO COMPLICATIONS WITH M42 PROGRAMME OF WORKS.

KEY

- PROPOSED ALIGNMENT MAJOR ROADS
- CARRIAGEWAY TO BE STOPPED UP
- HS2 RAIL ALIGNMENT (INDICATIVE)
- HS2 ROAD ALIGNMENT (INDICATIVE)
- HS2 PEOPLE MOVER (INDICATIVE)
- 132kV WESTERN POWER DISTRIBUTION (132kV)
- 400kV NATIONAL GRID (400kV)
- AQUEDUCT AQUEDUCT
- LANDFILL
- MADE GROUND
- SSSI
- ANCIENT WOODLAND/COPPICE/COPSE
- 0001N STRUCTURE LOCATION

Revision	Amendment	Drawn/Designed	Checked	Approved	Date
P04	STRUCTURES REFERENCES ADDED	TT	GM	GM	NOV 16
P03	OPTION 11A NOTE ADDED	JC	GM	GM	NOV 16
P02	MINOR ROADS & ASSOCIATED TEXT REMOVED	JC	GM	GM	OCT 16

Project
WEST MIDLANDS AREA 9
M42 JUNCTION 6 IMPROVEMENTS

Drawing Title
OPTION 2P
GENERAL ARRANGEMENT DRAWING

Office
mouchel
building great relationships
KNIGHTS HOUSE, 2 PARADE SUTTON COLDFIELD, B72 1PH
Tel: 0121 355 8949
Fax: 0121 355 8901
www.mouchel.com

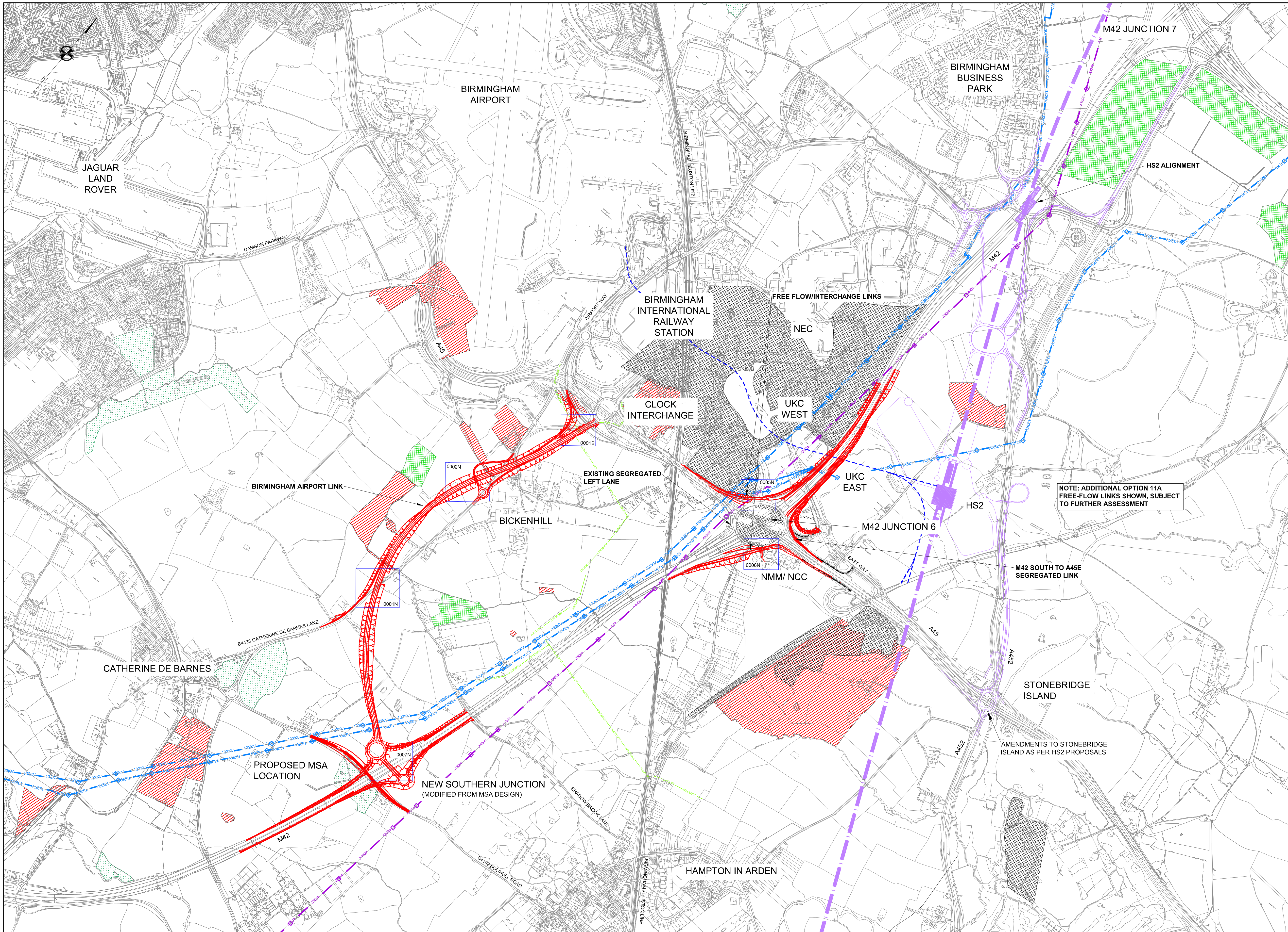
Client
Working on behalf of highways england

Scale	Designed / Drawn	Checked	Approved	Authorised
1:10000	TT	GM	RJ	
Original Size	Date	Date	Date	Date
A1	SEP 16	SEP 16	OCT 16	

Status: WORK IN PROGRESS

Drawing No				Suitability
Project	Originator	Volume		S0
HE551485 -	MOU -	GEN		
M42_J6 -	DR -	CH -	0001	Revision P04
Location	Type	Role	Number	

filepath: W:\Highways\TRANSPORT JOBS\107103\8 M42 J6 RIP Stage 1\16 Drawings\16_04 Drawings Working\Sketches\Preferred Options\Drawing for presentation 2016_10_05\HE551485A\OU\GEN\M42 J6\DR\CH\0001_P04.dwg
by: Jamie Clift
plot date: 16/01/2017 10:11:28



NOTES

1. DO NOT SCALE FROM THIS DRAWING.
2. HS2 ALIGNMENT BASED ON AN XREF RECEIVED FROM ARUP.
3. HS2 PEOPLE MOVER BASED ON INTERPRETATION OF THE HYBRID BILL DRAWINGS.
4. NMU PROVISIONS ARE NOT SHOWN AND ANY INDICATIVE PROPOSED STRUCTURES DO NOT MAKE ALLOWANCES FOR THESE.
5. EXISTING PROW ARE NOT SHOWN. FOR DETAILS REFER TO DRAWING HE551485-MOU-ENM-M42 J6-SK-D-0001. PROPOSED INDICATIVE STRUCTURES DO NOT INCLUDE STRUCTURES FOR NMU DIVERSIONS.
6. FOR DETAILS OF ENVIRONMENTAL CONSTRAINTS REFER TO DRAWINGS HE551485-MOU-EGN-M42 J6-DR-EN-0001 AND 0002.
7. FOR DETAILS OF GEOHAZARDS REFER TO DRAWING HE551485-MOU-HGT-M42 J6-DR-GE-0001.
8. SIZES ARE INDICATIVE FOR ALL ROUNDABOUTS SHOWN.
9. THE A45 AND ASSOCIATED SLIP ROADS ARE CONSIDERED AS URBAN. THE M42 AND ASSOCIATED SLIP ROADS ARE CONSIDERED AS RURAL. THESE WILL BOTH IMPACT THE GEOMETRY OF PROPOSALS INCLUDING CROSS SECTIONS.

TRAFFIC MODELLING NOTES:

1. AN APPROVED TRAFFIC MODEL WITH OPENING AND DESIGN YEAR FLOWS IS REQUIRED. CONFIRMATION OF THE GROWTH AND DEVELOPMENTS FOR THE DESIGN YEAR 2038 TO REVIEW IMPACT ON DESIGN OPTIONS.
2. FUTURE WIDENING/FUTURE PROOFING TO BE CONFIRMED ON COMPLETION OF RESPECTIVE TRAFFIC MODELLING (FUTURE FLOWS).
3. AMENDMENTS TO A45 ON WESTSIDE OF THE M42 TO BE AGREED WITH SMBC.

STATUTORY UNDERTAKER APPARATUS NOTES:

1. NATIONAL GRID 400kV OUTAGE BOOKED BY HS2 FOR 2019. NEXT AVAILABLE OUTAGE IS 2023.
2. WESTERN POWER NEED TO DIVERT IN ADVANCE OF NATIONAL GRID. PLANNED DATE IS 2017/EARLY 2018. WORKS REQUIRE EASEMENT (UNDER OUR DCO)
3. ESSENTIAL TO AVOID IMPACT TO 400kV DUE TO COMPLICATIONS WITH M42 PROGRAMME OF WORKS.

KEY

- PROPOSED ALIGNMENT MAJOR ROADS
- CARRIAGEWAY TO BE STOPPED UP
- HS2 RAIL ALIGNMENT (INDICATIVE)
- HS2 ROAD ALIGNMENT (INDICATIVE)
- HS2 PEOPLE MOVER (INDICATIVE)
- WESTERN POWER DISTRIBUTION (132kV)
- NATIONAL GRID (400kV)
- AQUEDUCT
- LANDFILL
- MADE GROUND
- SSSI
- ANCIENT WOODLAND/COPPICE/COPSE
- 0001N STRUCTURE LOCATION

Revision	Amendment	Drawn/Designed	Checked	Approved	Date
P04	STRUCTURES REFERENCES ADDED	TT	GM	GM	NOV 16
P03	OPTION 11A NOTE ADDED	JC	GM	GM	NOV 16
P02	FREE FLOW LEFTS AT JUNCTION 6 ADDED	JC	GM	GM	OCT 16

Project

WEST MIDLANDS AREA 9
M42 JUNCTION 6 IMPROVEMENTS

Drawing Title

OPTION 2R
GENERAL ARRANGEMENT
DRAWING

mouchel
building great relationships

Office

KNIGHTS HOUSE, 2 PARADE SUTTON COLDFIELD, B72 1PH
Tel: 0121 355 8949
Fax: 0121 355 8901
www.mouchel.com

Client

Working on behalf of
highways england

Scale	Designed / Drawn	Checked	Approved	Authorised
1:10000	JC	DM	RJ	
Original Size: A1	Date: OCT 16	Date: OCT 16	Date: OCT 16	Date

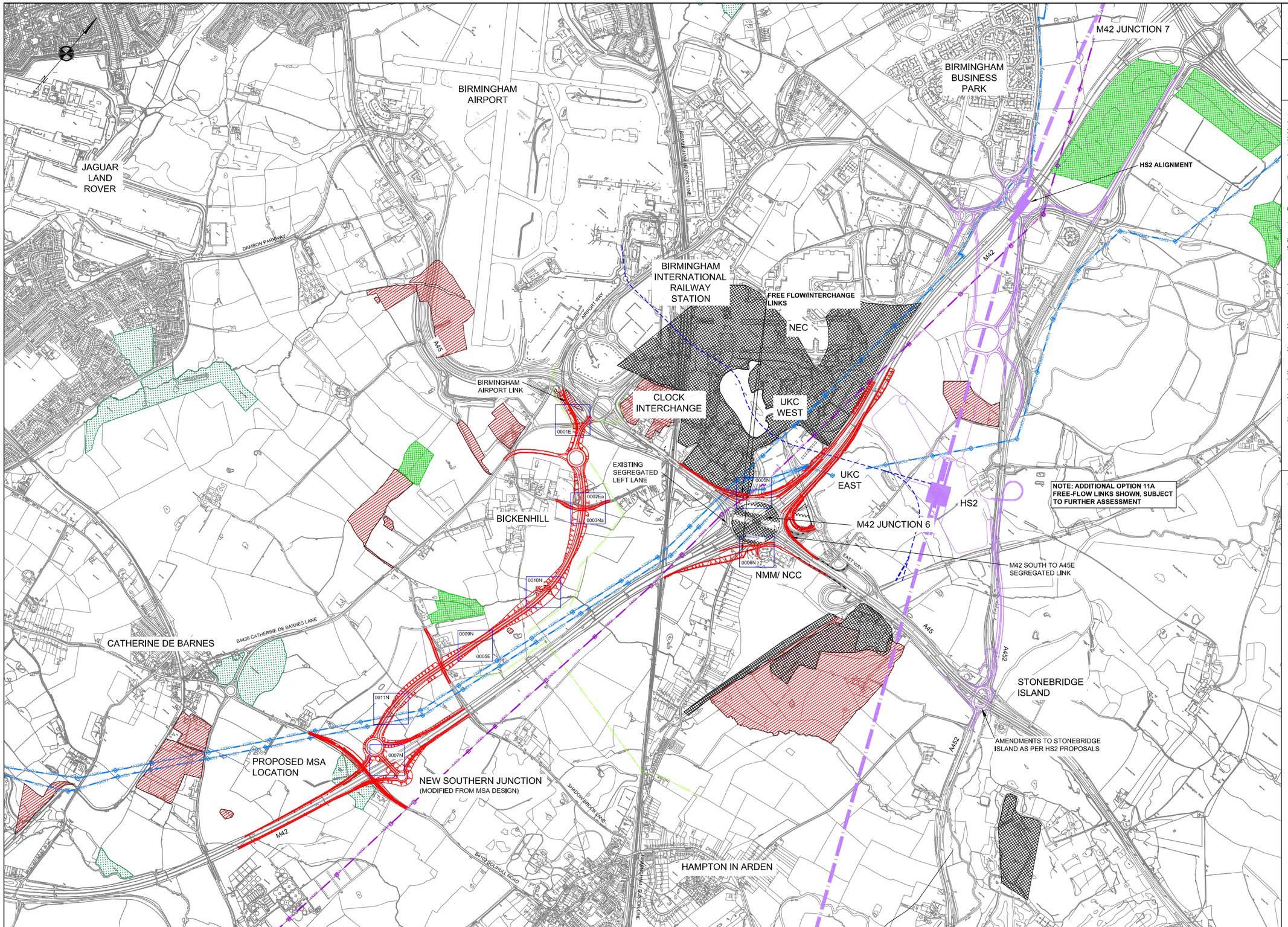
Status: WORK IN PROGRESS

Drawing No				Suitability
Project: HE551485 -	Originator: MOU -		Volume: GEN	S0
Location: M42_J6 -	Type: DR -	Role: CH -	Number: 0004	Revision: P04

filepath: W:\Highways\TRANSPORT JOBS\1071038 M42 J6 RIP Stage 1\16 Drawings\16_04 Drawings Working\Sketches\Preferred Options\Drawings for presentation 2016_10_05\HE551485-MOU-GEN-M42 J6-DR-CH-0004_RevP04.dwg

by: Jamie Clift

plot date: 16/01/2017 10:13:01



NOTES

1. DO NOT SCALE FROM THIS DRAWING.
2. HS2 ALIGNMENT BASED ON AN XREF RECEIVED FROM ARUP.
3. HS2 PEOPLE MOVER BASED ON INTERPRETATION OF THE HYBRID BILL DRAWINGS.
4. NMU PROVISIONS ARE NOT SHOWN AND ANY INDICATIVE PROPOSED STRUCTURES DO NOT MAKE ALLOWANCES FOR THESE.
5. EXISTING PROW ARE NOT SHOWN. FOR DETAILS REFER TO DRAWING HE551485-MOU-ENM-M42 J6-SK-D-0001. PROPOSED INDICATIVE STRUCTURES DO NOT INCLUDE STRUCTURES FOR NMU DIVERSIONS.
6. FOR DETAILS OF ENVIRONMENTAL CONSTRAINTS REFER TO DRAWINGS HE551485-MOU-EGN-M42 J6-DR-EN-0001 AND 0002.
7. FOR DETAILS OF GEOHAZARDS REFER TO DRAWING HE551485-MOU-HGT-M42 J6-DR-GE-0001.
8. SIZES ARE INDICATIVE FOR ALL ROUNDABOUTS SHOWN.
9. THE A45 AND ASSOCIATED SLIP ROADS ARE CONSIDERED AS URBAN, THE M42 AND ASSOCIATED SLIP ROADS ARE CONSIDERED AS RURAL. THESE WILL BOTH IMPACT THE GEOMETRY OF PROPOSALS INCLUDING CROSS SECTIONS.

TRAFFIC MODELLING NOTES:

1. AN APPROVED TRAFFIC MODEL WITH OPENING AND DESIGN YEAR FLOWS IS REQUIRED, CONFIRMATION OF THE GROWTH AND DEVELOPMENTS FOR THE DESIGN YEAR 2038 TO REVIEW IMPACT ON DESIGN OPTIONS.
2. FUTURE WIDENING/FUTURE PROOFING TO BE CONFIRMED ON COMPLETION OF RESPECTIVE TRAFFIC MODELLING (FUTURE FLOWS).
3. AMENDMENTS TO A45 ON WESTSIDE OF THE M42 TO BE AGREED WITH SMBC.

STATUTORY UNDERTAKER APPARATUS NOTES:

1. NATIONAL GRID 400kV OUTAGE BOOKED BY HS2 FOR 2019. NEXT AVAILABLE OUTAGE IS 2023.
2. WESTERN POWER NEED TO DIVERT IN ADVANCE OF NATIONAL GRID, PLANNED DATE IS 2017/EARLY 2018. WORKS REQUIRE EASEMENT (UNDER OUR DCO)
3. ESSENTIAL TO AVOID IMPACT TO 400kV DUE TO COMPLICATIONS WITH M42 PROGRAMME OF WORKS.

KEY

- PROPOSED ALIGNMENT MAJOR ROADS
- CARRIAGEWAY TO BE STOPPED UP
- HS2 RAIL ALIGNMENT (INDICATIVE)
- HS2 ROAD ALIGNMENT (INDICATIVE)
- HS2 PEOPLE MOVER (INDICATIVE)
- 132KV WESTERN POWER DISTRIBUTION (132kV)
- 400kV NATIONAL GRID (400kV)
- AQUEDUCT AQUEDUCT
- LANDFILL
- MADE GROUND
- SSSI
- ANCIENT WOODLAND/COPPICE/COPSE
- 0001N STRUCTURE LOCATION

Revision	Amendment	Drawn/Designed	Checked	Approved	Date
P04	STRUCTURES REFERENCES ADDED	TT	GM	GM	NOV 16
P03	OPTION 11A NOTE ADDED	JC	GM	GM	NOV 16
P02	FREE FLOW LEFTS AT JUNCTION 6 ADDED	JC	GM	GM	OCT 16

Project
WEST MIDLANDS AREA 9
M42 JUNCTION 6 IMPROVEMENTS

Drawing Title
OPTION 2R EAST GENERAL ARRANGEMENT DRAWING

Office
mouchel
building great relationships
KNIGHTS HOUSE, 2 PARADE SUTTON COLDFIELD, B72 1PH
Tel: 0121 355 8949
Fax: 0121 355 8901
www.mouchel.com

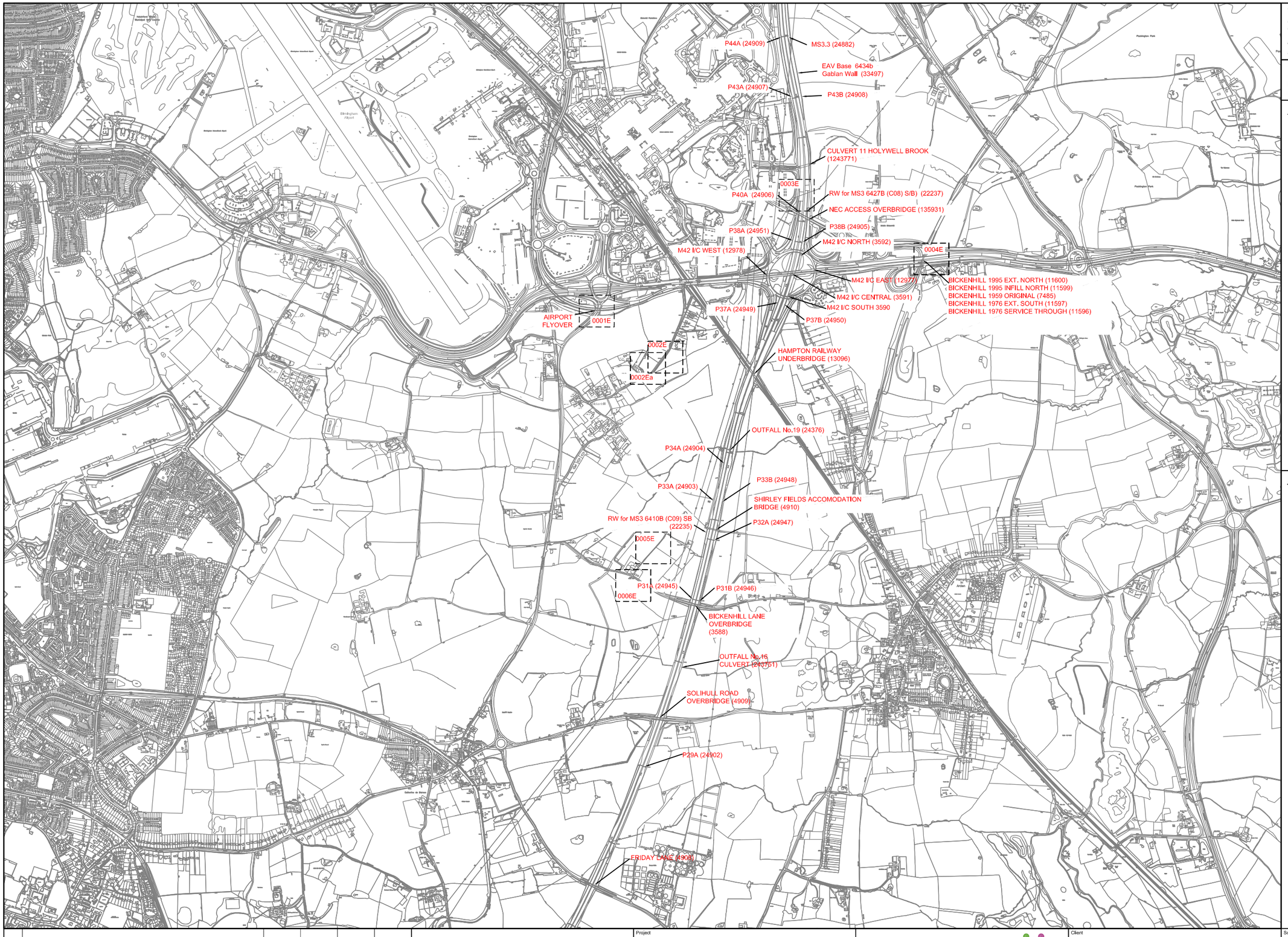
Client
Working on behalf of highways england

Scale	Designed / Drawn	Checked	Approved	Authorised
1:10000	TT	GM	GM	
Original Size	**Date**	**Date**	**Date**	**Date**
A1	NOV 16	NOV 16	NOV 16	

Status: WORK IN PROGRESS

Drawing No Project	Originator	Volume	Suitability
HE551485 -	MOU -	GEN	S0
M42_J6 -	DR -	CH - 0008	Revision P04
Location	Type	Role	Number	

filepath: W:\Highways\TRANSPORT JOBS\107103B M42 J6 RIP Stage 1\16 Drawings\16_04 Drawings Working\Sketches\Preferred Options\Drawing_ReviP04.dwg
by: Jamie Clift
plot date: 16/01/2017 10:13:45



NOTES

1. DO NOT SCALE FROM THIS DRAWING.
2. LOCATION OF STRUCTURES IS ESTIMATED BASED ON THE MILEAGE OF EACH STRUCTURE FROM SMIS DATABASE.
3. IT SHOULD BE NOTED THAT THE REPORTED STRUCTURES SHOWN ARE TAKEN FROM THE HE SMIS DATABASE.
4. STRUCTURES HELD BY LOCAL AUTHORITIES ARE NOT REPORTED ON THIS DRAWING, THIS STRUCTURE INFORMATION SHOULD BE OBTAINED BY DIRECT CONTACT WITH THE LOCAL AUTHORITY.

NOTE:

THE FOLLOWING EXISTING RETAINING STRUCTURES HAVE A LENGTH GREATER THAN 10M OR HEIGHT GREATER THAN 2M :
P29A, P33A, P34A, P38B, P43A, P43B, MS3 6410B(C09) SB, MS3 6427B (C08) S/B.

KEY

- - - - - - ZONE OF STRUCTURE TO BE CONFIRMED

Revision	Amendment	Drawn/Designed	Checked	Approved	Date

Project
WEST MIDLANDS AREA 9
M42 JUNCTION 6 IMPROVEMENTS

Drawing Title
EXISTING STRUCTURES LOCATION PLAN

mouchel
building great relationships
Office
KNIGHTS HOUSE, 2 PARADE SUTTON COLDFIELD, B72 1PH
Tel: 0121 355 8949
Fax: 0121 355 8901
www.mouchel.com

Client
Working on behalf of highways england

Scale	Designed / Drawn	Checked	Approved	Authorised
1:10000	MS	SQ	MN	MN
Original Size	Date	Date	Date	Date
A1	31/10/16	31/10/16	31/10/16	31/10/16

Status: WORK IN PROGRESS

Drawing No

Project	Originator	Volume	Suitability
HE551485 -	MOU -	GEN	S0
M42_J6 -	SK -	CB - 0001	Revision P01
Location	Type	Role	Number

plot date: 16/01/2017 10:14:47
by: Jamie Clift
filepath: W:\Highways\TRANSPORT_JOBS\10710038 M42 J6 R&P Stage 1\16 Drawings\16_04 Drawings Working\Sketches\STRUCTURES\HE551485\MOU\SGN\M42_J6-SK-CB-0001-P01.dwg

Appendix D – Existing Utilities Drawing

NOTES

1. STATUTORY UNDERTAKERS APPARATUS SHOWN ARE INDICATIVE AND BASED ON INFORMATION RECEIVED FOLLOWING C2 REQUESTS.
2. FOR ENVIRONMENTAL CONSTRAINT PLAN REFER TO DRAWING HE551485-MOU-GEN-M42 J6-DR-EN-0001 TO 0002.
3. FOR GEOHAZARD PLAN REFER TO DRAWING HE551485-MOU-HGT-M42 J6-DR-GE-0001.

KEY

- ESSO PETROLEUM MAIN
- BT(UG) — BT OPENREACH (UNDERGROUND)
- BT(OH) — BT OPENREACH (OVERHEAD)
- 132kV — WESTERN POWER DISTRIBUTION (132kV)
- 33kV — WESTERN POWER DISTRIBUTION (33kV)
- 11kV — WESTERN POWER DISTRIBUTION (11kV)
- LV(OH) — WESTERN POWER DISTRIBUTION (LV) OH
- LV(UG) — WESTERN POWER DISTRIBUTION (LV) UG
- G — GENESYS
- GAS(LHP) — NATIONAL GRID GAS (LHP)
- GAS(LP) — NATIONAL GRID GAS (LP)
- GAS(MP) — NATIONAL GRID GAS (MP)
- 400kV — NATIONAL GRID POWER (OH) 400kV
- ZAYO — ZAYO GROUP
- VM — VIRGIN
- VODA — VODAFONE
- WATER — SEVERN TRENT WATER PIPE
- FS — SEVERN TRENT FOUL SEWER
- FS(P) — SEVERN TRENT PRESSURISED FOUL SEWER
- Xs — SEVERN TRENT ABANDONED SEWER
- X — SEVERN TRENT ABANDONED PIPE
- AQUEDUCT — AQUEDUCT
- WESTERN POWER DISTRIBUTION TBC
- WESTERN POWER DISTRIBUTION TBC
- WESTERN POWER DISTRIBUTION PYLON
- NATIONAL GRID PYLON

SCALE 1:2500

Iss:	Amendment	By	Chkd	Appd	Date
0.2	General updates to plan & Inset added	IS	GM	GM	MAY 16

Client: Working on behalf of highways england

Issued only for purpose Indicated

INFORMATION

Project: REGIONAL INVESTMENT PROGRAMME
WEST MIDLANDS AREA 9
M42 JUNCTION 6 IMPROVEMENTS

Title: EXISTING STATUTORY UNDERTAKER'S APPARATUS PLAN

Overall Scheme Plan (NTS)

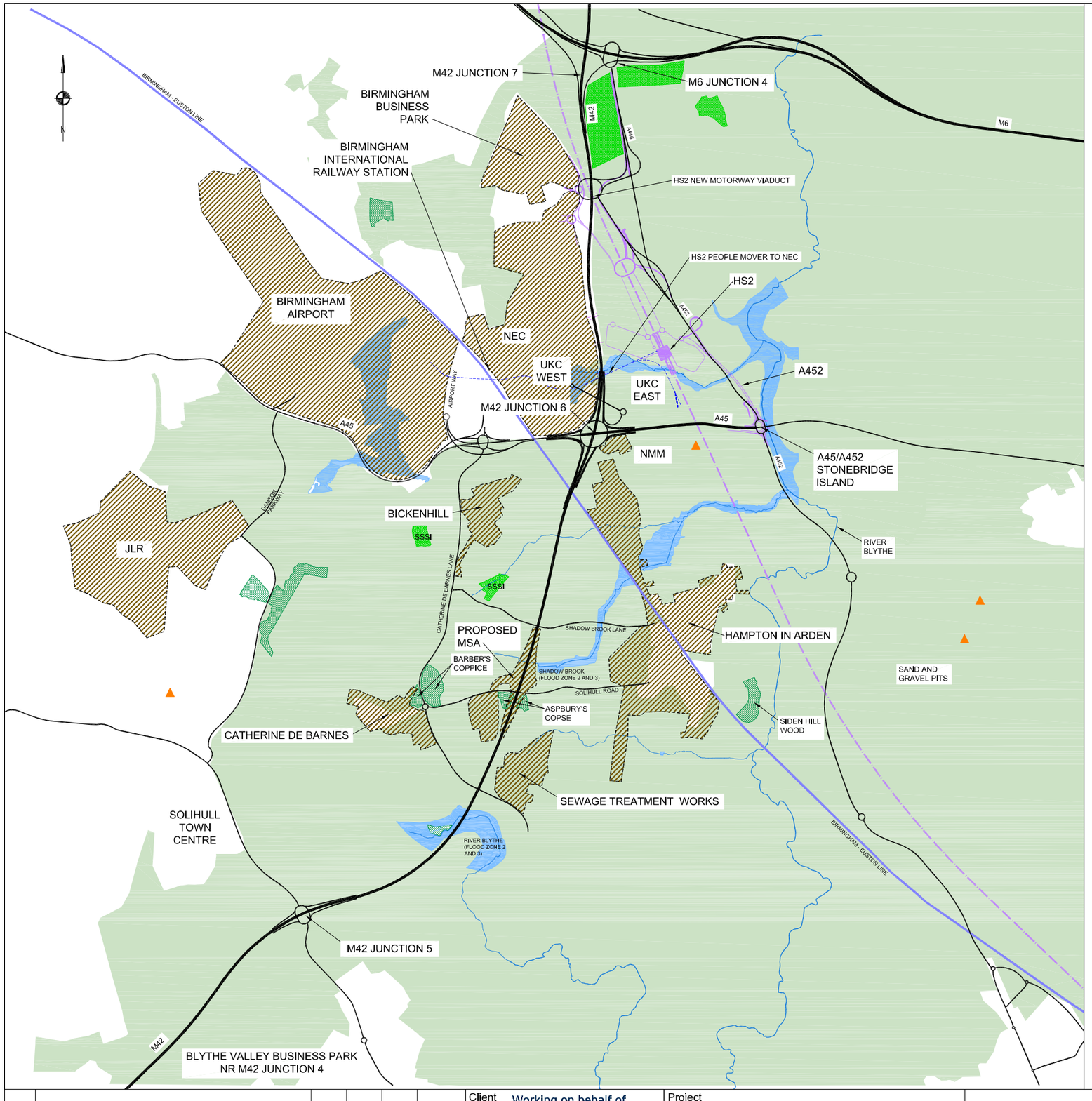
Designed	Date	Drawn	Date	Checked	Date	Approved	Date
DM	JAN 16	DM	JAN 16	GMN	JAN 16	OG	JAN 16

Scale	Project Ref No.
1:10000	1071038
Original Size	**Revision/ Issue Number**
A1	0.2

Drawing Number: HE551485 – MOU – VUT – M42 J6 – SK – D – 0001
(HE PIN | Originator | Volume | Location | Type | Role | Number)

mouchel
building great relationships
KNIGHTS HOUSE, 2 PARADE
SUTTON COLDFIELD, B72 1PH
Tel: 0121 355 8949
Fax: 0121 355 8901

Appendix E – Constraint Plans



STAKEHOLDER NOTES AND KEY FIGURES

BIRMINGHAM BUSINESS PARK
- 9 HECTARE SITE SOUTH WEST OF THE BUSINESS PARK ALLOCATED FOR DEVELOPMENT - SOURCE SOLIHULL LOCAL PLAN (DEC 2013).

NATIONAL EXHIBITION CENTRE (NEC)
- IT HAS BEEN ESTIMATED THAT THE RESORTS WORLD SCHEME WILL GENERATE 1,710 NET ADDITIONAL CONSTRUCTION JOBS DURING ITS DEVELOPMENT PHASE AND 1,100 OPERATIONAL JOBS AND THAT IT WILL GENERATE AN ADDITIONAL £25.5 MILLION OF ECONOMIC OUTPUT PER ANNUM. THE PLANNED OPENING IS 2015 - SOURCE SMBC M42 ECONOMIC GATEWAY MASTERPLAN REPORT (JUNE 2013).
- NOW RESORTS WORLD IS OPEN CAN THESE FIGURES BE REVIEWED AGAINST CURRENT VALUES.

BIRMINGHAM INTERNATIONAL AIRPORT
- GROWTH (11.5m PASSENGERS/YEAR IN 2010 TO 27.2m PASSENGERS/YEAR IN 2030 - SOURCE SOLIHULL LOCAL PLAN (DEC 2013).
- 19,340 NEW JOBS BY 2021 - SOURCE LONDON TO SCOTLAND WEST ROUTE STRATEGY EVIDENCE REPORT - APRIL 2014.
- 20,000 NEW JOBS PLUS OPPORTUNITY FOR A FURTHER 2770 JOBS SUBJECT TO CAPITAL INVESTMENT PROGRAMMES, AS WELL AS FURTHER JOB CREATION IF NEW AND EXISTING AIRLINES ARE ENGAGED TO INCLUDE FURTHER ROUTES - SOURCE SMBC M42 ECONOMIC GATEWAY MASTERPLAN REPORT (JUNE 2013).

HS2
- 47,000m^2 OF OFFICE SPACE (3,300 JOBS), 600 HOTEL BEDS (300 JOBS) 1,000m^2 OF RETAIL (50 JOBS) AND 10,000m^2 OF LEISURE SPACE (EQUIVALENT TO 150 JOBS). THIS EQUATES TO AN OVERALL NET IMPACT OF 3,800 ADDITIONAL JOBS - SOURCE SMBC M42 ECONOMIC GATEWAY MASTERPLAN REPORT (JUNE 2013).

UK CENTRAL (UKC)
- 60,000 NEW JOBS BY 2035 - SOURCE LONDON TO SCOTLAND WEST ROUTE STRATEGY EVIDENCE REPORT (APRIL 2014).

JAGUAR LAND ROVER (JLR)
- LODE LANE PLANT CURRENTLY PROVIDES 5,000 JOBS EXPECTED TO INCREASE WORKFORCE BY 25% - SOURCE SOLIHULL LOCAL PLAN (DEC 2013).

SOLIHULL TOWN CENTRE
- ABOUT 34,000m^2 OF ADDITIONAL COMPARISON RETAIL FLOORSPACE BY 2021; A FURTHER 23,000m^2 DURING 2021 TO 2026; AND AN ADDITIONAL 2,800m^2 OF CONVENIENCE RETAIL FLOORSPACE TO 2026, AS WELL AS UP TO 35,000m^2 OF NEW OFFICE FLOORSPACE.
- NOTE - SHIRLEY TOWN CENTRE AND CHELMSLEY WOOD TOWN CENTRE ARE ALSO PLANNED FOR DEVELOPMENT - SOURCE SOLIHULL LOCAL PLAN (DEC 2013).

BLYTHE VALLEY BUSINESS PARK
- CIRCA 600 HOMES TO BE CONSTRUCTED AND 1.75 MILLION SQ.FT. OF DEVELOPMENT WITHIN THE BUSINESS PARK - SOURCE SOLIHULL LOCAL PLAN (DEC 2013).

HOUSING SITES - SOURCE SOLIHULL LOCAL PLAN (DECEMBER 2013)
- 24 HOUSING SITES HAVE BEEN IDENTIFIED WITHIN THE SMB BOUNDARY, THIS EQUATES TO APPROXIMATELY 3960 NEW HOMES.

BUSINESS SITES - SOURCE SOLIHULL LOCAL PLAN (DECEMBER 2013)
- 41.5 HA. OF ALLOCATED BUSINESS SITES OF WHICH 27.5 HA. IS READILY AVAILABLE.
- LIST OF SITES:
  - TRW STRATFORD ROAD, SHIRLEY
  - SOLIHULL BUSINESS PARK, HIGHLANDS ROAD, MONKSPATH
  - FORE, STRATFORD ROAD, ADJ TO M42
  - CHEP/HIGGINSON, BICKENHILL LANE, BICKENHILL
  - LAND NORTH OF CLOCK INTERCHANGE COVENTRY ROAD
  - LAND ADJACENT TO THE BIRMINGHAM BUSINESS PARK (AS NOTED ON THE PLAN)

OTHER HEADLINE FIGURES
- LONDON TO SCOTLAND WEST ROUTE STRATEGY EVIDENCE REPORT (APRIL 2014)
- FUTURE CONSIDERATIONS OF 55000 NEW HOMES AND 155000 NEW JOBS IN THE GREATER BIRMINGHAM AND SOLIHULL AREA.
- BIRMINGHAM CITY ENTERPRISE ZONE (BIRMINGHAM BOX) - 40000 JOBS BY 2031.
- SMBC M42 ECONOMIC GATEWAY MASTERPLAN REPORT (JUNE 2013)
  - SOME 80% OF ALL OF THE NEW JOBS ASSOCIATED WITH THE MASTERPLAN ARE EXPECTED TO BE CREATED AT THE HUB AND THIS WILL HAVE A SIGNIFICANT EFFECT ON THE HIGHWAY NETWORK, PARTICULARLY AT M42 JUNCTION 6. THIS JUNCTION CURRENTLY CARRIES SOME 5,900 VEHICLES PER HOUR IN PEAK PERIODS AND OF THESE:
    - 15%-20% OF TRIPS ARE ASSOCIATED WITH BIRMINGHAM AIRPORT;
    - 10%-15% OF TRIPS ARE ASSOCIATED WITH THE NEC;
    - 30% OF TRIPS ARE MOVING BETWEEN THE M42 AND A45 COVENTRY ROAD TOWARD BIRMINGHAM; AND 35% OF TRIPS ARE MOVING BETWEEN M42 AND A45 COVENTRY ROAD TOWARDS COVENTRY.

NOTES

1. DO NOT SCALE FROM THIS DRAWING.
2. STATUTORY UNDERTAKERS APPARATUS SHOWN ARE INDICATIVE AND BASED ON INFORMATION RECEIVED FOLLOWING C2 ENQUIRIES.
3. UKC STRUCTURE LOCATIONS BASED ON INFORMATION RECEIVED FROM HIGHWAYS ENGLAND.
4. HS2 ALIGNMENT BASED ON AN XREF RECEIVED FROM ARUP.
5. HS2 PEOPLE MOVER BASED ON INTERPRETATION OF THE HYBRID BILL DRAWINGS.
6. STRATEGIC WASTE MANAGEMENT SITE LOCATIONS ARE BASED ON SOLIHULL LOCAL PLAN PROPOSALS MAP CREATED NOVEMBER 2013.
7. STAKEHOLDER BOUNDARIES SHOWN ARE INDICATIVE AND NOT ALL ARE SHOWN FOR CLARITY.
8. FOR A DETAILED ENVIRONMENTAL CONSTRAINTS PLAN REFER TO DRAWING HE551485-MOU-3000-M42 J6-DR-EN-001 TO 002.
9. FOR A DETAILED GEOTECHNICAL HAZARDS PLAN REFER TO DRAWING HE551485-MOU-0600-M42 J6-SK-GE-001.

KEY

- HIGHWAYS ENGLAND NETWORK
- LOCAL ROADS
- STAKEHOLDERS - COMMUNITIES & BUSINESSES
- HS2 RAIL ALIGNMENT (INDICATIVE)
- HS2 ROAD ALIGNMENT (INDICATIVE)
- HS2 PEOPLE MOVER (INDICATIVE)
- BIRMINGHAM - EUSTON LINE
- RIVER/STREAM/BROOK
- PROPOSED UKC STRUCTURES
- SSSI
- ANCIENT WOODLAND/COPPICE/COPSE
- STRATEGIC WASTE MANAGEMENT SITE
- GREEN BELT
- FLOOD ZONE

Iss:	Amendment	By	Chkd	Appd	Date
0.5	UPDATED RAILWAY TEXT & M6 LINETYPE	JC	GM	OG	MAY 16
0.4	OS MAP REMOVED & GREEN BELT/NOTES UPDATED	IS	GM	OG	APR 16
0.3	REF NO REV, GREEN BELT & FLOOD ZONES ADDED	DM	OG	RJ	09/12/15
0.2	SCALE, CONTENT AND DISPLAY AMENDED	DM	OG	RJ	13/11/15

Client: Working on behalf of highways england

Issued only for purpose Indicated: INFORMATION

Project: REGIONAL INVESTMENT PROGRAMME
WEST MIDLANDS AREA 9
M42 JUNCTION 6 IMPROVEMENTS

Title: STAKEHOLDER PLAN
KEY AREAS/DEVELOPMENTS

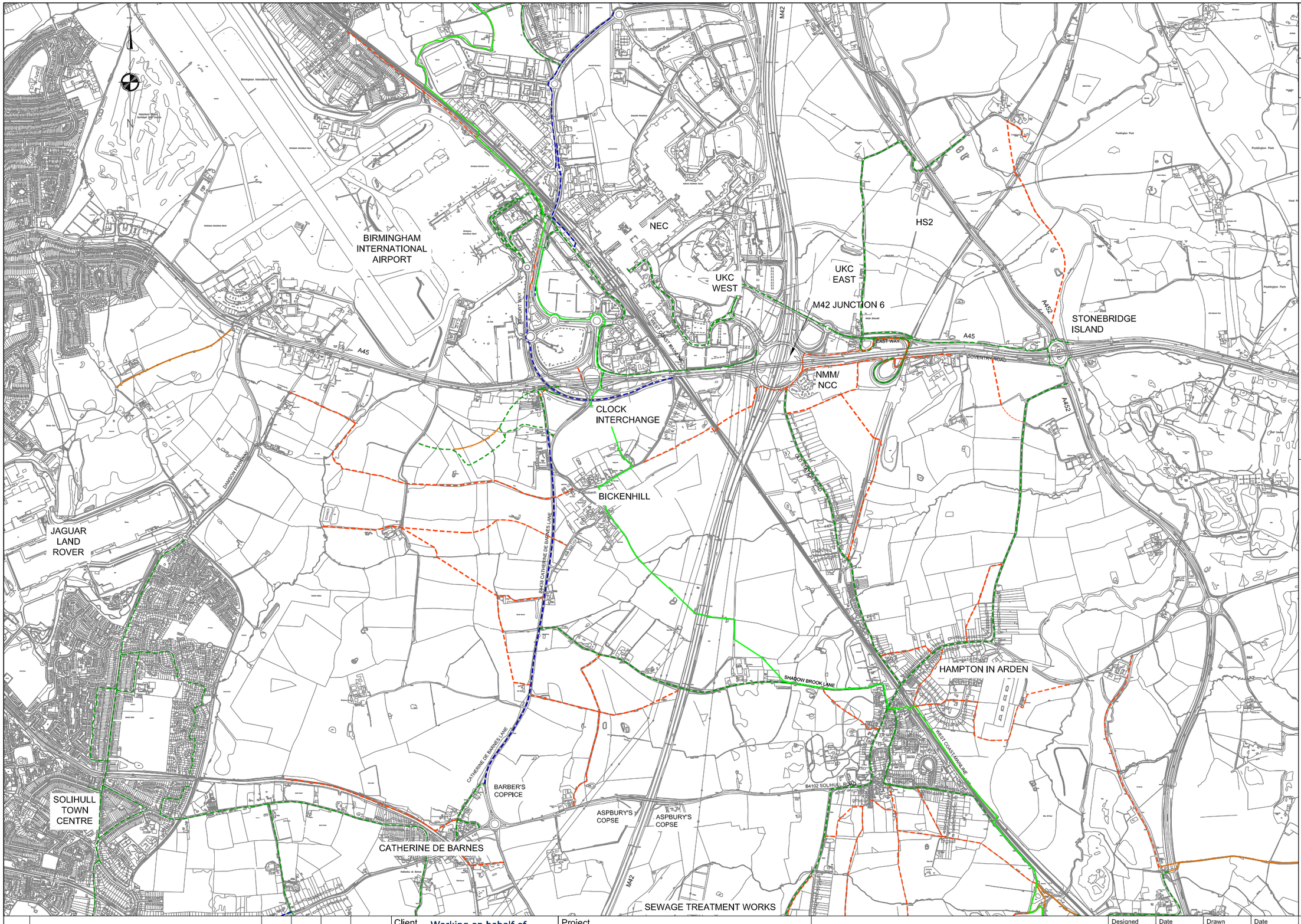
Overall Scheme Plan (NTS)

Designed	Date	Drawn	Date	Checked	Date	Approved	Date
DM	NOV 15	DM	NOV 15	OG	NOV 15	OG	NOV 15

Scale: 1:20000
Project Ref No.: 1071038
Original Size: A1
Revision/ Issue Number: 0.5

Drawing Number: HE551485 – MOU – GEN – M42 J6 – SK – D – 0100
(HE PIN | Originator | Volume | Location | Type | Role | Number)

mouchel
building great relationships
KNIGHTS HOUSE, 2 PARADE
SUTTON COLDFIELD, B72 1PH
Tel: 0121 355 8949
Fax: 0121 355 8901



NOTES

1. DO NOT SCALE FROM THIS DRAWING.
2. PUBLIC RIGHTS OF WAY SHOWN ARE BASED ON ORDNANCE SURVEY MAPPING AND SOLIHULL CYCLING AND WALKING MAP (2014).

KEY

- EXISTING FOOTPATHS
- EXISTING ADVISORY CYCLE ROUTES
- EXISTING SHARED FOOTPATH/CYCLEWAY
- EXISTING BRIDLEWAY
- GREEN MAN TRAIL

Iss:	Amendment	By	Chkd	Appd	Date

Client: Working on behalf of highways england

Issued only for purpose Indicated

INFORMATION

Project: REGIONAL INVESTMENT PROGRAMME
WEST MIDLANDS AREA 9
M42 JUNCTION 6 IMPROVEMENTS

Title: NON-MOTORISED USERS PLAN
PCF STAGE 1
OPTIONEERING

Overall Scheme Plan (NTS)

Designed	Date	Drawn	Date
DM	JAN 16	DM	JAN 16

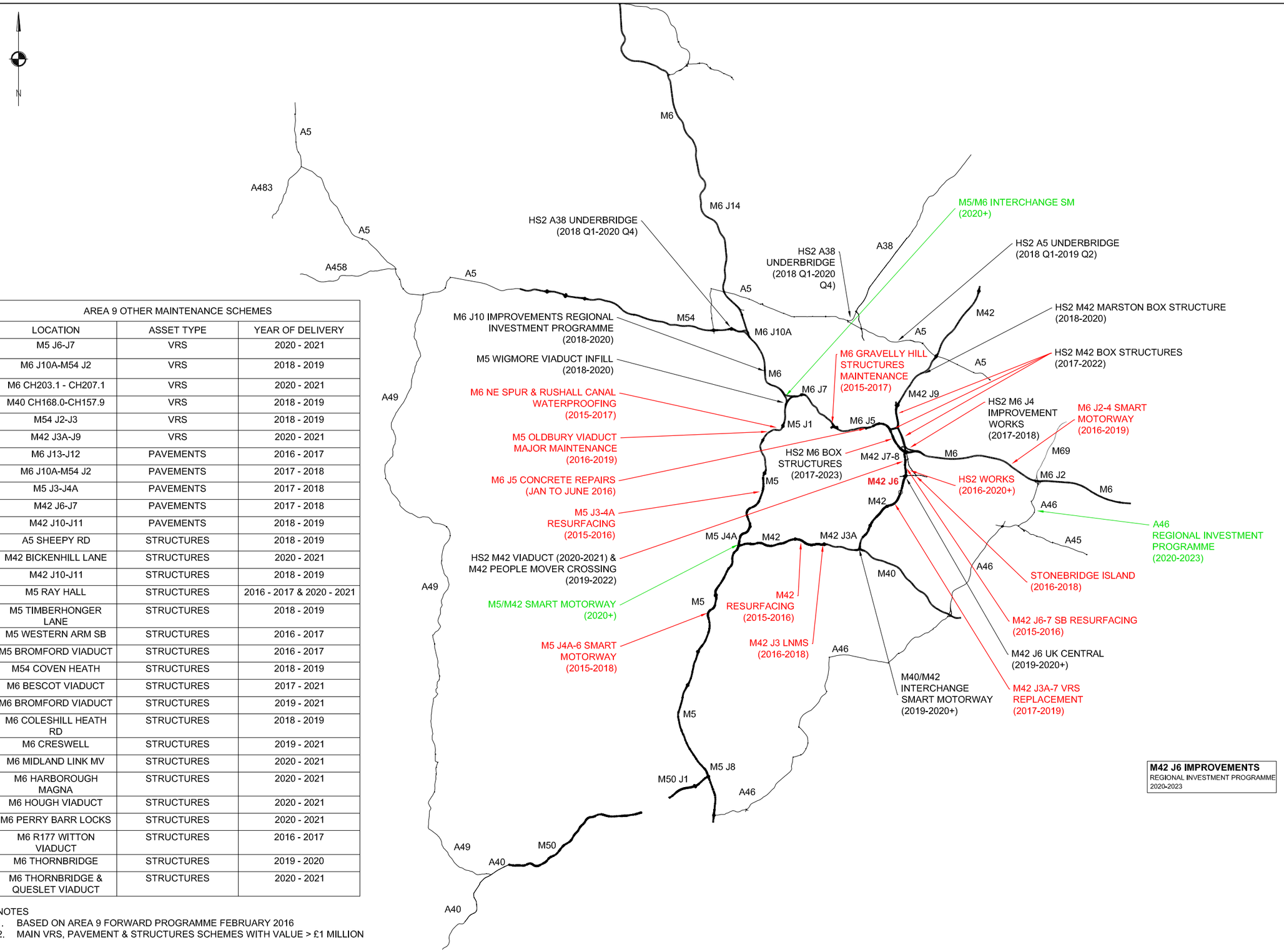
Checked	Date	Approved	Date
OG	JAN 16	RJ	JAN 16

Scale	Project Ref No.
1:10000	1071038
Original Size	**Revision/ Issue Number**
A1	0.1

mouchel
building great relationships
KNIGHTS HOUSE, 2 PARADE
SUTTON COLDFIELD, B72 1PH
Tel: 0121 355 8949
Fax: 0121 355 8901

Drawing Number

HE PIN	Originator	Volume	Location
HE551485	MOU	ENM	M42 J6
	SK	D	0001
	Type	Role	Number



AREA 9 OTHER MAINTENANCE SCHEMES		
LOCATION	ASSET TYPE	YEAR OF DELIVERY
M5 J6-J7	VRS	2020 - 2021
M6 J10A-M54 J2	VRS	2018 - 2019
M6 CH203.1 - CH207.1	VRS	2020 - 2021
M40 CH168.0-CH157.9	VRS	2018 - 2019
M54 J2-J3	VRS	2018 - 2019
M42 J3A-J9	VRS	2020 - 2021
M6 J13-J12	PAVEMENTS	2016 - 2017
M6 J10A-M54 J2	PAVEMENTS	2017 - 2018
M5 J3-J4A	PAVEMENTS	2017 - 2018
M42 J6-J7	PAVEMENTS	2017 - 2018
M42 J10-J11	PAVEMENTS	2018 - 2019
A5 SHEEPY RD	STRUCTURES	2018 - 2019
M42 BICKENHILL LANE	STRUCTURES	2020 - 2021
M42 J10-J11	STRUCTURES	2018 - 2019
M5 RAY HALL	STRUCTURES	2016 - 2017 & 2020 - 2021
M5 TIMBERHONGER LANE	STRUCTURES	2018 - 2019
M5 WESTERN ARM SB	STRUCTURES	2016 - 2017
M5 BROMFORD VIADUCT	STRUCTURES	2016 - 2017
M54 COVEN HEATH	STRUCTURES	2018 - 2019
M6 BESCOT VIADUCT	STRUCTURES	2017 - 2021
M6 BROMFORD VIADUCT	STRUCTURES	2019 - 2021
M6 COLESHILL HEATH RD	STRUCTURES	2018 - 2019
M6 CRESWELL	STRUCTURES	2019 - 2021
M6 MIDLAND LINK MV	STRUCTURES	2020 - 2021
M6 HARBOROUGH MAGNA	STRUCTURES	2020 - 2021
M6 HOUGH VIADUCT	STRUCTURES	2020 - 2021
M6 PERRY BARR LOCKS	STRUCTURES	2020 - 2021
M6 R177 WITTON VIADUCT	STRUCTURES	2016 - 2017
M6 THORNBRIDGE	STRUCTURES	2019 - 2020
M6 THORNBRIDGE & QUESLET VIADUCT	STRUCTURES	2020 - 2021

NOTES
1. BASED ON AREA 9 FORWARD PROGRAMME FEBRUARY 2016
2. MAIN VRS, PAVEMENT & STRUCTURES SCHEMES WITH VALUE > £1 MILLION

NOTES

1. DO NOT SCALE FROM THIS DRAWING.
2. ROADWORKS INFORMATION BASED ON INFORMATION RECEIVED DURING PCF STAGE 0 DEVELOPMENT, TO BE UPDATED DURING EACH PCF STAGE AND AS INFORMATION BECOMES AVAILABLE.
3. DATES SHOWN ARE START OF WORKS ON SITE AND SUBJECT TO CHANGE.

KEY

- CONSTRUCTION START DATE 2016 - 2017
- CONSTRUCTION START DATE 2018 - 2020
- CONSTRUCTION START DATE 2020+

Revision	Amendment	Drawn/Designed	Checked	Approved	Date
P02	DRAWING FRAME UPDATED & LATEST ROADWORKS ADDED	JC	GM	RJ	OCT 16

Project: **WEST MIDLANDS AREA 9**
M42 JUNCTION 6 IMPROVEMENTS

Drawing Title: **AREA 9**
ROADWORKS PLAN

mouchel
building great relationships
Office
KNIGHTS HOUSE, 2 PARADE SUTTON COLDFIELD, B72 1PH
Tel: 0121 355 8949
Fax: 0121 355 8901
www.mouchel.com

Client: Working on behalf of highways england

Scale	Designed / Drawn	Checked	Approved	Authorised
NTS	ZS	DM	OG/GMN	
Original Size	Date	Date	Date	Date
A1	NOV 15	NOV 15	NOV 15	

Status: WORK IN PROGRESS

Drawing No				Suitability
Project	Originator		Volume	S0
HE551485 -	MOU	-	HGN	Revision
AREA 9 -	SK	- D -	0001	P02.01
Location	Type	Role	Number	

filepath: W:\Highways\TRANSPORT JOBS\107\1038 M42 J6 RIP Stage 1\16 Drawings\16_04 Drawings Working\Sketches\HE551485AOU4HGNAREA 9-SKD-0001.dwg
plot date: 15/12/2016 09:56:00
by: Jamie Clift

NOTES

1. INFORMATION SHOWING THE LOCATION OF THE FEATURES IN GREATER DETAIL AND FURTHER INFORMATION ON THE FEATURES CAN BE FOUND IN THE ARUP 2002 PSSR (HA GDMS NO.18059)
2. GEOHAZRAD FOOTPRINT TO BE EXTENDED AS REQUIRED.

KEY

GEOLOGY

- FLUVIOGLACIAL SAND AND GRAVEL
- MADE GROUND
- ALLUVIUM
- RIVER TERRACE
- DIP-SLIP FAULT (DISPLACEMENT UNKNOWN)

HE EARTHWORKS

- EW-32 EARTHWORK REFERENCE: REFER TO SUMMARY TABLE FOR DETAILS
- EARTHWORK (CUTTING)
- EARTHWORK (EMBANKMENT)
- DEFECT IN EARTHWORK

HAZARDS

- LANDFILL
- SHADOW BROOK
- OTHER HAZARD
- 65 HAZARD REFERENCE: REFER TO SUMMARY TABLE FOR DETAILS

TRANSPORT INFRASTRUCTURE

- HS2 ALIGNMENT
- EXISTING HIGHWAY TO BE IMPROVED
- SIDE ROAD, LOCAL ROAD
- PROPOSED LINKS/ROAD
- PROPOSED STRUCTURE
- INDICATIVE EMBANKMENTS

Iss:	Amendment	By	Chkd	Appd	Date
0.2	Revised scale, general drawing update.	BAA	MH	BS	05/16

Client: Working on behalf of highways england

Issued only for purpose Indicated: INFORMATION

Project: REGIONAL INVESTMENT PROGRAMME
WEST MIDLANDS AREA 9
M42 JUNCTION 6 IMPROVEMENTS

Title: GEOHAZARD PLAN

Overall Scheme Plan (NTS)

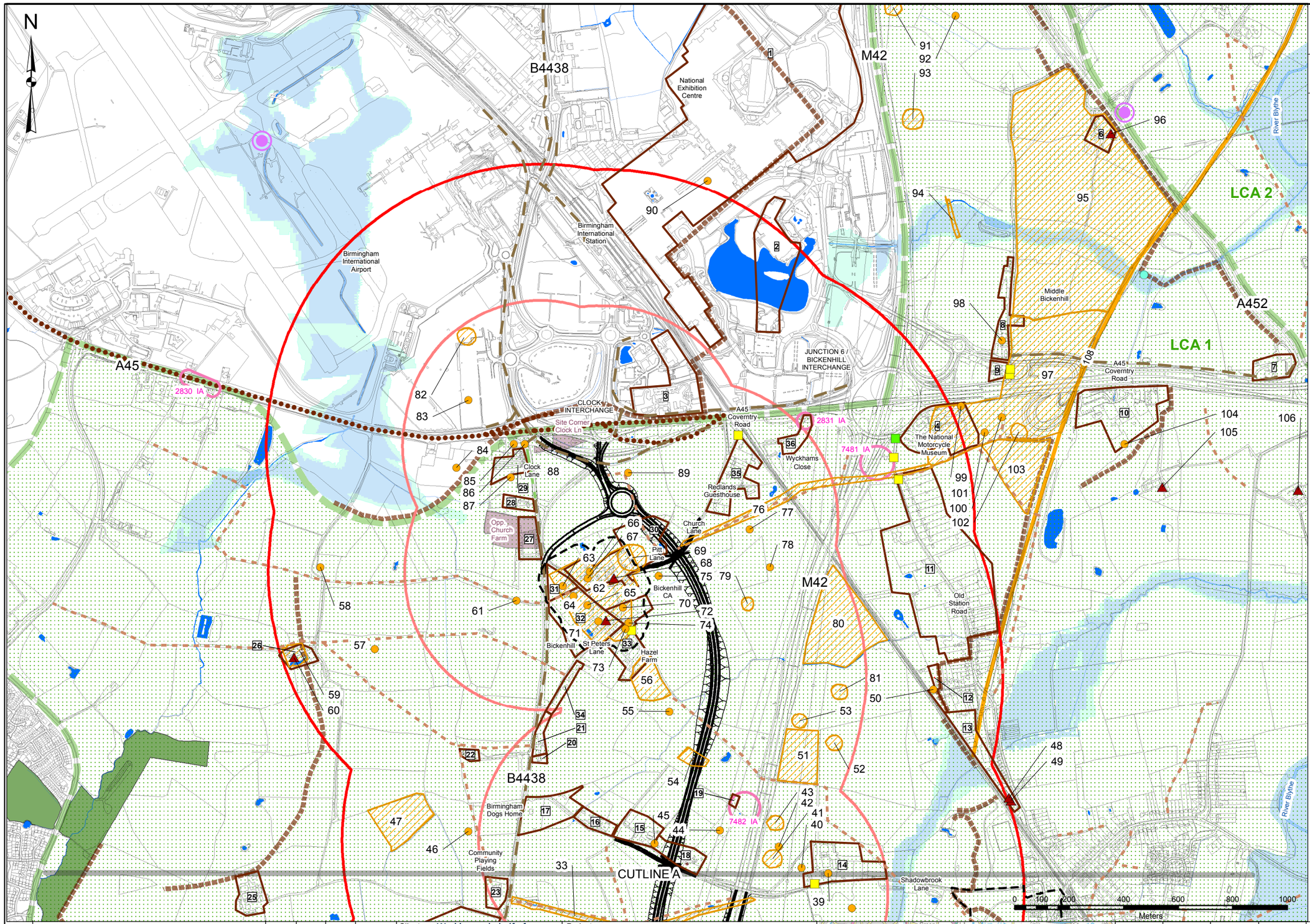
Designed	Date	Drawn	Date
JH	AUG 15	JH	AUG 15

Checked	Date	Approved	Date
MH	AUG 15	BS	AUG 15

Scale	Project Ref No.
1:10000	1071038
Original Size	**Revision/ Issue Number**
A1	0.2

Drawing Number: HE PIN | Originator | Volume | Location
HE551485 – MOU – HGT – M42 J6
– DR – GE – 0001
Type | Role | Number

mouchel
building great relationships
KNIGHTS HOUSE, 2 PARADE
SUTTON COLDFIELD, B72 1PH
Tel: 0121 355 8949
Fax: 0121 355 8901



KEY

- Proposed Option
- 1km Buffer
- 500m Buffer

Air Quality

- Pollution Climate Mapping (PCM) Link
- Highways England Air Quality Monitoring Site
- Local Authority Air Quality Monitoring Site

Cultural Heritage

- Listed Building
- Heritage Asset
- Sceduled Monument
- Conservation Area (CA)
- Registered Park and Gardens

Landscape

- Ancient Woodland (AW)
- Preliminary Zone of Theoretical Visibility (ZTV)
- Visual Receptors
- Landscape Character Area - LCA

Noise

- Defra Noise Important Area (IA)

Road Drainage & Water Environment

- Main River
- River & Open Water
- Flood Zone 3
- Flood Zone 2

Pollution Incident

- Major
- Significant

Water Abstraction Licence -

- Groundwater sources: Small
- Surfacewater sources: Medium, Small

People and Communities

Public Rights of Way

- Footpath
- Cycleway off road
- National Cycle Network
- Cycleway on road

Geology and Soils

- Historic Landfill
- GeoHazard - Other Hazard

Iss:	Amendment	By	Chkd.	Appd.	Date
P1	FIRST ISSUE	DAW	JB	LV/AT	SEPT 2016

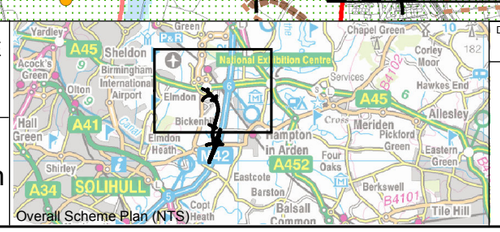
Client: Working on behalf of highways england

Issued only for purpose Indicated

Information

Project: REGIONAL INVESTMENT PROGRAMME
WEST MIDLANDS AREA 9
M42 JUNCTION 6 IMPROVEMENTS

Title: OPTION 2RE
Environmental Constraints Plan
Sheet 1 of 2



Overall Scheme Plan (NTS)

Designed	Date	Drawn	Date	Checked	Date	Approved	Date
CM/JB	AUG 15	DAW	AUG 15	JB/CM	AUG 15	JB/CM	AUG 15

Scale: 1:14,000

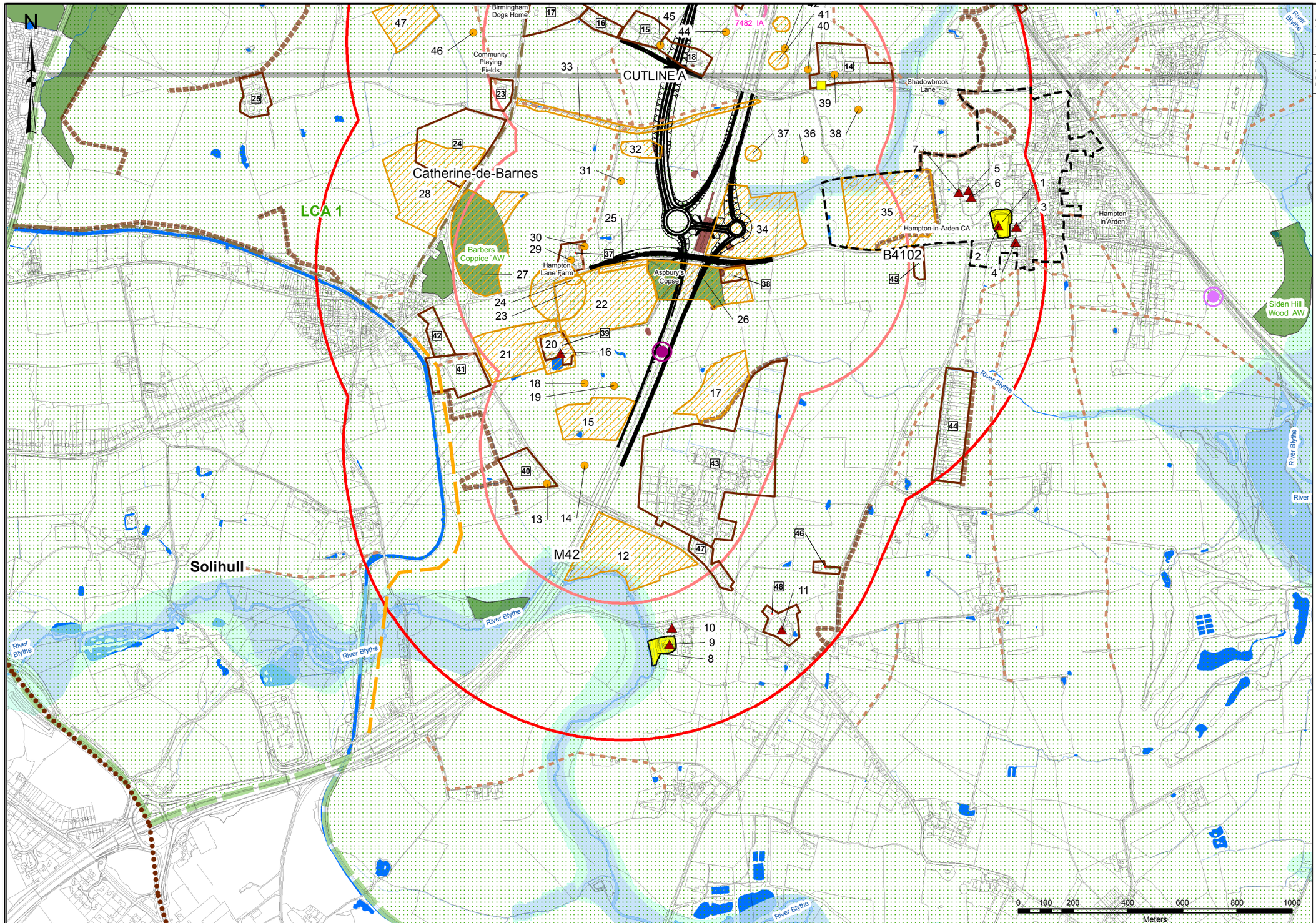
Project Ref No.: 1068569

Original Size: A3

Revision/Issue Number: P1

Drawing Number: HE551485 — MOU — EGN — M42 J6 — DR — EN — 0012
(HE PIN | Originator | Volume | Location | Type | Role | Number)

mouchel
building great relationships
Knights House, 2 Parade
Sutton Coldfield, B72 1PH
Tel: 0121 355 8949
Fax: 0121 355 8901



KEY

- Proposed Option
- 1km Buffer
- 500m Buffer

Air Quality

- Pollution Climate Mapping (PCM) Link
- Highways England Air Quality Monitoring Site
- Local Authority Air Quality Monitoring Site

Cultural Heritage

- Listed Building
- Heritage Asset
- Sceduled Monument
- Conservation Area (CA)
- Registered Park and Gardens

Landscape

- Ancient Woodland (AW)
- Preliminary Zone of Theoretical Visibility (ZTV)
- Visual Receptors
- Landscape Character Area - LCA

Noise

- Defra Noise Important Area (IA)

Road Drainage & Water Environment

- Main River
- River & Open Water
- Flood Zone 3
- Flood Zone 2

Pollution Incident

- Major
- Significant

Water Abstraction Licence -

- Groundwater sources: Small
- Surfacewater sources: Medium, Small

People and Communities

Public Rights of Way

- Footpath
- Cycleway off road
- National Cycle Network
- Cycleway on road

Geology and Soils

- Historic Landfill
- GeoHazard - Other Hazard

Iss:	Amendment	By	Chkd.	Appd.	Date
P1	FIRST ISSUE	DAW	JB	LV/AT	SEPT 2016

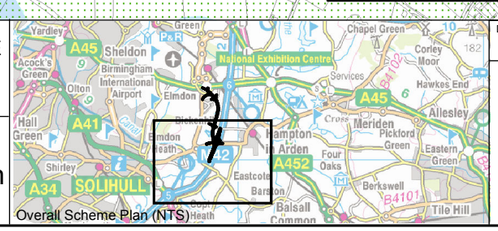
Client: Working on behalf of highways england

Issued only for purpose Indicated

Information

Project: REGIONAL INVESTMENT PROGRAMME
WEST MIDLANDS AREA 9
M42 JUNCTION 6 IMPROVEMENTS

Title: OPTION 2RE
Environmental Constraints Plan
Sheet 2 of 2



Overall Scheme Plan (NTS)

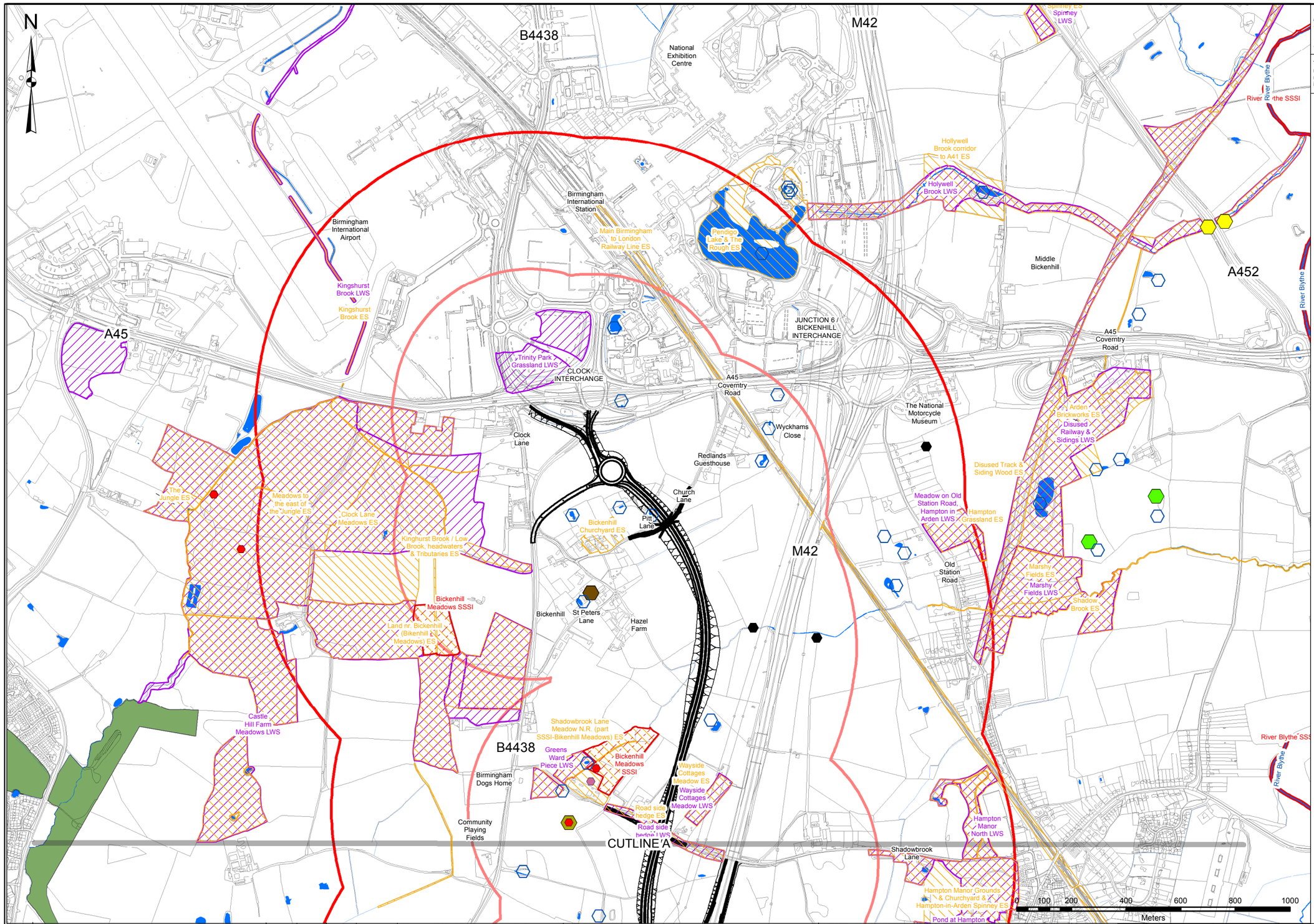
Designed	Date	Drawn	Date	Checked	Date	Approved	Date
CM/JB	AUG 15	DAW	AUG 15	JB/CM	AUG 15	JB/CM	AUG 15

mouchel
building great relationships
Knights House, 2 Parade
Sutton Coldfield, B72 1PH
Tel: 0121 355 8949
Fax: 0121 355 8901

Scale	Project Ref No.
1:14,000	1068569
Original Size	**Revision/Issue Number**
A3	P1

Drawing Number

HE PIN	Originator	Volume	Location	Type	Role	Number
HE551485	MOU	EGN	M42 J6	DR	EN	0013



KEY

- Proposed Option
- 1km Buffer
- 500m Buffer

Nature Conservation

- Sites of Special Scientific Interest (SSSI)
- Local Wildlife Site (LWS)
- Ecosite (ES)
- Ancient Woodland (AW)

Species

- Bat Roosts
- Common Toad
- Great Crested Newt
- Otter spraints
- Small Heath
- Latticed Heath
- Black Poplar
- Pond

Iss:	Amendment	By	Chkd.	Appd.	Date
P1	FIRST ISSUE	DAW	JB	LV/AT	SEPT 2016

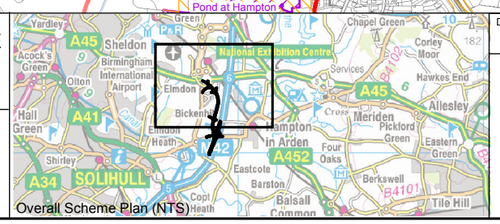
Client: Working on behalf of highways england

Issued only for purpose Indicated

Information

Project: REGIONAL INVESTMENT PROGRAMME
WEST MIDLANDS AREA 9
M42 JUNCTION 6 IMPROVEMENTS

Title: OPTION 2RE
Ecological Plan
Sheet 1 of 2



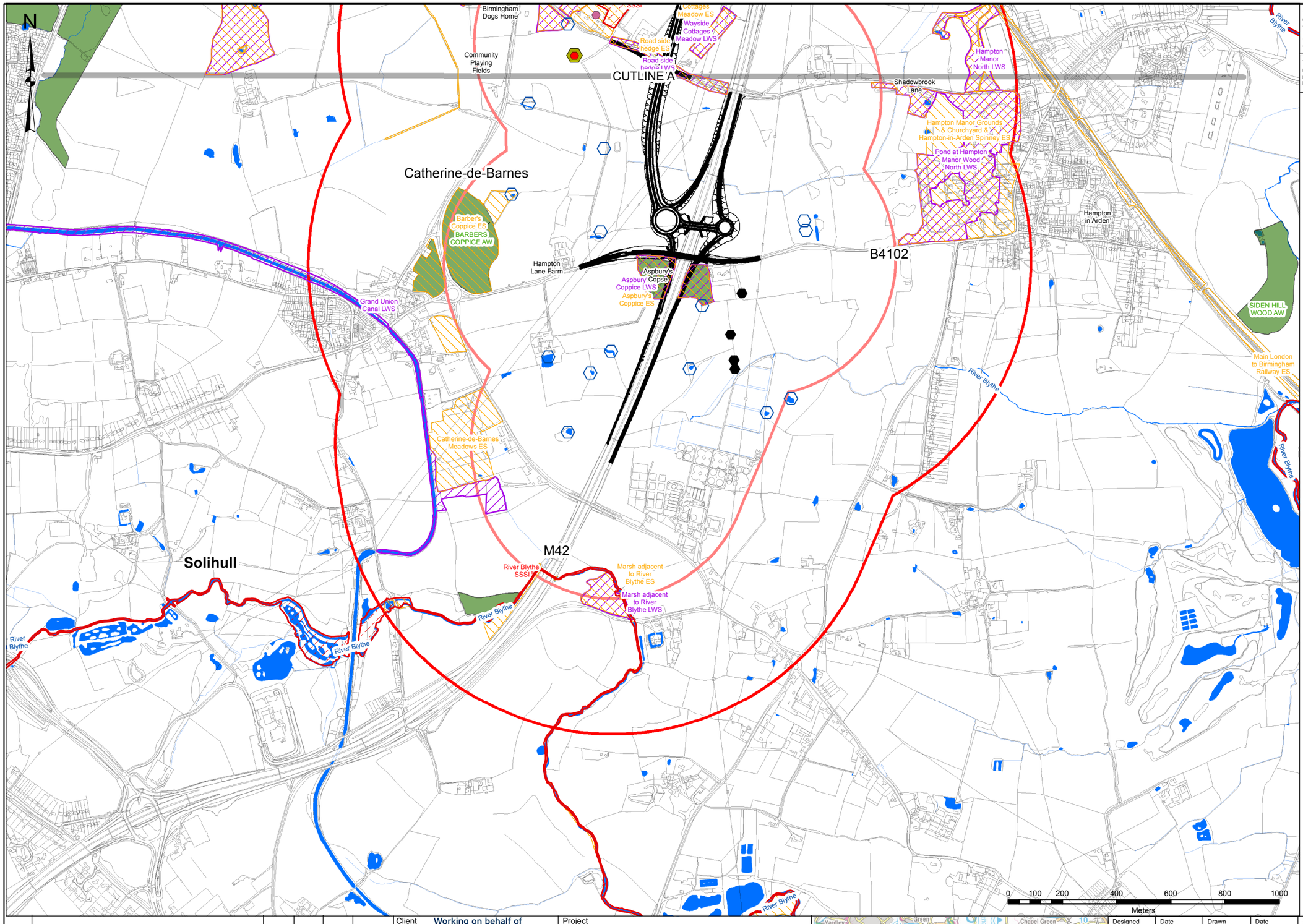
Overall Scheme Plan (NTS)

Designed	Date	Drawn	Date	Checked	Date	Approved	Date
CM/JB	AUG 15	DAW	AUG 15	JB/CM	AUG 15	JB/CM	AUG 15

Scale	Project Ref No.
1:14,000	1068569
Original Size	**Revision/Issue Number**
A3	P1

Drawing Number: HE551485 — MOU — EGN — M42 J6 — DR — EN — 0009
(HE PIN | Originator | Volume | Location | Type | Role | Number)

mouchel
building great relationships
Knights House, 2 Parade
Sutton Coldfield, B72 1PH
Tel: 0121 355 8949
Fax: 0121 355 8901



KEY

- Proposed Option
- 1km Buffer
- 500m Buffer

Nature Conservation

- Sites of Special Scientific Interest (SSSI)
- Local Wildlife Site (LWS)
- Ecosite (ES)
- Ancient Woodland (AW)

Species

- Bat Roosts
- Common Toad
- Great Crested Newt
- Otter spraints
- Small Heath
- Latticed Heath
- Black Poplar
- Pond

Iss:	Amendment	By	Chkd.	Appd.	Date
P1	FIRST ISSUE	DAW	JB	LV/AT	SEPT 2016

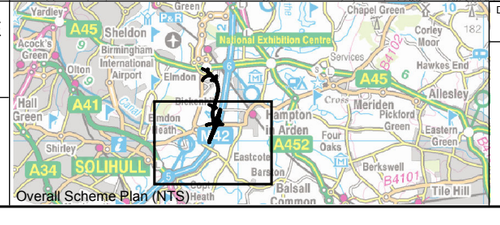
Client: Working on behalf of highways england

Issued only for purpose Indicated

Information

Project: REGIONAL INVESTMENT PROGRAMME
WEST MIDLANDS AREA 9
M42 JUNCTION 6 IMPROVEMENTS

Title: OPTION 2RE
Ecological Plan
Sheet 2 of 2



Overall Scheme Plan (NTS)

Designed	Date	Drawn	Date	Checked	Date	Approved	Date
CM/JB	AUG 15	DAW	AUG 15	JB/CM	AUG 15	JB/CM	AUG 15

Scale: 1:14,000

Project Ref No.: 1068569

Original Size: A3

Revision/Issue Number: P1

Drawing Number: HE PIN | Originator | Volume | Location
HE551485 — MOU — EGN — M42 J6
— DR — EN — 0010
| Type | Role | Number

mouchel
building great relationships
Knights House, 2 Parade
Sutton Coldfield, B72 1PH
Tel: 0121 355 8949
Fax: 0121 355 8901

Appendix F

Appendix F1 – Options Assessments

Initial options assessment for January 2016 workshop

Option Numbers	Option Theme	Description	North Junction	South Junction	Junction 6	MSA	Junction Links	HS2/BIA Links	Structures Impact	Geotech Impact	Envmt Impact	Buildability Impact	Highway Design Impact	Traffic Impact (Connectivity & Resilience)	Statutory Undertakers Apparatus Impact (Pylons Only)
1	North and South Junction	Original Study Work New North and South Junctions, J6 part retained	Yes	Yes	Part-retained (A45 Slips and Circulatory)	No	Yes	Yes via North Junction	2	2	1	*2*	1	1	Approximately 12 132kv pylons
1A		Original Study Work revision to Option 1 - increased weaving north junction	Yes	Yes	Part-retained (A45 Slips and Circulatory)	No	Yes	Yes via North Junction	2	2	1	*2*	2	1	Approximately 10 132kv pylons
1B		New North and South Junction	Yes	Yes	Part-retained (A45 Slips and Circulatory)	No	No	Yes via North and South Junctions	2	2	1	*2*	1	1	Approximately 10 132kv pylons
1C		New North and South Junction with MSA	Yes	Yes	Part-retained (A45 Slips and Circulatory)	Yes	No	Yes via North and South Junctions	2	2	1	*2*	1	1	Approximately 10 132kv pylons
1D		New North and South Junction with parallel link roads	Yes	Yes	Part-retained (A45 Slips and Circulatory)	No	Yes	Yes via North and South Junctions	2	3	1	*2*	1	3	Approximately 17 132kv pylons
1E		New North and South Junction with parallel link roads and MSA link	Yes	Yes	Part-retained (A45 Slips and Circulatory)	Yes	Yes	Yes via North and South Junctions	2	2	1	*2*	1	3	Approximately 17 132kv pylons
2	South Junction Only	Original Study Work - New South Junction and connecting to J6 via parallel links (these link roads have additional diverge connections from the M42	No	Yes	Part-retained (A45 Slips, M42 N Facing Slips and circulatory	No	Yes	Yes via South Junction	2	4	1	*3*	3	4	Approximately 15 132kv pylons
2A		Original Study Work - New South Junction re-positioned for MSA Location, connecting to J6 via parallel links (these link roads have additional diverge connections from the M42	No	Yes	Part-retained (A45 Slips, M42 N Facing Slips and circulatory	Yes	Yes	Yes via South Junction	2	1	1	3	3	4	Approximately 19 132kv pylons
2B		New Southern Junction with parallel links to J6, positioned to reduce impact on AW and to serve the MSA	No	Yes	Part-Retained (A45 Slips and M42 N facing slips inc circulatory)	Yes	Yes	Yes via South Junction	2	2	1	3	3	3 to 4	Approximately 16 132kv pylons
2C		New Southern Junction with merge and diverge access to the M42, positioned for MSA	No	Yes	Retained	Yes	No	Yes via South Junction	4	2	1	3	2	3	Approximately 6 132kv pylons
2D		New Southern Junction with parallel links to Junction 6, positioned to reduce impact on AW and flood zones	No	Yes	Part-Retained (A45 slips, M42 N Facing Slips and circulatory)	No	Yes	Yes via South Junction	2	4	1	3	3	3 to 4	Approximately 15 132kv pylons
2E		New Southern Junction with merge and diverge access to the M42, positioned to reduce impact on AW and Flood Zones	No	Yes	Retained	No	No	Yes via South Junction	4	4	1	3	2	3	Approximately 6 132kv pylons
2F		New Southern Junction with parallel links to Junction 6, positioned to reduce impact on AW and to serve the MSA - alternative links to Damson Parkway and A452	No	Yes	Part-Retained (A45 Slips and M42 N facing slips inc circulatory)	Yes	Yes	Yes via South Junction, Damson Parkway and A452	1	2	1	3	3	1	Approximately 15 132kv pylons
2G		New Southern Junction with parallel links to J6, positioned to reduce impact on AW and to serve the MSA - alternative links to Damson Parkway and A452 Stonebridge Island	No	Yes	Part-Retained (A45 Slips and M42 N facing slips inc circulatory)	Yes	Yes	Yes via South Junction, Damson Parkway and Stonebridge Island	1	2	1	*3*	3	2	Approximately 17 132kv pylons
2H		New Southern Junction with parallel links to Junction 6, positioned to reduce impact on AW and to serve the MSA - alternative links to A45 and A452 Stonebridge Island	No	Yes	Part-Retained (A45 Slips and M42 N facing slips inc circulatory)	Yes	Yes	Yes via South Junction, Clock I/C and Stonebridge Island	1	2	1	*3*	3	3	Approximately 17 132kv pylons
2J		New Southern Junction with parallel links to J6, positioned to reduce impact on AW and to serve MSA - alternative links to A45 and HS2	No	Yes	Part-Retained (A45 Slips and M42 N facing slips inc circulatory)	Yes	Yes	Yes via South Junction	1	1	1	*3*	3	3	Approximately 17 132kv pylons
3	Interchange	Interchange	No	No	Remodelled	No	No	A45/A452	1	4	2	*1*	3	4	Approximately 12 132kv pylons
3A		Interchange with MSA	No	No	Remodelled	Yes	No	A45/A452	1	2	2	*1*	2	4	Approximately 12 132kv pylons

4	North Junction Only	New Northern Junction with parallel links to Junction 6	Yes	No	Retained	No	Yes	Yes via North Junction	4	4	3	*2*	1	2	Approximately 6 132kv pylons
4A		New Northern Junction with parallel links to Junction 6 and MSA	Yes	No	Retained	Yes	Yes	Yes via North Junction	4	4	3	*2*	1	2	Approximately 6 132kv pylons
5	The Do Minimum Options	Do Nothing which includes Amey PPP Scheme	No	No	Retained	No	No	As existing	1	N/A	4	*N/A*	N/A	N/A	N/A
5A		Do Nothing which includes Amey PPP Scheme and MSA	No	No	Retained	Yes	No	As existing	1	N/A	4	*N/A*	N/A	N/A	N/A
6		Do minimum - tbc based on traffic figures	No	No	Retained	No	No	TBC	1	N/A	N/A	*N/A*	N/A	N/A	TBC
6A		Do minimum - tbc based on traffic figures	No	No (MSA bridge)	Retained	Yes	No	TBC	1	N/A	N/A	*N/A*	N/A	N/A	TBC
7		Low Cost Do Something - Amey PPP Scheme with dedicated lefts at Junction 6	No	No	Retained but improved	No	No	A45/A452 and HS2 Works	1	3	4	*1*	3	2	Approximately 2 132kv pylons (depending on NEC stats levels)
8		Birmingham Business Park Roundabout with South Facing Slips to M42	No	No	Retained	No	No	A45/A452 and HS2 Works	1	3	3	*2*	1	1	Approximately 2 132kv pylons
9		HS2 Extend and amend enabling works	No	No	HS2 Proposals	No	No	HS2 Works	3	3	3	*2*	2	1	Approximately 4 132kv pylons
10		HS2 GSJ relocated over the M42 and connected to Birmingham Business Park via parallel links	No	No	Part Retained	Yes	No	HS2 Works and existing routes	3	4	3	*1*	2	1	Approximately 7 132kv pylons
11		(5 lanes) All Lanes Running, including new southern junction with Dedicated left turns on the south side of Junction 6	No	No	Part Retained	Yes	No	No - HS2 Works only and BIA as existing	4	4	2	*2*	3	3	Approximately 4 132kv pylons
12		HS2 GSJ relocated over M42 and connected to Birmingham Business Park HS2 Proposals	No	No	Part Retained	Yes	No	HS2 works	3	4	N/A	*2*	2	1	Approximately 3 132kv pylons
13		Traffic Modelling Exercise - Review Signage Arrangements within and outside Birmingham Box Network to encourage drivers to take other routes							N/A	N/A	N/A	N/A	N/A	N/A	N/A

1	Very small overall impact	Would have a very small positive impact, possibly with undesirable consequences
2	Minor impact	Would have a modest overall impact
3	Moderate impact	Expected to have a reasonably significant impact on the problem identified
4	Significant impact	Expected to significantly alleviate the problem
5	Fully addresses the identified problem	Expected to fully solve the identified problem, without any undesirable consequences

Further options assessment post-workshop with initial sifting

Option Number	Option Theme	Description	Drawing Number	Initial Engineering Assessment								Progress	Comments
				Structures Impact	Geotech Impact	Envmt Impact	Buildability Impact	Highway Impact	Traffic Impact	Ops & Safety Impact	Stats Apparatus		
1	North and South Junction	Original Study Work New North and South Junctions, junction 6 part retained	HE551485-MOU-GEN-M42 J6-SK-D-0101	2	2	1	2	1	1	N/A	12 132kv pylons	NO	Option 1 evolved into Option 1A; significant weaving issue as a DfS
1A		Original Study Work revision to Option 1 - increased weaving north junction	HE551485-MOU-GEN-M42 J6-SK-D-0102	2	2	1	2	2	1	1	10 132kv pylons	NO	Option 1A evolved into 1B with better weaving distance but still DfS but short slip road lengths (standard tapers)
1B		New North and South Junction	HE551485-MOU-GEN-M42 J6-SK-D-0103	2	2	1	2	1	1	1	10 132kv pylons	NO	Option 1B evolved into 1D; slip roads evolved into lane gain/drop & ghost islands
1C		New North and South Junction with MSA	HE551485-MOU-GEN-M42 J6-SK-D-0104	2	2	1	2	1	1	1	10 132kv pylons	NO	As 1B with MSA
1D		New North and South Junction with parallel link roads	HE551485-MOU-GEN-M42 J6-SK-D-0105	2	3	1	2	1	3	1	17 132kv pylons	YES	Evolved from 1B & removes M42-A45 severance issue;
1E		New North and South Junction with parallel link roads and MSA link	HE551485-MOU-GEN-M42 J6-SK-D-0106	2	2	1	2	1	3	1	17 132kv pylons	YES	As 1D but with MSA; but need to assess weaving impact
2	South Junction	Original Study Work - New South Junction and connecting to Junction 6 via parallel links (these link roads have additional diverge connections from the M42	HE551485-MOU-GEN-M42 J6-SK-D-0107	2	4	1	3	3	4	N/A	15 132kv pylons	NO	Option 2 evolved from 1A
2A		Original Study Work - New South Junction re-positioned for MSA Location, connecting to Junction 6 via parallel links (these link roads have additional diverge connections from the M42	HE551485-MOU-GEN-M42 J6-SK-D-0108	2	1	1	3	3	4	2	19 132kv pylons	YES	As 2 with MSA (and junction slightly repositioned)
2B		New Southern Junction with parallel links to Junction 6, positioned to reduce impact on AW and to serve the MSA	HE551485-MOU-GEN-M42 J6-SK-D-0109	2	2	1	3	3	3 to 4	2	16 132kv pylons	YES	Variant of 2A
2C		New Southern Junction with merge and diverge access to the M42, positioned for MSA	HE551485-MOU-GEN-M42 J6-SK-D-0110	4	2	1	3	2	3	2	6 132kv pylons	NO	Sub-standard weaving
2D		New Southern Junction with parallel links to Junction 6, positioned to reduce impact on AW and flood zones	HE551485-MOU-GEN-M42 J6-SK-D-0111	2	4	1	3	3	3 to 4	2	15 132kv pylons	YES	Variant of 2A
2E		New Southern Junction with merge and diverge access to the M42, positioned to reduce impact on AW and Flood Zones	HE551485-MOU-GEN-M42 J6-SK-D-0112	4	4	1	3	2	3	2	6 132kv pylons	NO	Sub-standard weaving
2F		New Southern Junction with parallel links to Junction 6, positioned to reduce impact on AW and to serve the MSA - alternative links to Damson Parkway and A452	HE551485-MOU-GEN-M42 J6-SK-D-0113	1	2	1	3	3	1	2	15 132kv pylons	NO	Poor connectivity to main stakeholders; increased journey time; but improves severance to communities
2G		New Southern Junction with parallel links to Junction 6, positioned to reduce impact on AW and to serve the MSA - alternative links to Damson Parkway and A452 Stonebridge Island	HE551485-MOU-GEN-M42 J6-SK-D-0114	1	2	1	3	3	2	2	17 132kv pylons	YES	Severance to Hampton in Arden
2H		New Southern Junction with parallel links to Junction 6, positioned to reduce impact on AW and to serve the MSA - alternative links to A45 and A452 Stonebridge Island	HE551485-MOU-GEN-M42 J6-SK-D-0115	1	2	1	3	3	3	2	17 132kv pylons	YES	Evolved from 2G with existing severance issue to Hampton in Arden
2J		New Southern Junction with parallel links to Junction 6, positioned to reduce impact on AW and to serve the MSA - alternative links to A45 and HS2	HE551485-MOU-GEN-M42 J6-SK-D-0116	1	1	1	3	3	3	2	17 132kv pylons	YES	Evolved from 2G/2H with reduced severance and with direct connection to HS2
2K		Added following Optioneering Workshop. New Southern Junction as per Option 2B but following the alignment of Catherine De Barnes Lane to Clock Interchange.	HE551485-MOU-GEN-M42 J6-SK-D-0132	2	2	1	3	3	3	2	17 132kv pylons	YES	Variant of 2A
2L		Added following Optioneering Workshop. New Southern Junction as per Option 2B but with a Compact Loop at East Way (Variant of Ken Harrison suggestion).	HE551485-MOU-GEN-M42 J6-SK-D-0133	2	2	1	3	3	3	2	18 132kv pylons	YES	Variant of 2A
2M		Added following Optioneering Workshop. New Southern Junction as per Option 2B but with a connection to East Way under the A45 (Ken Harrison).	HE551485-MOU-GEN-M42 J6-SK-D-0134	2	2	1	3	3	3	2	18 132kv pylons	YES	Variant of 2A
3		Interchange	HE551485-MOU-GEN-M42 J6-SK-D-0117	1	4	2	1	3	4	3	12 132kv pylons	NO	Geometric issue with clock interchange; wide footprint; Evolved into Option 3D

3A	**Interchange**	Interchange with MSA	HE551485-MOU-GEN-M42 J6-SK-D-0118	1	2	2	1	2	4	3	12 132kv pylons	NO	As 3 with MSA
3B		Added following the Optioneering Workshop. Hybrid Interchange Option.	HE551485-MOU-GEN-M42 J6-SK-D-0136	1	2	2	1	3	3	3	7 132kv pylons	NO	Free-flow but no clover-leaf; issue with M42 SB merge/MSA diverge
3C		Added following the Optioneering Workshop. Hybrid Interchange with connections to Stonebridge Island.	HE551485-MOU-GEN-M42 J6-SK-D-0138	1	2	2	1	2	2	3	16 132kv pylons	NO	Severely reduces land development potential; sub-standard weaving lengths
3D		Alternative Interchange Option	HE551485-MOU-GEN-M42 J6-SK-D-0139	1	2	2	1	2	4	3	14 132kv pylons	YES	Evolved from Option 3-3C with a more practicable geometry & buildability
4	**North Junction**	New Northern Junction with parallel links to Junction 6	HE551485-MOU-GEN-M42 J6-SK-D-0119	4	4	3	2	1	2	1	6 132kv pylons	NO	To mirror benefits from a southern junction option; sub-standard weaving to J7; Evolved into Option 4B
4A		New Northern Junction with parallel links to Junction 6 and MSA	HE551485-MOU-GEN-M42 J6-SK-D-0120	4	4	3	2	1	2	1	6 132kv pylons	NO	As 4 with MSA
4B		Added following Optioneering Workshop. Variant of a New Northern Junction with alternative slip arrangements to improve weaving.	HE551485-MOU-GEN-M42 J6-SK-D-0131	4	4	3	2	1	3	1	5 132kv pylons	YES	Evolved from 4, 4A and 1D with improved weaving distances
5	**Do Minimum/Something Options**	Do Nothing which includes Amey PPP Scheme	HE551485-MOU-GEN-M42 J6-SK-D-0121	1	N/A	4	*N/A*	N/A	N/A	2	N/A	NO	Use as a 'do nothing' option comparison; progress if MSA planning application refused
5A		Do Nothing which includes Amey PPP Scheme and MSA	HE551485-MOU-GEN-M42 J6-SK-D-0122	1	N/A	4	*N/A*	N/A	N/A	2	N/A	YES	As 5 with MSA
6		Do minimum - tbc based on traffic figures	*Not developed*	N/A	N/A	N/A	*N/A*	N/A	N/A	N/A	N/A	NO	Use Option 5 as do minimum
6A		Do minimum - tbc based on traffic figures	*Not developed*	N/A	N/A	N/A	*N/A*	N/A	N/A	N/A	N/A	NO	Use Option 5A as do minimum
7		Low Cost Do Something - Amey PPP Scheme with dedicated lefts at Junction 6	HE551485-MOU-GEN-M42 J6-SK-D-0125	1	3	4	1	3	2	N/A	2 132kv pylons	YES	Free-flow at grade movements but severs NEC/NMM access
8		Birmingham Business Park Roundabout with South Facing Slips to M42	HE551485-MOU-GEN-M42 J6-SK-D-0126	1	3	3	2	1	1	N/A	2 132kv pylons	NO	Dropped due to HS2 vertical geometry issue; dependent on traffic figures
9		HS2 Extend and amend enabling works	HE551485-MOU-GEN-M42 J6-SK-D-0127	3	3	3	2	2	1	N/A	4 132kv pylons	NO	Dropped due to HS2 vertical geometry issue; dependent on traffic figures
10		HS2 GSJ relocated over M42 and connected to Birmingham Business Park via parallel links	HE551485-MOU-GEN-M42 J6-SK-D-0128	3	4	3	1	2	1	N/A	7 132kv pylons	NO	Dropped due to HS2 vertical geometry issue; dependent on traffic figures
11		(5 lanes)/ All Lanes Running with Dedicated left turns on the south side of Junction 6	HE551485-MOU-GEN-M42 J6-SK-D-0129	4	4	2	2	3	3	2	4 132kv pylons	YES	Future-proofing solution for proposed SMART motorway programme
12		HS2 GSJ relocated over M42 and connected to Birmingham Business Park HS2 Proposals	HE551485-MOU-GEN-M42 J6-SK-D-0130	3	4	3	2	2	1	N/A	3 132kv pylons	NO	Little benefit to scheme objectives; unlikely to relieve congestion at J6
13		Traffic Modelling Exercise - Review Signage Arrangements within and outside Birmingham Box Network to encourage drivers to take other routes		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NO	Use option 5/5A as do minimum; modelling exercise not applicable
14		M42 Junction 6 with hook turn between NB Diverge and A45 Eastbound Traffic Movements, alternative hook turn SB Diverge to A45 Westbound.	HE551485-MOU-GEN-M42 J6-SK-D-0135	2	3	3	1	1	2	N/A	N/A	YES	Can be combined with Option 15; dependent on traffic figures
15		Added following Optioneering Workshop. Free flow link from A45 E to M42 N under the existing NEC access/egress.	HE551485-MOU-GEN-M42 J6-SK-D-0137	3	3	3	1	1	1	N/A	2 132kv pylons	YES	Combine with Option 14; dependent on traffic figures

1	Very small overall impact	Would have a very small positive impact, possibly with undesirable consequences
2	Minor impact	Would have a modest overall impact
3	Moderate impact	Expected to have a reasonably significant impact on the problem identified
4	Significant impact	Expected to significantly alleviate the problem
5	Fully addresses the identified problem	Expected to fully solve the identified problem, without any undesirable consequences

Additional options added at workshop

East Assessment – Strategic Impact (Page 1)

	Option Theme	North & South Junction		South Junction Only									Interchange	North Junction Only	Do-Minimum/Something Options				
	Option	1D	1E	2A	2B	2D	2G	2H	2J	2K	2L	2M	3D	4B	5/5A	7	11	14	15
Strategic	Identified Problems & Objectives	The scheme objectives have been identified as: • Provide additional junction capacity at M42 J6 that will provide high quality access to the key stakeholder interests and alleviate the congestion problems that currently exist, thereby unlocking additional investment and further economic growth • Enhance accessibility between the key assets in the area and ensure that access to the proposed new High Speed 2 (HS2) station is not compromised • Contribute positively to the effective and safe operation of the wider strategic corridor/ through route • Deliver a design solution that will not compromise or undermine longer term options. In providing the increased junction capacity, there is a need to recognise that longer term improvements to the Birmingham Motorway Box may also be needed • Improve journey reliability and provide added resilience to the strategic network • Contribute to reduction in the impact on the wider environment.																	
	Scale of Impact	**2 - Minor impact** (would have a modest overall impact)		**3 - Moderate Impact** (would have a modest overall impact)	**3 - Moderate Impact** (would have a modest overall impact)	**3 - Moderate Impact** (would have a modest overall impact)	**2 - Very small overall impact** (would have a very small positive impact, possibly with undesirable consequences)		**3 - Moderate Impact** (would have a modest overall impact)	**2- Very small overall impact** (would have a very small positive impact, possibly with undesirable consequences)			**4 - Significant impact** (expected to significantly alleviate problem)	**3 - Moderate Impact** (Expected to have a reasonably significant impact on the problem identified)	**2 - Minor impact** (would have a modest overall impact)		**4 - Significant impact** (expected to significantly alleviate problem)		**2 - Minor impact** (would have a modest overall impact)
	Scale of impact - Comments	Can partially solve the identified problems but has some undesirable impacts due to the scale of the footprint affecting the environment and properties. Does not allow for growth on the M42.		Can partially solve the identified problems but has undesirable impacts due to the scale of the footprint affecting the environment and properties. Does not allow for growth on the M42.	Can partially solve the identified problems but has some undesirable impacts due to the scale of the footprint affecting the environment and properties. Does not allow for growth on the M42.	Can partially solve the identified problems but has some undesirable impacts due to the scale of the footprint affecting the environment and properties. Does not allow for growth on the M42.	Can partially solve the identified problems but has undesirable impacts due to the scale of the footprint affecting the environment and properties. Does not allow for growth on the M42.		Can partially solve the identified problems but has some undesirable impacts due to the scale of the footprint affecting the environment and properties. Does not allow for growth on the M42.	Can partially solve the identified problems but has undesirable impacts due to the scale of the footprint affecting the environment and properties. Does not allow for growth on the M42.			Can solve the identified problems but has some undesirable impacts due to the footprint affecting the environment and properties.	Can solve the identified problems with low impact on the environment.	Will solve the short term growth problem. Unlikely to accommodate growth from HS2 & UKC. Unlikely to be able to offer a high level of service with high level of aspirational growth	Alleviates problems along M42. Marginally improvement to performance of junction. Likely that benefits are derived from widening rather than junction improvements.	Will solve the short term growth problem. Unlikely to accommodate growth from HS2 & UKC. Unlikely to be able to offer a high level of service with high level of aspirational growth.
	Fit with wider transport and government objectives	The Government will deliver national networks that meet the country's long-term needs; supporting a prosperous and competitive economy and improving overall quality of life, as part of a wider transport system. This means: • Networks with the capacity and connectivity and resilience to support national and local economic activity and facilitate growth and create jobs. • Networks which support and improve journey quality, reliability and safety. • Networks which support the delivery of environmental goals and the move to a low carbon economy. • Networks which join up our communities and link effectively to each other. For this scheme this means that it needs to: • Recognise the strategic importance of the M42 as it forms part of the Trans-European road network. • Facilitate the delivery of HS2 • Facilitate access to National Exhibition Centre (NEC) • Facilitate access to Birmingham Airport.																	
	Key uncertainties	HS2 - **Proposed** High Speed link between London and Crewe. These schemes meet the requirements to facilitate HS2 if it goes ahead. The link to HS2 can be removed if scheme does not progress. UKC - Proposed development for jobs and housing. These schemes meet the requirements to facilitate UKC if it goes ahead. The link to UKC can be removed if scheme does not progress. Birmingham Airport & National Exhibition Centre - Plans for growth of these two facilities. All options allow for growth should it occur. M42 Motorway Service Area - Proposals to construct a new MSA to the south of M42 J6. All options do not prejudice this development.													HS2 - Proposed High Speed link between London and Crewe. These schemes do not meet the requirements to facilitate HS2 if it goes ahead. UKC - Proposed development for jobs and housing. These schemes do not meet the requirements to facilitate UKC if it goes ahead. Birmingham Airport & National Exhibition Centre - Plans for growth of these two facilities. These options will not cater for additional growth should it occur. M42 Motorway Service Area - Proposals to construct a new MSA to the south of M42 J6. All options do not prejudice this development.			

East Assessment – Strategic Impact (Page 2)

	Option Theme	North & South Junction		South Junction Only									Interchange	North Junction Only	Do-Minimum/Something Options				
	Option	1D	1E	2A	2B	2D	2G	2H	2J	2K	2L	2M	3D	4B	5/5A	7	11	14	15
Strategic	Wider transport and government objectives - Comments	**3 - Reasonable fit.** Does not improve the corridor capacity of the M42. Facilitates access to HS2. Removes free flow lane to Airport & Birmingham International Rail Station, adds additional junctions for access from south. Facilitates NEC access for M42north traffic, detrimental for M42 south traffic due to additional junction.		**3 - Reasonable fit** Does not improve the corridor capacity of the M42. Reduces capacity of mainline due to additional off-slips and associated weaving between J6 & Southern roundabout. Link roads improve access to Airport & HS2. Detrimental for egressing NEC traffic to M42southbound.	**3 - Reasonable fit.** Does not improve the corridor capacity of the M42. Facilitates access to HS2. Detrimental to M42 south traffic for Airport, Birmingham International Rail Station & NEC as it introduces additional junction(s). Removes free flow lane to Airport & Birmingham International Rail Station.		**2 - Low fit.** Does not improve the corridor capacity of the M42. Facilitates access to HS2. Detrimental to Airport, Birmingham International Rail Station, NEC & UKC as introduces additional junction. Link to west does not benefit to Airport due to length of diversion.	**3 - Reasonable fit.** Does not improve the corridor capacity of the M42. Facilitates access to HS2 and Airport. Detrimental to M42 south traffic for NEC as it introduces an additional junction.	**3 - Reasonable fit.** Does not improve the corridor capacity of the M42. Facilitates access to HS2. Detrimental to M42 south traffic for Airport & NEC as it introduces additional junction(s). Removes free flow lane to Airport & Birmingham International Rail Station.	**2 - Low fit.** Does not improve the corridor capacity of the M42. Facilitates access to HS2. Detrimental to NEC - introduces a new junction. Removes free flow lane BIA & Rail Station, adds new junction& uses local roads for access from south.	**3 - Reasonable fit.** Does not improve the corridor capacity of the M42. Facilitates access to HS2, NEC/UKC. Detrimental to M42 traffic for Airport & Birmingham International Rail Station - introduces new junction. Removes free flow lane to BIA & Rail Station.	**3 - Reasonable fit.** Does not improve the corridor capacity of M42. Facilitates access to HS2 & UKC. Detrimental to M42 traffic for BIA, NEC & Birmingham Int. Rail Station as it introduces additional junctions and removes free flow lane from A45E.	**4 - Good fit.** Improves the corridor capacity of the M42. Facilitates access to HS2, Airport, Birmingham International Rail Station and UKC. Neutral for NEC as it facilitates some movements but is detrimental to A45west approach and egress to M42 & A45E.	**2 - Low fit.** Does not improve the corridor capacity of the M42. Does not remove strategic turning movements from J6. Facilitates access to HS2 and NEC. Provides good alternative access to Airport & Birmingham International Rail Station from M42N.	**1 - Poor fit.** Does not improve the corridor capacity of the M42. Does not facilitate access to any Stakeholder. Facilitates access to proposed MSA.	**1 - Poor fit.** Does not improve the corridor capacity of the M42. Does not facilitates access to HS2. Facilitates egress from A45west (Airport & Birmingham International Rail Station) to M42northbound. Detrimental for NEC traffic. Detrimental for National Motorcycle Museum.	**4 - Good fit.** Improves capacity of M42 Facilitates access to HS2, UKC, Airport & Birmingham International Rail Station. Detrimental to National Motorcycle Museum.	**1 - Poor fit.** Does not improve the corridor capacity of the M42. Does not facilitate access to HS2. Does not improve situation for any stakeholder.	**1 - Poor fit.** Does not improve the corridor capacity of the M42. Does not facilitate access to HS2. Facilitates egress from A45west (Airport & Birmingham International Rail Station) to M42northbound.
	Fit with other objectives	Common policies and aims of Solihull MBC, North Warwickshire DC, West Midlands LEP and West Midlands Local Integrated Transport Authority (Midlands Connect) are: • To facilitate the growth of the economy and create jobs. • To improve connectivity. • To optimise assets. • To strengthen network resilience by avoiding or reducing congestion and disruption.																	
	Fit with other objectives - Comments	**4 - Good fit** Facilitates growth, improves connectivity and strengthens resilience. Optimises assets by facilitating multi-modal trips		**4 - Good fit** Facilitates growth, improves connectivity and strengthens resilience. Optimises assets by facilitating multi-modal trips									**4 - Good fit** Facilitates growth, improves connectivity and strengthens resilience. Optimises assets by facilitating multi-modal trips	**4 - Good fit** Facilitates growth, improves connectivity and strengthens resilience. Optimises assets by facilitating multi-modal trips	**1 - Poor fit** Does not facilitate growth, does not improves connectivity, does not optimise assets and does not strengthens resilience.		**3 - Reasonable fit** Facilitates growth but does not improve connectivity. Small benefit to optimise assets and resilience	**1 - Poor fit** Does not facilitate growth, does not improves connectivity, does not optimise assets and does not strengthens resilience.	
	Degree of consensus over outcomes?	A workshop has been undertaken with representatives from Birmingham Airport, HS2, NEC and Solihull MBC. This was done with 5 options from 3 themes (North & South Junctions, South Junction Only, and the Interchange).												No opinions have been sought from Stakeholders on these options					
	Degree of consensus over outcomes? - Comments	None.																	

East Assessment – Economic Impact (Page 1)

Option Theme		North & South Junction		South Junction								Interchange	North Junction	Do-Minimum/Something Options				
Option Number		1D	1E	2A	2B	2D	2G	2H	2J	2K	2L	2M	3D	4B	5/5A	7	11	14	15
Economic Growth	Connectivity	These options have two additional junctions as well as J6 for M42 traffic to travel through, slowing average speeds. The severing of the free flow lane to the Airport and Birmingham International will also impose a delay to traffic. However, the average journey length will be marginally shorter.		The majority of traffic benefits from this layout. The A45E & W to M42S will have an additional junction to negotiate. For this option it is likely that both the distance and journey time will be significantly beneficial, mainly due to the additional diverge links on the M42.	No change for M42N traffic. M42S traffic will have an additional junction to travel through, slowing average speeds. The severing of the free flow lane to the Airport and Birmingham International will also impose a delay to traffic. Overall, there is likely to be a small benefit in both journey time and distance.		The link South Junction to A45W will benefit A45 traffic but not the Stakeholders in the vicinity of J6. Stakeholders will continue to use the existing J6, traffic to/from M42S will have an additional junction to travel through. Overall, there is likely to be a small disbenefit in journey time but a small benefit in journey distance.	The majority of traffic benefits from this layout. The A45E & W to M42S will have an additional junction to negotiate, slowing average journey times. For this option it is likely that both the distance and journey time will have a small benefit.	M42S traffic will have an additional junction to travel through, slowing average speeds. The severing of the free flow lane to the Airport and Birmingham International will also impose a delay to traffic. Overall, there is likely to be a small benefit in both journey time and distance.	M42S traffic will have an additional junction to travel through, slowing average speeds. M42S traffic will need to join with the local road network traffic along Catherine de Barnes Lane. The severing of the free flow lane to the Airport and B'ham International will impose a delay to traffic. Overall, there is likely to be a small benefit in both journey time and distance.	M42S traffic will have an additional junction to travel through, slowing average speeds. The severing of the free flow lane to the Airport and Birmingham International will also impose a delay to traffic. Overall, there is likely to be a small benefit in both journey time and distance.	Journey times will be beneficial with the free flow links. There will be a disbenefit in connectivity for traffic leaving the NEC.	M42N traffic to the A45E & W will need to travel through an additional junction, slowing average travel times. M42S traffic unaffected. Improved connectivity to HS2, UKC, NEC from the north. Airport and Birmingham International Rail Station have an alternative connection from M42N. This option does not relieve J6 of strategic traffic.	No change	No change	Improved capacity on main line will and free flow left turn links will be significantly beneficial to journey times.	No change	The free flow left turn lane from A45W to M42N will have a small benefit to journey times
	Reliability	The dispersal of flows on the new, high standard links should help to improve reliability of journey time. However, the increased number of junctions will increase the probability of collisions disrupting the network.		The dispersal of flows on the new, high standard links should help to improve reliability of journey time. However, the increased number of junctions will increase the probability of collisions disrupting the network.									Improved capacity on main line will improve reliability. Removing conflicts at junction by increasing free flow links will significantly improve reliability.	Journey reliability will be improved for local Stakeholders.	No change	No change	Improved capacity on main line and free flow left turn links will improve reliability.	No change	The free flow left turn lane from A45W to M42N will be beneficial to reliability for this movement.
				Additional diverge slips on M42 will increase weaving on M42, leading to increased probability of collisions occurring.	As above		Only M42S traffic from the Airport, B'ham International & NEC have an additional junction to travel through.	As above		The introduction of local network traffic from Catherine de Barnes Lane will increase the probability of collisions disrupting the network.	As above							
	Wider Economic Impacts	The scale of the wider economic impacts will be assessed during Stage 3.																

East Assessment – Economic Impact (Page 2)

<table>
<tr><th colspan="2">Option Theme</th><th colspan="2">North & South Junction</th><th colspan="9">South Junction</th><th>Interchange</th><th>North Junction</th><th colspan="5">Do-Minimum/Something Options</th></tr>
<tr><th colspan="2">Option Number</th><th>1D</th><th>1E</th><th>2A</th><th>2B</th><th>2D</th><th>2G</th><th>2H</th><th>2J</th><th>2K</th><th>2L</th><th>2M</th><th>3D</th><th>4B</th><th>5/5A</th><th>7</th><th>11</th><th>14</th><th>15</th></tr>
<tr><td rowspan="3">Economic Growth</td><td>Resilience</td><td colspan="2">The "North & South Junction" options add resilience to the network by providing a parallel route to the M42 for 2km to the south of J6 and 1km to the north of J6. It provides an alternative link to Birmingham Airport, HS2 and UKC.</td><td colspan="9">The "South Junction Only" options add resilience to the network by providing a parallel route to the M42 for 2km to the south of J6. They provide an alternative link to Birmingham Airport, HS2, UKC and the wider local network.</td><td>Good resilience as all movements are isolated due to free flow links.</td><td>Adds resilience by providing a parallel route to the M42 1km north of J6. North Jn provides alternative link to Airport, HS2, UKC and the wider local network.</td><td colspan="5">These options do not alter the resilience of the network.</td></tr>
<tr><td>Delivery of Housing</td><td colspan="2">On the assumption that the majority of housing growth will be delivered within UKC, these options facilitate the delivery of housing growth with the Northern Jn providing direct access.</td><td colspan="9">On the assumption that the majority of housing growth will be delivered within UKC, all the "South Junction Only" options do not prejudice the delivery of housing growth.</td><td colspan="2">On the assumption that the majority of housing growth will be delivered within UKC, delivery of housing growth is facilitated.</td><td colspan="5">The proposed UKC development has a housing element within its masterplan. All options do not prejudice the delivery of UKC, however, the scale of developer led highway network improvements would be greater with these options in order to access the site.</td></tr>
<tr><td rowspan="5">Carbon emissions</td><td>Activity (change in vehicle kms)</td><td colspan="2">Indicative modelling shows that there will be a marginal benefit due to an overall decrease in vehicle km.</td><td colspan="9">Indicative modelling shows that there will be a marginal benefit due to an overall decrease in vehicle km.</td><td>No change</td><td>Indicative modelling shows a marginal benefit due to an overall decrease in vehicle km.</td><td colspan="5">No change</td></tr>
<tr><td rowspan="2">Embedded</td><td colspan="14">All these proposals will generate embedded carbon due to the construction work. The amount will vary according to the amount of construction in the scheme. Relative to other options this one is rated High.</td></tr>
<tr><td colspan="2">Relative to other options this one is rated High.</td><td colspan="9">Relative to other options this one is rated Medium.</td><td>Relative to other options rated High.</td><td>Relative to others, Medium.</td><td colspan="2">Relative to other options this one is rated Low.</td><td>Relative to other options, rated Medium.</td><td>Relative to other options this one is rated Low.</td></tr>
<tr><td>Switch to low carbon fuel</td><td colspan="14">Alterations to the network are not anticipated to lead to a change in use of low carbon fuel.</td></tr>
<tr><td>Efficiency (fuel per veh/km)</td><td colspan="14">No material impact</td></tr>
<tr><td>Overall effect</td><td colspan="14">Operationally there is no real differentiator between the options. However for embedded carbon, the more construction involved, the higher the overall embedded carbon will be.</td></tr>
</table>

East Assessment – Economic Impact (Page 3)

Option Theme		North & South Junction		South Junction									Interchange	North Junction	Do-Minimum/Something Options				
Option Number		**1D**	**1E**	**2A**	**2B**	**2D**	**2G**	**2H**	**2J**	**2K**	**2L**	**2M**	**3D**	**4B**	**5/5A**	**7**	**11**	**14**	**15**
Socio-distributional impacts and the regions	**Severance**	Where a Public Right of Way (PRoW) crosses, it is likely that provision can be made for these to be temporarily diverted during construction and reinstated after scheme opening.											Crosses PRoW at 2 locations	No impacts on PRoW	No impacts on PRoW				
		Crosses PRoW at 8 locations		Crosses PRoW at 13 locations	Crosses PRoW at 12 locations		Crosses PRoW at 5 locations	Crosses PRoW at 11 locations	Crosses PRoW at 12 locations										
	Accidents	The increased number of junctions and associated stop lines / conflict points will increase the probability of a collision. These will be designed to current standards so this risk is minimised. There is likely to be a reduction in collisions due to the reduction in congestion.											The free flow lanes will reduce the number of stop lines and conflict points so should reduce the probability of a collision.	The increased number of junctions and associated stop lines will increase the probability of a collision.	Increasing the number of lanes on the gyratory increases the probability of collision due to drivers moving across lanes; especially traffic for NEC & airport who will not be regular users.	Access to the National Motorcycle Museum is severely compromised with this option leading to the potential for vehicles to make an unpredictable manoeuvre.	The potential safety impacts of 5-lane arrangement is not known at this stage.	Driver confusion over the layout may lead to an increased number of collisions.	Movements from A45W to M42 N are removed from signalisation. However these movements will merge with M42 northbound slip road traffic at a higher speed.
	User Benefits	The User Benefits have not been assessed at this stage but initial model outputs indicate that there will be the following time travel saving:																	
		Substantial disbenefit		Significant benefit									Substantial benefit	Significant disbenefit	Small benefit	Small benefit	Significant benefit	Small benefit	Small disbenefit
	Personal Affordability	Has no significant impact.																	
	Regeneration	Regeneration in the area is led by UKC East & West. All these options facilitate the development of these sites.													Regeneration in the area is led by UKC East & West. All these options will not facilitate the development of these sites due to the lack of increased capacity in the network.				
	Regional Imbalance	These schemes on their own do not address regional imbalance. However, as they facilitate access to UKC and HS2, they will help counter regional imbalance.													These schemes do not help to counterbalance regional imbalance.				

East Assessment – Economic Impact (Page 4)

<table>
<tr><td colspan="2">Option Theme</td><td colspan="2">North & South Junction</td><td colspan="9">South Junction</td><td>Interchange</td><td>North Junction</td><td colspan="5">Do-Minimum/Something Options</td></tr>
<tr><td colspan="2">Option Number</td><td>1D</td><td>1E</td><td>2A</td><td>2B</td><td>2D</td><td>2G</td><td>2H</td><td>2J</td><td>2K</td><td>2L</td><td>2M</td><td>3D</td><td>4B</td><td>5/5A</td><td>7</td><td>11</td><td>14</td><td>15</td></tr>
<tr><td rowspan="4">Local environment</td><td>Air Quality</td><td colspan="2">There is potential for adverse impact on AQ with the introduction on new slips near residential areas and a SSSI within 200m</td><td colspan="3">There is potential for adverse impact on AQ with the introduction on new slips near residential areas and a SSSI within 200m</td><td>There is potential for adverse impact on AQ with the introduction on new slips near residential areas</td><td colspan="5">There is potential for adverse impact on AQ with the introduction on new slips near residential areas and a SSSI within 200m</td><td>There is potential for adverse impacts on AQ with residential properties within 200m of the junction.</td><td>There is potential for adverse impacts on AQ with receptors within 200m.</td><td>Relatively small impacts from the works</td><td>There is potential for adverse impacts on AQ with residential properties within 200m of the junction</td><td colspan="2">There is potential for adverse impacts on AQ with receptors within 200m of the proposed widening</td><td>Relatively small impacts from the works</td></tr>
<tr><td rowspan="2">Noise</td><td colspan="11">This Option does not reduce absolute disturbance from noise with the introduction of new slips near residential areas.</td><td rowspan="2">Relatively small impacts from the works. There are two noise Important Areas in proximity to this option</td><td rowspan="2">There is potential for adverse impacts on noise with residential properties within 200m of the junction. 2 NIA's in proximity</td><td colspan="2" rowspan="2">Does not reduce absolute disturbance from noise. 3 Noise Important Areas in proximity. Potential for mitigation and in places improvement through acoustic barriers/low noise surfacing.</td><td rowspan="2">Relatively small impacts from the works. There are 2 noise Important Areas in proximity to this option</td></tr>
<tr><td colspan="2">There are 3 noise Important Areas in proximity to this option</td><td colspan="2">There are 2 noise Important Areas in proximity to this option.</td><td>1 noise Important Area in proximity.</td><td>5 Noise Important Areas in proximity.</td><td>4 noise Important Areas in proximity.</td><td colspan="4">There is 1 noise Important Area in proximity to this option.</td><td>2 noise Important Areas in proximity.</td><td>No noise Important Areas in proximity.</td></tr>
<tr><td>Natural Environment, Heritage & Landscape</td><td colspan="11">This option requires a large area of land take with associated adverse impacts on land use, ecology, archaeology and landscape. No statutory designated areas are affected by land take.</td><td colspan="2">There will be some potential for mitigation and in places improvement through acoustic barriers/low noise surfacing.</td><td>The majority of the impact likely be limited to the interchange area.</td><td>The majority of the impact likely be limited to the inter-change area.</td></tr>
<tr><td></td><td></td><td>Some cumula-tive impacts with the MSA, including Asbury Copse</td><td></td><td>This is likely to be slightly less than 2A with a smaller footprint</td><td>Southern Junction positioned to reduce impact on ancient woodland</td><td>This scheme has a particularly larger land take requirement</td><td>The impacts are likely to be greater than 2A with a larger land take to the east</td><td>Likely to be slightly less than 2A. Requires demolition of residential properties</td><td>This option has a smaller land take by utilising Catherine de Barnes Road.</td><td>Southern Junction positioned to reduce impact on ancient woodland.</td><td>This option has a small land take which reduces potential impacts on ecology, archaeology, land use and landscape</td><td>All on junction improve-ments. Small impacts from the works</td><td>This option has a small land take which reduces potential impacts on ecology, archae-ology, land use and landscape.</td><td colspan="2">Small land take as involves the alteration of signage within and outside the B'ham Box Network to encourage drivers to take other routes.</td><td>This option has a small land take which reduces potential impacts on ecology, archaeology, land use and landscape.</td></tr>
<tr><td colspan="2">Streetscape & Urban Envmt</td><td colspan="13">Not Applicable.</td></tr>
<tr><td colspan="2">Well being</td><td colspan="13">There is not anticipated to be any change to the physical activity in the area; to injury or deaths as the new links and junctions will be to Standards; to crime; to terrorism or to severance. Access to range of goods, services, people, places, should be improved by easing congestion on the trunk road network in the area.</td><td colspan="5">There is not anticipated to be any change to the physical activity in the area; to injury or deaths as the new links and junctions will be to Standards; to crime; to terrorism or to severance.</td></tr>
<tr><td colspan="2"></td><td colspan="13"></td><td>No change to access to range of goods, services, people, places.</td><td>Access to range of goods, etc should be improved by easing congestion on the M42.</td><td colspan="3">No change to access to range of goods, services, people, places.</td></tr>
<tr><td colspan="2">Expected VfM</td><td colspan="18">The expected VfM has not determined at this stage.</td></tr>
<tr><td colspan="2">Expected VfM Comments</td><td colspan="18">Not done at this stage.</td></tr>
</table>

M42 Junction 6 - Detailed Buildability Review

Rev 4 - Nov 16

	Option 2P Variant 2	Option 11A	Option 2R (Without Free Flow Schematic)	Option 2R (With Free Flow Schematic)	Option 2R East (Without Free Flow Schematic)	Option 2R East (With Free Flow Schematic)
	Drawing No - HE551485-MOU-GEN-M42 J6-SK-D-0176	**Drawing No - HE551485-MOU-GEN-M42 J6-SK-D-0178**	**Drawing No - HE551485-MOU-GEN-M42 J6-SK-CH-0006**	**Drawing No - HE551485-MOU-GEN-M42 J6-SK-CH-0028**	**Drawing No - HE551485-MOU-GEN-M42 J6-DR-CH-0008**	**Drawing No - HE551485-MOU-GEN-M42 J6-DR-CH-0008**
Summary of Key Buildability Challenges	Demolition and replacement of Shirley Fields Accommodation bridge, if required, and replacement of Eastway bridge. NEC access severely affected. 1200mm STW aqueduct and chamber on west side affected by parallel links - diversion or extension/protection required. Also numerus crossings of aqueduct along link and around roundabout works to airport. 132KV and 400KV crossed by route in vicinity of links off/on the M42. A number of pylons severed. Clearances to be checked for slip road embankment and NEC Underpass works, pylon affected for slip road in cutting. - diversion required. LHP National Grid gas crossed by link to airport. Route part in cutting, diversion will be required. Temporary diversion of Bickenhill Lane during construction Import of suitable fill materials will be required as it is likely that there will a deficit due to new M42 southbound overbridge embankment. A number of portal superspan gantries, cantilever gantries and signing along the M42 corridor will be affected. Extensive diversion works to the NRTS system to provide an interrupter cable to maintain functionality through the works during construction. Closures of the M42 and A45 will be necessary for construction of the new overbridges, demolition of existing bridges, gantry demolition / erection and tie in works. Severe disruption to NEC and NMM during underpass construction works. Diversion arrangements will be extensive. M42 J6 Gyratory - Severe disruption to road users during bridge widening (if feasible) and demolition and replacement of the A45 eastern underbridge Gantry and signing replacement at M42 J6. Traffic signal phasing and signing on all arms at M42 J6 will need to be reviewed.	Demolition and replacement of Eastway bridge. NEC access severely affected. 132KV and 400KV crossed by route in vicinity of links off/on the M42. A number of pylons severed. Clearances to be checked for slip road embankment and NEC Underpass works, pylon affected for slip road in cutting. - diversion required. Any surplus material will necessitate disposal offsite Some portal superspan gantries, cantilever gantries and signing along the M42 corridor to the north will be affected. Closures of the M42 and A45 will be necessary for construction of the new overbridges, demolition of existing bridges, gantry demolition / erection and tie in works. Severe disruption to NEC and NMM during underpass construction works. Diversion arrangements will be extensive. M42 J6 Gyratory - Severe disruption to road users during bridge widening (if feasible) and demolition and replacement of the A45 eastern underbridge Gantry and signing replacement at M42 J6. Traffic signal phasing and signing on all arms at M42 J6 will need to be reviewed.	Demolition and replacement of B4102 Solihull Road and Shadowbrook Lane bridges over the M42. Diversions will be required. Loss of ancient woodland Diversion of LHP National Grid and Western Power apparatus - link in cutting Diversion or protection of 1200mm dia STW main at roundabout works. Closure of Catherine de Barnes Lane for construction of bridge - localised diversion may be possible. Large diaphragm walling or similar required for merge slip road. Minor disruption to existing technology along M42 corridor but some gantries and signing will be affected. Closures of the M42 will be necessary for construction of the new overbridges, demolition of existing bridges, gantry demolition / erection and tie in works. Link in cutting will generate significant surplus of material which will require disposal Ditch and culvert severed by link in cutting at location of Catherine de Barnes Lane. Deep drainage to local ditches if feasible, possible need for pumping station.	Demolition and replacement of B4102 Solihull Road, Shadowbrook Lane and Eastway bridges over the M42. Diversions will be required. NEC access severely affected. Loss of ancient woodland Diversion of LHP National Grid and Western Power apparatus - link in cutting Diversion or protection of 1200mm dia STW main at roundabout works. Closure of Catherine de Barnes Lane for construction of bridge - localised diversion may be possible. Large diaphragm walling or similar required for merge slip road. Minor disruption to existing technology along M42 corridor but some gantries and signing will be affected. Closures of the M42 will be necessary for construction of the new overbridges, demolition of existing bridges, gantry demolition / erection and tie in works. Link in cutting will generate significant surplus of material which will require disposal Ditch and culvert severed by link in cutting at location of Catherine de Barnes Lane. Deep drainage to local ditches if feasible, possible need for pumping station. Severe disruption to NEC and NMM during underpass construction works. Diversion arrangements will be extensive. 400KV and 132KV overheads and pylons - clearances to be checked for slip road embankment and NEC Underpass works, pylon affected for slip road in cutting. Gantry and signing replacement at M42 J6. Traffic signal phasing and signing on all arms at M42 J6 will need to be reviewed.	Demolition and replacement of B4102 Solihull Road and Shadowbrook Lane bridges over the M42. Diversions will be required. Loss of ancient woodland Diversion of LHP National Grid and Western Power apparatus - link in cutting Diversion or protection of 1200mm dia STW main at roundabout works. Minor disruption to existing technology along M42 corridor but some gantries and signing will be affected. Closures of the M42 will be necessary for construction of the new overbridges, demolition of existing bridges, gantry demolition / erection and tie in works. Early diversion of Bickenhill Lane to avoid severance of residential properties. 400KV and 132KV overheads and pylons - clearances to be checked for slip road embankment works, Local ditches crossed by the route in two locations will require culverting.	Demolition and replacement of B4102 Solihull Road, Shadowbrook Lane and Eastway bridges over the M42. Diversions will be required. NEC access severely affected. Loss of ancient woodland Diversion of LHP National Grid and Western Power apparatus - link in cutting Diversion or protection of 1200mm dia STW main at roundabout works. Minor disruption to existing technology along M42 corridor but some gantries and signing will be affected. Closures of the M42 will be necessary for construction of the new overbridges, demolition of existing bridges, gantry demolition / erection and tie in works. Early diversion of Bickenhill Lane to avoid severance of residential properties. Severe disruption to NEC and NMM during underpass construction works. Diversion arrangements will be extensive. 400KV and 132KV overheads and pylons - clearances to be checked for slip road embankment and NEC Underpass works, pylon affected for slip road in cutting. Local ditches crossed by the route in two locations will require culverting. Gantry and signing replacement at M42 J6. Traffic signal phasing and signing on all arms at M42 J6 will need to be reviewed.

Option Number	Option Theme	Envmt Assessment Scores/Text						
		Ecology Impact	**Heritage Impact**	**Noise Impact**	**Landscape Impact**	**Road Drainage and Water**	**Air Quality**	**Score Tally**
1E	N+S	**1. large env impact** This option passes through several non-statutory designated sites such as Ecosites, Local Wildlife Sites and Ancient Woodland. It is unlikely this option would be approved at planning due to loss off ancient woodland unless we can show there are no other suitable alternatives. It also crosses watercourses and would involve the permanent loss of habitats where land-take is required.	**3. Moderate env Impact** All options will have a moderately adverse affect on Heritage. None of the options will adversely affect a designated site. Option 1E will impact upon c.22 undesignated sites and has the potantial to impact upon currently unknown sites.	**1. large env impact** There are 3 noise important areas in proximity of option. Likely increase in noise levels at receptors - new slip roads proposed near residential areas.	**2. Large - Mod Env Impact** This option would influence the landscape between Catherine de Barnes in the south and the M6 to the north by adding two new raised junctions to the corridor as well as increasing the width of the M42 corridor through the parallel link roads along the length of this option. The offline link road to the Clock Interchange would also sever and fragment the local landscape around Bickenhill. Overall this option would significantly increase the presence of the M42 within the area which is already heavily influenced by transport corridors. Visual impacts are likely to arise around the village of Bickenhill, Old Station Road (north of Hampton in Arden) due to the link roads and for properties around the southern junction and in close proximity to the M42 corridor.	**3. Moderate env Impact** 2 Watercourse Crossings Non-WFD designated watercourse (Blythe downstream, overall Poor status 2015) Watercourses crosses and downstream Flood Zone 3 Assumed increase in operational run-off Groundwater Body (Tame Anker Mease Secondary Combined) Overall Good Status	**3. Moderate env Impact** Option re-alignment and proposed new links have potential to increase volume of traffic and reduce distance between vehicle emission sources and sensitive receptors, particularly in proximity to Old Station Road, Shadow Brook Lane, B4102 Solihull Road, and B4438 Catherine De Barnes Road.	**13**
2A modified	South	**2. Large - Mod Env Impact** This option passes through several non-statutory designated sites such as Ecosites, Local Wildlife Sites and Ancient Woodland. It is unlikely this option would be approved at planning due to loss off ancient woodland unless we can show there are no other suitable alternatives. It also crosses watercourses and would involve the permanent loss of habitats where land-take is required.	**3. Moderate env Impact** All options will have a moderately adverse affect on Heritage. None of the options will adversely affect a designated site. Option 2A will impact upon c.22 undesignated sites and has the potantial to impact upon currently unknown sites.	**1. large env impact** There are 2 noise important areas in proximity of option. Likely increase in noise levels at receptors - new slip roads proposed near residential areas. Potential for mitigation by use of barriers / low noise surfacing.	**3. Moderate env Impact** This option would influence the landscape between Catherine de Barnes in the south and the A45 to the north by adding one new raised junction as well as increasing the width of the M42 corridor through the parallel link roads along the length of this option. The offline link road to the Clock Interchange would also sever and fragment the local landscape. Overall this option would significantly increase the presence of the M42 within the area already heavily influenced by transport corridors. Visual impacts are likely to arise around the village of Bickenhill, Old Station Road (north of Hampton in Arden) due to the link roads and for properties around the southern junction and in close proximity to the M42 corridor.	**3. Moderate env Impact** 2 Watercourse Crossings Non-WFD designated watercourse (Blythe downstream, overall Poor status 2015) Watercourses downstream feature Flood Zone 3 Assumed increase in operational run-off Groundwater Body (Tame Anker Mease Secondary Combined) Overall Good Status	**3. Moderate Env Impact** Option re-alignment and proposed new links have potential to increase volume of traffic and reduce distance between vehicle emission sources and sensitive receptors, particularly in proximity to Old Station Road, Shadow Brook Lane, B4102 Solihull Road, and B4438 Catherine De Barnes Road.	**15**
2K		**2. Large - Mod Env Impact** This option passes through several non-statutory designated sites such as Ecosites, Local Wildlife Sites and Ancient Woodland. It is unlikely this option would be approved at planning due to loss off ancient woodland unless we can show there are no other suitable alternatives. It also crosses watercourses and would involve the permanent loss of habitats where land-take is required.	**3. Moderate env Impact** All options will have a moderately adverse affect on Heritage. None of the options will adversely affect a designated site. Option 2K will impact upon c.24 undesignated sites and has the potantial to impact upon currently unknown sites.	**1. large env impact** There is 1 noise important area in proximity of option. Likely increase in noise levels at receptors - new slip roads proposed near residential areas. Potential for mitigation by use of barriers / low noise surfacing.	**3. Moderate env Impact** This option would influence the landscape between Catherine de Barnes in the south and the A45 to the north by adding one new raised junction as well as increasing the width of the M42 corridor through the parallel link roads along the length of this option. The offline link road to the Clock Interchange would also sever and fragment the local landscape. Overall this option would significantly increase the presence of the M42 within the area already heavily influenced by transport corridors. Visual impacts are likely to arise around the village of Bickenhill, Old Station Road (north of Hampton in Arden) due to the link roads and for properties around the southern junction and in close proximity to the M42 corridor.	**3. Moderate env Impact** 2 Watercourse Crossings Non-WFD designated watercourse (Blythe downstream, overall Poor status 2015) Watercourses downstream feature Flood Zone 3 Assumed increase in operational run-off Groundwater Body (Tame Anker Mease Secondary Combined) Overall Good Status	**3. Moderate Env Impact** Option re-alignment and proposed new links have potential to increase volume of traffic and reduce distance between vehicle emission sources and sensitive receptors, particularly in proximity to Old Station Road, Shadow Brook Lane, B4102 Solihull Road, and B4438 Catherine De Barnes Road.	**15**
3D	Interchange	**3. Moderate env Impact** Some permanent loss of habitat due to lane widening and alignment of minor roads. This option would also require new watercourse crossings. However, no Ecosites or Local wildlife Sites affected by this option.	**3. Moderate env Impact** All options will have a moderately adverse affect on Heritage. None of the options will adversely affect a designated site. Option 3D will impact upon c.23 undesignated sites and has the potantial to impact upon currently unknown sites.	**2. Large- moderate env impact** There are 2 noise important areas in proximity of option. Noise impacts will be limited to area of the interchange.	**4. Moderate - Slight env Impact** This option would increase the size of the A45/M42 junction and include localised widening on the M42 and additional link roads along the A45. Localised widening may result in the loss of vegetation acting as visual screening or landscape integration along the M42 and overall the presemce of trasnport corrdors would be raised primarily around the M42/A45 junciton. Visual impacts are likely to be limited to properties along or near the existing M42 corridor (potentially affecting residential properties along Old Station Road north of Hampton in Arden and properties in Bickenhill).	**4. Moderate - Slight env Impact** 1 Watercourse Crossing Non-WFD designated watercourse (Blythe downstream, overall Poor status 2015) Flood Zone Class 3 downstream Assumed increase in operational run-off Groundwater Body (Tame Anker Mease Secondary Combined) Overall Good Status	**3. Moderate env Impact** Option proposes full redesign of M42 J6, which has potential to increase volume of traffic and reduce distance between vehicle emission sources and sensitive receptors located on Old Station Road to the southeast.	**19**
4B	North	**1. large env impact** This option impacts a SSSI and passes through several non-statutory designated sites such as Ecosites and Local Wildlife Sites. It is unlikely this option would be approved at planning due to impacts to the integrity of the SSSI. It also crosses watercourses and would involve the permanent loss of habitats where land-take is required.	**3. Moderate env Impact** All options will have a moderately adverse affect on Heritage. None of the options will adversely affect a designated site. Option 4B will impact upon c.22 undesignated sites and has the potantial to impact upon currently unknown sites.	**3. Moderate env Impact** There are no noise important areas in proximity of option. Noise impacts will be limited to area of the interchange.	**2. Large - Mod Env Impact** This option would add one new junction with a short link road and localised widening along the M43 entirely within the degraded rural landscape contained within the existing motorway/highway corridors of the M42, M6, A45 and A452 and large scale development. Localised widening may result in the loss of vegetation acting as visual screening or landscape integration. This area is largely free of sensitive visual receptors and the visual containment would minimise effects to potential surrounding visual receptors in the wider area.	**3. Moderate env Impact** 1 Watercourse Crossing Non-WFD designated watercourse (Blythe downstream, overall Poor status 2015) Flood Zone Class 3 downstream Assumed increase in operational run-off Groundwater Body (Tame Anker Mease Secondary Combined) Overall Good Status	**4. Moderate-Slight Env Imapct** Option includes proposed widening of M42 to the south of J7, which will reduce distance between vehicle emission sources and SSSI's adjacent to the east and northeast. SSSI's may include habitats potentially sensitive to nitrogen deposition and elevated oxides of nitrogen (NOx) concentrations.	**16**
11	Do Something	**3. Moderate env Impact** Some permanent loss of habitat due to lane widening and new southern junction. It is unlikely this option would be approved at planning due to loss off ancient woodland unless we can show there are no other suitable alternatives. However, no Ecosites or Local wildlife Sites affected by this option.	**3. Moderate env Impact** All options will have a moderately adverse affect on Heritage. None of the options will adversely affect a designated site. Option 11 will impact upon c.20 undesignated sites and has the potantial to impact upon currently unknown sites.	**2. Large - Mod Env Impact** There are 3 noise important areas in proximity of this option. Potential for mitigation by use of barriers / low noise surfacing.	**5. Slight env Impact** This option would involve localsied online widening only and as such would not introduce new infrastructure outside the existing boundaries, but may result in the loss of vegetation acting as visual screening or landscape integration and locally inrease the influence of the M42 in the surrounding landscape . Visual impacts are likely to arise for receptors in close proximity to the M42 corridor only.	**3. Moderate env Impact** 3 Watercourse Crossings Non-WFD designated watercourse (Blythe downstream, overall Poor status 2015) Watercourses crosses and downstream Flood Zone 3 Assumed increase in operational run-off Groundwater Body (Tame Anker Mease Secondary Combined) Overall Good Status	**3. Moderate env Impact** Option proposes widening of M42 and improvements to J6 slip roads, with small potential to impact local air quality at existing sensitive receptors in proximity to J6.	**19**

1	Large env impact
2	Large - moderate env impact
3	Moderate env impact
4	Moderate - slight env impact
5	Slight env impact

Appendix F2 – Technical Notes

Working on behalf of highways england

mouchel building great relationships

Project:	M42 Junction 6 Improvement Scheme	**Date:**	12/08/16
		TN Ref:	0002
Subject:	Technical Note on Viability of BHX/A45 Link		
Author:	Jamie Clift	**Project Ref:**	HE551485-MOU-GEN-M42_J6-FN-TR-0002
Reviewed:	Graham MacNicol	**Date:**	30/08/16
Approved:	Robin Jackson	**Date:**	31/08/16

1.0 Introduction to the Scheme

The proposed improvement scheme is required to alleviate the current congestion and journey reliability issues associated with the M42 Junction 6. The junction lies at the heart of an area of dynamic growth, and is a gateway to Birmingham Airport, the National Exhibition Centre (NEC) and Birmingham Business Park. In addition, a station for the proposed High Speed Two (HS2) is to be located nearby and the plans for Solihull MBC's UK Central (UKC) mixed use development will continue to add significant demand to the network and increase dependence on M42 Junction 6. Other key stakeholders within close proximity to the scheme and Strategic Road Network (SRN) include the National Motorcycle Museum/National Conference Centre (NMM/NCC), Jaguar Land Rover (JLR) and Solihull Metropolitan Borough Council (SMBC). A new Motorway Service Area (MSA) is proposed south of the existing junction 6 - this proposal has been submitted for planning approval but no formal decision has to date been made.

2.0 Technical Note

Following a meeting with Highways England on 6 April 2016 held at the Mouchel Sutton Coldfield office, a request from the Highways England Programme Manager (Jonathan Pizzey) to produce a technical note focusing on the links from the new southern junction to HS2/UKC and A45/Birmingham Airport identifying advantages and disadvantages of these links. This technical note will focus on the A45/Birmingham Airport connecting links.

3.0 HS2/UKC Connecting Links

The A45/Birmingham Airport connecting link road commences from a new southern junction which is centred approximately 2.24km south of the existing junction 6 circulatory and then runs in between the two villages of Bickenhill and Catherine De Barnes and connects to the Clock Interchange. The following part of this technical note will give a general overview of the existing conditions followed by a consideration on its impact with respect to severance, environment, stakeholders, non-motorised users, existing road network, resilience, congestion, maintenance, safety and traffic.

3.1 Existing Conditions

M42 J6 has been noted as currently operating at near capacity and on event days that additional event based demand contributes to significant congestion. This impacts on both the M42 mainline and the local road network (LRN) impacting journey times, resilience and safety.

Traffic modelling has shown that even without proposed local development by 2019 the M42 J6 will be expected to suffer from significant congestion during peak hours and operate at an unacceptable level of service. This is in relation to the Pinch Point Programme (PPP) scheme which was completed in March 2015 and is considered as a short-medium term solution.

Significant development has been earmarked for the area including (but not limited to) UK Central with growth around the NEC, Birmingham Airport and the proposed HS2 Station. It is considered that without a suitable upgrade of the

existing junction, there is likely to be significant impact on the proposed development as well as local and regional and even national economy, connectivity and accessibility. Without junction upgrades it is assumed there will be a further deterioration in safety resulting in increased accidents.

There are several areas of man-made superficial deposits in the study area. There are also several historical landfill sites shown to be present to the west of the M42 in the vicinity of this link. Glacio-fluvial deposits are present in isolated areas, mainly to the north of the M42. Localised areas of alluvium associated with small watercourses underlay parts of the M42. . If the alluvium is found to be weak and/or compressible, such material may need removing or strengthening using ground improvement techniques.

The study area is predominantly within the green belt. There are also flood zones areas (2 and 3), presence of sites of special scientific interest (SSSI), ancient woodland, eco and wildlife sites, cultural heritage assets, historic buildings and noise important areas. The proposed link is near to the villages of Bickenhill and Catherine de Barnes as well as other key stakeholders.

3.2 The Proposals

The proposed dual link road to the west of the new southern junction provides access to Birmingham Airport at the existing Clock Interchange via a new roundabout proposed south of the junction as well as providing a free flow link to the A45 for westbound traffic. The horizontal radii proposed on the link to the Airport has a minimum radius of 515m and crosses Catherine De Barnes Lane at one location and interacts at the far north near the Clock Interchange. The free flow link to the A45 westbound has a radius of 510m. A new structure will be provided to raise Catherine De Barnes Lane over the new link road near to Shadowbrook Lane.

The overall length of the link road from the southern junction to the clock interchange is approximately 2.538km and the length of the A45 free flow link is 720m. This link is included in both Southern options and the North + South option.

Severance

The link road is aligned to reduce severance to the villages of Bickenhill and Catherine De Barnes. The impacts to the B4438 Catherine De Barnes Lane are at two locations. The first is where the B4438 would need to be raised above the link road where they cross near to Shadowbrook Lane. The second is to the far north of the B4438 Catherine De Barnes Lane where the existing road will connect to a proposed roundabout and will be able to access the new dual link road, A45 and Birmingham Airport. No discussions have been held with the local authority about this arrangement or an alternative to stop up this section of road. If the latter occurs this would be considered a severance issue, however, alternative routes are available using B4102, Lugtrout Lane, and Damson Parkway..

Environment

The inclusion of this link passes through various locations of landfill sites and an area of SSSI. It is also close to the villages of Bickenhill and Catherine De Barnes which causes visual, air and noise pollution.

Stakeholders

The list below includes a number of key stakeholders that are directly impacted in the area:

- UK Central (UKC)
- Birmingham Airport
- Birmingham International Railway Station

- NEC
- Motorway Service Area
- Local Residents around Bickenhill and Catherine De Barnes

Stakeholders not directly impacted:

- HS2
- Jaguar Land Rover
- Solihull Metropolitan Borough Council (SMBC)
- Network Rail
- Environment Agency
- National Motorcycle Museum/National Conference Centre

NEC, SMBC, NMM, JLR and HS2 may receive a benefit due to the reduced flows at existing junction 6, however, it is considered that this benefit would be negligible.

Local residents around Bickenhill and Catherine De Barnes would be impacted the most due to the alignment of the link road. it is possible that this impact can be mitigated, however, this will increase whole life costs, due to the added mitigation and maintenance measures required.

Non-motorised users (NMU)

At present only a desk study exercise has been undertaken to locate a number of public rights of way (PRoW). An NMU survey and NMU Context Report has not yet been carried out. The inclusion of a link to Birmingham Airport/A45 will clash with a number of PRoW's. It is envisaged that new structures or diversions will be incorporated to avoid any severance of existing NMU routes.

Existing road network

This connecting link interacts with Catherine De Barnes Lane at two locations. The intention is to raise Catherine De Barnes Lane over the connecting link nearest to Shadowbrook Lane. The interaction with Catherine De Barnes lane at the far north would include a new roundabout and realignment to maintain access from Bickenhill and Catherine De Barnes to the A45, Birmingham Airport NEC and new link road.

Resilience

The benefit of this link provides direct access to A45 westbound, Birmingham Airport and the NEC and is an alternative access to these during closures of the M42/A45.

Congestion

The link has the potential to alleviate congestion on the M42 and particularly around junction 6 - the extent to which this link eases congestion would needs to be confirmed via traffic model tests. However, the fact remains that this would remove traffic from junction 6 and part of the M42 mainline.

Maintenance

Due to the inclusion of this link along with the M42, parallel link roads between junction 6 and the new southern junction would result in a wide scheme footprint to maintain. The inclusion of this link could assist operational maintenance by providing another diversion route for drivers during standard maintenance operations and in some instances emergency

maintenance. As part of the design, maintenance requirements of the asset support contractor (ASC) would be discussed and where applicable applied into the design.

Safety

Safety impacts should be reviewed in two ways for the road users and road workers;

Road users – most accidents occur around junctions and this option requires vehicles to travel from the SRN to either the new and existing roundabouts at Clock Interchange or merging with the A45 westbound traffic. However, the links would be designed to a compliant alignment with an appropriate merge type and have sufficient capacity for the traffic flows envisaged.

Road workers – there will be an increased area and infrastructure for road workers to maintain and therefore increases the probability of accidents that involve road workers. The inclusion of any maintenance risk and/or access would need to be agreed and discussed with the ASC. The reduced traffic flow on the M42 mainline and around junction 6 is expected to have an improved accident record on the SRN which would reduce the need for ASC intervention and assistance.

Traffic

The presence of a connecting link directly to Birmingham Airport/A45 should be an attractive route for road users. As stated earlier, this should remove traffic from the mainline and junction 6 thus increasing capacity (the actual percentage benefits are to be confirmed).

At present the traffic flows using this link vary between the known traffic models and the results need to be confirmed, JMP results from the Concept Study in 2014 indicate the following results for a 2034 design year:

- AM Peak – 3089vph to Birmingham Airport/A45 and 642vph away from Birmingham Airport/A45
- PM Peak – 2054vph to Birmingham Airport/A45and 846vph away from Birmingham Airport/A45
- Ave – 1343vph to Birmingham Airport/A45and 389vph away from Birmingham Airport/A45

Note: vph is vehicles per hour

The current traffic modelling based on a 'cut-out' from an old prism model (v4.1) which indicates peak hour flows similar to the average flows quoted above. The links connecting to Birmingham Airport and A45 designed in the traffic model follow a different alignment to what is proposed. Currently, discussions are being held between Mouchel, HS2 and UKC to establish origins and destinations.

4.0 Conclusion

An A45/BHX link road from a new southern junction on the M42 would contribute to the alleviation of congestion associated with the current Junction 6 and provide additional resilience to the strategic highway network. This would provide indirect benefits to stakeholders currently reliant in whole or in part on the existing junction. There would be some inevitable local and environmental impacts for which mitigation would need to be considered.

Based on the projected traffic flows, it is concluded that the demand associated with Birmingham Airport alone would be sufficient to warrant a direct link and deliver a net benefit in cost-benefit terms. Taking into account future growth plans for the Airport and the projected 19.8% traffic growth predicted for the West Midlands by 2031 provides further substantiation for the link.

Project:	M42 Junction 6 Improvement Scheme	**Date:**	12/08/16
		TN Ref:	0003
Subject:	Technical Note on Viability of HS2/UKC Link		
Author:	Darren Morris/David Whittle	**Project Ref:**	HE551485-MOU-GEN-M42_J6-FN-CH-0003
Reviewed:	Graham MacNicol	**Date:**	30/08/16
Approved:	Robin Jackson	**Date:**	31/08/16

1.0 Introduction to the Scheme

The proposed improvement scheme is required to alleviate the current congestion and journey reliability issues associated with the M42 Junction 6. The junction lies at the heart of an area of planned growth, and is a gateway to Birmingham Airport, the National Exhibition Centre (NEC) and Birmingham Business Park. In addition, a station for the proposed High Speed Two (HS2) is to be located nearby and the plans for Solihull MBC's UK Central (UKC) mixed use development will continue to add significant demand to the network and increase dependence on M42 Junction 6. Other key stakeholders within close proximity to the scheme and Strategic Road Network (SRN) include the National Motorcycle Museum (NMM)), and Jaguar Land Rover (JLR). A new Motorway Service Area (MSA) is proposed south of the existing junction 6 - this proposal has been submitted for planning approval but no formal decision has to date been made.

2.0 Technical Note

Following a review of expected traffic figures received from HS2, information resulting from stakeholder consultations, and an internal workshop, Highways England requested a technical note focusing on the links from the new southern junction to HS2/UKC and A45/Birmingham Airport (refer to Technical Note HE551485-MOU-GEN-M42_J6-FN-CH-0002) looking at advantages and disadvantages of these links.

This technical note will focus on HS2/UKC (eastern) connecting links.

3.0 HS2/UKC Connecting Links

The HS2/UKC connecting link road is shown within the options drawings for the new southern junction (Option 2K) and on drawing HE551485-MOU-GEN-M42_J6-SK-CH-0001 (attached). The following part of this technical note will give a general overview of the existing conditions followed by a consideration on its impact with respect to safety, severance, environment, stakeholders, non-motorised users, existing road network, resilience, congestion, maintenance, utilities and traffic.

3.1 Existing Conditions

M42 J6 as described in Highways Agency Strategic Outline Business Case (SOBC):

"Current congestion and journey reliability issues at Junction 6 are constraining investment and economic growth. Without infrastructure investment to improve the junction a major investment opportunity of national significance could be lost.

A recent study (UK Central Study 1 Report: Identifying the need for Intervention &

Developing Options August 2014) commissioned by the Highways Agency has been completed that focuses on the operation at Junction 6 and on the M42 adjacent to this junction. This study has assessed the current

and forecast conditions with and without the inclusion of the proposed UK Central development. In this study Junction 6 has been identified as a current and future congestion hot spot and noted as extremely likely to require significant improvements in infrastructure in order to realise the full economic potential of the growth along the M42 corridor."

As well as the above NEC major event days, peak times and after local incidents, that additional demand contributes to significant congestion. This impacts on both the M42 mainline and the local road network (LRN) impacting journey times, resilience and safety.

Earlier traffic modelling has shown that even without proposed local development that by 2019 the M42 J6 will be expected to suffer from significant congestion during peak hours and operate at an unacceptable level of service. This is in relation to the Pinch Point Programme (PPP) scheme which was completed in March 2015 and considered as a short-medium term solution.

Significant development has been earmarked for the area including but not limited to UK Central with growth around the NEC, Birmingham Airport and the proposed HS2 Station. It is considered that without a suitable upgrade of the existing junction, there is likely to be significant impact on the proposed development as well as local and regional (and even national) economy, connectivity and accessibility. Without junction upgrades it is assumed that there will be a further deterioration in safety resulting in increased accidents.

There are several areas of man-made superficial deposits in the study area. There is also an historical landfill site to the east of the M42 adjacent to this link. Glacio-fluvial deposits are present in isolated areas, mainly to the north of the M42. Localised areas of alluvium associated with small watercourses underlay parts of the M42. If the alluvium is found to be weak and/or compressible, such material may need removing or strengthening using ground improvement techniques.

The study area is predominantly within green belt, there are also flood zones areas (2 and 3), presence of sites of special scientific interest (SSSI), ancient woodland, eco and wildlife sites, cultural heritage assets, historic buildings and noise important areas. The proposed link is near to Hampton in Arden village.

3.2 The Proposals

The HS2/UKC link road connects to the new southern junction and runs parallel to the M42 and A45 with a connection to HS2/UKC area via an alignment under the A45. This alignment is achieved by including two roundabouts to turn the link through 90°. A separate option provided a long horizontal curve rather than two roundabouts but this option resulted in impacting several properties within Hampton-in-Arden village.

The overall length of the link road between the new southern junction and HS2 is approximately 3.21km - which does not include the two roundabouts mentioned above or the new southern junction. It passes under the existing local road of Shadow Brook Lane as well as the Birmingham-Euston railway line and then under the A45 to connect to HS2.

3.21 Safety

Safety should be reviewed in two ways - the impact on the road users and road workers:-

Road users – most accidents occur around junctions and this option requires vehicles to travel from the SRN and pass through three roundabouts to access HS2/UKC. However, the links would be designed to a compliant alignment and have sufficient capacity for the traffic flows envisaged. There is a potential that the link running adjacent to the parallel

link roads could result in a visual intrusion hazard due to the relatively straight alignment and close proximity to the M42. The presence of screening/planting and speed mitigation measures should combat this.

Road workers – the increased footprint and infrastructure to maintain increases the probability of accidents involving road workers. The inclusion of any maintenance risk and/or access would need to be agreed and discussed with the local ASC. The removal of traffic from a congested motorway and junction would hopefully see an improved accident record on the SRN which would, in turn, reduce the need for ASC intervention and assistance.

3.22 Severance

The link road is aligned to reduce severance to the village of Hampton in Arden. The only impacts are to the far north of Old Station Road (refer to drawing HE551485-MOU-GEN-M42_J6-SK-CH-0001) where the alignment turns 90° via a roundabout to the south of the National Motorcycle Museum and where the alignment passes under Shadow Brook Lane. Some discussions have taken place with stakeholders about this arrangement and resultant comments are described below in the Stakeholder section.

3.23 Environment

The link impacts flood zones 2 and 3 at the head of Shadow Brook. It also passes through Cultural Heritage Assets adjacent to the M42 and A45 and is directly on a Defra noise important area to the north of Old Station Road. Due to the inclusion of this link the road network is also closer to Hampton in Arden causing visual, air and noise pollution.

3.24 Stakeholders

The list below includes a number of key stakeholders in the area, (note this list is not exhaustive):

Directly Impacted

- HS2
- UK Central (UKC)
- NEC (via Eastway)
- Solihull Metropolitan Borough Council (SMBC)
- Network Rail
- Environment Agency
- Local Residents around Hampton in Arden
- Local businesses including Bickenhill Waste Recycling site and Landfill Site
- National Motorcycle Museum

Indirectly Impacted

- Birmingham Airport
- Birmingham International Railway Station
- Jaguar Land Rover (JLR)
- Motorway Service Area (MSA)

Birmingham Airport, Birmingham International Railway Station, NEC, SMBC and JLR may receive a benefit due to the reduced flows at existing junction 6, however, it is considered that this benefit would be negligible.
The presence of this link would require a new structure over the Birmingham-Euston line and due to the high risk of possessions, advanced and maintained communication with Network Rail is recommended.

Local residents around Hampton in Arden would be impacted the most due to the alignment of the link road. It is possible that this impact can be mitigated, however, this will increase whole life costs due to the added mitigation and maintenance measures required.

Initial stakeholder consultations have resulted in residents not in favour of this link (southern junction option in general), HS2 group have included improvements to the A452 to provide better access to car parks so would not really require a link in this location. SMBC were in favour of the link primarily for access to the future UKC development, however traffic demand would not likely be needed until sometime in the future (i.e. significantly beyond the expected construction date).

The presence of this link to the rear of NMM could impact on future development and/or expansion of this business due to the location of the connecting link.

3.25 Non-motorised users (NMU)

At present only a desk study exercise has been undertaken to locate a number of public rights of way (PRoW). An NMU survey and NMU Context Report has not yet been carried out. The inclusion of a link to HS2/UKC as shown on the drawing will clash with a number of PRoW and one National Trail. It is envisaged that new structures or a diversion will be incorporated to avoid any severance of existing NMU routes.

3.26 Existing road network

This connecting link interacts with two local roads, namely Shadow Brook Lane and East Way (from Coventry Road to NEC). The intention would be to raise Shadow Brook Lane over the connecting link due to its current alignment over the M42. However the current proposals would impact use of the East Way loop: this could be amended by adding in an additional roundabout to the East Way spiral for continued access to NEC, however westbound exit from the Waste and Landfill sites onto the service road would be restricted.

3.27 Resilience

The benefit of this link allows for alternative access to M42/A45 during closures of the M42/A45 with diversions via A452 and HS2 road network (and vice versa). This is only proposed as a single carriageway road.

The resilience benefit of this link is considered negligible.

3.28 Congestion

The link has the potential to alleviate congestion on the M42 and particularly around junction 6 - the extent to which this link eases congestion would need to be confirmed via traffic modelling tests. However, the fact remains that this link would remove some traffic from junction 6 and part of the M42 mainline.

3.29 Maintenance

The maintenance of a single carriageway like this is not uncommon. However, due to the inclusion of this link in addition to the M42 mainline, and the parallel link roads between junction 6 and the new southern junction, would result in a wide scheme footprint to maintain. The inclusion of this link could assist operational maintenance by providing another diversion route for drivers during standard maintenance operations and in some instances emergency maintenance. As part of the design, maintenance requirements of the asset support contractor (ASC) would be discussed and where applicable applied into the design.

3.30 Utilities

The location of this connecting link is likely to impact on a number of 400kV pylons (approximately four). This will obviously increase scheme costs for potential diversions and introduce construction constraints due to the type and location of the hazard.

3.31 Traffic

The presence of a connecting link directly to HS2/UKC should be an attractive route for road users. This, as stated earlier, should remove traffic from the mainline and junction 6, thus increasing the available capacity for the remaining trips (the actual percentage benefits are to be confirmed).

At present the traffic flows using this link vary between the known traffic models and the results need to be confirmed, JMP results from the Concept Study in 2014 indicate the following flows (in number of vehicles) for a 2034 design year:

- AM Peak Hour – 1,058 veh towards HS2/UKC and 247 veh away from HS2/UKC
- PM Peak Hour – 135 veh towards HS2/UKC and 934 veh away from HS2/UKC
- Ave Hour – 312 veh towards HS2/UKC and 309 veh away from HS2/UKC

However, it is important to recognise that these flows are a combination of traffic associated with the two developments – HS2 and UKC. From reference to the published transport assessment for HS2, it can be demonstrated that based on the forecast trip distributions that show 35% of passengers are to/from the M42 south, the number of vehicles that might transfer to a direct link road would be some 350 vehicles (two-way) in each of the am and pm periods in 2026, rising to 550 to 600 vehicles (two-way) by 2041.

- 2026 is the HS2 Phase 1 design year for London to West Midlands
- 2041 is the HS2 Phase 2 design year for West Midlands to Manchester and Leeds

Similarly, drawing on the forecasts presented in the preliminary assessment of the M42 Junction 6 improvement undertaken by Arup for SMBC, based on the forecast trip distribution for UKC that shows 40% of the demand to/from UKC is from the M42 south direction, the two-way vehicle flow in 2026 is forecast to be 650 vehicles in the am peak and 700 vehicles in the pm peak. These figures are forecast to increase to 2200 vehicles in each period by 2041.

The additional demand arising from the UKC development is expected to increase these potential traffic flows to approximately 3000 vehicles per peak hour by 2041.

The preliminary set of traffic modelling tests conducted using a 'cut-out' from previous version of PRISM (v4.1 - currently being updated to v4.5) indicates peak hour flows lower than the average flows quoted above. Currently discussions are being held between Mouchel, HS2 and UKC to establish the expected flows, as well as origins and destinations.

4.0 Conclusion

An HS2/UKC link road from a new southern junction on the M42 would contribute to the alleviation of congestion associated with the current Junction 6 and provide additional resilience to the strategic highway network. This would provide indirect benefits to stakeholders currently reliant in whole or in part on the existing junction. There would be some inevitable local and environmental impacts for which mitigation would need to be considered.

However, based on the projected traffic flows, it is concluded that the demand associated with HS2 alone, either in 2026 or 2041 would not be sufficient to suggest that a direct link would deliver a net benefit in cost-benefit terms.

Rather, it is the additional demand arising from UKC which would increase potential traffic flows to some 3000 vehicles per peak hour by 2041 that would be necessary for the link road to deliver more substantial benefits.

Knights House, 2 Parade Sutton Coldfield West Midlands B72 1PH
T 0121 355 8949 **F** 0121 355 8901 info@mouchel.com www.mouchel.com

Working on behalf of highways england

mouchel building great relationships

Project:	M42 Junction 6 Improvement Scheme	**Date:**	30/07/16
		TN Ref:	0006
Subject:	Review of mainline capacity Junctions 4 to 7		
Author:	Stephen Pringle/David Whittle	**Project Ref:**	HE551485-MOU-GEN-M42_J6-FN-TR-0006
Reviewed:	Rehan Mian	**Date:**	23/08/16
Approved:	Rehan Mian	**Date:**	23/08/16

1.0 Overview

This Technical Note provides a summary of analyses undertaken to investigate the case for the provision of additional mainline capacity on the M42 motorway. As part of the data collection for the M42 Junction 6 improvement scheme, data on traffic flows and speeds were collected between junctions 4 and 7. These data have been supplemented with further information obtained from Highways England's Traffic Information System and via the Performance Analysis Unit.

Two aspects of performance have been considered in this Note. The first set of analyses considers traffic flows using the M42 and provides comparisons against link capacity. Commentary is included on the implications of seasonal variation in traffic flows together with the implications arising from future traffic growth.
The second set of analyses considers traffic speeds as these can highlight particular instances of congestion that are not evident from a consideration of traffic volumes alone.

2.0 Assessment of Traffic Volumes

An analysis of the link capacity of the M42 from Junction 7a in the north to Junction 4 in the south has been undertaken based on the 'critical flow' calculation described in the COBA Manual within DMRB. The formula uses a combination of default values and the observed percentage of heavy goods vehicles (PHV) in order to produce a likely critical flow factor related to the speeds on links. This factor indicates at which point congestion is likely to occur on any given link in relation to the link's capacity. The COBA formula is based on the concept of a maximum realistic value of flow of 2330 vehicles per lane per hour. This maximum value is then reduced proportionately as the percentage of heavy goods vehicles in the flow increases. During the inter-peak period when the proportion of HGVs is highest – nearing 20% of the flow on the M42 – the resulting capacity reduces to a value nearer 1800 vehicles per lane per hour which coincides with the guideline figure used for the purposes of highway design.

For the initial capacity assessment, traffic volumes were taken from the surveys undertaken for the Junction 6 improvement study. The manual classified traffic counts undertaken in February 2016 (during school term time) have been used to provide the estimates of flow. These traffic flows have then been compared to the calculated capacities in the form of volume / capacity ratios to provide an indication of the presence of congestion. A value of volume to capacity of 0.85 is generally taken as the threshold above which a link is deemed to be experiencing congestion. The appended Table A1 provides a summary of the assessment results. The highest flows are seen in the AM peak period. It can be seen that the v/c ratios are generally below the threshold level of 0.85.

Perhaps of more significance is that capacity assessments based on link flows alone do not take account of the effects of merge, diverge and weaving movements whose combined effects will significantly influence capacity particularly with relatively short distances between successive junctions.

Paragraph 2.26 in DMRB Volume 6 Section 2 Part 1 TD 22/92 gives a formula for the number of traffic lanes required for weaving. Traffic modellers have used this relationship to derive an estimate for the reduction in capacity that arises from weaving within an existing carriageway provision, essentially by inverting the TD22/92 formula. On this basis it

has been estimated[1] that weaving will typically reduce the capacity by up to a quarter. Taking the value of 2330 vehicles per hour per lane as representing the maximum realistic link capacity, then under weaving conditions, the capacity could be reduced to some 1725 vehicles per hour per lane. On this basis it seems reasonable to adopt a figure of 1800 vehicles per hour per lane as an estimate of practical capacity. Accordingly, Table A1 also provides values for the v/c ratios based on 1800 vehicles with those sections exceeding the congestion threshold of 0.85 highlighted in red text. It can readily be seen that, in contrast to the realistic maximum capacity assessment, the majority of links exceed the threshold for most of the day, particularly in the northbound direction.

However, an assessment of link capacity under current flow conditions during February does not provide the complete picture. Firstly, it is necessary to take account of seasonality over the year. Second, traffic flows on the M42 are significantly affected by events, particularly associated with major exhibitions at the NEC. Finally, following the recent recession, a resumption in the growth in traffic flows is now forecast.

The table below shows the seasonality profile index across the year for the M42. It can be seen that February flows are slightly below the neutral March average (index 100) and that flows are generally some 4-6% higher than February across the summer months.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
M42	92	98	100	102	103	102	102	102	104	103	101	91

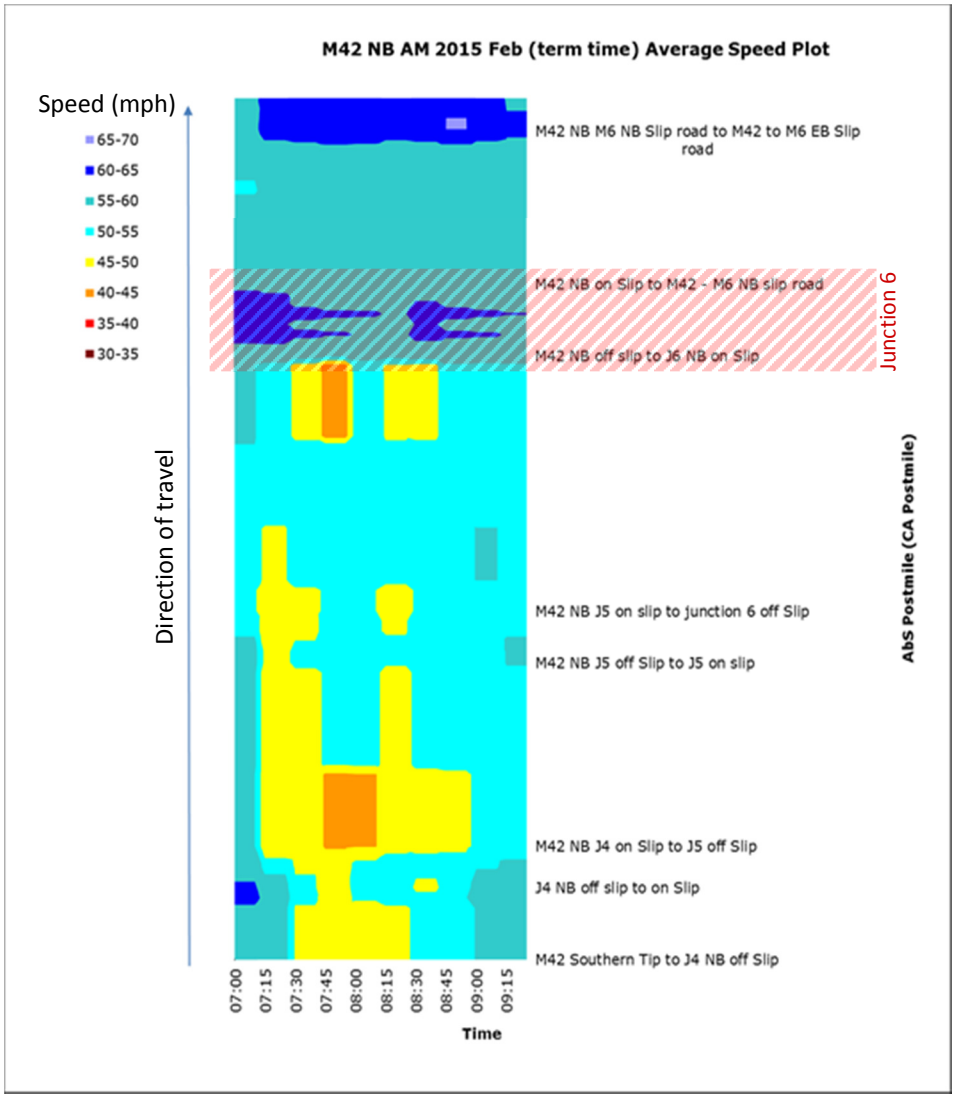
A study was undertaken in 2012[2] for the Pinch Point scheme at junction 6. Manual classified counts were undertaken at junction 6 over a 12 hour day in two consecutive weeks. The first day (2nd February) was representative of 'normal' traffic conditions. The second day (9th February) included traffic associated with the annual 'Spring Fair' at the NEC. Traffic flows at junction 6 during the Spring Fair were recorded as being 28% higher than the previous week, with traffic from junction 6 to the M42N being 7% higher and to the south 18.5% higher. It is anticipated that similar traffic conditions will occur during other annual major events at the NEC (Autumn Fair, Crufts, Gardeners' World etc.)

Finally, the National Road Traffic Forecasts for motorways in the West Midlands suggests that traffic flows will increase by some 20% between 2015 and 2030.

[1] Saturn Manual, section 15.40, ITS Leeds & Atkins.
[2] MAC 9: M42 Junction 6, Economy Study, August 2012

3.0 Journey Time Data

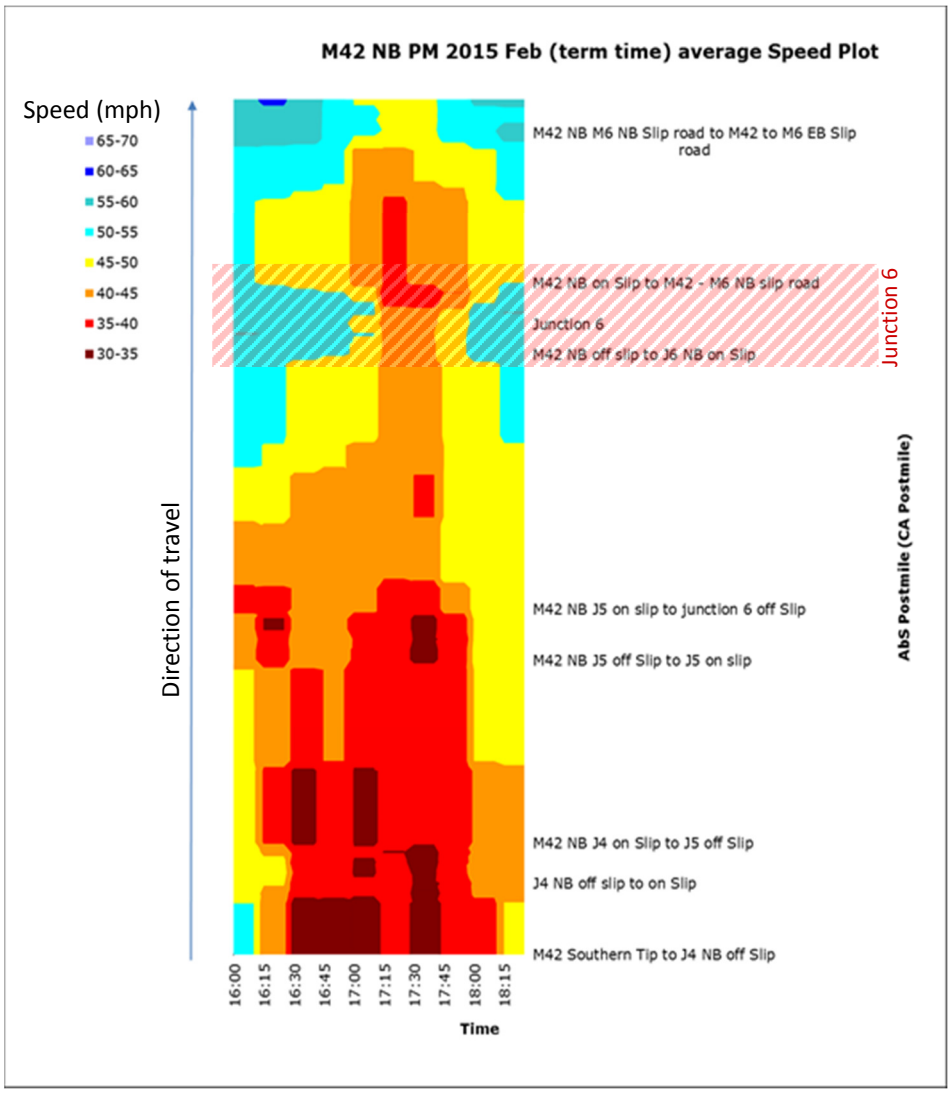
Journey time observations were undertaken as part of the Junction 6 improvement study and data on traffic speeds was also obtained from Trafficmaster for the comparable month in 2015. These data have been used to analyse speeds on the M42. Again analysis has been undertaken between J7a in the north and J4 in the south. The use of speed and journey time data allows an analysis of the performance of a link/ set of links in order to better understand the operational impact of mainline traffic volumes. Figures 1 to 4 below illustrate speeds along this section of the M42 in the form of heat maps. Generally free-flowing speed conditions are coloured blue and as speeds drop, the map shows yellow through to red.



Source: DfT Trafficmaster

Figure 1: Speed Heat Map M42 J4-7 AM Northbound

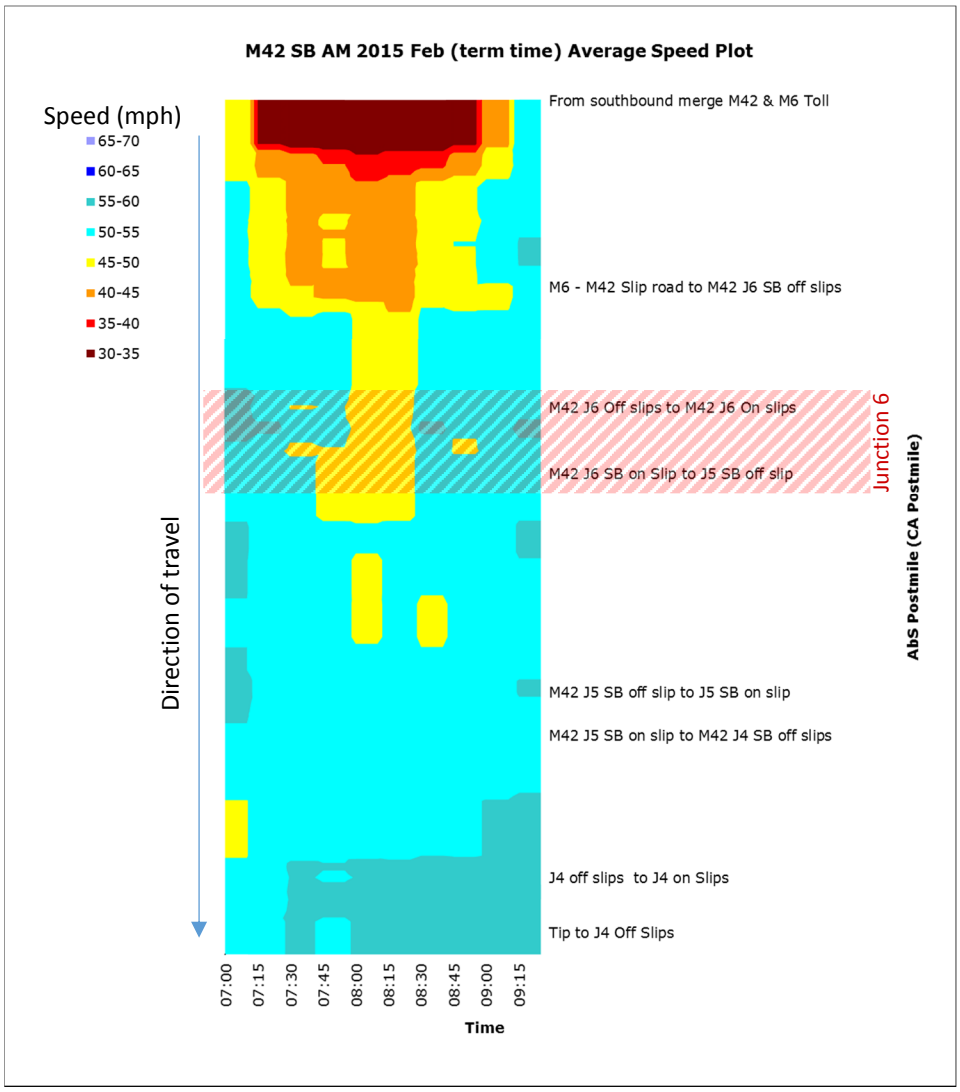
In the northbound direction during the morning peak period, some congestion occurs south of junction 5 and to a lesser extent approaching the northbound off slip at J6 where some 2300 vehicles were observed to leave the M42 at this location in the 2012 Economy Study. More detailed analysis of the northbound speeds over several days at Junction 6 shows that this issue can be significant, particularly on a Monday morning.



Source: DfT Trafficmaster

Figure 2: Speed Heat Map M42 J4-7 PM Northbound

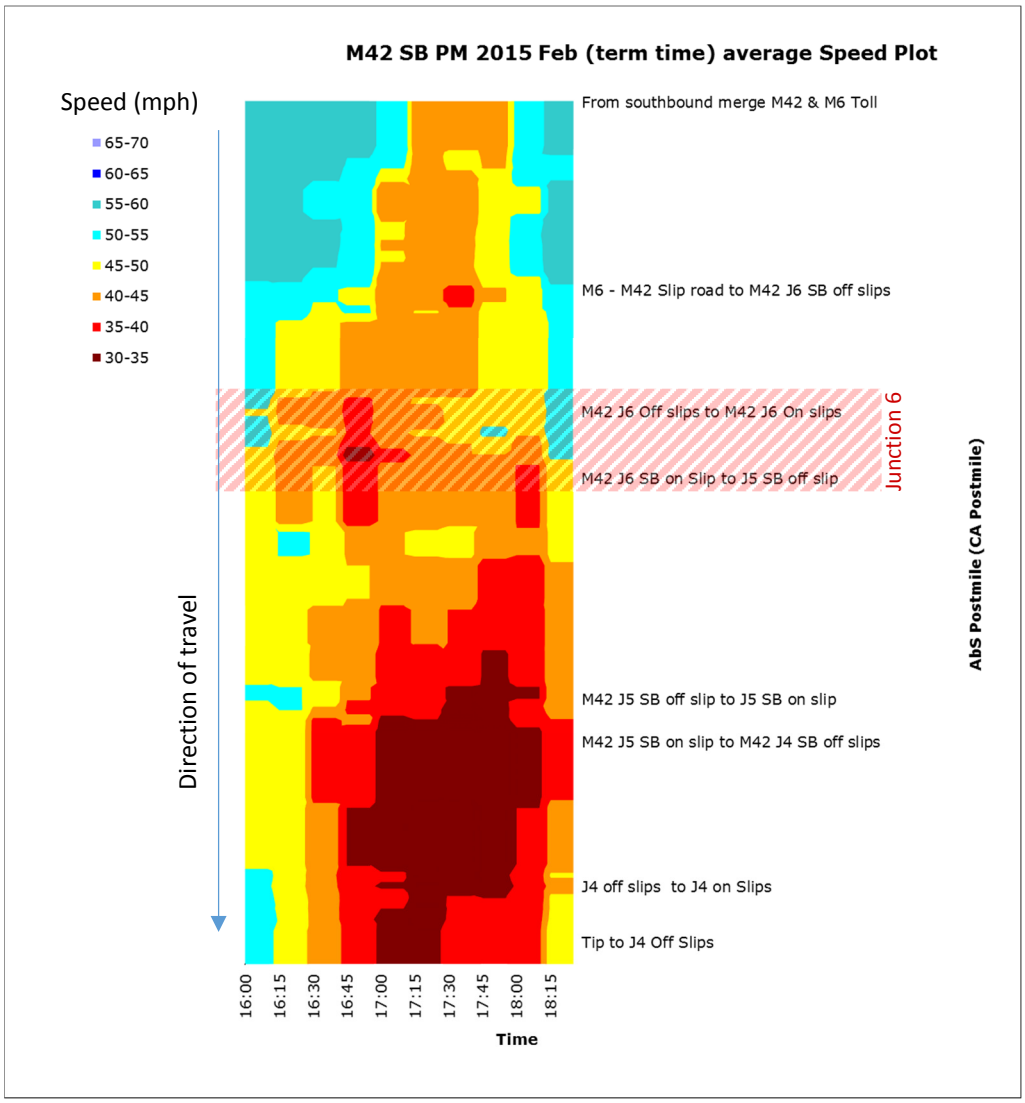
In the northbound direction during the evening peak period the data again shows a pattern similar to the southbound AM period with significant congestion occurring south of junction 5. Lower speeds / longer journey times are also observed north of Junction 6 which appear to tail back and impact the flow at junction 6, albeit for a limited period only.



Source: DfT Trafficmaster

Figure 3: Speed Heat Map M42 J4-7 AM Southbound

In the southbound direction during the morning peak period low speeds / high journey times are noted between Junctions 7 and 7a with some lower speed issues noted at Junction 6 which is likely to be related to weaving traffic from both the diverge and merge movements. The southbound diverging flow from the M42 at junction 6 was observed (2012 Economy Study) as 1800 vehicles in the AM peak hour and the equivalent merging volumes from junction 6 on to the M42 southbound were 1650 vehicles in the AM peak hour.



Source: DfT Trafficmaster

Figure 4: Speed Heat Map M42 J4-7 PM Southbound

The analysis of the speed data in the southbound direction during the evening peak period shows significant congestion over a substantial time period from Junction 5 southwards. From the plot presented above, it appears that this congestion inhibits southbound traffic flows as far north as junction 7a, particularly concentrated in and around Junction 6. It cannot be stated with any certainty whether this would continue to be the case if the source of the congestion in and around junction 5 was to be resolved.

4.0 Additional Data

Further useful data have been acquired via the Performance Analysis Unit. These data have been obtained from NTIS and HATRIS and cover a year of observations of flow and speed obtained principally from the MIDAS radar technology. These data have been analysed to identify by section and time period, the frequencies that speeds fall into various bands. The results are tabulated below, with separate summaries for weekdays and weekends. The results highlight the regular occurrence of low traffic speeds along this section of the M42.

mouchel
building great relationships

M42 South of J6(SB)

		Total		Monday	Tuesday	Wednesday	Thursday	Friday	Weekday		Saturday	Sunday	Weekend	
AM Peak	<50	53	15%	18	15	8	9	3	53	20%	0	0	0	0%
	<40	31	8%	11	9	3	5	3	31	12%	0	0	0	0%
	<30	6	2%	4	1	0	1	0	6	2%	0	0	0	0%
IP	<50	38	10%	2	1	4	4	19	30	11%	6	2	8	8%
	<40	19	5%	1	1	3	2	8	15	6%	3	1	4	4%
	<30	8	2%	1	0	1	1	3	6	2%	1	1	2	2%
PM Peak	<50	183	50%	13	33	41	48	34	169	65%	0	14	14	13%
	<40	139	38%	7	25	31	44	26	133	51%	0	6	6	6%
	<30	102	28%	5	16	22	38	20	101	39%	0	1	1	1%

M42 North of J6(SB)

		Total		Monday	Tuesday	Wednesday	Thursday	Friday	Weekday		Saturday	Sunday	Weekend	
AM Peak	<50	83	23%	27	24	17	13	1	82	31%	1	0	1	1%
	<40	45	12%	18	16	5	6	0	45	17%	0	0	0	0%
	<30	25	7%	11	9	2	3	0	25	10%	0	0	0	0%
IP	<50	42	12%	2	1	3	4	21	31	12%	8	3	11	11%
	<40	31	8%	1	1	2	2	15	21	8%	8	2	10	10%
	<30	15	4%	1	0	2	2	7	12	5%	3	0	3	3%
PM Peak	<50	154	42%	14	28	29	42	30	143	55%	0	11	11	11%
	<40	123	34%	11	15	24	36	29	115	44%	0	8	8	8%
	<30	87	24%	6	12	18	29	19	84	32%	0	3	3	3%

M42 South of J6(NB)

		Total		Monday	Tuesday	Wednesday	Thursday	Friday	Weekday		Saturday	Sunday	Weekend	
AM Peak	<50	61	17%	18	12	14	10	2	56	21%	1	4	5	5%
	<40	17	5%	7	3	4	3	0	17	7%	0	0	0	0%
	<30	4	1%	1	2	0	1	0	4	2%	0	0	0	0%
IP	<50	69	19%	6	2	6	11	31	56	21%	9	4	13	13%
	<40	30	8%	2	1	3	2	16	24	9%	6	0	6	6%
	<30	13	4%	1	0	0	1	7	9	3%	4	0	4	4%
PM Peak	<50	206	56%	21	39	45	48	37	190	73%	2	14	16	15%
	<40	146	40%	11	25	34	45	26	141	54%	1	4	5	5%
	<30	86	24%	8	13	16	35	12	84	32%	0	2	2	2%

M42 ML thru J6(SB)

		Total		Monday	Tuesday	Wednesday	Thursday	Friday	Weekday		Saturday	Sunday	Weekend	
AM Peak	<50	125	34%	33	31	27	23	6	120	46%	3	2	5	5%
	<40	63	17%	20	21	12	10	0	63	24%	0	0	0	0%
	<30	35	10%	15	13	3	4	0	35	13%	0	0	0	0%
IP	<50	60	16%	7	1	6	4	27	45	17%	9	6	15	14%
	<40	34	9%	1	1	2	2	18	24	9%	8	2	10	10%
	<30	24	7%	1	1	2	2	13	19	7%	3	2	5	5%
PM Peak	<50	174	48%	14	34	33	44	32	157	60%	0	17	17	16%
	<40	135	37%	12	21	25	38	30	126	48%	0	9	9	9%
	<30	107	29%	7	14	21	34	25	101	39%	0	6	6	6%

M42 N of J6(NB)

		Total		Monday	Tuesday	Wednesday	Thursday	Friday	Weekday		Saturday	Sunday	Weekend	
AM Peak	<50	23	6%	6	4	5	2	0	17	7%	0	6	6	6%
	<40	8	2%	3	2	2	1	0	8	3%	0	0	0	0%
	<30	4	1%	2	2	0	0	0	4	2%	0	0	0	0%
IP	<50	66	18%	8	4	5	13	21	51	20%	10	5	15	14%
	<40	20	5%	2	0	1	3	10	16	6%	4	0	4	4%
	<30	9	2%	2	0	0	2	4	8	3%	1	0	1	1%
PM Peak	<50	197	54%	17	36	39	50	39	181	69%	2	14	16	15%
	<40	58	16%	7	4	11	22	8	52	20%	0	6	6	6%
	<30	36	10%	6	4	7	12	7	36	14%	0	0	0	0%

M42 thru J6(NB)

		Total		Monday	Tuesday	Wednesday	Thursday	Friday	Weekday		Saturday	Sunday	Weekend	
AM Peak	<50	61	17%	18	12	14	10	2	56	21%	1	4	5	5%
	<40	17	5%	7	3	4	3	0	17	7%	0	0	0	0%
	<30	4	1%	1	2	0	1	0	4	2%	0	0	0	0%
IP	<50	69	19%	6	2	6	11	31	56	21%	9	4	13	13%
	<40	30	8%	2	1	3	2	16	24	9%	6	0	6	6%
	<30	13	4%	1	0	0	1	7	9	3%	4	0	4	4%
PM Peak	<50	206	56%	21	39	45	48	37	190	73%	2	14	16	15%
	<40	146	40%	11	25	34	45	26	141	54%	1	4	5	5%
	<30	86	24%	8	13	16	35	12	84	32%	0	2	2	2%

5.0 Conclusions

The analysis of traffic volumes and speeds on the section of the M42 between junctions 4 and 7 has highlighted a number of issues associated with the current operation of this section of the motorway. The majority of links exceed their theoretical practical capacity of 1800 vehicles per hour per lane during much of the working day. The speed plots illustrate that the slowest speeds appear to be at the extremes of this section, ie around junctions 4 and 7 respectively and that the effects of congestion can spread beyond the immediate seed point. The annual analyses have shown that the issue of slow traffic speeds occurs all year. In respect of both aspects of the analysis, flows and speeds, conditions can be expected to be worse during the summer months, during major events at the NEC and over time as further traffic growth materialises.

In conclusion, the analyses point to the need for a corridor approach to the issue and a suggested need for additional capacity, extending possibly as far as the M40/M42 junction to the south and the M42/M6 junctions to the north.

Working on behalf of highways england

mouchel
building great relationships

Table A1: M42 Link Capacity Assessment

Capacity calculation
1800 / (1 + 0.015 x PHV)
2330 / (1 + 0.015 x PHV) for motorways,
2100 / (1 + 0.015 x PHV) for all-purpose dual carriageways.

PHV taken from MCC counts Feb 2016 - Trads data, which is based on Radar data pre June 2016, was found to be unrealisitically high SEE TRADS nb 5-6

V/C values in red > 0.85

		Northbound							Southbound						
AM	No of Lanes	Lanes running Pk	NB Volume	PHV	Capacity (2330)	Capacity (1800)	V/C (2330)	V/C (1800)	Lanes running Pk	NB Volume	PHV	Capacity (2330)	Capacity (1800)	V/C (2330)	V/C (1800)
M42 NB M6 NB Slip road to M42 to M6 EB Slip road	3/4				2330	1800	0.00	0.00				2330	1800	0.00	0.00
M42 NB on Slip to M42 - M6 NB on slip road	3/4	4	1326	11	2003	1548	0.66	0.86	4	1652	14	1928	1489	0.86	1.11
M42 NB J6 off slip to J6 NB on Slip	3	3	1331	11	2003	1548	0.66	0.86	3	1585	14	1928	1489	0.82	1.06
M42 NB J5 on slip to J6 Off Slip	3 / 4	4	1500	9	2040	1576	0.74	0.95	4	1570	14	1914	1479	0.82	1.06
M42 NB J5 off Slip to J5 on slip	3 / 4	3	1708	9	2040	1576	0.84	1.08	4	1318	14	1914	1479	0.69	0.89
M42 NB J4 on Slip to J5 off Slip	3 / 4	4	1395	11	2009	1552	0.69	0.90	4	1488	15	1913	1478	0.78	1.01
J4 NB off slip to on Slip	3	3	1426	11	2009	1552	0.71	0.92	3	1578	15	1913	1478	0.82	1.07
M42 Southern tip to J4 NB off Slip	3 / 4	4	1252	11	2009	1552	0.62	0.81	4	1361	15	1913	1478	0.71	0.92

		Northbound							Southbound						
IP	No of Lanes	Lanes running Pk	NB Volume	PHV	Capacity (2330)	Capacity (1800)	V/C (2330)	V/C (1800)	Lanes running Pk	NB Volume	PHV	Capacity (2330)	Capacity (1800)	V/C (2330)	V/C (1800)
M42 NB M6 NB Slip road to M42 to M6 EB Slip road	3/4				2330	1800	0.00	0.00	3			2330	1800	0.00	0.00
M42 NB on Slip to M42 - M6 NB on slip road	3/4	3	1600	19	1817	1403	0.88	1.14	3	1373	18	1834	1417	0.75	0.97
M42 NB J6 off slip to J6 NB on Slip	3	3	1235	19	1817	1403	0.68	0.88	3	1040	18	1834	1417	0.57	0.73
M42 NB J5 on slip to J6 Off Slip	3 / 4	3	1567	19	1823	1408	0.86	1.11	3	1483	18	1845	1425	0.80	1.04
M42 NB J5 off Slip to J5 on slip	3 / 4	3	1302	19	1823	1408	0.71	0.92	3	1182	18	1845	1425	0.64	0.83
M42 NB J4 on Slip to J5 off Slip	3 / 4	3	1530	19	1817	1404	0.84	1.09	3	1461	17	1862	1439	0.78	1.02
J4 NB off slip to on Slip	3	3	1296	19	1817	1404	0.71	0.92	3	1250	17	1862	1439	0.67	0.87
M42 Southern tip to J4 NB off Slip	3 / 4	3	1413	19	1817	1404	0.78	1.01	3	1350	17	1862	1439	0.72	0.94

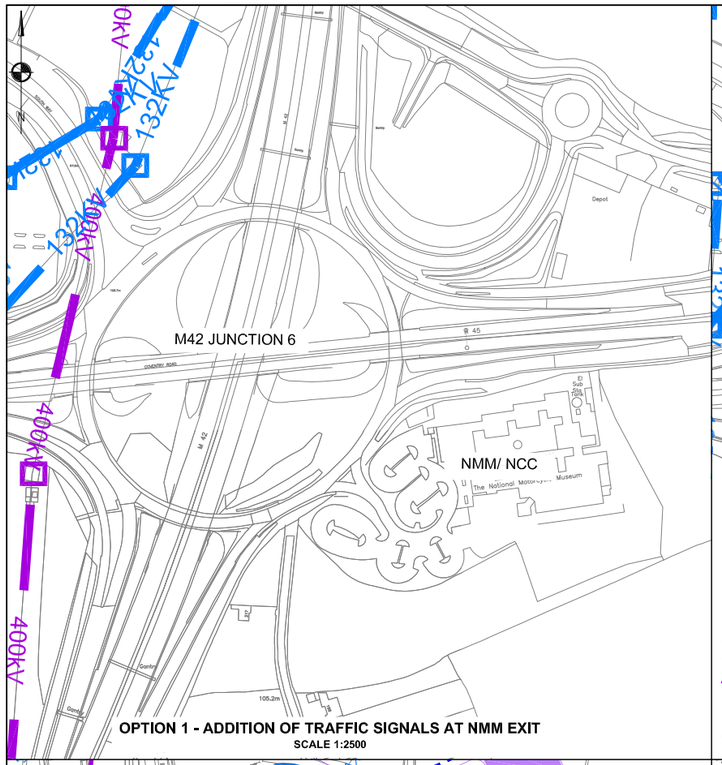
		Northbound							Southbound						
PM	No of Lanes	Lanes running Pk	NB Volume	PHV	Capacity (2330)	Capacity (1800)	V/C (2330)	V/C (1800)	Lanes running Pk	NB Volume	PHV	Capacity (2330)	Capacity (1800)	V/C (2330)	V/C (1800)
M42 NB M6 NB Slip road to M42 to M6 EB Slip road	3/4				2330	1800	0.00	0.00				2330	1800	0.00	0.00
M42 NB on Slip to M42 - M6 NB on slip road	3/4	4	1775	9	2065	1595	0.86	1.11	4	1339	11	1990	1537	0.67	0.87
M42 NB J6 off slip to J6 NB on Slip	3	3	1602	9	2065	1595	0.78	1.00	3	1024	11	1990	1537	0.51	0.67
M42 NB J5 on slip to J6 Off Slip	3 / 4	4	1551	10	2031	1569	0.76	0.99	4	1361	11	2007	1551	0.68	0.88
M42 NB J5 off Slip to J5 on slip	3 / 4		1714	10	2031	1569	0.84	1.09	4	1173	11	2007	1551	0.58	0.76
M42 NB J4 on Slip to J5 off Slip	3 / 4	4	1529	10	2014	1556	0.76	0.98	4	1314	10	2019	1560	0.65	0.84
J4 NB off slip to on Slip	3	3	1631	10	2014	1556	0.81	1.05	3	1036	10	2019	1560	0.51	0.66
M42 Southern tip to J4 NB off Slip	3 / 4	4	1402	10	2014	1556	0.70	0.90	4	1177	10	2019	1560	0.58	0.75

Knights House, 2 Parade Sutton Coldfield West Midlands B72 1PH
T 0121 355 8949 **F** 0121 355 8901 info@mouchel.com www.mouchel.com

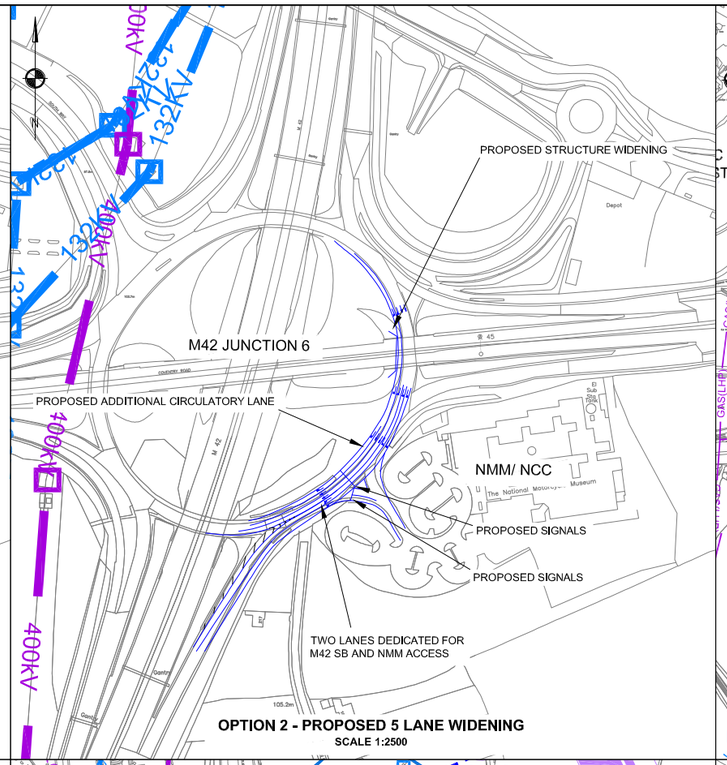
NMM Alternative Access assessment

(Refer to drawing number HE551485-MOU-GEN-M42_J6-SK-CH-0037)

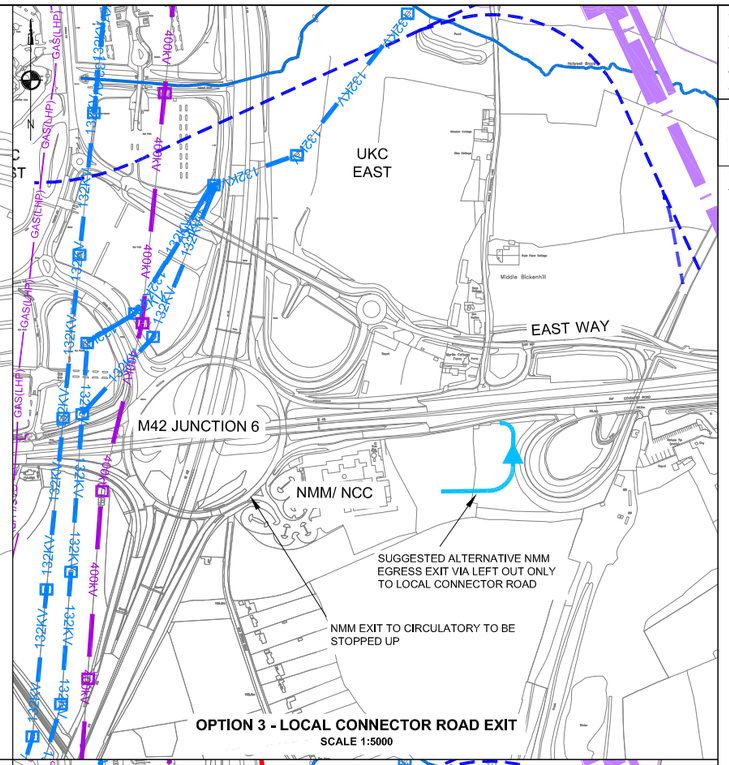
OPTIONS	ADVANTAGES	DISADVANTAGES
Option 1 – Do Nothing (but with potential changes to traffic signals)	Signalising the access would alleviate congestion, enabling traffic to flow more fluently from all directions. This would prohibit potential blockages carried out by vehicles exiting the NMM, resulting in better traffic flow on the circulatory.	Signalisation of the access may also require additional signals on the circulatory, which in turn could delay journey time through the junction. Signalisation may not be sufficient to deal with future traffic flows.
Option 2 – Proposed 5 Lane Widening (outside NMM access)	Additional lane on circulatory may help improve flow of non-NMM traffic (during off-peak, periods where there is no congestion)	Circulatory widening will result in major structure changes and significant disruption to the network (road users) Circulatory widening has been deemed as not safe by GD04 Assessment – NMM traffic would have extra lane to cross Circulatory widening may increase congestion issues when there are incidents/lock-ups as it may take longer to clear
Option 3 – Local Connector Road Exit	Alternative rear access removes traffic from circulatory (at least directly)	Rear access onto A45 connector road will result in additional land take for new road and may impact existing business accesses A45 connector road has existing non-compliant standards for both mainline merge/diverge and proximity of mainline diverge with connector road merge. Refer to (TD22/06) Additional traffic using connector road will exacerbate existing non-compliant standards. Refer to (TD22/06)
Option 4 – Local Connector Road Exit Using Existing Business Accesses	Alternative rear access removes traffic from circulatory (at least directly)	Rear access onto A45 connector road at current business access will result in additional business land take for new road, potential road construction upgrade and improvements to various business accesses A45 connector road has existing non-compliant standards for both mainline merge/diverge and proximity of mainline diverge with connector road merge. Refer to (TD22/06) Additional traffic using connector road will exacerbate existing non-compliant standards. Refer to (TD22/06)
Option5 – Close Existing NMM Access at J6	Alternative rear access removes traffic from circulatory (at least directly)	Rear access onto Eastway loop will increase journey time to A452 Stonebridge Island junction and would impact NEC road network if traffic travels west along East Way. This could then result in more disruption at NEC access onto circulatory.
Option 6 – Free Flow Left Turn (With Inclusion of Option 3,4 or 5)	Removes traffic from circulatory and improves journey time of SB traffic	To assist with weaving issues, connector road would be stopped up west of Eastway Loop – but this will also push more traffic over to Eastway-Stonebridge or NEC road network



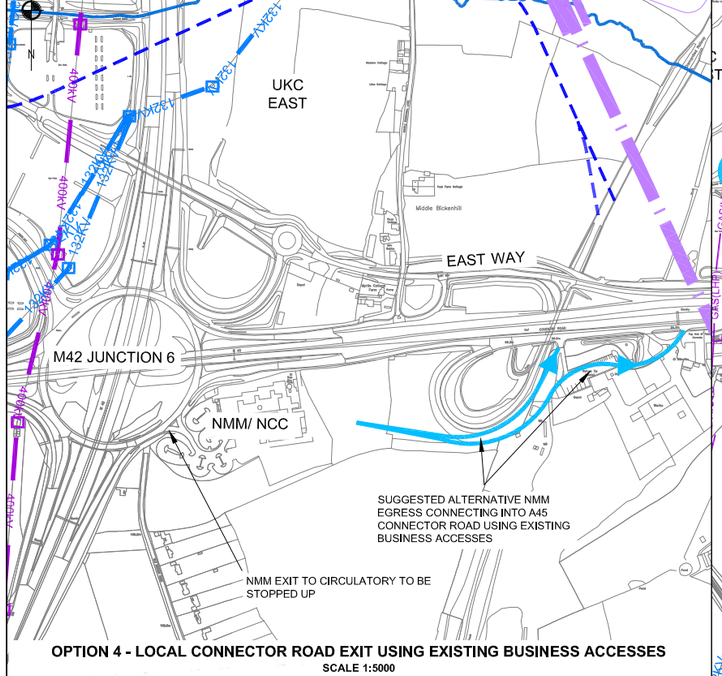
OPTION 1 - ADDITION OF TRAFFIC SIGNALS AT NMM EXIT
SCALE 1:2500



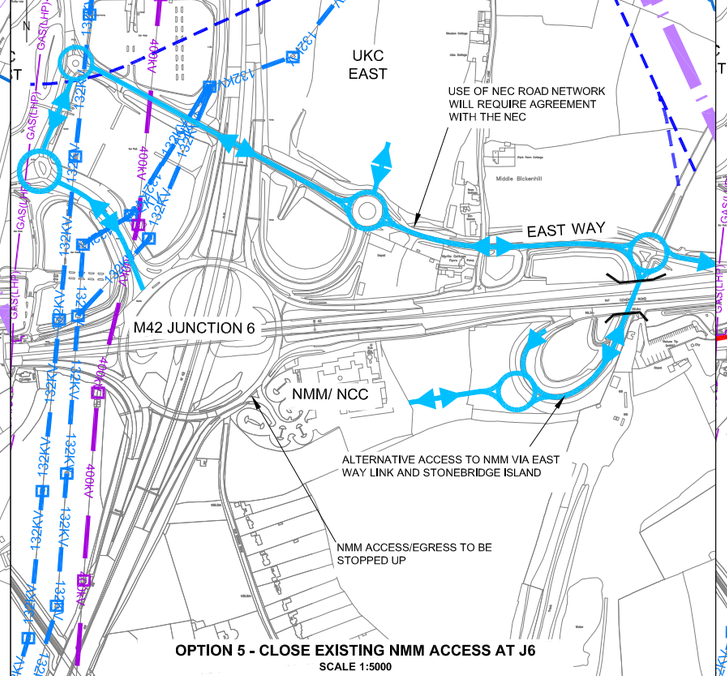
OPTION 2 - PROPOSED 5 LANE WIDENING
SCALE 1:2500



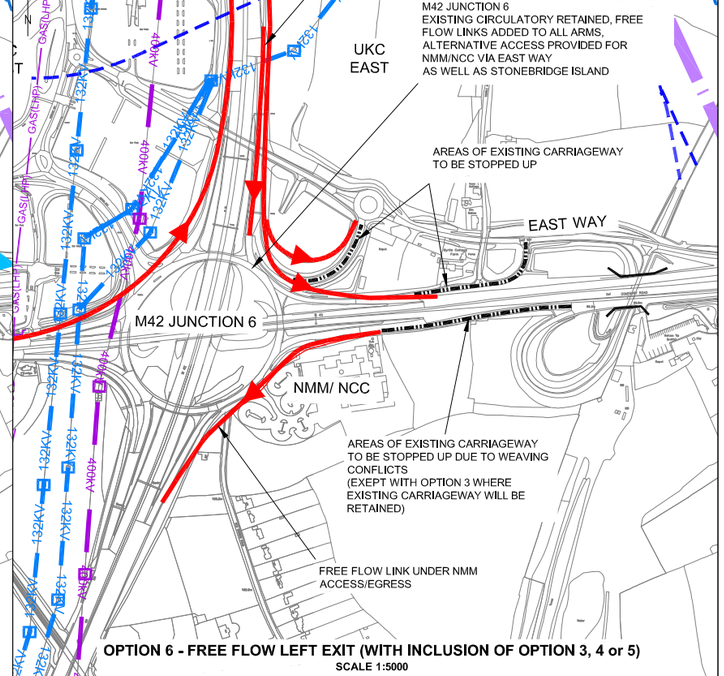
OPTION 3 - LOCAL CONNECTOR ROAD EXIT
SCALE 1:5000



OPTION 4 - LOCAL CONNECTOR ROAD EXIT USING EXISTING BUSINESS ACCESSES
SCALE 1:5000



OPTION 5 - CLOSE EXISTING NMM ACCESS AT J6
SCALE 1:5000



OPTION 6 - FREE FLOW LEFT EXIT (WITH INCLUSION OF OPTION 3, 4 or 5)
SCALE 1:5000

NOTES

1. DO NOT SCALE FROM THIS DRAWING.
2. STATUTORY UNDERTAKERS APPARATUS SHOWN ARE INDICATIVE AND BASED ON INFORMATION RECEIVED FOLLOWING C2 ENQUIRIES.
3. FOR DETAILS OF THE LOCATION OF OTHER STATUTORY UNDERTAKERS APPARATUS REFER TO DRAWING HE551485-MOU-VUT-M42 J6-SK-D-0001.
4. HS2 ALIGNMENT BASED ON AN XREF RECEIVED FROM ARUP.
5. HS2 PEOPLE MOVER BASED ON INFORMATION RECEIVED FROM HS2.
6. NMU PROVISIONS ARE NOT SHOWN AND ANY INDICATIVE PROPOSED STRUCTURES DO NOT MAKE ALLOWANCES FOR THESE.
7. FOR DETAILS OF ENVIRONMENTAL CONSTRAINTS REFER TO DRAWINGS HE551485-MOU-EGN-M42 J6-DR-EN-0001 AND 0002.
8. FOR DETAILS OF CONSTRAINTS FOR ALTERNATIVE NMM ACCESS/EGRESS REFER TO DRAWING HE551485-MOU-GEN-M42 J6-SK-D-200.

KEY

- PROPOSED ALIGNMENT MAJOR ROADS
- PROPOSED ALIGNMENT MINOR ROADS
- PROPOSED ROAD WIDENING
- TRAFFIC FLOW DIRECTION MAJOR ROAD
- TRAFFIC FLOW DIRECTION MINOR ROAD
- PROPOSED INDICATIVE STRUCTURES
- EXISTING C'WAY TO BE STOPPED UP
- HS2 RAIL ALIGNMENT (INDICATIVE)
- HS2 ROAD ALIGNMENT (INDICATIVE)
- HS2 PEOPLE MOVER (INDICATIVE)
- 132kV — WESTERN POWER DISTRIBUTION (132KV)
- 400kV — NATIONAL GRID (400KV)
- GAS — WESTERN POWER DISTRIBUTION (132KV)
- RIVER/STREAM/BROOK

Revision	Amendment	Drawn/Designed	Checked	Approved	Date

Project
WEST MIDLANDS AREA 9
M42 JUNCTION 6 IMPROVEMENTS

Drawing Title
ALTERNATIVE NMM ACCESS/EGRESS

mouchel
building great relationships
Office
KNIGHTS HOUSE, 2 PARADE SUTTON COLDFIELD, B72 1PH
Tel: 0121 355 8949
Fax: 0121 355 8901
www.mouchel.com

Client
Working on behalf of highways england

Scale	Designed / Drawn	Checked	Approved	Authorised
AS SHOWN	BAA	DM	GM	
Original Size	Date	Date	Date	Date
A1	NOV 16	NOV 16	NOV 16	

Status: WORK IN PROGRESS

Drawing No				Suitability
Project	Originator	Volume		S0
HE551485 -	MOU -	GEN		
M42_J6 -	SK -	CH -	0037	Revision P01
Location	Type	Role	Number	

filepath: W:\Highways\TRANSPORT JOBS\10710308 M42 J6 RIP Stage 1\16 Drawings\16_04 Drawings Working\Sketches\HE551485AOU-GEN-M42_J6-SK-CH-0037.dwg
by: Jamie Clift
plot date: 15/12/2016 10:09:32

Appendix G – Design Narratives

Project:	M42 Junction 6 Improvement Scheme	**Date:**	15/08/16
		TN Ref:	0055
Subject:	Option 2P Variant 2		
Author:	Darren Morris	**Project Ref:**	HE551485-MOU-GEN-M42_J6-FN-CH-0055
Reviewed:	Graham MacNicol	**Date:**	18/11/16
Approved:	Graham MacNicol	**Date:**	18/11/16

Introduction

The proposed improvement scheme is required to alleviate the current congestion and journey reliability issues associated with the M42 Junction 6. The junction lies at the heart of an area of dynamic growth, and is a gateway to Birmingham Airport, the National Exhibition Centre (NEC) and Birmingham Business Park. In addition, a station for the proposed High Speed Two (HS2) is to be located nearby and the plans for Solihull MBC's UK Central (UKC) mixed use development will continue to add significant demand to the network and increase dependence on M42 Junction 6. Other key stakeholders within close proximity to the scheme and Strategic Road Network (SRN) include the National Motorcycle Museum (NMM), Jaguar Land Rover (JLR) and Solihull Metropolitan Borough Council (SMBC). A new Motorway Service Area (MSA) is proposed south of the existing junction 6 - this proposal has been submitted for planning approval but no formal decision has to date been made.

Description of Proposals

Following an options review meeting held at the Sutton Coldfield office on 6 July 2016 with Highways England, the previous reduced three options (2A, 11 and Hybrid) which had OME estimate forms produced and costed by Highways England (except Hybrid option) have been revised to the following options, which in short looks at solutions with and without the MSA. Options summarised below:

2P – number of variants produced, focus is on 2P V2 following communications with Highways England. This option is without MSA and provides an additional diverge and merge from/to the M42 located south of existing Junction 6.
2Q – similar to Option 2A, but proposes free flow lefts at Junction 6 (as per Option 11A below). This is with an MSA and considered a Do Max.
11A – considered a Do Minimum and is without the MSA, and purely looks at free flow lefts for all movements between M42 and A45.
11B – similar to Option 11A, but includes the MSA

The focus of this technical note will be on Option 2P Variant 2 (Option 2PV2)

Option 2PV2 as shown on drawing HE551485-MOU-GEN-M42_J6-SK-D-0176 provides an additional diverge and merge from/to M42, located to the south of the existing junction 6 south facing slip roads. To note, these slip roads were present in all variants (1 to 4), the difference in the variants was the connection arrangement to Airport Way/Clock Interchange and Local Roads. Variant 2 was chosen following email communications with Highways England Project Manager (Graham Littlechild – email dated 15 July 2016), this option is considered the "most promotable".

For variant 2 a new roundabout is proposed to form a dumb-bell roundabout with the existing Clock Interchange, this new roundabout has the new slips to/from the M42 connecting to it, as well as a link to Catherine de Barnes, the dumb-bell link connection to Clock is dual, however, on the exit from the new roundabout a third lane is proposed, the nearside lane of the three will be a dedicated link to Airport Way which will merge with Airport Way as a lane gain.

Design Standards

- **TD9/93 – Highway Link Design**
- **TD16/07 – Geometric Design of Roundabouts**
- **TD22/06 – Layout of Grade Separated Junctions**
- **TD27/05 – Cross-sections and Headrooms**
- **TD39/94 – The Design of Major Interchanges**

Mouchel Design

Design Speed

- Slip roads – amendments to junction 6 slip roads for a 70kph design speed, unless the slip road is longer than 0.75km then it will be 85kph
- New southern junction links – designed as interchange links to an 85kph design speed
- Catherine de Barnes re-alignment – 70kph as existing in signed as 40mph prior to the St Peters Lane junction
- Dumb-bell Link and Airport Way Link – designed to a 70kph design speed
- Segregated/Free flow left turns – design to a 70kph design speed

Proposed Horizontal Alignment

Slip road layouts

The proposed diverge and merge which forms a junction 5A the slip road layouts are to be confirmed, presently assumed to provide a taper merge and ghost island diverge, but these are subject to change based on traffic modelling.

The existing junction 6 south northbound diverge and southbound merge may also require alteration due to the presence of the additional slip roads at the new junction (5A), these are also to be confirmed via traffic modelling.

Interchange links

The interchange links from/to the M42 have a minimum radius of 255m to a maximum radius of 1440m, superelevation on the alignment will be as per TD 9/93 Table 3 for an 85kph design speed. As there is a limited weaving distance between the fork for the Airport free flow link and the link to the Clock roundabout – northbound approach to the proposed Bickenhill roundabout would require lane dedication on the approach and through the roundabout.
Proposed Interchange links are proposed to be designed as II2A – 2 lane with hardstrip links.

Proposed Bickenhill Roundabout.

It is not possible to connect the proposed Interchange Links directly with Clock Junction as it is done in Option 2R West. Because of the approach angle it is necessary to introduce a roundabout to enable a sharp change in the alignment curvature. It is also necessary to introduce the proposed roundabout in order to provide access to CdB Lane. The size of the roundabout will be based on traffic modelling and alignment design to provide a safe and efficient layout, it is currently shown with a 100m inscribed circular diameter.

Dumb-bell Link

A dumb-bell link connection between existing Clock Interchange and the new Bickenhill Roundabout, this will be a dual link, with the exit from the new roundabout with an additional lane which drops to Airport Way. The southbound visibility on the link will be restricted by the existing structure to a minimum of 35m, in order to improve this an alteration to the existing flyover structure will be required. The lane drop to Airport Way in northbound direction situated 80m from the roundabout exit, this is a substantial reduction to the 262m weaving distance requirements for 70kph design speed. In

order to provide a sufficient manoeuvring distance the lane designation has to be introduced within the Interchange Link approach to the proposed Bickenhill roundabout – the offside lane should be marked with Clock Junction designation and the nearside lane should be marked designated to Airport and Bickenhill. A similar lane dedication would be required on the proposed CdB Lane approach.
The connecting link from the Bickenhill Roundabout to Airport freeflow requires a 127m left hand bend radius in order to provide sharp change in direction to the Airport freeflow. Vertical alignment of this link is determined by extensions of the cross fall from the dumb-bell link and the airport free flow link. Connection with the existing flyover can be done as a taper merge prior to the existing A45 viaduct, but a safer fay would reduce existing flyover dual link to a single lane link to enable the proposed link from the Bickenhill roundabout to be a lane gain.

Local Roads
Catherine de Barnes Lane is re-aligned to connect to the new Bickenhill Roundabout, the alignment of this link is based on a 70kph design speed with horizontal radii ranging from 127m to 720m. The severance of the existing St Peters Lane junction will most likely require the introduction of a small roundabout to connect Clock Lane to the CdB Lane.

Free flow lefts at J6

Refer to design narrative for the Option 11A - HE551485-MOU-GEN-M42_J6-FN-CH-0057

Proposed Vertical Alignment

Proposed vertical alignment design is constraint by the extension of the cross fall where straight forward widening is provided. Where proposed alignment is situated outside of the existing widening requirements the design is constraint by a Design Speed requirements and need to provide adequate headroom clearance for the proposed structures.
The proposed Airport Way link through Bickenhill village are designed in cutting in order to minimise impact on the village and to provide an opportunity for the severed Church Ln crossing.

Non-standard Impacts

Geometric Alignment

- Reduced visibility on dumbbell link between Clock Roundabout and the proposed Bickenhill roundabout (35m minimum)
- Reduced horizontal radius of 127m on the proposed link with the existing airport free flow.
- In vicinity of the proposed M42 overbridge interchange merge link from the new roundabout to the M42 currently has a one-step reduction in vertical curvature (30K radius), two step reduction in horizontal curvature (255 radius) and one step SSD reduction (120m). Such an alignment would to reduce the impact on Bickenhill in particular the Church Lane amendments and minimise proposed heavily skewed structure scale.

Weaving

For weaving distances between the proposed free flows at J6 and the existing J7 refer to design narrative for the Option 11A - HE551485-MOU-GEN-M42_J6-FN-CH-0057

Stakeholders

- NEC – existing access and egress is retained to the circulatory carriageway, however, the free flow link is proposed to be constructed underneath the existing access, this will require reduced access provision during the construction phase;
- NMM – existing access and egress is retained to the circulatory carriageway, however, the proposals are similar to the NEC and the similar restrictions to access is expected, consideration has been given to provide a second exit point to the rear of the NMM via East Way/Stonebridge Island
- Birmingham Airport – should benefit due to improved capacity at J6 especially for vehicles travelling from the north, vehicles from the south have a link via a new roundabout to East Way
- UK Central – link proposed from existing East Way loop into UKC, general capacity improvements at Junction 6 due to free flow turns
- HS2 – similar to Birmingham Airport and UKC, should benefit due to capacity improvements and free flow left from M42 S to A45 E
- Villages – Bickenhill severely impacted due to the presence of the new southern access and egress points, will also require amendments to Church Lane over the proposed links as well as revisions to the St Peters Lane Junction with Catherine de Barnes. A number of properties are directly impacted with others indirectly.
- Statutory Undertakers Apparatus – this option would impact 132kv and potentially the 400kv overheads and associated pylons, it is likely the aqueduct of Severn Trent Water would also be impacted at a number of locations.
- Network Rail – it is envisaged that the existing structure will remain unaffected by these proposals
- Motorway Service Area (MSA) – is this option the MSA doesn't exist
- SMBC – connection to Clock Interchange and amendments to Catherine de Barnes Lane and local roads within Bickenhill. Consideration needs to be given regarding increasing the size of the existing Clock Interchange roundabout.

Traffic

At the time of producing this technical note no traffic figures had been produced for this option. However, based on work carried out to date, it is like that there will be:

- M42(N)-A45 no change with little impact on J6 movements;
- M42(S)-A45 additional links providing access to Airport and HS2;
- New southern link and access through diverges south of M42 J6 reduces northbound traffic to Junction 6;
- Stakeholders access improvement for HS2, NEC, NMM, BIA, Birmingham International Rail Station;
- There is overall benefit of journey time, including traffic through M42 J6.

Structures

There are 2no. existing bridge structures (1no. belongs to Solihull Metropolitan Borough Council which will be further investigated at a later stage), 3no. 'major' retaining wall structures and 1no. culvert structure which will be affected by this option.

Shirley Fields Accommodation Bridge and Outfall No.19 Culvert will require complete replacement or modification, respectively. Complete closure of the Shirley Fields Accommodation Bridge may be required during works. Alternatively, a new bridge can be built offline and the existing bridge can be demolished once the new bridge opens to traffic. The need for extension of the culvert and corresponding traffic management requirements should be considered.

The existing link bridge (which belongs to Solihull Metropolitan Borough Council will be further investigated at a later stage) between the Clock Interchange and the new Bickenhill Roundabout will need to be checked to confirm that the existing bridge can fit within the scheme. If the existing bridge cannot fit within the scheme, a new bridge is likely to be

required. The proposed new bridge could take the form of two adjacent multi-span flyovers. Temporary lane closures will be required during construction.
Smart motorway gantries and small retaining walls will be affected in the designated area of Option 2P. Existing gantries will require modification in order to sign the new layout.
A number of new structures will however be required to facilitate free traffic flow around the M42 Junction 6 roundabout. The dimensions and structure types of the proposed structures will be confirmed in the later stage.

To form the parallel links to the south of the M42 Junction 6, two new structures are proposed:
Under/over M42 structures
Two options have been proposed for the M42 under/over structures. The first option is to construct a bridge over Shadow Brook stream which then leads traffic into a culvert under the M42. This option will require temporary diversion of the M42 during construction of the culvert. It should be noted that the alignment of any temporary diversion of the M42 will be constrained by Shadow Brook stream and the presence of 400kV overhead powerlines to the east and 132kV power lines to the west. The alternative option is to construct a multi-span bridge over both Shadow Brook stream and the M42. However, the vertical clearance between the M42 and the overbridge may be restricted by the presence of the aforementioned utilities which may require relocation.
Church Lane Bridge
Two options are also proposed for Church Lane Bridge. The first option is to build a single span bridge structure. The abutments will be built at the proposed location on either side of Church Lane and the bridge deck can be built offline and subsequently lifted into position. This option will minimum disruption to traffic. The second option is to temporarily divert Church Lane while a buried box/bridge structure is built at the proposed location.

Maintenance access arrangements and/or provisions have yet to be agreed, but would need to be discussed with all relevant parties to ensure the design incorporates maintenance requirements.

Geotechnical
A small section of the link roads to the A45, where the earthworks are likely to be at their highest, will be located over areas of Alluvium which is likely to be weak and/or compressible. Some sections of the proposed new free flow links around Junction 6 impinge onto areas of Made Ground associated with the construction of the NEC and the M42.

The extent and nature of the Alluvium and Made Ground is not known and would be established during ground investigation along with the rest of the ground conditions. The presence of the Alluvium and Made Ground is a manageable risk.

Environment
There is risk that Option 2P will result in air quality, noise and visual impacts to sensitive receptors in Bickenhill and the wider area. Further survey and modelling work including the development of mitigation measures is required to resolve this. These measures should also be designed to mitigate impacts to cultural heritage assets. Option 2P severs the village of Bickenhill at Church Lane. Further mitigation design is required to prevent the option significantly impacting private dwellings and businesses through land take, severance and loss of amenity.
This option has potential impacts on European Protected Species. Further survey and assessment work is required to confirm the presence of these species or habitat for other species, to determine likely impacts and develop suitable mitigation measures. It is anticipated that suitable drainage and flood compensation will be designed during PCF Stages 2 and 3 to avoid impacts to the water environment.

Risks/Hazards

- Departures from standard required which need to be submitted to Highways England and SMBC

- Interchange Link, new roundabout and local road re-alignment within and adjacent to Bickenhill,
- Existing structures to be demolished and/or replaced – footbridge/accommodation bridge, depending on the length of the slips required Shadow Brook Lane may be impacted by proposals.
- Local road networks will be impacted by the proposals the extent of which is still to be determined via traffic modelling.
- Proposals over areas of soft ground, made ground and landfill mainly around junction 6.
- Impact to aqueduct, 132kV and 400kV pylons and lines. Plus a number of other apparatus around junction 6.
- Widening proposals and utilising/stitching to existing structures at junction 6 may not be feasible and will require removal and replacement of four major structures with extensive and complicated traffic management arrangements.
- Note – at this time impact to existing PRoWs and National Trail have not been determined. The provision of link connecting to Airport freeflow would block the existing footway/cycleway along the existing flyover. Details of the alternative arrangement may require an additional underpass structure.

Knights House 2 Parade Sutton Coldfield West Midlands B72 1PH

T 0121 355 8949 **F** 0121 355 8901 info@mouchel.com www.mouchel.com

Working on behalf of highways england

mouchel building great relationships

Project:	M42 Junction 6 Improvement Scheme	**Date:**	17/08/16
		TN Ref:	0057
Subject:	Option 11A		
Author:	Darren Morris/Oleg Makarov	**Project Ref:**	HE551485-MOU-GEN-M42_J6-FN-CH-0057
Reviewed:	Graham MacNicol	**Date:**	18/11/16
Approved:	Graham MacNicol	**Date:**	18/11/16

Introduction

The proposed improvement scheme is required to alleviate the current congestion and journey reliability issues associated with the M42 Junction 6. The junction lies at the heart of an area of dynamic growth, and is a gateway to Birmingham Airport, the National Exhibition Centre (NEC) and Birmingham Business Park. In addition, a station for the proposed High Speed Two (HS2) is to be located nearby and the plans for Solihull MBC's UK Central (UKC) mixed use development will continue to add significant demand to the network and increase dependence on M42 Junction 6. Other key stakeholders within close proximity to the scheme and Strategic Road Network (SRN) include the National Motorcycle Museum (NMM), Jaguar Land Rover (JLR) and Solihull Metropolitan Borough Council (SMBC). A new Motorway Service Area (MSA) is proposed south of the existing junction 6 - this proposal has been submitted for planning approval but no formal decision has to date been made.

Description of Proposals

Following an options review meeting held at the Sutton Coldfield office on 6 July 2016 with Highways England, the previous reduced three options (2A, 11 and Hybrid) which had OME estimate forms produced and costed by Highways England (except Hybrid option) have been revised to the following options, which in short looks at solutions with and without the MSA. Options summarised below:

2P – number of variants produced, focus is on 2P V2 following communications with Highways England. This option is without MSA and provides an additional diverge and merge from/to the M42 located south of existing Junction 6.
2Q – similar to Option 2A, but proposes free flow lefts at Junction 6 (as per Option 11A below). This is with an MSA and considered a Do Max.
11A – considered a Do Minimum and is without the MSA, and purely looks at free flow lefts for all movements between M42 and A45.
11B – similar to Option 11A, but includes the MSA

The focus of this technical note will be on Option 11A.

Option 11A as shown on drawing HE551485-MOU-GEN-M42_J6-SK-D-0178 is considered a do minimum focusing on works around junction 6, which as stated above involve introduction of free flow lefts at all arms.

The free flow lefts in front of the NEC and NMM are proposed to go under the existing access and egress points, however, the option also suggests improvements to East Way and an alternative access and egress for the NMM at the rear via East Way.

Design Standards

- **TD9/93 – Highway Link Design** used for link road horizontal curvature radius in accordance with Table 3.
- **TD16/07 – Geometric Design of Roundabouts**

- **TD22/06 – Layout of Grade Separated Junctions**
- **TD27/05 – Cross-sections and Headrooms**
- **TD51/03 – Segregated Left Turn Lanes and Subsidiary Deflection Islands at Roundabouts**

Note: Design Standards to be expanded as design options progress

Design Speeds

- Free flow left will be designed to a 70kph design speed, unless greater than 750m in length then a 85kph design speed will be used
- East Way amendments to be confirmed 60 to 70kph design speed, depending on the part of the network

Geometry

Horizontal Alignment

Free flow lefts

A number of free flow left turns are proposed at junction 6 between the M42 and A45, each free flow is summarised below:

- A45 E to M42 N – a segregated lane/free flow interchange link starting in the vicinity of the A45 EB diverge nose. Overall length of 800m from start of the diverge taper to the end of the merge taper. An alternative auxiliary diverge lane can be considered instead of the diverge taper - if it can be justified on traffic and safety merits but will impact further on NEC land. Majority of the free flow left is position on 400m left hand radius and consistent with the required interchange link design speed - one step below the adjacent mainline. The offside channel offset by a minimum 12m from the J6 circulatory nearside channel, it is assumed at this stage that this would provide a sufficient clearance for the construction to avoid impact on J6 circulatory. The merge of the free flow link with M42 NB merge occurs on the nearside tiger tail lane as it is done in a similar examples throughout the UK. Vertical alignment of the proposed free flow link has elements reduced by one step below desirable radius (20K crest is used at the back of the diverge nose) – this is done on order to bring levels of the free flow link sufficiently down to provide headroom for the proposed structure at NEC access. As a result of the reduced vertical curve – visibility is going to be reduced to a low object to a minimum of 104m but would remain within desirable minimum 120m to a high object. There is a rapid deviation between the free flow link and the A45 EB slip road levels- it would require a retaining wall as separation between adjacent carriageways is not sufficient to provide earthworks slope. A retaining wall is also likely to be required north of the Eastway Bridge to alleviate impact on the existing 400KV pylon – unless it can be diverted as part of the HS2 works.
- M42 S to A45 E – In order to provide a compliant successive diverge slip road (not interchange link)- distance for M42 SB diverge segregation to A45 WB and A45 EB as well as diversion to Eastway Roundabout – the start of the proposed diverge is required to be moved some 250m north from the existing position. It is not possible to provide the merge with the existing A45 EB slip at a compliant position as separation between Stonebridge Island and J6 is already substandard and J6 EB merge can not be extended further. The existing diverge form A45 EB merge slip road to DHL delivery depo can not be maintained and access would be redirected via Eastway roundabout.
- A45 W to M42 S – the proposed segregated lane/free flow link is designed to minimise impact on the NMM. The start position is determined by TD 51 – some 70m upstream from the roundabout give way line. The position of the proposed free flow nose is also determined by TD22 requirement for the successive diverge distances and is 262m – as adequate for the 70kph sleep road design speed. The link is designed with the offside channel positioned with a minimum 3m from the J6 circulatory nearside channel – there will be need for a lane closure on the existing circulatory in order to provide safe construction zone for the driven pile

installation. In order to provide sufficient headroom clearance with NMM access - proposed vertical alignment is required to be steepened to a minimum 20K crest and 9K sag curve, maximum longitudinal gradient is 7%. TD 22 requires maximum gradient to be a no steeper than 6% - this would require a departure from standards. A widening for 120m SSD is provided at the entry of the segregated lane. As a result of the reduced vertical curve – visibility is going to be reduced to a low object to a minimum of 104m but would remain within desirable minimum 120m to a high object. There is a rapid deviation between the free flow link and the J6 circulatory and NMM car park levels- it would require a retaining wall (on both sides of the free flow link) as separation between adjacent carriageways and NMM land is not sufficient to provide earthworks slope. The existing service road merge with A45 WB diverge can not be maintained with the proposed arrangement and a diversion via Stonebridge Island will be required for local traffic. The proposed low point of the segregated lane alignment is located directly below NMM access and is likely to require a pumping station to remove surface water.

- M42 N to A45 W – at present the proposed parallel link is modified by the Solihull CC works – there are no plans to alter the new built layout as part of the Option 11A works.

Vertical Alignment

Proposed vertical alignment design is constraint by the extension of the cross fall where straight forward widening is provided. Where proposed alignment is situated outside of the existing widening requirements the design is constraint by a Design Speed requirements and need to provide adequate headroom clearance at NEC/NMM access structures. Resulting vertical curvature on segregated lane an NMM access is composed of alignment adequate to 60 KPH Design Speed requirements. The maximum longitudinal fall is 7% which contradicts TD22 requirements. It maybe be possible to provide an alternative alignment and should be investigated at the preliminary design stage. Alternatively a Departure from Standards should be applied.
Vertical curvature of the proposed segregated lane from A45 EB to M42 NB is consistent with 70kph Design Speed requirements. Longitudinal gradient does not exceed 4%.

Non-standard Impacts

Geometric Alignment

- A45 E to M42 N the position of the free flow left results in a successive diverge departure, the reason for this departure was to retain the existing slip road layout from the A45 to avoid confusion with drivers that are used to this existing layout. A consideration to adopt a ghost island layout has been considered, however, TD 22 guidance states that the use of ghost island are not recommended on urban roads, this section of the A45 is a urban road. The provision of Ghost Island would also increase weaving maneuverers for vehicles existing Clock Junction and wishing to go to M42 Southbound.
- 7% gradient and reduced vertical curvature on the free flow link at NMM would require a departure from standards.
- Reduced successive merge on A45 EB slip road and free flow connection is 50m short of the minimum required 262m distance.

Weaving

TD 22/06 Clause 4.30 states:

Successive Merges or Diverges Within Interchanges

4.30 Where there are closely spaced successive merges or diverges on mainlines and connector roads within a junction or interchange (Figure 4/5), the minimum spacing between the tips of noses must be 3.75V m, where V is the design speed in kph, subject to the minimum requirements for effective signing and motorway signalling. If the merges or diverges are on a connector road, the design speed must be that for the connector road. This paragraph applies to successive merges (merge followed by a merge) or successive diverges (diverge followed by a diverge). It also applies to a diverge followed by a merge but not to a merge followed by a diverge (the latter is a weaving section).

The weaving length table below details the existing weaving lengths:

Northbound		Southbound	
Section	**L_{act} (km)**	**Section**	**L_{act} (km)**
J5 merge to J6 diverge	4.286	J7 to J6 diverge	1.915*
J6 merge to J7 diverge	2.239	J6 merge to J5 diverge	4.330

Table 1: Existing Weaving Length (J6 to J7)

*** measured to Final Gantry at J6 (minus 100m)**

The weaving length table below shows proposed weaving lengths:

Northbound		Southbound	
Section	**L_{act} (km)**	**Section**	**L_{act} (km)**
J5 Merge to J6 diverge	4.286	J7 to Proposed J6 diverge	1.640* 1.730**
Proposed J6 merge to J7 diverge	2.011	J6 merge to J5 diverge	4.330

Table 2: Proposed Weaving Length (J5 to J7)

*** weaving measured to tip of taper of proposed diverge**

**** weaving measured to a notional diverge tip based on Figure 4/9 B of TD 22/06**

Note: the existing south facing slips may require alteration due to traffic flows

Table 2 above indicates a departure from standard is required for non-compliant weaving length between J7 and J6 southbound. This is non-compliant compared to Clause 4.35 of TD 22/06, depending on how the weaving length is measured it is out of standard by 360*/270m**. (Note the proposed slip road layouts will need to be justified by traffic movements, these layouts are to be confirmed).

It is envisaged that the existing south facing slips at junction 6 will require alteration for successive diverges and merges for the free flows, however, due to the existing weaving length and requirement of TD 22/06 will remain compliant.

Stakeholders

- NEC – free flow left under the NEC access/egress will have disruption during construction following reduced access provision
- NMM – as NEC, but consideration has been given to provide an additional entry and exit to the rear of the NMM.
- NEC/NMM – should benefit from reduced flow passing through the circulatory due to the dedicated left turns.
- HS2 – access is as per the Hybrid Bill proposals, may benefit due to the reduced number of users at the circulatory due to the dedicated left turns.
- Birmingham Airport – as above for HS2, works currently being constructed as part of SMBC/BA improvements are to be retained.
- UKC – a connection to UKC is proposed off the improved East Way loop roundabout, UKC could benefit from the reduced flow on the circulatory.
- Network Rail – existing structure over the M42 is likely to be unaffected depending on any slip road layout alterations which are to be based on traffic figures which are still to be confirmed.
- Solihull Metropolitan Borough Council – proposals will impact A45 especially for the diverge/free flow to M42 N.
- Stats – M42 Junction 6 circulatory – a number of stats around the circulatory will be impacted as well as 132kV pylons adjacent to the free flow A45 E to M42 N.

Traffic

Following 2016 traffic count data collected in February, the tables below indicate the total turning flows passing through the circulatory with an additional table to see the implication of introducing free flow lefts at all arms:

Total Flows Through J6 Circulatory	
	2016
A45 W	1399
NEC	188
M42 N	1559
A45 E	1721
NMM	32
M42 S	2064
TOTAL	6963

Total Flows Through J6 Circulatory - minus free flow lefts	
	2016
A45 W	783
NEC	188
M42 N	1027
A45 E	760
NMM	32
M42 S	1245
TOTAL	4035

2928 vehicles are removed from the circulatory, which equates to a 42% reduction in circulatory flow in 2016, note this figure also includes the existing free flow left from M42 S to A45 W.

Structures

1no. existing bridge structure, 2no. 'major' retaining wall structures and 1no. culvert structure will be affected by introducing free flow links at Junction 6.

Due to the new road alignment, the length of Culvert 11 Holywell Brook will need to be extended to suit the proposed alignment. Additionally, the NEC Access Bridge will also need extension or complete replacement as well as the Eastway Bridge. It is proposed that a new two-span bridge structure is built to replace the NEC Access bridge.

3no. retaining walls will need to be relocated/removed within the general scheme limits. To avoid disruption to traffic, a 132kV pylon within the scheme boundary should either be protected or relocated to a safe distance away from the proposed carriageway.
Smart motorway gantries and small retaining walls will be affected in the area of the southern junction and existing gantries will require modification in order to sign the new layout.

To form the new road layout, two new structures are proposed:
Free Flow Link under the National Exhibition Centre
This structure will take the form of an underpass that will carry the M42 southbound traffic to the west of Coventry Road (A45). A deck-on-pile system (with secant piles) is planned at the proposed location. However, the safe working clearance between the location of the proposed drilled piles and the live traffic should be confirmed by Geotechnics. Alternatively, an offline construction method could be used. The underpass structure will be extended with retaining walls at each end.
Free Flow Links under the National Motorcycle Museum
This structure will be identical to the proposed free flow link under the NEC. However, the length and height of the retaining walls will vary.

Maintenance access arrangements and/or provisions have yet to be agreed, but would need to be discussed with all relevant parties to ensure the design incorporates maintenance requirements.

Geotechnical
Some sections of the proposed new free flow links around Junction 6 impinge onto areas of Made Ground associated with the construction of the NEC and the M42.

The extent and nature of the Made Ground is not known and would be established during ground investigation along with the rest of the ground conditions. The presence of the Made Ground is a manageable risk.

Environment
There is risk that Option 11A will result in air quality, noise and visual impacts to sensitive receptors in Bickenhill and the wider area. Further survey and modelling work including the development of mitigation measures is required to resolve this. These measures should also be designed to mitigate impacts to cultural heritage assets.
This option has potential impacts on European Protected Species. Further survey and assessment work is required to confirm the presence of these species or habitat for other species, to determine likely impacts and develop suitable mitigation measures. It is anticipated that suitable drainage and flood compensation will be designed during PCF Stages 2 and 3 to avoid impacts to the water environment.

Risks/Hazards

- Departures from standard required which need to be submitted to Highways England and SMBC
- Widening of the existing junction 6 circulatory, may require replacement structures, not widening of the existing.
- Existing gantries along M42 mainline to be extended/replaced/repositioned
- M42 localised widening may fall outside of existing highway boundary.
- Local road networks will be impacted by the proposals the extent of which is still to be determined via traffic modelling.

- Impact to flood zones 2 and 3 refer to Environmental Constraint Drawings HE551485-MOU-3000-M42 J6-DR-EN-0001 and 0002
- Proposals over areas of soft ground, made ground and landfill.
- Impact to a number of 132kv pylons
- Impact to NEC and NMM day to day business during construction of underpasses/tunnels
- Replacement of existing East Way Bridge, tight construction room and disturbance of NEC business
- HS2 People Mover pier locations will need to alter due to north facing slip provisions
- The new connection from the existing dedicated left for East Way from M42 southbound diverge to the A45 may cause some conflicting movements from vehicles when trying to merge with the A45 traffic.
- Note – at this time impact to existing PRoWs and National Trails have not been determined.

Knights House 2 Parade Sutton Coldfield West Midlands B72 1PH

T 0121 355 8949 **F** 0121 355 8901 info@mouchel.com www.mouchel.com

Project:	M42 Junction 6 Improvement Scheme	**Date:**	28/09/16
		TN Ref:	0059
Subject:	Option 2R		
Author:	Oleg Makarov	**Project Ref:**	HE551485-MOU-GEN-M42_J6-FN-CH-0059
Reviewed:	Graham MacNicol	**Date:**	18/11/16
Approved:	Graham MacNicol	**Date:**	18/11/16

Introduction

The proposed improvement scheme is required to alleviate the current congestion and journey reliability issues associated with the M42 Junction 6. The junction lies at the heart of an area of dynamic growth, and is a gateway to Birmingham Airport, the National Exhibition Centre (NEC) and Birmingham Business Park. In addition, a station for the proposed High Speed Two (HS2) is to be located nearby and the plans for Solihull MBC's UK Central (UKC) mixed use development will continue to add significant demand to the network and increase dependence on M42 Junction 6. Other key stakeholders within close proximity to the scheme and Strategic Road Network (SRN) include the National Motorcycle Museum (NMM), Jaguar Land Rover (JLR) and Solihull Metropolitan Borough Council (SMBC). A new Motorway Service Area (MSA) is proposed south of the existing junction 6 - this proposal has been submitted for planning approval but no formal decision has to date been made.

Description of Proposals

Following a decision in September 2016 to promote MSA and the preliminary result of the TUBA assessment of the selected 4 options (2Q, 2P, 11A, 11B) the need to design a simplified southern junction option derived a new option – 2R.

Option 2R as shown on drawing HE551485-MOU-GEN-M42 J6-SK-D-0207 utilises amended MSA layout with a dual link towards Birmingham Airport and the Clock Roundabout. The access to and from Catherine de Barnes Ln and Bickenhill village is accommodated via two staggered slip roads. The proposed MSA dumbbell layout is utilised with some modifications – western roundabout is increased in size and south facing slip roads are converted to parallel merge/diverge from the proposed taper merge/diverge layout.

Design Standard

- **TD9/93 – Highway Link Design**
- **TD16/07 – Geometric Design of Roundabouts**
- **TD22/06 – Layout of Grade Separated Junctions**
- **TD27/05 – Cross-sections and headrooms**
- **TD42/95 – Geometric Design of Major/Minor Priority Junctions**

Note: Design Standards to be expanded as design options progress

Geometry

Design Speed

- Slip roads are to be 70kph unless length of slip road is greater than 750m then it will be designed to an 85kph design speed
- Dual Carriageway link from the MSA roundabout to Clock Interchange Roundabout to be designed as 120kph,
- Link to connection from the proposed dual carriageway to the Airport Way flyover link is designed as a single carriageway link for 70kph design speed. The existing Airport Way has speed limit of 40mph – 70kph design speed.
- Existing Catherine de Barnes Ln has 50mph – 85kph design speed.
- Dumb-bell Link Road as 70kph

Alignment

Slip road layouts

The proposed slip road layouts for the new southern junction are aimed to maximise use of the proposed MSA scheme design, but due to increase in traffic (to be confirmed by the microsimulation traffic modelling) would require some alterations. The current MSA scheme proposes taper merge/diverge single lane slip road arrangement, but the increase in traffic would likely require Ghost Island diverge and lain gain merge layout with two lanes on the south facing slip roads. The vertical alignment of the proposed slip roads ideally would aim to be similar to Arup's MSA proposal, but the preliminary design shows that it is unlikely that the vertical design of the roundabouts can be maintained and hence the vertical alignment of the proposed slip roads is likely to differ with the current MSA junction design. Horizontal changes would likely require additional earthworks and new pavement widening, there is also an impact on the proposed Solihull Road B4102 bridge as visibility splay requirement and slip road position affects the proposed structure. Alterations to south facing slip roads is likely to affect proposed M42 signing strategy for MSA. The extent of the north facing slip roads would likely to remain the same as in the current MSA proposal and as such not affecting Shadowbrook Ln overbridge structure.

In order to avoid impact on the Shadowbrook Ln overbridge the proposed northbound merge requires a shorter length of the taper – 160m instead of the required by TD22 205m taper. A similar proposal has been shown in the Arup's MSA design drawings.

In order to reduce the environmental impact, where the proposed south facing slip roads positioned in the vicinity of the ancient woodland – the design of the proposed earthworks has been done with 1 in 1 slope steepness (similar to the Arup's design).

The proposed weaving length between the existing J6 and MSA northbound merge/diverge is likely to remain the same as in the proposed Arup's design proposal of the MSA. The weaving distance between J5 and the proposed southbound merge slip road is likely to remain within a compliant 2km distance if the proposed merge configuration would be lane gain or parallel merge layout. The Northbound diverge has been designed as a ghost island diverge layout, unlike the Arup's taper diverge layout – this would reduce weaving distance to 1.82km.

Junction 6 slip road layouts for the A45 E and W largely remain unchanged as per the current situation.

MSA dumbbell roundabout GSJ

Option 2R aims to take maximum advantage of the proposed MSA GSJ design provision. The key difference is in the western roundabout changes. In order to connect the firth arm of the airport link connection the roundabout size is required to be increased to 100m ICD – the current design shows 60m ICD. As a result the current Arup's design of

the connecting arms would require alterations horizontally and vertically. The ARCADY analysis shows that the eastern roundabout, in the current design configuration, is able to cope with the proposed traffic increase as a result of the airport connection, but as a precaution (pending the derivation of traffic flows) it is proposed to increase the proposed eastern roundabout to 70m ICD. As a result - Arup's design of the slip roads approaches would require modification – to be detailed at the preliminary design.

Link to Airport

A 70mph design speed dual carriageway is proposed to connect the new southern junction with the existing Clock Junction roundabout. This link also proposes a free flow left to Airport Way. The horizontal curvature consists of a near straights on the approaches to MSA and Clock junction roundabouts and a bend of 1200 and 900m radius through Bickenhill, a sharper alignment can be considered at the preliminary design stage in order to minimise impact on the sports ground. The free flow connection to the airport is designed with a reduced horizontal radius of 127m and although is a departure from standards for 70kph design speed but is necessary to connect the proposed link with the existing airport free flow link to avoid impact on the existing structure. The 127m radius would also help to emphasise the change in the design speed from the 120kph to 70kph (speed limit of the existing free flow link). The existing free flow link has currently 2 lanes so in order to connect the new link it would be tapered to a single lane prior to the merge of the proposed link. From the point of two link merge at the airport free flow there will be 320m available weaving to the airport roundabout – this is sufficient distance for safe weaving of the traffic. Vertical alignment of the proposed link from MSA roundabout to Clock roundabout is designed predominantly in deep cutting in order to minimise visual and environmental impact on Bickenhill and surrounding countryside, such an approach would also facilitate a simpler connection with the CdB Lane and minimise impact on the adjacent properties.

The provision of a new connection from the proposed southern junction to Clock Roundabout and Airport free flow would inevitably change traffic patterns on the Clock junction (consisting of 4 roundabouts) – the detailed microsimulation model and LinSig model would provide more clarity of the extent of a potential problem and any remediation required. To be considered at the preliminary design.

Bickenhill Roundabout and CdB southbound diverge slip.

In order to provide access to CdB lane in southbound direction from Clock Interchange as well as Bickenhill village – a taper diverge slip road is proposed 450m south of the Clock Interchange roundabout. The slip road would connect to the CdB Lane via a new roundabout with an arm on the west to the gain access to Caravan Park and properties at the end of Clock Lane. The main access to Bickenhill village would be provided via St Peters Ln.

CdB northbound merge slip to the proposed link.

In order to provide access from CdB lane in northbound direction to Clock Interchange – a taper merge slip road is proposed 170m north from the access to new dogs home. The current design of the slip road is done in accordance with TD42 para 7.55 – this permits a shorter diverge taper of 55m in comparison to the TD22 requirement of 70m. The correct application of standard can be confirmed at the preliminary design. The shorter taper enables longer separation between dogs home access and the start of the diverge slip. Although both TD22 and TD 42 compliant diverge taper would enable safe sighting of the ADS sign as the tolerance for it is between 150 and 90m. However the private access located 55 m south of the start of the proposed merge slip would likely require a closure. An alternative access can be provided from the access to dogs home, the existing mature hedge at the property boundary would need to be repositioned to provide adequate to 50mph visibility (unless CdB can be realigned to the east).
The provision of northbound merge slip from CdB results in the reduced weaving length between slip road merge and airport free flow connection. The weaving length is approximately 550m while min 1Km is required. An alternative

arrangement with a compliant weaving length for the NB slip road from CdB is also feasible – an early engagement with HE PTS is required.

Free flow lefts at J6

Refer to design narrative for the Option 11A - HE551485-MOU-GEN-M42_J6-FN-CH-0057

Non-standard Impacts

Geometric Alignment

- Reduced weaving length between CdB northbound merge with the proposed dual carriageway link and Airport Link free flow diverge – 560m.
- Reduced horizontal radius of 127m on the proposed link with the existing airport free flow.
- Reduced taper length on the proposed southern junction northbound merge - 160m.
- Reduced weaving length between J5 and J6 – see Table 1 below for details

The weaving length table below shows proposed weaving lengths, these are measured when the dynamic hard shoulder is open:

Weaving

The weaving length table below shows proposed weaving lengths:

Northbound		Southbound	
Section	**L_{act} (km)**	**Section**	**L_{act} (km)**
J5 Merge to MSA diverge	1.935	MSA merge to J5 diverge	2.337
Proposed MSA merge to Proposed J6 diverge	1.164	Proposed J6 merge to Proposed MSA diverge	1.154

Table 1: Proposed Weaving Length (J5 to J6)

*** weaving measured to tip of taper of proposed diverge**

**** weaving measured to a notional diverge tip based on Figure 4/9 B of TD 22/06**

Note: the existing south facing slips may require alteration due to traffic flows

Stakeholders

- Birmingham Airport – direct link from the proposed southern junction to Airport Way. Access from the north would be as per existing flyover arrangement;
- Birmingham International Railway Station – direct link from the proposed southern junction via Clock Interchange;
- Natural England – impact on Ancient Woodland - Aspbury's Copse;
- Bickenhill residents – link road passes close to the village;

Traffic

At the time of producing this technical note no traffic figures had been produced for this option. However, based on work carried out to date, it is like that there will be:

- M42(N)-A45 no change with little impact on J6 movements;
- M42(S)-A45 additional links providing access to Airport and HS2;
- New southern link and access through diverges south of M42 J6 reduces northbound traffic to Junction 6;
- Stakeholders access improvement for HS2, NEC, NMM, BIA, Birmingham International Rail Station;
- There is overall benefit of journey time, including traffic through M42 J6.

Structures

There are 3no. existing bridge structures (one belongs to Solihull Metropolitan Borough Council) and 1no. culvert structure will be affected by this option.

The Bickenhill Lane Bridge will have less impact on the scheme as it is expected to tie into the proposed road alignment. However, the existing bridge structure may need to be extended if the new alignment is not tied into the proposed road alignment.

The width of the proposed road alignment does not fit within the current clear span length of the Solihull Road Bridge. Hence, modification of the existing structure will be required. The construction stages will be discussed and agreed at a later stage.

Due to the new junction proposed at the south of Junction 6, the length of the existing culvert (Outfall No.19) will not be able to suit the proposed design layout. Hence, lengthening the culvert structure is required.

Smart motorway gantries and small retaining walls will be affected in the designated area of Option 2P and will require modification in order to sign the new layout. It should be noted that the lengthening of existing structures will also influence the existing pylon locations.

In order to form the design layout, three new structures are also required:

Bridge Over M42

The new proposed junction, at the south of Junction 6 will require a dumbbell bridge over the M42. The structure will be a two span bridge structure. The preferred option is the use of precast elements. The abutments and pier will be cast insitu at the proposed locations. The precast elements can then be lifted into position. This solution will minimum disruption to traffic.

Over Catherine de Barnes Lane Bridge

The structure is envisaged to be a highly skewed single span bridge that carries the M42 over Catherine de Barnes Lane. The abutments will be built at the proposed location on either side of Catherine de Barnes Lane. The bridge deck will be built offline to minimise disruption to traffic and then lifted into position.

Bridge over the proposed road at north

This single span structure will not affect traffic during the construction phase, hence, both precast or insitu options are viable.

Maintenance access arrangements and/or provisions have yet to be agreed, but would need to be discussed with all relevant parties to ensure the design incorporates maintenance requirements.

Geotechnical

The area of the new junction on the M42 will be located over areas of Alluvium which is likely to be weak and/or compressible.

Made ground associated with a historic landfill may underlie the tie in with the Clock Interchange and the link to the Clock Interchange impinges slightly onto a strip of land identified as former landfill where the route is in cutting. Should

contaminated former landfill material be encountered and require removal to off-site landfill, additional disposal cost may be incurred.

The extent and nature of the Alluvium and Made Ground is not known and would be established during ground investigation along with the rest of the ground conditions. The presence of the Alluvium and Made Ground is a manageable risk.

Environment

There is risk that Option 2R will result in air quality, noise and visual impacts to sensitive receptors in Bickenhill. Further survey and modelling work including the development of mitigation measures is required to resolve this. These measures should also be designed to mitigate impacts to cultural heritage assets. Option 2R severs community playing fields which are also used for National Gaelic Football matches. Further mitigation design is required to prevent the options precluding future use of this community facility. This option has potential physical impacts on Castle Hill Farm Meadows LWS, Meadows to the east of the Jungle Ecosite, Clock Lane Meadows Ecosite, Roadside Hedge Ecosite and Aspbury's Coppice Ancient Woodland/LWS/Ecosite. Further survey work is required to categorise the importance of these sites both for their floristic interest and as habitat for other species, such as bats and invertebrates, to determine likely impacts and develop suitable mitigation measures. It is anticipated that suitable drainage and flood compensation will be designed during PCF Stages 2 and 3 to avoid impacts to the water environment.

Risks/Hazards

- Departures from standard required which need to be submitted to Highways England and SMBC
- Link road close to Bickenhill Village and access arrangements amended for Bickenhill due to stopping up of St Peters Lane/Catherine de Barnes Lane Junction
- Existing structures to be demolished and/or replaced at Solihull Road
- Local road networks will be impacted by the proposals the extent of which is still to be determined via traffic modelling.
- Impact to flood zones 2 and 3.
- Ancient Woodland impacted by scheme.
- Proposals over areas of soft ground, made ground and landfill which needs to be confirmed via ground investigations
- Potential diversion works for 132kV pylons as well as aqueduct
- Note – at this time impact to existing PRoWs and National Trail have not been determined. The provision of link connecting to Airport freeflow would block the existing footway/cycleway along the existing flyover. Details of the alternative arrangement may require an additional underpass structure.

Project:	M42 Junction 6 Improvement Scheme	**Date:**	08/11/2016
		TN Ref:	0060
Subject:	Option 2R East		
Author:	Oleg Makarov	**Project Ref:**	HE551485-MOU-GEN-M42_J6-FN-CH-0060
Reviewed:	Graham MacNicol	**Date:**	18/11/16
Approved:	Graham MacNicol	**Date:**	18/11/16

Introduction

The proposed improvement scheme is required to alleviate the current congestion and journey reliability issues associated with the M42 Junction 6. The junction lies at the heart of an area of dynamic growth, and is a gateway to Birmingham Airport, the National Exhibition Centre (NEC) and Birmingham Business Park. In addition, a station for the proposed High Speed Two (HS2) is to be located nearby and the plans for Solihull MBC's UK Central (UKC) mixed use development will continue to add significant demand to the network and increase dependence on M42 Junction 6. Other key stakeholders within close proximity to the scheme and Strategic Road Network (SRN) include the National Motorcycle Museum (NMM), Jaguar Land Rover (JLR) and Solihull Metropolitan Borough Council (SMBC). A new Motorway Service Area (MSA) is proposed south of the existing junction 6 - this proposal has been submitted for planning approval but no formal decision has to date been made.

Description of Proposals

Following a decision in September 2016 to promote MSA and the preliminary result of the TUBA assessment of the selected 4 options (2Q, 2P, 11A, 11B) the need to design a simplified southern junction option derived a new option – 2R. An alternative to the Option 2R layout, proposing Clock Junction Link road to the east of the Bickenhill village, has been developed. This Option described as Option 2R East.

Option 2R East as shown on drawing HE551485-MOU-GEN-M42 J6-SK-D-0008 utilises amended MSA layout with a dual link towards Birmingham Airport and the Clock Roundabout. The access to and from Catherine de Barnes Ln and Bickenhill village is accommodated via the proposed Bickenhill roundabout. The proposed MSA dumbbell layout is utilised with some modifications – roundabouts are increased in size and south facing slip roads (northbound diverge and southbound merge) are converted to ghost island merge/diverge from the proposed taper merge/diverge layout.

Design Standard

- **TD9/93 – Highway Link Design**
- **TD16/07 – Geometric Design of Roundabouts**
- **TD22/06 – Layout of Grade Separated Junctions**
- **TD27/05 – Cross-sections and headrooms**
- **TD42/95 – Geometric Design of Major/Minor Priority Junctions**

Note: Design Standards to be expanded as design options progress

Geometry

Design Speed

- Slip roads are to be 70kph unless length of slip road is greater than 750m then it will be designed to an 85kph design speed.
- Dual Carriageway link from the MSA roundabout to the proposed Bickenhill Roundabout to be designed as 120kph.
- Connection from the proposed Bickenhill Roundabout to the Airport Way flyover link is designed as a single carriageway link for 70kph design speed. The existing Airport Way has speed limit of 40mph – 70kph design speed.
- Link from the proposed Bickenhill Roundabout to the existing Clock Roundabout to be designed as a dual carriageway with 70kph design speed.
- Existing Catherine de Barnes Ln has 40mph – 70kph design speed. The proposed link from Catherine de Barn Ln to the proposed Bickenhill Roundabout is designed as a single carriageway with 70kph design speed.
- Dumb-bell Link Road as 70kph.
- Existing Shadoowbrook Ln in the vicinity of the proposed diversion has 40mph speed limit. The proposed Shadowbrook Ln design for 70kph design speed.
- Existing Church Ln in the vicinity of the proposed diversion appears to have derestricted speed limit but the nature of the existing single track lane with passing places would allow for a maximum 50kph design speed.

Alignment

Slip road layouts

The proposed slip road layouts for the new southern junction are aimed to maximise use of the proposed MSA scheme design, but due to increase in traffic (to be confirmed by the microsimulation traffic modelling) would require some alterations. The current MSA scheme proposes taper merge/diverge single lane slip road arrangement, but the increase in traffic would likely require Ghost Island diverge and lain gain merge layout with two lanes on the south facing slip roads. The vertical alignment of the proposed slip roads ideally would aim to be similar to Arup's MSA proposal, but the preliminary design shows that it is unlikely that the vertical design of the roundabouts can be maintained and hence the vertical alignment of the proposed slip roads is likely to differ with the current MSA junction design. Horizontal changes would likely require additional earthworks and new pavement widening, there is also an impact on the proposed Solihull Road B4102 bridge as visibility splay requirement and slip road position affects the proposed structure. Alterations to south facing slip roads is likely to affect proposed M42 signing strategy for MSA. The extent of the north facing slip roads would likely to remain the same as in the current MSA proposal and as such not affecting Shadowbrook Ln overbridge structure.

In order to avoid impact on the Shadowbrook Ln overbridge the proposed northbound merge requires a shorter length of the taper – 160m instead of the required by TD22 205m taper. A similar proposal has been shown in the Arup's MSA design drawings.

In order to reduce the environmental impact, where the proposed south facing slip roads positioned in the vicinity of the ancient woodland – the design of the proposed earthworks has been done with 1 in 1 slope steepness (similar to the Arup's design).

The proposed weaving length between the existing J6 and MSA northbound merge/diverge is likely to remain the same as in the proposed Arup's design proposal of the MSA. The weaving distance between J5 and the proposed southbound merge slip road is likely to remain within a compliant 2km distance if the proposed merge configuration would be lane

gain or parallel merge layout. The Northbound diverge has been designed as a ghost island diverge layout, unlike the Arup's taper diverge layout – this would reduce weaving distance to 1.82km.

Junction 6 slip road layouts for the A45 E and W largely remain unchanged as per the current situation.

MSA dumbbell roundabout GSJ

Option 2R East aims to take maximum advantage of the proposed MSA GSJ design provision. The key difference is in the western roundabout changes. In order to connect the firth arm of the airport link connection - the roundabout size is required to be increased to 100m ICD – the current design shows 60m ICD. As a result the current Arup's design of the connecting arms would require alterations horizontally and vertically. The ARCADY analysis shows that the eastern roundabout, in the current design configuration, is able to cope with the proposed traffic increase as a result of the airport connection, but as a precaution (subject to the detailed traffic analysis) it is proposed to increase the proposed eastern roundabout to 70m ICD. As a result - Arup's design of the slip roads approaches would require modification – to be detailed at the preliminary design.

Link to Airport

A 70mph design speed dual carriageway is proposed to connect the new southern junction with a new roundabout at Bickenhill. The proposed link consist of 720m radius right hand bend from the southern junction roundabout, a straight and a 720m radius left hand bend on the approach to the proposed Bickenhill roundabout. Although 720m radius is one step below desirable radius for 70mph design speed – it is a relaxation from standards as vertical curvature and SSD requirements are adequate to 70mph design speed requirements.

Vertical alignment of the proposed link was designed in such a way that at the existing Shadowbrook Ln and Church Ln crossings – the existing road can be retained at grade. This puts proposed link in a 7-8m deep cutting at the Shadowbrook Ln and Church Rd crossings. In the middle of the proposed link – alignment is elevated by up to 9m above the existing ground level.

Proposed Bickenhill Roundabout.

It is not possible to connect the proposed Airport Link directly with Clock Junction as it is done in Option 2R West. Because of the approach angle it is necessary to introduce a roundabout to enable a sharp change in the alignment curvature. It is also necessary to introduce the proposed roundabout in order to provide access to CdB Lane. The size of the roundabout will be based on traffic modelling and alignment design to provide a safe and efficient layout, it is currently shown with a 100m inscribed circular diameter.

Dumb-bell Link

A dumb-bell link connection between existing Clock Interchange and the new Bickenhill Roundabout, this will be a dual link, with the exit from the new roundabout with an additional lane which drops to Airport Way. The southbound visibility on the link will be restricted by the existing structure to a minimum of 35m, in order to improve this an alteration to the existing flyover structure will be required. The lane drop to Airport Way in northbound direction situated 80m from the roundabout exit, this is a substantial reduction to the 262m weaving distance requirements for 70kph design speed. In order to provide a sufficient manoeuvring distance the lane designation has to be introduced within the Airport Link approach to the proposed Bickenhill roundabout – the offside lane should be marked with Clock Junction designation and the nearside lane should be marked designated to Airport and Bickenhill. A similar lane dedication would be required on the proposed CdB Lane approach.

The connecting link from the Bickenhill Roundabout to Airport Freeflow requires a 127m left hand bend radius in order to provide sharp change in direction to the Airport freeflow. Vertical alignment of this link is determined by extensions of the cross fall from the dumb-bell link and the airport free flow link. Connection with the existing flyover can be done as a taper merge prior to the existing A45 viaduct, but a safer fay would reduce existing flyover dual link to a single lane link to enable the proposed link from the Bickenhill roundabout to be a lane gain.

Local Roads

Shadowbrook Lane and Church Lane require some realignment at the point of crossing with the proposed Airport Link. It will be possible to retain alignment in the existing lane position but in order to improve buildability it is proposed to realign the existing lanes in order to build proposed structure offline. Horizontal and vertical curvature of both Shadowbrook Ln and Church Ln are adequate to the existing speed limit.

Free flow lefts at J6

Refer to design narrative for the Option 11A - HE551485-MOU-GEN-M42_J6-FN-CH-0057

Non-standard Impacts

Geometric Alignment

- Reduced visibility on dumbbell link between Clock Roundabout and the proposed Bickenhill roundabout (35m minimum)
- Reduced horizontal radius of 127m on the proposed link with the existing airport free flow.
- Reduced weaving between the proposed Bickenhill roundabout and Airport freeflow connection – 80m.
- Reduced taper length on the proposed southern junction northbound merge - 160m.
- Reduced weaving length between J5 and J6 – see Table 1 below for details

The weaving length table below shows proposed weaving lengths, these are measured when the dynamic hard shoulder is open:

Weaving

The weaving length table below shows proposed weaving lengths:

Northbound		Southbound	
Section	**L_{act} (km)**	**Section**	**L_{act} (km)**
J5 Merge to MSA diverge	1.935	MSA merge to J5 diverge	2.337
Proposed MSA merge to Proposed J6 diverge	1.164	Proposed J6 merge to Proposed MSA diverge	1.154

Table 1: Proposed Weaving Length (J5 to J6)

*** weaving measured to tip of taper of proposed diverge**

**** weaving measured to a notional diverge tip based on Figure 4/9 B of TD 22/06**

Note: the existing south facing slips may require alteration due to traffic flows

Stakeholders

- Birmingham Airport – direct link from the proposed southern junction to Airport Way. Access from the north would be as per existing flyover arrangement;
- Birmingham International Railway Station – direct link from the proposed southern junction via Clock Interchange;
- Natural England – impact on Ancient Woodland - Aspbury's Copse;
- Bickenhill residents – link road passes close to the village;

Traffic

At the time of producing this technical note no traffic figures had been produced for this option. However, based on work carried out to date, it is like that there will be:

- M42(N)-A45 no change with little impact on J6 movements;
- M42(S)-A45 additional links providing access to Airport and HS2;
- New southern link and access through diverges south of M42 J6 reduces northbound traffic to Junction 6;
- Stakeholders access improvement for HS2, NEC, NMM, BIA, Birmingham International Rail Station;
- There is overall benefit of journey time, including traffic through M42 J6.

Structures

There are 3no. existing bridge structures (1no. airport flyover, belongs to Solihull Metropolitan Borough Council), 1no. culvert structure and 1no. retaining wall structure will be affected by this option.

1no. major retaining wall, P29A, will need to be removed or relocated to suit the scheme. Smart motorway gantries and small retaining walls will be affected in the designated area of this option. Existing gantries will require modification in order to sign the new layout. Additionally, this option affects a number of local roads which belong to Solihull Metropolitan Borough Council. The presence of the existing structures within seveal areas needs to be confirmed should this option be selected.

To form the new road layout of this option, six new structures are proposed:

Bridge Over M42

The new proposed junction, at the south of Junction 6 will require a dumbbell bridge over the M42. The structure will be a two span bridge structure. The preferred option is the use of precast elements. The abutments and pier will be cast insitu at the proposed locations. The precast elements can then be lifted into position. This solution will minimum disruption to traffic.

Over Shadowbrook Lane Bridge

To minimise disruption to traffic flow at Shadowbrook Lane, the preferred option is to build a single span bridge over Shadowbrook Lane. Alternatively, a new bridge could be built at the south of Shadowbrook Lane over the proposed road layout. This option will minimise the disruption to traffic flow at Shadowbrook Lane, however a larger superstructure will be required.

Bridge over the private/local road adjacent to Shadowbrook Lane

The proposed road layout crosses a frequently used private road. Hence, maintaining the access to the private road will be required during construction. A precast box culvert solution is the preferred option here.

Structures over both north and south branches of Shadowbrook River

Due to the limited width for the new structure, a small culvert is the preferred option. There are no known site constraints. To minimise environmental impact, a precast culvert is the preferred option.

Structure over Church Lane

Two options are also proposed for Church Lane Bridge. The first option is to build a single span bridge structure. The abutments will be built at the proposed location on either side of Church Lane and the bridge deck can be built offline and subsequently lifted into position. This option will cause minimum disruption to live traffic. The second option is to temporarily divert Church Lane while a buried box/bridge structure is built at the proposed location.Maintenance access arrangements and/or provisions have yet to be agreed, but would need to be discussed with all relevant parties to ensure the design incorporates maintenance requirements.

Maintenance access arrangements and/or provisions have yet to be agreed, but would need to be discussed with all relevant parties to ensure the design incorporates maintenance requirements.

Geotechnical

The area of the new junction on the M42 will be located over areas of Alluvium which is likely to be weak and/or compressible.

Made ground associated with a historic landfill may underlie the tie in with the Clock Interchange and the link to the Clock Interchange passes through a small former landfill and where the route is in cutting. Should contaminated former landfill material be encountered and require removal to off-site landfill, additional disposal cost may be incurred.

The extent and nature of the Alluvium and Made Ground is not known and would be established during ground investigation along with the rest of the ground conditions. The presence of the Alluvium and Made Ground is a manageable risk.

Environment

There is risk that Option 2RE will result in air quality, noise and visual impacts to sensitive receptors in Bickenhill and the wider area. Further survey and modelling work including the development of mitigation measures is required to resolve these impacts. These measures should also be designed to mitigate impacts to cultural heritage assets.
Option 2RE severs the village of Bickenhill at Church Lane. Further mitigation design is required to prevent the option significantly impacting private dwellings and businesses through land take, severance and loss of amenity.
This option has potential physical impacts on Roadside Hedge EWS/Ecosite, Aspbury's Coppice Ancient Woodland / EWS and European Protected Species. Further survey and assessment work is required to catergorise the importance of the EWSs and confirm the presence of these species or the habitat for other species, to determine likely impacts and to develop suitable mitigation measures. It is anticipated that suitable drainage and flood compensation will be designed during PCF Stages 2 and 3 to avoid impacts to the water environment.

Risks/Hazards

- Departures from standard required which need to be submitted to Highways England and SMBC
- Airport Exit to new roundabout may not work
- Existing structures to be demolished and/or replaced at Solihull Road
- Local road networks will be impacted by the proposals the extent of which is still to be determined via traffic modelling.
- Impact to flood zones 2 and 3.
- Ancient Woodland impacted by scheme.
- Proposals over areas of soft ground, made ground and landfill which needs to be confirmed via ground investigations

- Potential diversion works for 132kV pylons as well as aqueduct
- Note – at this time impact to existing PRoWs and National Trail have not been determined. The provision of link connecting to Airport freeflow would block the existing footway/cycleway along the existing flyover. Details of the alternative arrangement may require an additional underpass structure.

Knights House 2 Parade Sutton Coldfield West Midlands B72 1PH

T 0121 355 8949 **F** 0121 355 8901 info@mouchel.com www.mouchel.com

Appendix H – Appraisal Summary Table

Appraisal Summary Table

Date produced:	25 August 2016

Contact:	
Name	G Littlechild
Organisation	Highways England
Role	Promoter/Official

Name of scheme:	M42 Junction 6 Improvements - Option 2P
Description of scheme:	Option 2P provides a northbound exit slip and southbound entry slip on the M42, to the south of Junction 6, will connect with the A45 at Clock Interchange, via a new Bickenhill roundabout. This roundabout will also connect to the existing northbound dedicated link to the airport.

Impacts		Summary of key impacts	Assessment: Quantitative	Qualitative	Monetary £(NPV)	Distributional 7-pt scale/ vulnerable grp
Economy	Business users & transport providers	The proposed improvement scheme is required to alleviate the current congestion and journey reliability issues associated with the M42 Junction 6. The junction lies at the heart of an area of dynamic growth, and is a gateway to Birmingham Airport, Birmingham International Rail Station, the National Exhibition Centre (NEC) and Birmingham Business Park. In addition, a station for the proposed High Speed Two (HS2) is to be located nearby and the plans for Solihull MBC's UK Central (UKC) mixed use development will continue to add significant demand to the network and increase dependence on M42 Junction 6. Other key stakeholders within close proximity to the scheme and Strategic Road Network (SRN) include the National Motorcycle Museum (NMM), Jaguar Land Rover (JLR) and Solihull Metropolitan Borough Council (SMBC). A new Motorway Service Area (MSA) is proposed south of the existing Junction 6 - this proposal has been submitted for planning approval but no formal decision has to date been made.	Value of journey time changes(£) Net journey time changes (£) 0 to 2min / 2 to 5min / > 5min Data unavailable at present due to delays with the traffic model.	Moderate Beneficial		
	Reliability impact on Business users	The M42 and J6 currently operate close to capacity so any incident or volume increase on the network in the vicinity has an impact on the journey reliability. An assessment of reliability benefits will be undertaken using MyRIAD. The provision of the new, high standard links, dedicated left turn links should help to improve reliability of journey time. However, the increased number of merges and junctions will increase the probability of collisions disrupting the network. The dedicated left turn lanes will also increase the speed at which vehicles are merging, however, this will be off set by the removal of the traffic from the circulatory carriageway and can be mitigated by implementing speed limits on the free flow links.	Data unavailable at present due to delays with the traffic model.	Moderate Beneficial		
	Regeneration	North Solihull is the subject of one of the largest regeneration programmes in England. In addition, there are pockets of deprivation in the Mature Suburbs and Rural Area with low incomes, unemployment and poor health in parts of Bickenhill, Elmdon, Lyndon, Olton and Shirley. Regeneration in the area is by UKC East & West. Accessibility to this area will be investigated.	If required a Regeneration Report will be produced.	There could be regeneration but this has not been assessed		
	Wider Impacts	The following will need to be considered as part of the assessment; the output change in imperfectly competitive markets, the tax revenues arising from changes in labour supply, agglomeration and the tax revenues arising from the move to more or less productive jobs. Bickenhill is classed as hinterland in the Functional Urban Region.	The scale of the wider economic impacts will be assessed during Stage 2.	Not assessed at this stage		
Environmental	Noise	Option 2P has the potential to introduce a closer road traffic noise source to some noise sensitive dwellings and other receptors particularly in Bickenhill. Any improvement scheme aimed at relieving congestion and increasing capacity could serve to attract additional vehicular traffic to the vicinity, which in turn could result in increases in noise and vibration. These impacts may require mitigation measures, these could lead to impacts on budget and programme. Appropriate engineering options that can mitigate such noise impacts would include acoustic barriers and low noise surfacing. These could mitigate any increases in noise generated by a scheme in some situations and additionally be applied to reduce noise levels at the Defra Noise important Area in proximity to the scheme. Confirmation of changes to traffic characteristics along affected road links as a result of the proposed scheme would be required to confirm this. For the Defra Important Areas consideration should be given to improving the noise environment in these locations where possible, even if the scheme itself does not cause a worsening of the impact. Low noise surfacing may not be sufficient to address noise level increases and the Highways England Project Manager should be made aware that subject to the outcome of the assessments, additional mitigation may be required, such as installation of noise barriers. There are 177 dwellings and 2 other noise sensitive receptors within 600 m of the scheme corridor. Within 1km of the corridor there are four Defra Noise Important Areas (NIAs): on the A45 at Elmdon, (reference number 2830); on the A45 West of jn6, (ref no 2831); on the M42 South of jn6 (ref no 7481) on the West of the M42 further south between jn6 and jn5. The locations of these NIAs and the 2 other noise sensitive receptors are detailed in the constraints plans.	In the absence of traffic data not calculated at PCF Stage 1.	Not calculated	n/a	
	Air Quality	At PCF Stage 1 no quantitative appraisal has been undertaken to compare the proposed option in relation to Air Quality. It is anticipated that this will be undertaken at PCF Stages 2 and 3. Therefore, an alternative methodology was used to identify the number of receptors within 200m of the proposed option. The proposed options are: Less than 50m - from 3 relevant sensitive receptors Between 50m to 100m – from 35 relevant sensitive receptors Between 100m to 200m - from 33 relevant sensitive receptors This indicates that there is the potential for adverse impacts during construction and operation of either option. There are no ecologically designated sites within 200m of the proposed option. Birmingham AQMA is the closest AQMA which is designated citywide for the exceedance of the annual mean nitrogen dioxide and PM10 objectives. It is situated approximately 2.2km from the proposed option. There is one PCM link (A45) within 200m of the proposed option.	In the absence of traffic data not calculated at PCF Stage 1.	Not calculated	n/a	
	Greenhouse gases	Alleviation of road traffic congestion as a result of the implementation of the proposed option has the potential to reduce Greenhouse Gas emissions. However, any increase in road traffic flows might negate the potential benefit. Confirmation of changes to traffic flows and speeds along the affected road links would be required to assess this quantitatively.	Change in non-traded carbon over 60y (CO2e) Change in traded carbon over 60y (CO2e)	Not calculated	n/a	
	Landscape	Option 2P would include the widening works around Junction 6 of the M42 as well as a new offline link road with flyover which would pass through the village of Bickenhill, resulting in vegetation loss, new traffic movements, field fragmentation and potential shifts away from the arable farmland. These changes would all be localised around Junction 6 of the M42 and the landscape between the M42 and Clock Interchange on the A45, giving rise to adverse changes. There would be no significant changes to the overall landscape character of the study area despite these localised changes.	Not Calculated	Slight Adverse	n/a	
	Townscape	n/a	n/a	n/a	n/a	
	Historic Environment	9 non-designated heritage assets will be directly impacted by the junction options, these mainly date to the medieval and post medieval periods. The setting of 1 Grade1 listed building, and 2 grade II listed buildings may be impacted upon by the Proposed Scheme. There is potential for the scheme to impact upon currently unknown below ground heritage assets.	The number of known assets affected is at least 12	Moderate	n/a	
	Biodiversity	Potential to directly impact: Bat roosts, great crested newt foraging and sheltering habitat, breeding birds due to removal of suitable nesting habitat, badgers if setts are present within embankment close to or within the working area, otter habitat should this species use Holywell Brook or Shadow Brook, white clawed crayfish if present within Holywell Brook or Shadow Brook, water voles and species habitat should these animals be present within Holywell Brook, Shadow Brook or field drains; reptiles and their habitat if these animals are present within embankment close to the working area or within land required for the option, dormouse habitat if these animals are present within embankment vegetation or hedgerows close to the working area, scarce invertebrates if suitable habitat is present within the embankment or land required for the option, fish habitat if these animals are present within Holywell Brook or Shadow Brook, hedgehog due to loss of foraging habitat, Holywell Brook LWS due to in-stream works and a culvert extension. Potential indirect impacts due to increased nitrogen deposition: Bickenhill Meadows SSSI, Coleshill and Bannerly Pools SSSI, Wayside Cottages Meadow LWS, Clock Lane Meadows Ecosite, Greens Ward Piece LWS, Castle Hill Farm Meadows LWS, Meadows to the East of the Jungle Ecosite, and Bickenhill Churchyard Ecosite.	N/A	Slight Adverse	n/a	
	Water Environment	Surface water features in the area comprise an unnamed tributary of Shadow Brook, Hollywell Brook plus other field drains. One groundwater body is assessed (Tame Anker Mease Secondary Combined). A number of standing waterbodies were assessed, including Pendingo Lake and other unnamed ponds. A number of surface and groundwater abstractions are located in the study area. Impacts include increased flood risk along watercourses including the Hollywell Brook, potential increase in discharge to tributary of Shadow Brook, Hollywell Brook plus new outfalls in other drains, potential changes to groundwater flow as a result of cuttings, and potential contamination of groundwater as a result of accidental spillage and routine runoff. Other impacts include potential direct or indirect loss of GWDTE's as a result of groundwater changes.	n/a	Moderate Adverse	n/a	
Social	Commuting and Other users	The proposed improvement scheme is required to alleviate the current congestion and journey reliability issues associated with the M42 Junction 6. Pending completion of forecasting models and subsequent economic analysis, it is not possible to complete this analysis.	Value of journey time changes(£) Net journey time changes (£) 0 to 2min / 2 to 5min / > 5min Data unavailable at present due to delays with the traffic model.	Moderate Beneficial		
	Reliability impact on Commuting and Other users	The M42 and J6 currently operate close to capacity so any incident or volume increase on the network in the vicinity has an impact on the journey reliability. An assessment of reliability benefits will be undertaken using MyRIAD.	Data unavailable at present due to delays with the traffic model.	Moderate Beneficial		
	Physical activity	The proposed improvement scheme will provide suitable provision for NMUs at J6	To be assessed as part of the NMU Audit	Neutral		
	Journey quality	The scheme includes signage and signals to provide clear and unambiguous information to the driver and is expected to alleviate congestion and improve journey time reliability. With the scheme in place, driver stress is predicted to be lower.	N/A	Beneficial		
	Accidents	An assessment of the accidents will be carried out using COLBALT.	Data unavailable at present due to delays with the traffic model.	Not assessed		
	Security	The TAME guidance for road schemes advises that they should never have anything other than a negligible effect on security.	To be assessed as part of the NMU Audit	Neutral		
	Access to services	Accessibility will be assessed in accordance with the guidance in TAG Unit A4.1.	To be assessed as part of the NMU Audit	Beneficial		
	Affordability	An assessment of affordability will be carried out using a distributional impact analysis in accordance with TAG Unit A4.1.	Data unavailable at present due to delays with the traffic model.	Neutral		
	Severance	The TAME guidance for road schemes advises that a highway scheme may have an impact on severance but the TAG Unit A4.1 indicates that this is dependent on whether the scheme has an impact on pedestrian movements. Severance has been considered throughout the option development stage and mitigated where ever possible. However, the NMU routes currently located in the vicinity of the Clock Interchange and the airport link may be problematic.	To be assessed as part of the NMU Audit	Not assessed at this stage		
	Option and non-use values	The scheme does not involve the loss or introduction of a new mode of transport, accordingly option values are unaffected.	N/A	N/A		
Public Account	Cost to Broad Transport Budget	All costs are attributable to Central Government.	Cost Estimate awaited.	N/A		
	Indirect Tax Revenues	Pending completion of the economic assessment as part of Stage 2.		N/A		

Appraisal Summary Table

Date produced:	25 August 2016

Contact:	
Name	G Littlechild
Organisation	Highways England
Role	Promoter/Official

Name of scheme:	M42 Junction 6 Improvements - Option 11A
Description of scheme:	Option 11A provides improvements to Junction 6. It involves the introduction of free flow left turns at all arms and consideration of widening the existing circulatory carriageway.

Impacts		Summary of key impacts	Assessment: Quantitative	Assessment: Qualitative	Assessment: Monetary £(NPV)	Assessment: Distributional 7-pt scale/ vulnerable grp
Economy	Business users & transport providers	The proposed improvement scheme is required to alleviate the current congestion and journey reliability issues associated with the M42 Junction 6. The junction lies at the heart of an area of dynamic growth, and is a gateway to Birmingham Airport, Birmingham International Rail Station, the National Exhibition Centre (NEC) and Birmingham Business Park. In addition, a station for the proposed High Speed Two (HS2) is to be located nearby and the plans for Solihull MBC's UK Central (UKC) mixed use development will continue to add significant demand to the network and increase dependence on M42 Junction 6. Other key stakeholders within close proximity to the scheme and Strategic Road Network (SRN) include the National Motorcycle Museum (NMM), Jaguar Land Rover (JLR) and Solihull Metropolitan Borough Council (SMBC). There is currently a planning application under consideration for a new Motorway Service Area (MSA) located to the south of the existing Junction 6. However, no formal decision has to date been made. This option assumes the MSA does not get approval.	Value of journey time changes(£) / Net journey time changes (£) — 0 to 2min | 2 to 5min | > 5min: Data unavailable at present due to delays with the traffic model.	Moderate Beneficial		
	Reliability impact on Business users	The M42 and J6 currently operate close to capacity so any incident or volume increase on the network in the vicinity has an impact on the journey reliability. An assessment of reliability benefits will be undertaken using MyRIAD. The provision of the dedicated left turn links should help to improve reliability of journey time. However, the increased number of merges and junctions will increase the probability of collisions disrupting the network. The dedicated left turn lanes will also increase the speed at which vehicles are merging, however, this will be off set by the removal of the traffic from the circulatory carriageway.	Data unavailable at present due to delays with the traffic model.	Moderate Beneficial		
	Regeneration	North Solihull is the subject of one of the largest regeneration programmes in England. In addition, there are pockets of deprivation in the Mature Suburbs and Rural Area with low incomes, unemployment and poor health in parts of Bickenhill, Elmdon, Lyndon, Olton and Shirley. Regeneration in the area is by UKC East & West. Accessibility to this area will be investigated.	If required a Regeneration Report will be produced.	There could be regeneration but this has not been assessed		
	Wider Impacts	The following will need to be considered as part of the assessment; the output change in imperfectly competitive markets, the tax revenues arising from changes in labour supply, agglomeration and the tax revenues arising from the move to more or less productive jobs. Bickenhill is classed as hinterland in the Functional Urban Region.	The scale of the wider economic impacts will be assessed during Stage 2.	Not assessed at this stage		
Environmental	Noise	Option 11A has the potential to increase noise levels due to changes in distance to noise sensitive receptors on the altered roads. The new link has the potential to introduce a closer road traffic noise source to some noise sensitive dwellings and other receptors particularly on Old Station Road and the farms and cottages on the north eastern side of junction 6. Any improvement scheme aimed at relieving congestion and increasing capacity could serve to attract additional vehicular traffic to the vicinity, which in turn could result in increases in noise and vibration. These impacts may require mitigation measures, these could lead to impacts on budget and programme. Appropriate engineering options that can mitigate such noise impacts would include acoustic barriers and low noise surfacing. These could mitigate any increases in noise generated by a scheme in some situations and additionally be applied to reduce noise levels at the Defra Noise important Area in proximity to the scheme. Confirmation of changes to traffic characteristics along affected road links as a result of the proposed scheme would be required to confirm this. For the Defra Important Areas consideration should be given to improving the noise environment in these locations where possible, even if the scheme itself does not cause a worsening of the impact. Low noise surfacing may not be sufficient to address noise level increases and the Highways England Project Manager should be made aware that subject to the outcome of the assessments, additional mitigation may be required, such as installation of noise barriers. There are 65 dwellings and 1 other noise sensitive receptor within 600 m of the scheme corridor. Within 1km of the corridor there are four Defra Noise Important Areas (NIAs): on the A45 at Elmdon, (reference number 2830); on the A45 West of jn6, (ref no 2831); on the M42 South of jn6 (ref no 7481) and on the West of the M42 further south between jn6 and jn5 (ref no 7482). The locations of these NIAs and the other noise sensitive receptor are detailed in the constraints plans.	In the absence of traffic data not calculated at PCF Stage 1.	Not calculated	n/a	Not calculated
	Air Quality	At PCF Stage 1 no quantitative appraisal has been undertaken to compare the proposed option in relation to Air Quality; this will be undertaken at PCF Stages 2 or 3. Therefore, an alternative methodology was used to identify the number of receptors within 200m of the proposed option. The proposed options are: Less than 50m - from 3 relevant sensitive receptors Between 50m to 100m - from 3 relevant sensitive receptors Between 100m to 200m - from 14 relevant sensitive receptors This indicates that there is the potential for adverse impacts during construction and operation of the proposed option. There are no ecologically designated sites within 200m of the proposed option. Coleshill AQMA is the closest AQMA which is designated for the exceedance of the annual mean nitrogen dioxide and PM10 objectives. It is situated approximately 2km from the proposed option. There is one PCM link (A45) within 200m of the proposed option.	In the absence of traffic data not calculated at PCF Stage 1.	Not calculated	n/a	Not calculated
	Greenhouse gases	Alleviation of road traffic congestion as a result of the implementation of the proposed options has the potential to reduce Greenhouse Gas emissions. However, any increase in road traffic flows might negate the potential benefit. Confirmation of changes to traffic flows and speeds along the affected road links would be required to assess this quantitatively.	Change in non-traded carbon over 60y (CO2e); Change in traded carbon over 60y (CO2e)	Not calculated	n/a	
	Landscape	Option 11A would compirse the introduction of free flow left turns at all arms and widening of the existing circulatory carriageway as well as localised widening on the M42, the reconfiguration of the associated secondary road connections to the NEC/Birmingham International Airport and widening of the M42 due to extended merge and diverge lanes between Junction 6 and Shadow Brook Lane. There would be works beyond the existing highways boundary due to the increased footprint of the M42 corridor, where this occurs there would be loss of existing established vegetation. The landscape character of the overall study area would be able to accommodate Option 11A without giving rise to significant impacts given the existing presence of Junction 6 and the relatively minor alterations to its configuration.	Not calculated	Neutral	n/a	
	Townscape	n/a	n/a	n/a	n/a	
	Historic Environment	4 non-designated heritage assets will be directly impacted by the junction options, these mainly date to the medieval and post medieval periods. The setting of 1 grade II listed building may be impacted upon by the Proposed Scheme. There is potential for the scheme to impact upon currently unknown below ground heritage assets.	The number of known assets affected is at least 5	Moderate Adverse	n/a	
	Biodiversity	Potential to directly impact: Bat roosts, great crested newt foraging and sheltering habitat, breeding birds due to removal of suitable nesting habitat, badgers if setts are present within embankment close to or within the working area, otter habitat should this species use Holywell Brook or Shadow Brook, white clawed crayfish if present within Holywell Brook or Shadow Brook, water voles and species habitat should these animals be present within Holywell Brook, Shadow Brook or field drains, hedgehog due to loss of foraging habitat; reptiles and their habitat if these animals are present within embankment close to the working area or within land required for the option, dormouse habitat if these animals are present within embankment vegetation or hedgerows close to the working area, fish habitat if these animals are present within Holywell Brook or Shadow Brook, hedgehog due to loss of foraging habitat, Main Birmingham to London Railway line Ecosite due to lane widening, Holywell Brook LWS due to in-stream works and a culvert extension. Potential to indirectly impact Coleshill and Bannerly Pools SSSI due to increased nirogen deposition.	n/a	Slight Adverse	n/a	
	Water Environment	Surface water features in the area comprise an unnamed tributary of Shadow Brook, the Shadow Brook, Hollywell Brook, plus other field drains. One groundwater body is assessed (Tame Anker Mease Secondary Combined). A number of standing waterbodies were assessed, including Pendingo Lake and other unnamed ponds. A number of surface and groundwater abstractions are located in the study area. Impacts include increased flood risk along watercourses including the Hollywell Brook, potential increase in discharge to tributary of Shadow Brook, Hollywell Brook plus new outfalls in other drains, potential changes to groundwater flow as a result of cuttings, and potential contamination of groundwater as a result of accidental spillage and routine runoff. Other impacts include potential direct or indirect loss of GWDTE's as a result of groundwater changes.	n/a	Moderate Adverse	n/a	
Social	Commuting and Other users	The proposed improvement scheme is required to alleviate the current congestion and journey reliability issues associated with the M42 Junction 6. Pending completion of forecasting models and subsequent economic analysis, it is not possible to complete this analysis.	Value of journey time changes(£) / Net journey time changes (£) — 0 to 2min | 2 to 5min | > 5min: Data unavailable at present due to delays with the traffic model.	Moderate Beneficial		
	Reliability impact on Commuting and Other users	The M42 and J6 currently operate close to capacity so any incident or volume increase on the network in the vicinity has an impact on the journey reliability. An assessment of reliability benefits will be undertaken using MyRIAD.	Data unavailable at present due to delays with the traffic model.	Moderate Beneficial		
	Physical activity	The proposed improvement scheme will provide suitable provision for NMUs at J6	To be assessed as part of the NMU Audit	Neutral		
	Journey quality	The scheme includes signage and signals to provide clear and unambiguous information to the driver and is expected to alleviate congestion and improve journey time reliability. With the scheme in place, driver stress is predicted to be lower	n/a	Beneficial		
	Accidents	An assessment of the accidents will be carried out using COLBALT.	Data unavailable at present due to delays with the traffic model.	Not assessed		
	Security	The TAME guidance for road schemes advises that they should never have anything other than a negligible effect on security.	To be assessed as part of the NMU Audit	Neutral		
	Access to services	Accessibility will be assessed in accordance with the guidance in TAG Unit A4.1	To be assessed as part of the NMU Audit	Beneficial		
	Affordability	An assessment of affordability will be carried out using a distributional impact analysis in accordance with TAG Unit A4.1	Data unavailable at present due to delays with the traffic model.	Neutral		
	Severance	The TAME guidance for road schemes advises that a highway scheme may have an impact on severance but the TAG Unit A4.1 indicates that this is dependent on whether the scheme has an impact on pedestrian movements. Severance has been considered throughout the option development stage and mitigated where ever possible.	To be assessed as part of the NMU Audit	Not assessed		
	Option and non-use values	The scheme does not involve the loss or introduction of a new mode of transport, accordingly option values are unaffected.	n/a	n/a		
Public Accounts	Cost to Broad Transport Budget	All costs are attributable to Central Government.	Cost Estimate awaited.	n/a		
	Indirect Tax Revenues	Pending completion of the economic assessment as part of Stage 2.		n/a		

Appraisal Summary Table

Date produced:	2	Nov	2016

Contact:	
Name	G Littlechild
Organisation	Highways England
Role	Promoter/Official

Name of scheme:	M42 Junction 6 Improvements - Option 2R
Description of scheme:	Option 2R provides an all movement junction to the south of Junction 6, will connect with the A45 at Clock Interchange. An additional free flow link will be provided, connecting the link road to the existing A45 westbound airport free flow link, avoiding Clock Interchange for northbound vehicles. North facing slip roads will be provided to connect Catherine de Barnes Lane and Bickenhill village to the Clock Interchange. A nothbound connection from Catherine de Barnes Lane to the northbound link road will also be provided.

Impacts		Summary of key impacts	Assessment: Quantitative	Qualitative	Monetary £(NPV)	Distributional 7-pt scale/ vulnerable grp
Economy	Business users & transport providers	The proposed improvement scheme is required to alleviate the current congestion and journey reliability issues associated with the M42 Junction 6. The junction lies at the heart of an area of dynamic growth, and is a gateway to Birmingham Airport, Birmingham International Rail Station, the National Exhibition Centre (NEC) and Birmingham Business Park. In addition, a station for the proposed High Speed Two (HS2) is to be located nearby and the plans for Solihull MBC's UK Central (UKC) mixed use development will continue to add significant demand to the network and increase dependence on M42 Junction 6. Other key stakeholders within close proximity to the scheme and Strategic Road Network (SRN) include the National Motorcycle Museum (NMM), Jaguar Land Rover (JLR) and Solihull Metropolitan Borough Council (SMBC). A new Motorway Service Area (MSA) is proposed south of the existing Junction 6 - this proposal has been submitted for planning approval but no formal decision has to date been made.	Value of journey time changes(£) Net journey time changes (£) 0 to 2min / 2 to 5min / > 5min Data unavailable at present due to delays with the traffic model.	Moderate Beneficial		
	Reliability impact on Business users	The M42 and J6 currently operate close to capacity so any incident or volume increase on the network in the vicinity has an impact on the journey reliability. An assessment of reliability benefits will be undertaken using MyRIAD. The provision of the new, high standard links, dedicated left turn links should help to improve reliability of journey time. However, the increased number of merges and junctions will increase the probability of collisions disrupting the network. The dedicated left turn lanes will also increase the speed at which vehicles are merging, however, this will be off set by the removal of the traffic from the circulatory carriageway and can be mitigated by implementing speed limits on the free flow links.	Data unavailable at present due to delays with the traffic model.	Moderate Beneficial		
	Regeneration	North Solihull is the subject of one of the largest regeneration programmes in England. In addition, there are pockets of deprivation in the Mature Suburbs and Rural Area with low incomes, unemployment and poor health in parts of Bickenhill, Elmdon, Lyndon, Olton and Shirley. Regeneration in the area is by UKC East & West. Accessibility to this area will be investigated.	If required a Regeneration Report will be produced.	There could be regeneration but this has not been assessed		
	Wider Impacts	The following will need to be considered as part of the assessment; the output change in imperfectly competitive markets, the tax revenues arising from changes in labour supply, agglomeration and the tax revenues arising from the move to more or less productive jobs. Bickenhill is classed as hinterland in the Functional Urban Region.	The scale of the wider economic impacts will be assessed during Stage 2.	Not assessed at this stage		
Environmental	Noise	Option 2R has the potential to introduce a closer road traffic noise source to some noise sensitive dwellings and other receptors particularly in Bickenhill. Any improvement scheme aimed at relieving congestion and increasing capacity could serve to attract additional vehicular traffic to the vicinity, which in turn could result in increases in noise and vibration. These impacts may require mitigation measures, these could lead to impacts on budget and programme. Appropriate engineering options that can mitigate such noise impacts would include acoustic barriers and low noise surfacing. These could mitigate any increases in noise generated by a scheme in some situations and additionally be applied to reduce noise levels at the Defra Noise important Area in proximity to the scheme. Confirmation of changes to traffic characteristics along affected road links as a result of the proposed scheme would be required to confirm this. For the Defra Important Areas consideration should be given to improving the noise environment in these locations where possible, even if the scheme itself does not cause a worsening of the impact. Low noise surfacing may not be sufficient to address noise level increases and the Highways England Project Manager should be made aware that subject to the outcome of the assessments, additional mitigation may be required, such as installation of noise barriers. There are 207 dwellings and 3 other noise sensitive receptors within 600 m of the scheme corridor. Within 1km of the corridor there are four Defra Noise Important Areas (NIAs): on the A45 at Elmdon, (reference number 2830); on the A45 West of jn6, (ref no 2831); on the M42 South of jn6 (ref no 7481) and on the West of the M42 further south between jn6 and jn5 (ref no 7482). The locations of these NIAs and the 3 other noise sensitive receptors are detailed in the constraints plans.	In the absence of traffic data not calculated at PCF Stage 1.	Not calculated	n/a	
	Air Quality	At PCF Stage 1 no quantitative appraisal has been undertaken to compare the proposed option in relation to Air Quality. It is anticipated that this will be undertaken at PCF Stages 2 and 3. Therefore, an alternative methodology was used to identify the number of receptors within 200m of the proposed option. The proposed options are: Less than 50m - from 17 relevant sensitive receptors Between 50m to 100m – from 23 relevant sensitive receptors Between 100m to 200m - from 56 relevant sensitive receptors This indicates that there is the potential for adverse impacts during construction and operation of the proposed option. There is one ecologically designated site within 200m of the proposed option. Birmingham AQMA is the closest AQMA which is designated citywide for the exceedance of the annual mean nitrogen dioxide and PM10 objectives. It is situated approximately 2.2km from the proposed option. There is one PCM link (A45) within 200m of the proposed option.		Not calculated	n/a	
	Greenhouse gases	Alleviation of road traffic congestion as a result of the implementation of the proposed options has the potential to reduce Greenhouse Gas emissions. However, any increase in road traffic flows might negate the potential benefit. Confirmation of changes to traffic flows and speeds along the affected road links would be required to assess this quantitatively.	Change in non-traded carbon over 60y (CO2e) Change in traded carbon over 60y (CO2e)	Not calculated	n/a	
	Landscape	Option 2R would comprise a new raised junction to the south of junction 6 on the M42 and a new offline link road from the new junction skirting around the village of Bickenhill to the Clock Interchange on the A45. Option 2R would result in the permanent loss of existing woodland and vegetation beyond the highways boundary (including Ancient Woodland and areas of landscape enhancements associated with the Birmingham International Airport), fragmentation of field patterns around the new link road, increased traffic movements and lighting within the landscape and the encapsulation of Bickenhill. The elements of this option would combine to noticeably increase the footprint and presence of the M42 in the local and wider landscape of the study area.	Not Calculated	Moderate Adverse	n/a	
	Townscape	n/a	n/a	n/a	n/a	
	Historic Environment	20 non-designated heritage assets will be directly impacted by the junction options, these mainly date to the medieval and post medieval periods. The setting of 2 grade I, 3 grade II* and 6 grade II listed building may be impacted upon by the Proposed Scheme. There is potential for the scheme to impact upon currently unknown below ground heritage assets.	The number of known assets affected is at least 32	Moderate Adverse	n/a	
	Biodiversity	Potential to directly impact: Bat roosts, great crested newt foraging and sheltering habitat, breeding birds due to removal of suitable nesting habitat, badgers if setts are present within embankment close to or within the working area, otter habitat should this species use Holywell Brook or Shadow Brook, white clawed crayfish if present within Holywell Brook or Shadow Brook, water voles and species habitat should these animals be present within Holywell Brook, Shadow Brook or field drains; reptiles and their habitat if these animals are present within embankment close to the working area or within land required for the option, dormouse habitat if these animals are present within embankment vegetation or hedgerows close to the working area, scarce invertebrates if suitable habitat is present within the embankment or land required for the option, fish habitat if these animals are present within Holywell Brook or Shadow Brook, hedgehog due to loss of foraging habitat, Holywell Brook LWS due to in-stream works and a culvert extension, Castle Hill Farm Meadows LWS, Clock Lane Meadows Ecosite and Meadows to the East of the Jungle Ecosite due to land take requirements, Aspury's Coppice Ecosite/Ancient Woodland due to lane widening. Potential indirect impacts due to increased nitrogen deposition: Bickenhill Meadows SSSI, Coleshill and Bannerly Pools SSSI, Wayside Cottages Meadow LWS, Clock Lane Meadows Ecosite, Greens Ward Piece LWS, Castle Hill Farm Meadows LWS, Meadows to the East of the Jungle Ecosite, and Bickenhill Churchyard Ecosite.		Slight Adverse	n/a	
	Water Environment	Surface water features in the area comprise an unnamed tributary of Shadow Brook, the Shadow Brook, Hollywell Brook, an unnamed tributary of the Low Brook, plus other field drains. One groundwater body is assessed (Tame Anker Mease Secondary Combined). A number of standing waterbodies were assessed, including Pendingo Lake and other unnamed ponds. A number of surface and groundwater abstractions are located in the study area. Impacts include increased flood risk along watercourses including the Hollywell Brook, potential increase in discharge to tributary of Shadow Brook, an unnamed tributary of the Shadow Brook, Hollywell Brook plus new outfalls in other drains, potential changes to groundwater flow as a result of cuttings, and potential contamination of groundwater as a result of accidental spillage and routine runoff. Other impacts include potential direct or indirect loss of GWDTE's as a result of groundwater changes.	n/a	Moderate Adverse	n/a	
Social	Commuting and Other users	The proposed improvement scheme is required to alleviate the current congestion and journey reliability issues associated with the M42 Junction 6. Pending completion of forecasting models and subsequent economic analysis, it is not possible to complete this analysis.	Value of journey time changes(£) Net journey time changes (£) 0 to 2min / 2 to 5min / > 5min Data unavailable at present due to delays with the traffic model.	Moderate Beneficial		
	Reliability impact on Commuting and Other users	The M42 and J6 currently operate close to capacity so any incident or volume increase on the network in the vicinity has an impact on the journey reliability. An assessment of reliability benefits will be undertaken using MyRIAD.	Data unavailable at present due to delays with the traffic model.	Moderate Beneficial		
	Physical activity	The proposed improvement scheme will provide suitable provision for NMUs at J6	To be assessed as part of the NMU Audit	Neutral		
	Journey quality	The scheme includes signage and signals to provide clear and unambiguous information to the driver and is expected to alleviate congestion and improve journey time reliability. With the scheme in place, driver stress is predicted to be lower.	N/A	Beneficial		
	Accidents	An assessment of the accidents will be carried out using COLBALT.	Data unavailable at present due to delays with the traffic model.	Not assessed		
	Security	The TAME guidance for road schemes advises that they should never have anything other than a negligible effect on security.	To be assessed as part of the NMU Audit	Neutral		
	Access to services	Accessibility will be assessed in accordance with the guidance in TAG Unit A4.1.	To be assessed as part of the NMU Audit	Beneficial		
	Affordability	An assessment of affordability will be carried out using a distributional impact analysis in accordance with TAG Unit A4.1.	Data unavailable at present due to delays with the traffic model.	Neutral		
	Severance	The TAME guidance for road schemes advises that a highway scheme may have an impact on severance but the TAG Unit A4.1 indicates that this is dependent on whether the scheme has an impact on pedestrian movements. Severance has been considered throughout the option development stage and mitigated where ever possible. However, the NMU routes currently located in the vicinity of the Clock Interchange and the airport link may be problematic.	To be assessed as part of the NMU Audit	Not assessed at this stage		
	Option and non-use values	The scheme does not involve the loss or introduction of a new mode of transport, accordingly option values are unaffected.	N/A	N/A		
Public Accounts	Cost to Broad Transport Budget	All costs are attributable to Central Government.	Cost Estimate awaited.	N/A		
	Indirect Tax Revenues	Pending completion of the economic assessment as part of Stage 2.		N/A		

Appraisal Summary Table

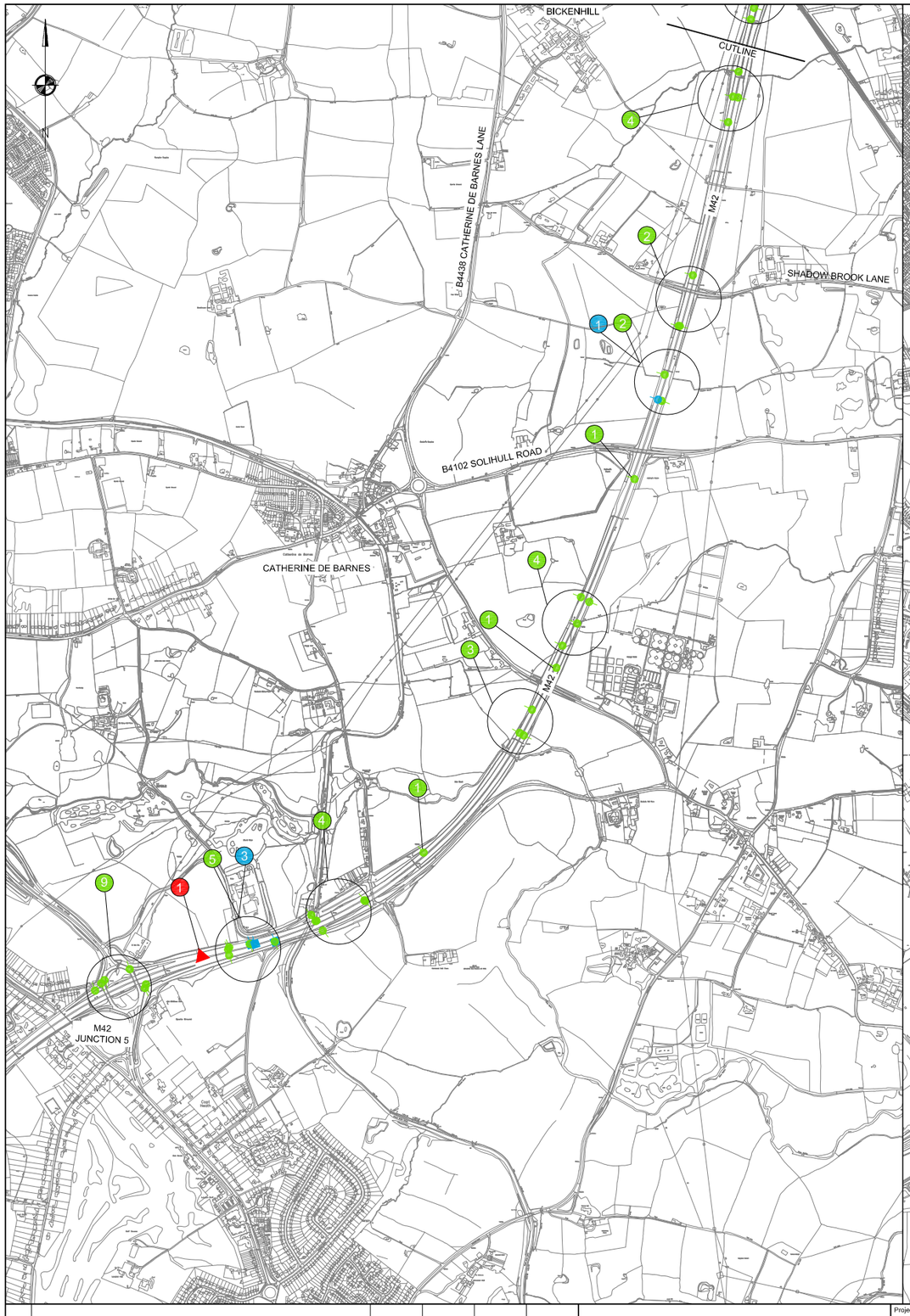
Date produced:	2	Nov	2016

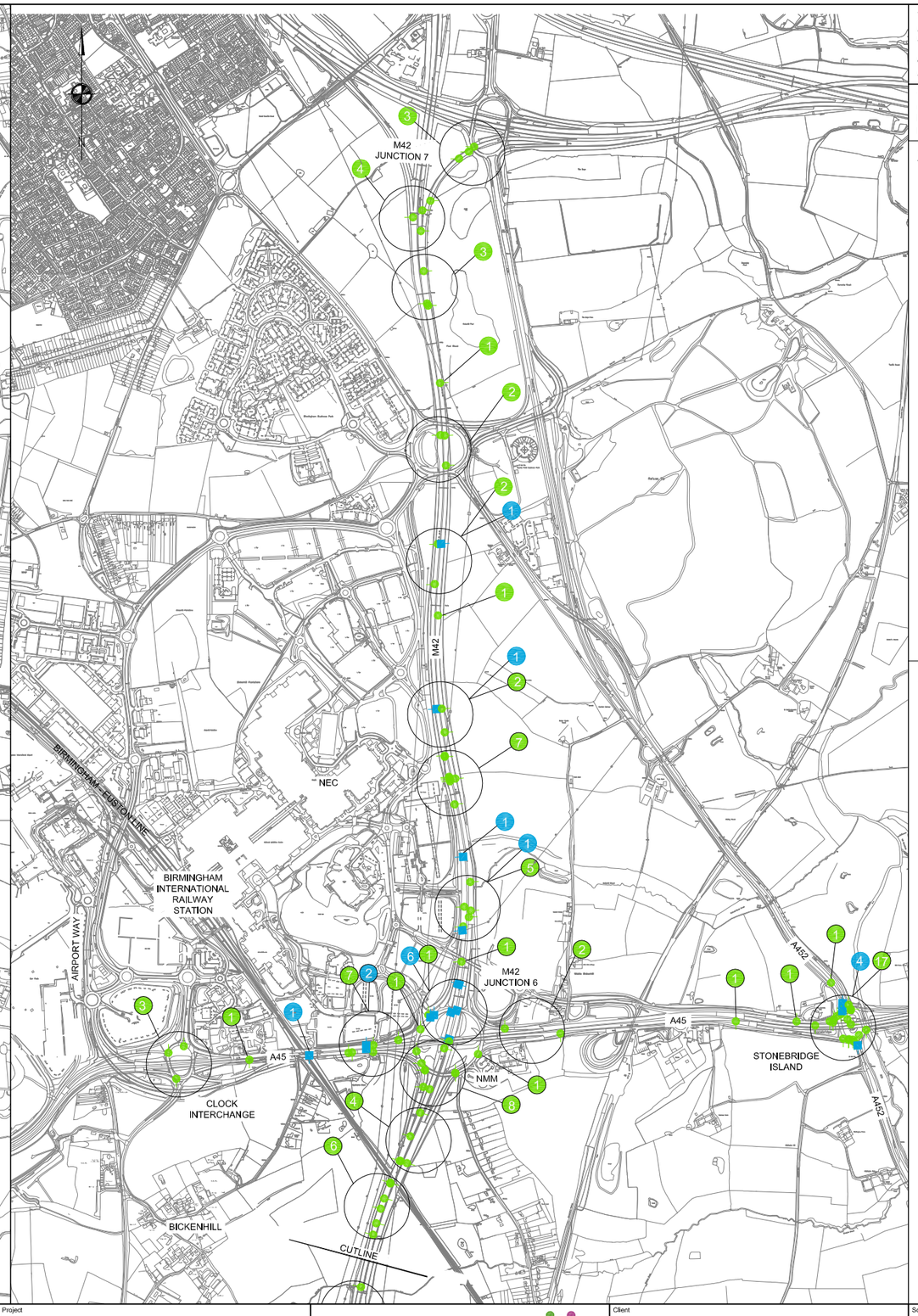
Contact:	
Name	G Littlechild
Organisation	Highways England
Role	Promoter/Official

Name of scheme:	M42 Junction 6 Improvements - Option 2R East
Description of scheme:	Option 2R East provides an all movement junction to the south of Junction 6, will connect with the A45 at Clock Interchange. Access to Catherine de Barnes Lane and Bickenhill village will be provided from a new roundabout located to the south of the Clock Interchange. A link to the A45 airport free flow link road will be provided from the new roundabout for northbound traffic.

Impacts		Summary of key impacts	Assessment: Quantitative	Qualitative	Monetary £(NPV)	Distributional 7-pt scale/ vulnerable grp
Economy	Business users & transport providers	The proposed improvement scheme is required to alleviate the current congestion and journey reliability issues associated with the M42 Junction 6. The junction lies at the heart of an area of dynamic growth, and is a gateway to Birmingham Airport, Birmingham International Rail Station, the National Exhibition Centre (NEC) and Birmingham Business Park. In addition, a station for the proposed High Speed Two (HS2) is to be located nearby and the plans for Solihull MBC's UK Central (UKC) mixed use development will continue to add significant demand to the network and increase dependence on M42 Junction 6. Other key stakeholders within close proximity to the scheme and Strategic Road Network (SRN) include the National Motorcycle Museum (NMM), Jaguar Land Rover (JLR) and Solihull Metropolitan Borough Council (SMBC). A new Motorway Service Area (MSA) is proposed south of the existing Junction 6 - this proposal has been submitted for planning approval but no formal decision has to date been made.	Value of journey time changes(£) / Net journey time changes (£): 0 to 2min | 2 to 5min | > 5min — Data unavailable at present due to delays with the traffic model.	Moderate Beneficial		
	Reliability impact on Business users	The M42 and J6 currently operate close to capacity so any incident or volume increase on the network in the vicinity has an impact on the journey reliability. An assessment of reliability benefits will be undertaken using MyRIAD. The provision of the new, high standard links, dedicated left turn links should help to improve reliability of journey time. However, the increased number of merges and junctions will increase the probability of collisions disrupting the network. The dedicated left turn lanes will also increase the speed at which vehicles are merging, however, this will be off set by the removal of the traffic from the circulatory carriageway and can be mitigated by implementing speed limits on the free flow links.	Data unavailable at present due to delays with the traffic model.	Moderate Beneficial		
	Regeneration	North Solihull is the subject of one of the largest regeneration programmes in England. In addition, there are pockets of deprivation in the Mature Suburbs and Rural Area with low incomes, unemployment and poor health in parts of Bickenhill, Elmdon, Lyndon, Olton and Shirley. Regeneration in the area is by UKC East & West. Accessibility to this area will be investigated.	If required a Regeneration Report will be produced.	There could be regeneration but this has not been assessed		
	Wider Impacts	The following will need to be considered as part of the assessment; the output change in imperfectly competitive markets, the tax revenues arising from changes in labour supply, agglomeration and the tax revenues arising from the move to more or less productive jobs. Bickenhill is classed as hinterland in the Functional Urban Region.	The scale of the wider economic impacts will be assessed during Stage 2.	Not assessed at this stage		
Environmental	Noise	Option 2R East has the potential to introduce a closer road traffic noise source to some noise sensitive dwellings and other receptors particularly in Bickenhill. Any improvement scheme aimed at relieving congestion and increasing capacity could serve to attract additional vehicular traffic to the vicinity, which in turn could result in increases in noise and vibration. These impacts may require mitigation measures, these could lead to impacts on budget and programme. Appropriate engineering options that can mitigate such noise impacts would include acoustic barriers and low noise surfacing. These could mitigate any increases in noise generated by a scheme in some situations and additionally be applied to reduce noise levels at the Defra Noise important Area in proximity to the scheme. Confirmation of changes to traffic characteristics along affected road links as a result of the proposed scheme would be required to confirm this. For the Defra Important Areas consideration should be given to improving the noise environment in these locations where possible, even if the scheme itself does not cause a worsening of the impact. Low noise surfacing may not be sufficient to address noise level increases and the Highways England Project Manager should be made aware that subject to the outcome of the assessments, additional mitigation may be required, such as installation of noise barriers. There are 128 dwellings and 3 other noise sensitive receptors within 600 m of the scheme corridor. Within 1km of the corridor there are four Defra Noise Important Areas (NIAs): on the A45 at Elmdon, (reference number 2830); on the A45 West of J6, (ref no 2831); on the M42 South of jn6 (ref no 7481) and on the West of the M42 further south between jn6 and jn5 (ref no 7482). The locations of these NIAs and the 3 other noise sensitive receptors are detailed in the constraints plans.	In the absence of traffic data not calculated at PCF Stage 1.	Not calculated	n/a	
	Air Quality	At PCF Stage 1 no quantitative appraisal has been undertaken to compare the proposed option in relation to Air Quality. It is anticipated that this will be undertaken at PCF Stages 2 and 3. Therefore, an alternative methodology was used to identify the number of receptors within 200m of the proposed option. The proposed options are: Less than 50m - from 9 relevant sensitive receptors Between 50m to 100m – from 42 relevant sensitive receptors Between 100m to 200m - from 19 relevant sensitive receptors This indicates that there is the potential for adverse impacts during construction and operation of the proposed option. There is one ecologically designated site within 200m of the proposed option. Birmingham AQMA is the closest AQMA which is designated citywide for the exceedance of the annual mean nitrogen dioxide and PM10 objectives. It is situated approximately 2.2km from the proposed option. There is one PCM link (A45) within 200m of the proposed option.		Not calculated	n/a	
	Greenhouse gases	Alleviation of road traffic congestion as a result of the implementation of the proposed options has the potential to reduce Greenhouse Gas emissions. However, any increase in road traffic flows might negate the potential benefit. Confirmation of changes to traffic flows and speeds along the affected road links would be required to assess this quantitatively.	Change in non-traded carbon over 60y (CO2e) Change in traded carbon over 60y (CO2e)	Not calculated	n/a	
	Landscape	Option 2R East would comprise a new raised junction to the south of junction 6 on the M42 and a new offline link road from the new junction skirting around the village of Bickenhill to the Clock Interchange on the A45. Option 2R East would result in the permanent loss of existing woodland and vegetation beyond the highways boundary (including Ancient Woodland and areas of landscape enhancements associated with the Birmingham International Airport), fragmentation of field patterns around the new link road, increased traffic movements and lighting within the landscape and the encapsulation of Bickenhill. The elements of this option would combine to noticeably increase the footprint and presence of the M42 in the local and wider landscape of the study area.	Not Calculated	Moderate Adverse	n/a	
	Townscape	n/a	n/a	n/a	n/a	
	Historic Environment	9 non-designated heritage assets will be directly impacted by the junction options, these mainly date to the medieval and post medieval periods. The setting of 1 Grade1 listed building, and 2 grade II listed buildings may be impacted upon by the Proposed Scheme. There is potential for the scheme to impact upon currently unknown below ground heritage assets.	The number of known assets affected is at least 12	Moderate Adverse	n/a	
	Biodiversity	Potential direct impacts to: Bat roosts, Bat roosts, great crested newt foraging and sheltering habitat, breeding birds due to removal of suitable nesting habitat, badgers if setts are present within embankment close to or within the working area, otter habitat should this species use Holywell Brook or Shadow Brook, white clawed crayfish if present within Holywell Brook or Shadow Brook, water voles and species habitat should these animals be present within Holywell Brook, Shadow Brook or field drains; reptiles and their habitat if these animals are present within embankment close to the working area or within land required for the option, dormouse habitat if these animals are present within embankment vegetation or hedgerows close to the working area, scarce invertebrates if suitable habitat is present within the embankment or land required for the option, fish habitat if these animals are present within Holywell Brook or Shadow Brook, hedgehog due to loss of foraging habitat, Holywell Brook LWS due to in-stream works and a culvert extension, Roadside Hedge Ecosite / Bickenhill Churchyard Ecosite due to land take requirements and Aspury's Coppice Ecosite/Ancient Woodland due to lane widening. Potential indirect impacts to: Bickenhill Meadows SSSI, Coleshill and Bannerly Pools SSSI, Wayside Cottages Meadow LWS, Clock Lane Meadows Ecosite, Greens Ward Piece LWS, Castle Hill Farm Meadows LWS, Meadows to the East of the Jungle Ecosite, and Bickenhill Churchyard Ecosite due to increased nitrogen deposition;		Slight Adverse	n/a	
	Water Environment	Surface water features in the area comprise an unnamed tributary of Shadow Brook, the Shadow Brook, Hollywell Brook, an unnamed tributary of the Low Brook, plus other field drains. One groundwater body is assessed (Tame Anker Mease Secondary Combined). A number of standing waterbodies were assessed, including Pendingo Lake and other unnamed ponds. A number of surface and groundwater abstractions are located in the study area. Impacts include increased flood risk along watercourses including the Hollywell Brook, potential increase in discharge to tributary of Shadow Brook, an unnamed tributary of the Shadow Brook, Hollywell Brook plus new outfalls in other drains, potential changes to groundwater flow as a result of cuttings, and potential contamination of groundwater as a result of accidental spillage and routine runoff. Other impacts include potential direct or indirect loss of GWDTE's as a result of groundwater changes.	n/a	Moderate Adverse	n/a	
Social	Commuting and Other users	The proposed improvement scheme is required to alleviate the current congestion and journey reliability issues associated with the M42 Junction 6. Pending completion of forecasting models and subsequent economic analysis, it is not possible to complete this analysis.	Value of journey time changes(£) / Net journey time changes (£): 0 to 2min | 2 to 5min | > 5min — Data unavailable at present due to delays with the traffic model.	Moderate Beneficial		
	Reliability impact on Commuting and Other users	The M42 and J6 currently operate close to capacity so any incident or volume increase on the network in the vicinity has an impact on the journey reliability. An assessment of reliability benefits will be undertaken using MyRIAD.	Data unavailable at present due to delays with the traffic model.	Moderate Beneficial		
	Physical activity	The proposed improvement scheme will provide suitable provision for NMUs at J6	To be assessed as part of the NMU Audit	Neutral		
	Journey quality	The scheme includes signage and signals to provide clear and unambiguous information to the driver and is expected to alleviate congestion and improve journey time reliability. With the scheme in place, driver stress is predicted to be lower.	N/A	Beneficial		
	Accidents	An assessment of the accidents will be carried out using COLBALT.	Data unavailable at present due to delays with the traffic model.	Not assessed		
	Security	The TAME guidance for road schemes advises that they should never have anything other than a negligible effect on security.	To be assessed as part of the NMU Audit	Neutral		
	Access to services	Accessibility will be assessed in accordance with the guidance in TAG Unit A4.1.	To be assessed as part of the NMU Audit	Beneficial		
	Affordability	An assessment of affordability will be carried out using a distributional impact analysis in accordance with TAG Unit A4.1.	Data unavailable at present due to delays with the traffic model.	Neutral		
	Severance	The TAME guidance for road schemes advises that a highway scheme may have an impact on severance but the TAG Unit A4.1 indicates that this is dependent on whether the scheme has an impact on pedestrian movements. Severance has been considered throughout the option development stage and mitigated where ever possible. However, the NMU routes currently located in the vicinity of the Clock Interchange and the airport link may be problematic.	To be assessed as part of the NMU Audit	Not assessed at this stage		
	Option and non-use values	The scheme does not involve the loss or introduction of a new mode of transport, accordingly option values are unaffected.	N/A	N/A		
Public Accounts	Cost to Broad Transport Budget	All costs are attributable to Central Government.	Cost Estimate awaited.	N/A		
	Indirect Tax Revenues	Pending completion of the economic assessment as part of Stage 2.		N/A		

Appendix I – Personal Injury Collision Locations





NOTES

1. ACCIDENT DATA IS FOR YEARS BETWEEN 2010 TO 2014 FOR SRN AND 2010 TO 2015 BETWEEN CLOCK INTERCHANGE AND JUNCTION 6.
2. ACCIDENT INFORMATION HAS BEEN SUPPLIED BY AREA 9 FOR M42 DATA AND SMBC FOR A45 DATA.

SEVERITY KEY

- FATAL
- SERIOUS
- SLIGHT
- NUMBER OF SLIGHT COLLISIONS
- NUMBER OF SERIOUS COLLISIONS
- NUMBER OF FATAL COLLISIONS

Revision	Amendment	Drawn/Designed	Checked	Approved	Date

Project: **WEST MIDLANDS AREA 9 M42 JUNCTION 6 IMPROVEMENTS**

Drawing Title: **PERSONAL INJURY COLLISION LOCATIONS OVERVIEW**

mouchel
building great relationships

Office
KNIGHTS HOUSE, 2 PARADE SUTTON COLDFIELD, B72 1PH
Tel: 0121 355 8949
Fax: 0121 355 8901
www.mouchel.com

Client: Working on behalf of highways england

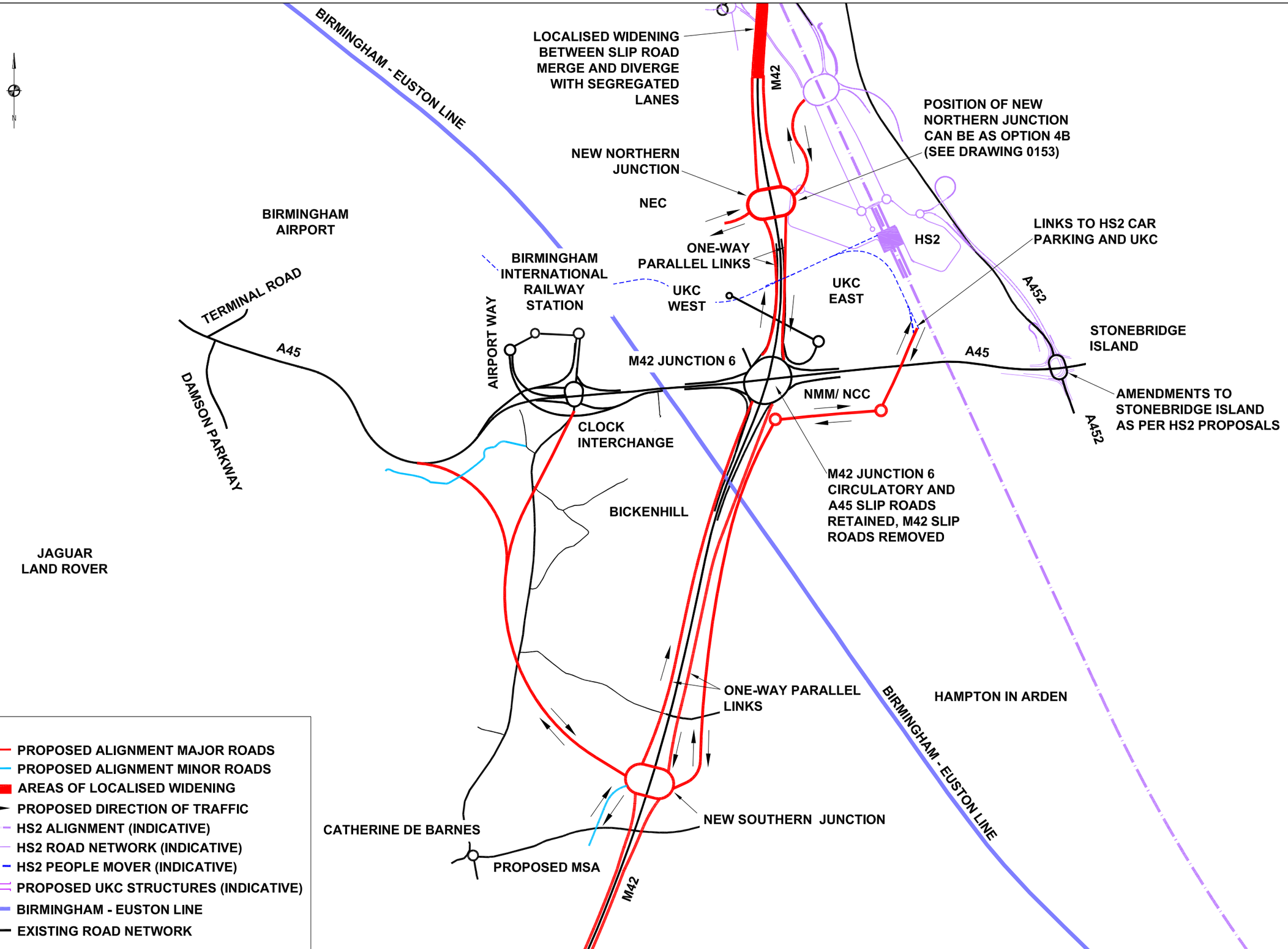
Scale	Designed / Drawn	Checked	Approved	Authorised
1:10000	TT	DM	GM	
Original Size	**Date**	**Date**	**Date**	**Date**
A1	NOV 16	NOV 16	NOV 16	

Status: SUITABLE FOR INFORMATION

Drawing No				Suitability
Project	Originator		Volume	S2
HE551485 -	MOU	-	GEN	
M42_J6 -	SK	- CH -	0042	Revision
Location	Type	Role	Number	P01

filepath: W:\Highways\TRANSPORT_JOBS\107\1038 M42 J6 RIP Stage 1\16 Drawings\16_04 Drawings Working\Sketchsheet\HE551485-MOU-GEN-M42_J6-SK-CH-0042.dwg
plot date: 16/01/2017 12:22:37
by: Jamie Clift

Appendix J – Option Themes Considered



KEY:

- PROPOSED ALIGNMENT MAJOR ROADS
- PROPOSED ALIGNMENT MINOR ROADS
- AREAS OF LOCALISED WIDENING
- PROPOSED DIRECTION OF TRAFFIC
- HS2 ALIGNMENT (INDICATIVE)
- HS2 ROAD NETWORK (INDICATIVE)
- HS2 PEOPLE MOVER (INDICATIVE)
- PROPOSED UKC STRUCTURES (INDICATIVE)
- BIRMINGHAM - EUSTON LINE
- EXISTING ROAD NETWORK

NOTES

1. DO NOT SCALE FROM THIS DRAWING.
2. HS2 ALIGNMENT BASED ON AN XREF RECEIVED FROM ARUP.
3. HS2 PEOPLE MOVER BASED ON INFORMATION RECEIVED FROM HS2.
4. EXISTING ROAD NETWORK BASED ON OS MAPPING, NOTE NOT ALL ROAD NETWORK IS SHOWN FOR CLARITY.
5. PROPOSED STRUCTURES FOR OPTION 1E ARE NOT SHOWN FOR CLARITY.

Iss:	Amendment	By	Chkd	Appd	Date
0.4	PLAN & NOTES UPDATED	TO	DM	OG	OCT 16
0.3	UPDATED TEXT & NORTHERN JUNCTION LOCATION	JC	GM	OG	MAY 16
0.2	HS2 LINKS AMENDED - TEXT AND DIRECTIONS INC.	JC	GM	OG	APR 16

Client: Working on behalf of highways england

Issued only for purpose Indicated: INFORMATION

Project: REGIONAL INVESTMENT PROGRAMME
WEST MIDLANDS AREA 9
M42 JUNCTION 6 IMPROVEMENTS

Title: OPTION 1E - SCHEMATIC
PCF STAGE 1
OPTION IDENTIFICATION

Overall Scheme Plan (NTS)

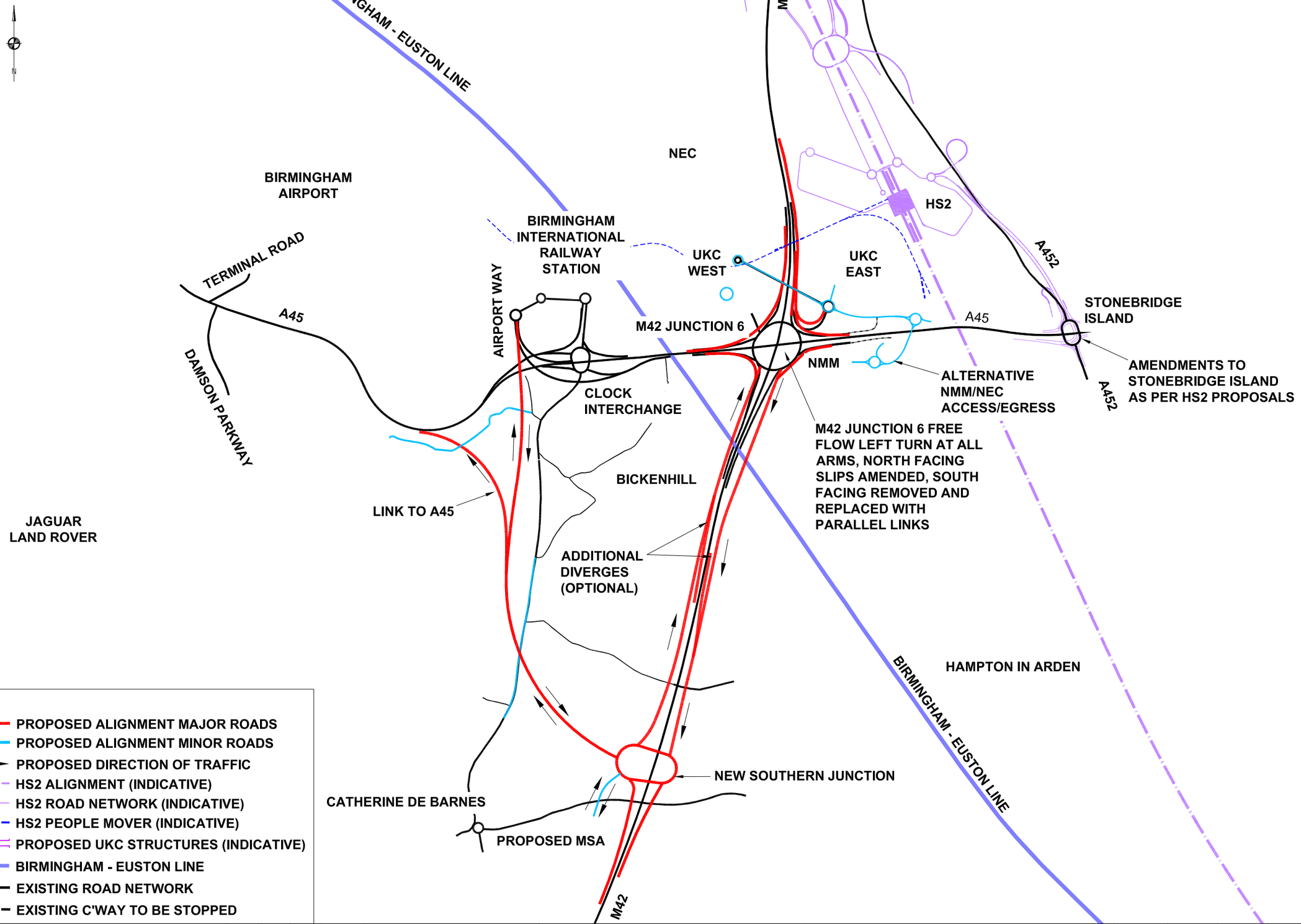
Designed	Date	Drawn	Date	Checked	Date	Approved	Date
JC	MAR 16	JC	MAR 16	DM	MAR 16	GM	MAR 16

mouchel
building great relationships
KNIGHTS HOUSE, 2 PARADE
SUTTON COLDFIELD, B72 1PH
Tel: 0121 355 8949
Fax: 0121 355 8901

Scale	Project Ref No.
1:10000	1071038
Original Size	**Revision/ Issue Number**
A1	0.4

Drawing Number

HE PIN	Originator	Volume	Location
HE551485	MOU	GEN	M42 J6
	SK	D	0150
	Type	Role	Number



KEY:

- PROPOSED ALIGNMENT MAJOR ROADS
- PROPOSED ALIGNMENT MINOR ROADS
- PROPOSED DIRECTION OF TRAFFIC
- HS2 ALIGNMENT (INDICATIVE)
- HS2 ROAD NETWORK (INDICATIVE)
- HS2 PEOPLE MOVER (INDICATIVE)
- PROPOSED UKC STRUCTURES (INDICATIVE)
- BIRMINGHAM - EUSTON LINE
- EXISTING ROAD NETWORK
- EXISTING C'WAY TO BE STOPPED

NOTES

1. DO NOT SCALE FROM THIS DRAWING.
2. HS2 ALIGNMENT BASED ON AN XREF RECEIVED FROM ARUP.
3. HS2 PEOPLE MOVER BASED ON INFORMATION RECEIVED FROM HS2.
4. EXISTING ROAD NETWORK BASED ON OS MAPPING, NOTE NOT ALL ROAD NETWORK IS SHOWN FOR CLARITY.
5. PROPOSED STRUCTURES FOR OPTION 2A ARE NOT SHOWN FOR CLARITY.

Iss:	Amendment	By	Chkd	Appd	Date
0.4	PLAN & NOTES UPDATED	TO	DM	OG	OCT 16
0.3	UPDATED RAILWAY TEXT	JC	GM	OG	MAY 16
0.2	HS2 LINKS AMENDED - TEXT AND DIRECTIONS INC.	DM	GM	OG	APR 16

Client: Working on behalf of highways england

Issued only for purpose Indicated: INFORMATION

Project: REGIONAL INVESTMENT PROGRAMME
WEST MIDLANDS AREA 9
M42 JUNCTION 6 IMPROVEMENTS

Title: OPTION 2A - SCHEMATIC
PCF STAGE 1
OPTION IDENTIFICATION

Overall Scheme Plan (NTS)

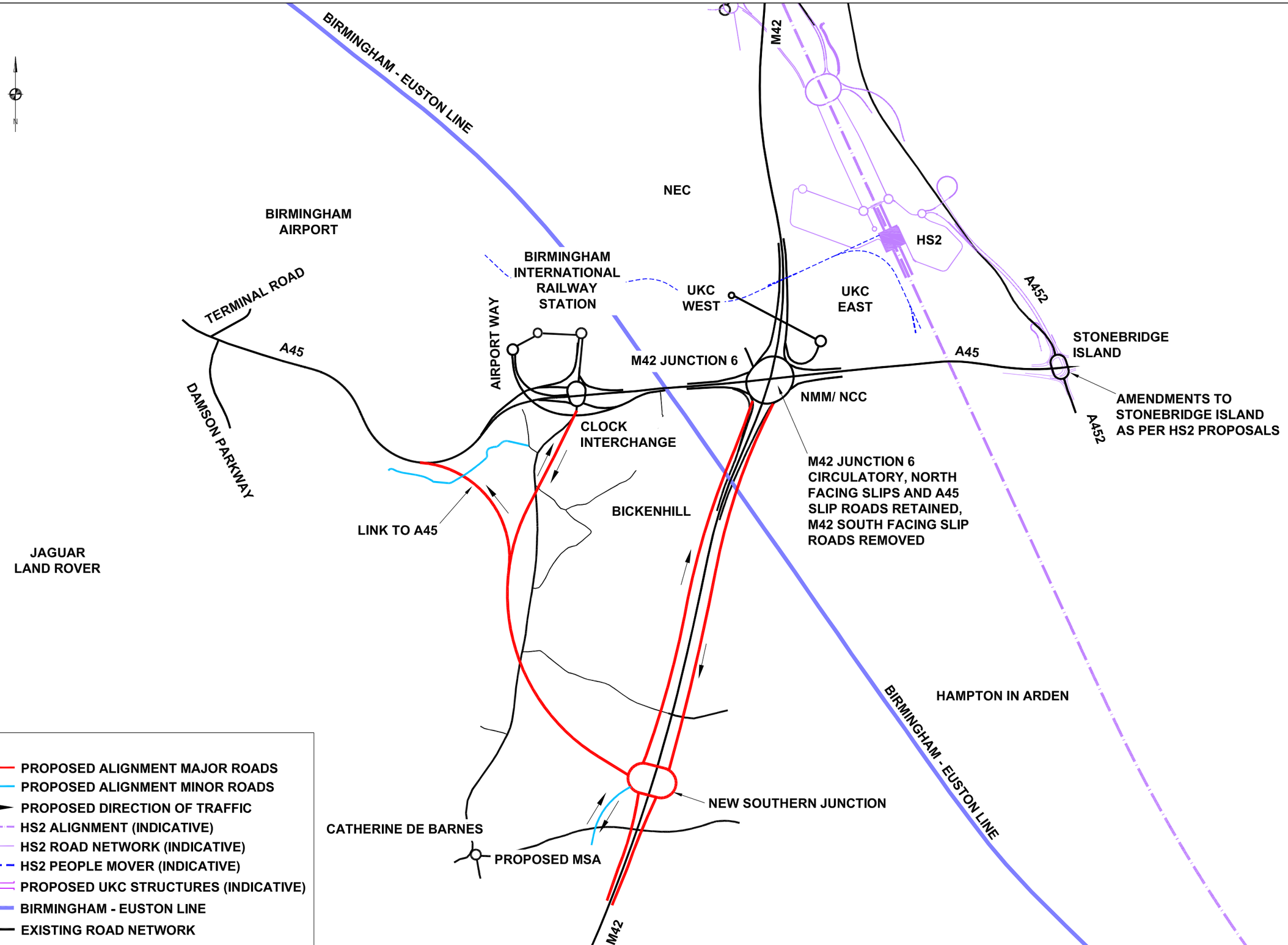
Designed	Date	Drawn	Date	Checked	Date	Approved	Date
JC	MAR 16	JC	MAR 16	DM	MAR 16	GM	MAR 16

mouchel
building great relationships
KNIGHTS HOUSE, 2 PARADE
SUTTON COLDFIELD, B72 1PH
Tel: 0121 355 8949
Fax: 0121 355 8901

Scale	Project Ref No.
1:10000	1071038
Original Size	**Revision/ Issue Number**
A1	0.4

Drawing Number

HE PIN	Originator	Volume	Location
HE551485	MOU	GEN	M42 J6
	SK	D	0151
	Type	Role	Number



KEY:

- PROPOSED ALIGNMENT MAJOR ROADS
- PROPOSED ALIGNMENT MINOR ROADS
- PROPOSED DIRECTION OF TRAFFIC
- HS2 ALIGNMENT (INDICATIVE)
- HS2 ROAD NETWORK (INDICATIVE)
- HS2 PEOPLE MOVER (INDICATIVE)
- PROPOSED UKC STRUCTURES (INDICATIVE)
- BIRMINGHAM - EUSTON LINE
- EXISTING ROAD NETWORK

NOTES

1. DO NOT SCALE FROM THIS DRAWING.
2. HS2 ALIGNMENT BASED ON AN XREF RECEIVED FROM ARUP.
3. HS2 PEOPLE MOVER BASED ON INFORMATION RECEIVED FROM HS2.
4. EXISTING ROAD NETWORK BASED ON OS MAPPING, NOTE NOT ALL ROAD NETWORK IS SHOWN FOR CLARITY.
5. PROPOSED STRUCTURES FOR OPTION 2K ARE NOT SHOWN FOR CLARITY.

Iss:	Amendment	By	Chkd	Appd	Date
0.3	PLAN & NOTES UPDATED	TO	DM	OG	OCT 16
0.2	UPDATED RAILWAY TEXT & HS2 LINK REMOVED	JC	GM	OG	MAY 16

Client: highways england — Working on behalf of

Issued only for purpose Indicated: INFORMATION

Project: REGIONAL INVESTMENT PROGRAMME
WEST MIDLANDS AREA 9
M42 JUNCTION 6 IMPROVEMENTS

Title: OPTION 2K - SCHEMATIC
PCF STAGE 1
OPTION IDENTIFICATION

Overall Scheme Plan (NTS)

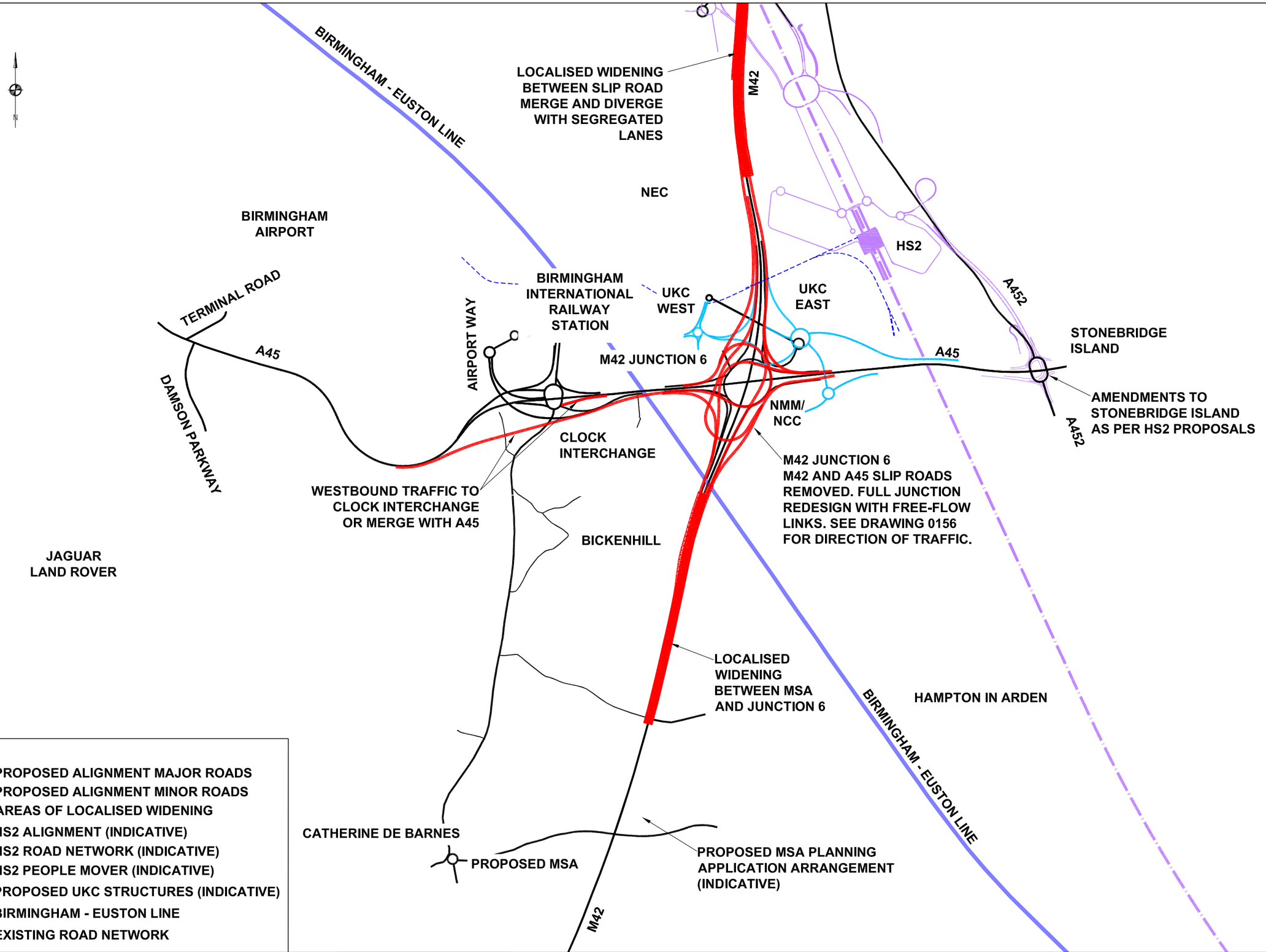
Designed	Date	Drawn	Date	Checked	Date	Approved	Date
DM	APR 16	DM	APR 16	GM	APR 16	OG	APR 16

mouchel
building great relationships
KNIGHTS HOUSE, 2 PARADE
SUTTON COLDFIELD, B72 1PH
Tel: 0121 355 8949
Fax: 0121 355 8901

Scale	Project Ref No.
1:10000	1071038
Original Size	**Revision/ Issue Number**
A1	0.3

Drawing Number

HE PIN	Originator	Volume	Location
HE551485	MOU	GEN	M42 J6
	SK	D	0155
	Type	Role	Number



NOTES

1. DO NOT SCALE FROM THIS DRAWING.
2. HS2 ALIGNMENT BASED ON AN XREF RECEIVED FROM ARUP.
3. HS2 PEOPLE MOVER BASED ON INFORMATION RECEIVED FROM HS2.
4. EXISTING ROAD NETWORK BASED ON OS MAPPING, NOTE NOT ALL ROAD NETWORK IS SHOWN FOR CLARITY.
5. PROPOSED STRUCTURES FOR OPTION 3D ARE NOT SHOWN FOR CLARITY.

Iss:	Amendment	By	Chkd	Appd	Date
0.4	PLAN & NOTES UPDATED	TO	DM	OG	OCT 16
0.3	UPDATED ALIGNMENT AND RAILWAY TEXT	JC	GM	OG	MAY 16
0.2	LAYOUT UPDATED & TEXT ADDED	JC	GM	OG	APR 16

Client: Working on behalf of highways england

Issued only for purpose Indicated: INFORMATION

Project: REGIONAL INVESTMENT PROGRAMME
WEST MIDLANDS AREA 9
M42 JUNCTION 6 IMPROVEMENTS

Title: OPTION 3D- SCHEMATIC
PCF STAGE 1
OPTION IDENTIFICATION

Overall Scheme Plan (NTS)

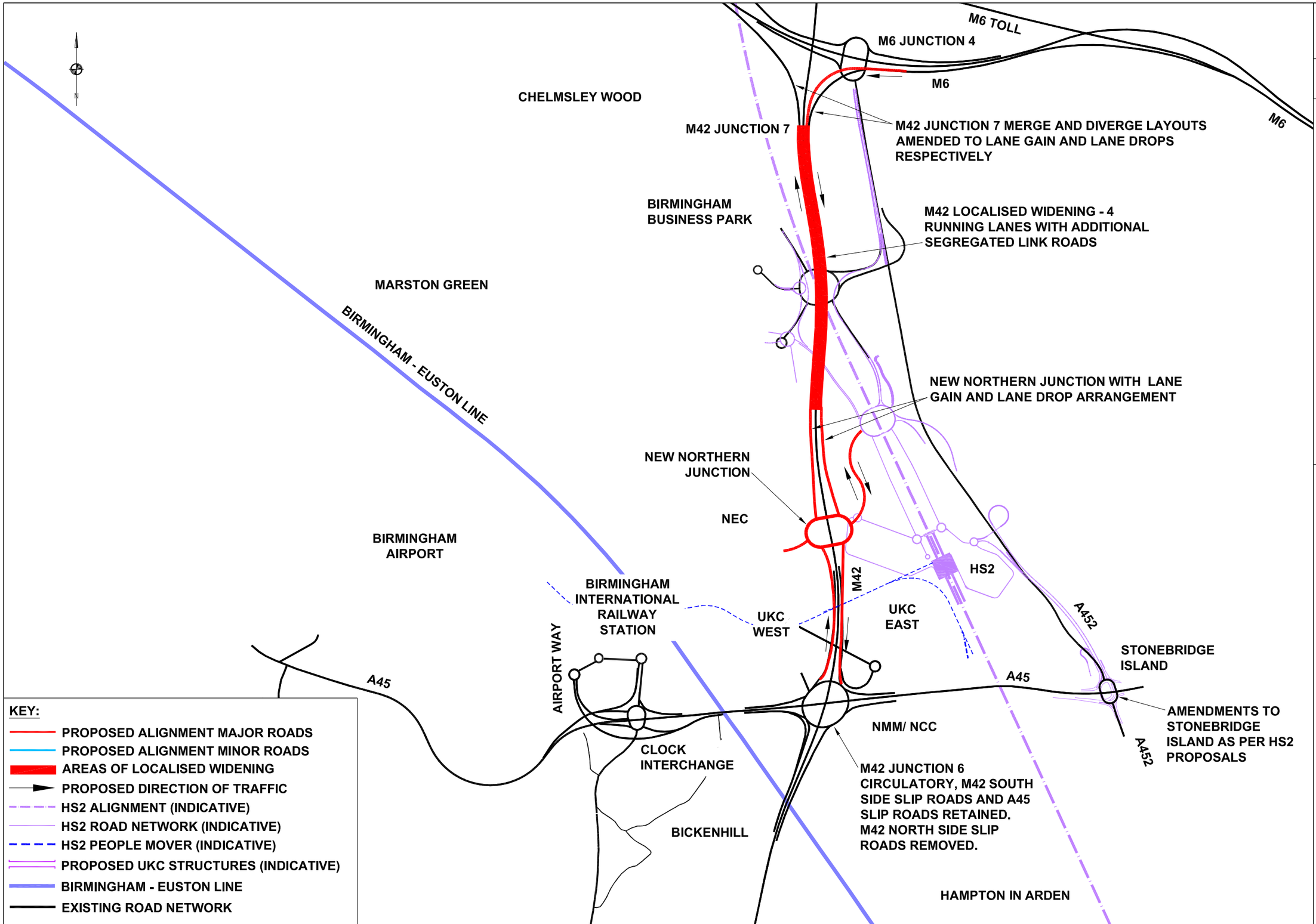
Designed	Date	Drawn	Date	Checked	Date	Approved	Date
OM	MAR 16	JC	MAR 16	DM	MAR 16	GM	MAR 16

mouchel
building great relationships
KNIGHTS HOUSE, 2 PARADE
SUTTON COLDFIELD, B72 1PH
Tel: 0121 355 8949
Fax: 0121 355 8901

Scale	Project Ref No.
1:10000	1071038
Original Size	**Revision/ Issue Number**
A1	0.4

Drawing Number

HE PIN	Originator	Volume	Location
HE551485	MOU	GEN	M42 J6
	SK	D	0152
	Type	Role	Number



NOTES

1. DO NOT SCALE FROM THIS DRAWING.
2. HS2 ALIGNMENT BASED ON AN XREF RECEIVED FROM ARUP.
3. HS2 PEOPLE MOVER BASED ON INFORMATION RECEIVED FROM HS2.
4. EXISTING ROAD NETWORK BASED ON OS MAPPING, NOTE NOT ALL ROAD NETWORK IS SHOWN FOR CLARITY.
5. PROPOSED STRUCTURES FOR OPTION 4B ARE NOT SHOWN FOR CLARITY.

Iss:	Amendment	By	Chkd	Appd	Date
0.4	PLAN & NOTES UPDATED	TO	DM	OG	OCT 16
0.3	UPDATED TEXT	JC	GM	OG	MAY 16
0.2	TEXT AND DIRECTIONS ADDED, SCHEMATIC ADDED	JC	GM	OG	APR 16

Client: Working on behalf of highways england

Issued only for purpose Indicated: INFORMATION

Project: REGIONAL INVESTMENT PROGRAMME
WEST MIDLANDS AREA 9
M42 JUNCTION 6 IMPROVEMENTS

Title: OPTION 4B - SCHEMATIC
PCF STAGE 1
OPTION IDENTIFICATION

Overall Scheme Plan (NTS)

Designed	Date	Drawn	Date
JC/OM	MAR 16	JC	MAR 16

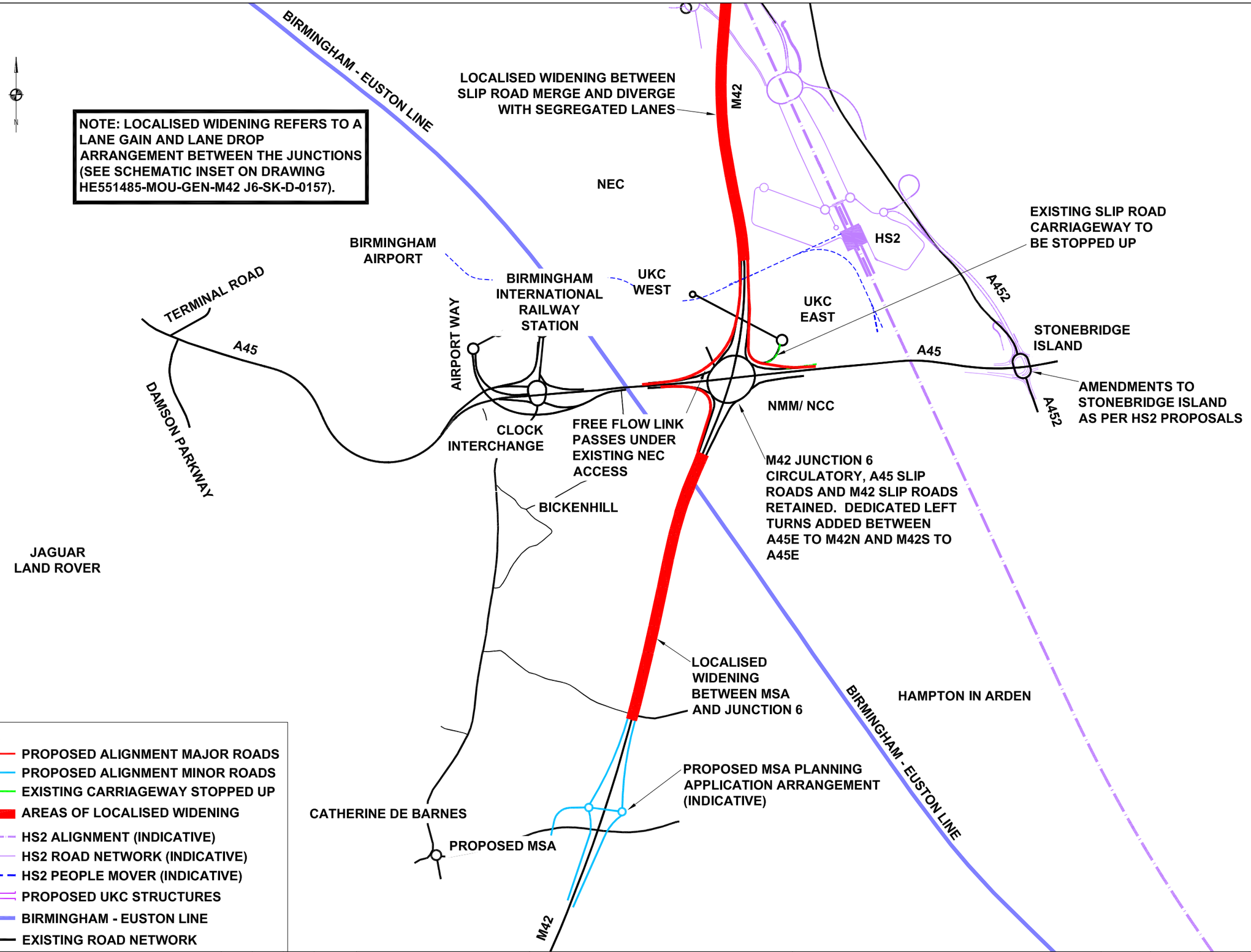
Checked	Date	Approved	Date
DM	MAR 16	GM	MAR 16

mouchel
building great relationships
KNIGHTS HOUSE, 2 PARADE
SUTTON COLDFIELD, B72 1PH
Tel: 0121 355 8949
Fax: 0121 355 8901

Scale	Project Ref No.
1:10000	1071038
Original Size	**Revision/ Issue Number**
A1	0.4

Drawing Number

HE PIN	Originator	Volume	Location
HE551485	MOU	GEN	M42 J6
	SK	D	0153
	Type	Role	Number



NOTES

1. DO NOT SCALE FROM THIS DRAWING.
2. HS2 ALIGNMENT BASED ON AN XREF RECEIVED FROM ARUP.
3. HS2 PEOPLE MOVER BASED ON INFORMATION RECEIVED FROM HS2.
4. EXISTING ROAD NETWORK BASED ON OS MAPPING, NOTE NOT ALL ROAD NETWORK IS SHOWN FOR CLARITY.
5. PROPOSED STRUCTURES FOR OPTION 11 ARE NOT SHOWN FOR CLARITY.
6. PROPOSED MSA IS PART OF A SEPARATE PLANNING APPLICATION WHICH CAN BE FOUND ON THE SOLIHULL PLANNING PORTAL. THE CURRENT STATUS OF THE APPLICATION IS "AWAITING DECISION".

Iss:	Amendment	By	Chkd	Appd	Date
0.4	PLAN & NOTES UPDATED	TO	DM	OG	OCT 16
0.3	UPDATED RAILWAY TEXT	JC	GM	OG	MAY 16
0.2	HS2 AMENDED, NOTES, PLAN AND KEY UPDATED	DM	GM	OG	APR 16

Client: Working on behalf of highways england

Issued only for purpose Indicated: INFORMATION

Project: REGIONAL INVESTMENT PROGRAMME
WEST MIDLANDS AREA 9
M42 JUNCTION 6 IMPROVEMENTS

Title: OPTION 11- SCHEMATIC
PCF STAGE 1
OPTION IDENTIFICATION

Overall Scheme Plan (NTS)

Designed	Date	Drawn	Date	Checked	Date	Approved	Date
JC	APR 16	JC	APR 16	GM	APR 16	RJ	APR 16

Scale: 1:10000 | Project Ref No.: 1071038
Original Size: A1 | Revision/ Issue Number: 0.4

mouchel
building great relationships
KNIGHTS HOUSE, 2 PARADE
SUTTON COLDFIELD, B72 1PH
Tel: 0121 355 8949
Fax: 0121 355 8901

Drawing Number: HE PIN | Originator | Volume | Location | Type | Role | Number
HE551485 – MOU – GEN – M42 J6 – SK – D – 0154

Appendix K – Client Scheme Requirements

Client Scheme Requirements

The Client Scheme Requirements is produced in SSP and reviewed at each subsequent Stage. The information given here is updated accordingly as the design evolves. Therefore certain sections below can only be completed / updated once a preferred option is selected. Where this applies to a section this will be indicated in the guidance notes below.

PROJECT DEFINITION

PROJECT TITLE The title provided here will be used by the MP Portfolio Office for establishing the set-up documentation and populating other products.	M42 Junction 6 Improvement		
ID NUMBERS PIN number is assigned by the MP Portfolio Office when it is entered onto the ORACLE cost system. MS number is assigned by the MP Portfolio Office when it is entered onto the PowerSteering system.	**PIN NUMBER:** **551485**	**MAJOR SCHEME MS NUMBER:** MS number is assigned by MP Portfolio Office when it is entered onto the PowerSteering system. **MP-0235**	
SCHEME CONTACT INFORMATION	**DfT Sponsor:** (if applicable) Only applicable to Tier 1 projects	**MP RIP Project Manager:** Graham Littlechild	**SRO:** Gary Stockbridge
	OD Senior User: Adrian Slack	**Other Key Consultees:** Matt Taylor (OD Patch Manager) Jonathan Pizzey (MP RIP Programme Manager)	
SCHEME TYPE Where scheme type is uncertain in the options phase this should be completed once a preferred option is selected. Types may include Junctions, widening and bypasses, complex infrastructure projects, smart motorways.	Junction Improvement		
ROAD AND/OR GEOGRAPHIC LOCATON	M42 Junction 6 (J6) provides connections between the national motorway network, and A45 Coventry Road which provides strategic access to Birmingham (to the west) and Coventry (to the east). Junction 6 lies on the eastern edge of Birmingham, approximately 9 miles from the city centre, with its nearest town being Solihull. M42 J6 lies at the heart of an area of dynamic growth and is surrounded by a unique mix of major assets that serve both the local and wider economy. It is located just north of Solihull centre and provides the main access to an expanding Birmingham International airport, Jaguar Land Rover, the National Exhibition Centre and Birmingham Business Park. In addition to the committed growth there is also the proposed addition of the HS2 station and Solihull's ambitious plans for the UK Central (UKC) mixed use development immediately to the North East of the Junction.		
PROJECT DESCRIPTION A high level statement of the scope is required. A full project description is to be added once the preferred option can be defined and solution type identified.	The 'Road Investment Strategy: for the 2015/16 – 2019/20 Road Period' (published 12/03/2015) indicated the project as a committed new scheme, first announced in Autumn Statement 2014, stating that the M42 Junction 6 Improvement scheme is a "comprehensive upgrade of the M42 junction 6 near Birmingham Airport, allowing better movement of traffic on and off the A45, supporting access to the airport and preparing capacity for the new HS2 station."		
STATUS Indicate the current Stage that the project is in. Note that this document is reviewed at every stage.	The project is an AS14 scheme (RIS 1), identified to start Construction before the end of Financial Year 2019/20. Planned Start of Works is March 2020 **Option Phase** PCF Stage 1 – Option Development (due to complete mid-October 2016) PCF Stage 2 – Option Selection (due to commence mid-October 2016)		

CHALLENGES AND ISSUES

Summarise the identified transport related problems with reference to the current conditions.	M42 J6 does not have sufficient capacity (even post Pinch Point scheme) to accommodate predicted forecast demands beyond 2019 (without the inclusion of HS2 or UKC traffic). Consequently a major upgrade is required to accommodate both the known and proposed developments in the area. Due to the nature of the developments in the area, it is expected that growth will be significantly greater than the national average growth included in standard WebTAG advice, and the junction design will have to accommodate for this. This is an unusual project in that it is part of a much larger regional strategy and programme of works to the east of Birmingham. The Government, along with local partners, are developing their strategy to maximise the economic benefits of that scheme. The emerging programme of other infrastructure works includes public transport connections to HS2's Birmingham Interchange station, new structures over the M42 north of J6 to link with the proposed UKC development and major improvements to the A45 at Damson Lane junction. Consequently the J6 solution is not just to improve the Strategic Road Network (SRN) in this area, but will also need to fit in with the overall development in the area.

	The scheme is generally in Green Belt land. Although the current options propose improvements to be undertaken at the M42 J6 gyratory and in some cases close to the motorway corridor, any proposed link road from south of J6 west to the A45 at Clockhouse interchange will have a significant impact on the local built and natural environments. This would affect local settlements. These interests would need to be managed. The National Motorcycle Museum (NMM) access is from the southeast quadrant of the existing M42 J6 gyratory; its access may be affected by the proposed scheme. Options for the scheme will be impacted by the potential for a new junction south of J6 to access a new Motorway Service Area (MSA). A planning application has been submitted for this development and is likely to go through the planning process before the J6 scheme has reached Preferred Route Announcement (PRA), which is normally when a scheme's status would have enough weight to affect nearby planning decisions. Some of the challenges the scheme will need to resolve: 1. Capacity: • The existing SRN does not have the capacity locally to accommodate the growth in the area. Leading to significant delay and congestion in comparison with the rest of the country. • The congestion in the area impacts on Journey Time Reliability on this section of the M42 at a location where high reliability is particularly important due to the high volume of scheduled flights/events/trains accessed via J6. • The resilience on this section of the M42 is/will be severely affected by current and potential future congestion, which is increasing the difficulty in managing incidents, particularly during high peak periods when events/peak flight flows occur. 2. Safety: • Increasing congestion coupled with the high level of unfamiliar drivers in this area (Airport, NEC, HS2 traffic) is likely to have detrimental impact on safety on this section of the SRN. 3. Economic Growth: • There is concern that without a significant upgrade to this junction the benefits of having HS2 or UK Central growth area will be lost. 4. Environmental: • Increasing congestion likely to impact negatively on air and Noise quality in the vicinity of Junction 6.
STRATEGIC CASE Summarise the strategic case for a solution, explaining how the scheme will contribute to the Regional Spatial Strategy and DfT's Roads Investment Strategy and the Highways England Strategic Business Plan. Illustrate the alignment of the scheme with local, regional and national objectives. Refer to previous study work which has addressed the strategic case for the scheme.	The Highways England (HE) 'Delivery Plan 2015-2020' (published 26/03/2015) states that HE "will be developing the options in more detail and preparing the scheme for public consultation in 2016, this will take into account planned station developments linked to High Speed 2." It also stated that we "anticipate being able to recommend a preferred route in early 2017. We are planning to start construction in 2020." This is an unusual project in that it is part of a much larger Government/HS2 Growth Strategy being developed with local partners to maximise the economic benefits of HS2. The J6 scheme would help facilitate significant economic growth in the area given that it would lie at the heart of an area of dynamic growth and is surrounded by a unique mix of existing and proposed major assets that serve both the local and wider economy. Junction 6 is the gateway to an expanding Birmingham Airport, the National Exhibition Centre (NEC), Birmingham Business Park and Jaguar Land Rover (JLR). In addition to the committed growth in the area, there is also the proposed addition of HS2's Birmingham Interchange station planning to be operational by 2026 and Solihull's ambitious plans for mixed use development of UKC. All of these will continue to add significant demand to the network and increase dependence on Junction 6. Current congestion and journey reliability issues on the M42 and at Junction 6 are a significant constraint to future investment and economic growth. Without infrastructure investment to improve the junction, a major investment opportunity of national significance could be lost. In response to direct questions from the Secretary of State for Transport, the Highways Agency (now Highways England) commissioned the 'UK Central Study 1 Report: Identifying the need for Intervention & Developing Options' August 2014. This study assessed the current and forecast conditions with and without the inclusion of the proposed UK Central development; and identified Junction 6 as a current and future congestion hot spot. The study promoted an initial solution that would promote future growth and maintain the safe operation of the SRN.

This scheme was then included in the government's Regional Investment Strategy (RIS), announced as part of the 2014 Autumn Statement (AS14), for start of construction within 5 years. This is replicated in the Highways England Development Plan, which states the scheme should go to Public Consultation in 2016 and start work in 2020.

TRANSPORT OBJECTIVES

Define the high level objectives of the scheme, in terms of desired outcomes, such as improvement in journey times, reliability, safety, or catering for economic and housing growth.

More detailed objectives (flowing from the high level objectives) should be developed as the design evolves and particularly once the preferred option is selected. These detailed objectives, comprised of specific, targets and measures should reflect the guidance given in Webtag and be consistent with the Appraisal Summary Table (AST).

There should also be an objective to deliver a scheme which matches or improves on the value for money of the selected option, as it has been assessed at completion of the Option Phase and set out in the AST and value for money (VFM) assessment.

Objective	How it aligns with strategic aims	Measures for success of objective
Objective 1: Increase capacity	• Support and facilitates economic growth through providing adequate capacity on the network.	• Improved journey time reliability and reduced congestion at J6 and on the M42 adjacent to it. • Annual Monitoring Reports.
Objective 2: Provide access to key assets	• Supports and facilitates economic growth. • Balances the needs of individuals and businesses who rely on it.	• Delivery of adjacent development site (UKC). • Journey time reliability to B'ham Airport, NEC and HS2 not compromised.
Objective 3: Promote reliable and safe operation of the wider corridor	• Supports and facilitates economic growth. • Balances the needs of individuals and businesses that rely on it.	• Average speed and reliability of journey on the M42 adjacent to J6. • Smart Motorway monitoring.
Objective 4: Increase resilience and reliability of network	• Supports and facilitates economic growth. • Is maintained to a safe and serviceable condition.	• Safety / Number of incidents. • Assessment of how the network copes with incidents at the junction and on the surrounding network.

PERFORMANCE SPECIFICATION

Provide a view on how the proposals relate where applicable to the Highways England Performance Specification together with an indication of how they support delivery of the Key Performance Indicators (KPIs).

Strategic business plan (SBP) performance specification (Key Performance Indicator)	Scheme benefit	Scheme disbenefit
Making the network safer (The number of KSIs on the SRN)		
Potential benefits to reduced rear shunt collisions due to reduced queuing on slips and junction approaches. Additionally, clear signing and segregation of trips based on destination should reduce dangerous weaving on the mainline and lane changing. Potential to improve resilience of the network, making future maintenance safer.	✓	
Delivering better environmental outcomes (Number of noise important area mitigated)		
The construction period would last for up to three years, with noise impacts intermittently through this period. Realignment (of junction, with potential new link road) will introduce additional operational noise to community and residential receptors.		✓
Delivering better environmental outcomes (Delivery of improved biodiversity, as set out in the Company's Biodiversity Action Plan)		
Where options propose a new southern gyratory junction, these could result in the loss of Ancient Woodland at Aspbury's Copse including Deciduous Woodland, BAP Priority Habitat and Ancient Woodland. This will likely result in a moderately adverse impact on biodiversity. Baseline ecological surveys and a full ecological impact assessment would be required to identify the significance of effects and required mitigation measures.		✓
Helping cyclists, walkers and other vulnerable users (The number of new or upgraded crossings)		
As part of the M42 J6 Improvement scheme, it is proposed to investigate the inclusion of the cycle network, with the opportunity to unlock some Designated Funds for Cycling Safety and Integration. Allowing local access routes/modes to be enhanced effectively. Benefits will not be undermined by unacceptably high traffic density.	✓	
Encouraging Economic Growth (Average delay (time lost per vehicle per mile))		
This project is a major factor in the potential success of the HS2 and UKC developments, the UKC masterplan and the anticipated growth at Birmingham Airport and NEC.	✓	

	Improvements will support the West Midlands LTP Strategic Principals and Objectives and build upon the successful implementation of Smart Motorway schemes which have increased capacity and reduced congestion on the main line carriageway.		
	Keeping the network in good condition (The percentage of pavement asset that does not require further investigation for possible maintenance)	✓	
	Increase in new pavement area. The improvements to the existing M42 J6 will ensure enhanced residual life of existing road assets.		
	Supporting the smooth flow of traffic (Network availability: the percentage of the SRN available to traffic)	✓	
	The M42 J6 Improvement scheme is likely to lead to improvements in traffic flow, as the current congestion as traffic enters M42 J6 will be improved. The series of improvements provides the opportunity to significantly reduce traveller stress through reduced congestion and safety improvements.		
	Supporting the smooth flow of traffic (Incident Management: percentage of motorway incidents cleared within one hour)	✓	
	Reduced congestion in the immediate vicinity of the project location, and potentially the ability to direct M42 traffic onto any proposed link roads, may enable HE to manage incidents more efficiently.		
	Achieving real efficiency (Cost savings: savings on capital expenditure)	✓	
	Better procurement strategy, working closely with partners and other stakeholders, risk and value management etc. are likely to result in cost saving on capital expenditure.		
	Achieving real efficiency (Delivery Plan Progress: progress of work, relative to forecast set out in the Delivery Plan, and annual updates to that Plan, and expectations at the start of Road Period 1)	✓	
	The scheme is being progressed with a focus on reducing the options/delivery and preparation phases of a project, in order to start construction work in 2020.		
	Improving user satisfaction (The percentage of National Road Users' Satisfaction Survey respondents who are Very or Fairly Satisfied)	✓	
	Less congestion at peak times enabling better journey reliability will improve the driver experience and enhance customer satisfaction.		

OPTIONS AND OUTPUTS

OPTIONS

At the start of the Options phase provide a list of the principal options which have been identified as meriting further investigation from the pre-options feasibility work, including details of any complementary measures.

The UK Central Study 1 Report: Identifying the need for Intervention & Developing Options August 2014, assessed a number of options, which have been looked at again during the Inception Phase of the project. Further options have been identified during Stage 1 (Option Identification) which have been assessed and sifted using DfT's Early Assessment and Sifting Tool (EAST) to reduce from approximately 40No. options to 2No. themes of two options each.

The themes/options which have already been looked at are:

Theme 1 – Do Something	
Option 1 (Option 11A – option if MSA planning application is rejected)	A comprehensive junction improvement of the existing M42 J6, including free-flow links and widening around the gyratory. Free-flow links at the northwestern and southeastern quadrants are proposed to be constructed to pass underneath the NEC and NMM accesses respectively. Some minor improvements to part of the local road network may be necessary.
Option 2 (Option 11B – option if MSA planning application is accepted)	A comprehensive junction improvement of the existing M42 J6 gyratory as proposed above. This option would also include a lane-gain/lane-drop arrangement between J6 and the proposed MSA junction to the south.
Theme 2 – Southern Junction Arrangement	
Option 3 (Option 2P Variant 2 – option if MSA planning application is rejected)	A two-junction solution that includes the comprehensive junction improvement of the existing M42 J6 gyratory as proposed above, with the addition of new southern junction just south of J6. The southern junction proposes south-facing slip roads and provides a western link, bisecting Bickenhill, to connect with a proposed new roundabout to the northwest of Bickenhill which in turn links to the A45 at Clockhouse Interchange and provides a free-flow

		link into Airport Way crossing over the A45.
	Option 4 (Option 2Q – option if MSA planning application is accepted)	A two-junction solution that includes the comprehensive junction improvement of the existing M42 J6 gyratory as proposed above, with the addition of new southern junction just south of J6. This option incorporates the new southern junction proposed by the MSA. The MSA planning application is currently under review. This options proposes parallel link roads between the MSA junction and J6 either side of the M42 carriageway. It also proposes a western link from the same southern junction, bypassing Bickenhill to the south and west, to link with a proposed new roundabout to the northwest of Bickenhill which in turn links to the A45 at Clockhouse Interchange and provides a free-flow link into Airport Way crossing over the A45.
	The above themes/options are being considered for Public Consultation in 2016.	

TRANSPORT AND ROAD INFRASTRUCTURE DELIVERABLES

List the principal elements of the scheme when they have been defined in the Development Phase.

The proposed scheme addresses the significant congestion issues and capacity constraints at M42 J6 as highlighted in the UKC Study 1 report. This study focussed on developing a suitable infrastructure solution through the review of various alternatives and their assessment against a set of key objectives. A primary goal has been to develop a solution that will provide adequate capacity for the anticipated growth and therefore promote economic growth whilst ensuring the continued safe and reliable operation of the surrounding SRN.

The scheme seeks to improve highway capacity and reduce vehicle delays by separating conflicting traffic streams based on their origin/destination at the various key assets adjacent to Junction 6 (i.e. NEC, Birmingham Airport, HS2 and the proposed UKC). An additional junction on the M42 to the south of Junction 6 is intended to accommodate the traffic to/from M42 South destined for Birmingham Airport, A45 into Birmingham and prepare capacity at Junction 6 for HS2. The removal of these trips from Junction 6 alleviates the congestion and reduces the volume of traffic on the existing Junction 6 gyratory.

The scheme may unlock potential development in the area whilst removing delay on the routes into the existing assets located off Junction 6 which are currently constrained

TIME FRAMES

Include the planned Phase and Stage dates, as given in the Project Schedule.

Option Phase			Development Phase			Construction Phase		
Stage	**From**	**To**	**Stage**	**From**	**To**	**Stage**	**From**	**To**
1	Q3 2015/16	Q3 2016/17	3	Q1 2017/18	Q1 2018/19	6	Q4 2019/20	Q4 2022/23
2	Q3 2016/17	Q1 2017/18	4	Q1 2018/19	Q1 2019/20	7	Q4 2022/23	Q4 2023/24
			5	Q2 2019/20	Q4 2019/20			

CONSTRAINTS

Special conditions that impact on the delivery should be noted; for example, particular environmental considerations. Factors influencing the required time table; for example, the timing of planned housing developments should be noted. Details should be provided of any other bodies involved in the delivery of the scheme or of complementary measures.

Significant Developments in the Area

The M42 J6 improvement scheme will be developed as part of an overall programme of major works planned for the area by a number of 3rd party organisations (HS2, SMBC, NEC, Birmingham Airport, Network Rail, Extra) in order to ensure that expected benefits for each individual scheme can be maximised; and to address the significant congestion issues and constraints in the area.

There is considerable synergy between the developments, which should facilitate efficiency savings to the Highways England scheme, either through direct contribution, or sharing of resources during development and construction.

The proposed HS2 station and new railway bridge over the M42 is expected to start advanced construction in 2017, and be complete by 2026, and these works will have a significant effect on the SRN and local road networks.

The UK Central Development includes significant change to the local road network, including an additional 3 structures over the M42, just North of Junction 6. There are no confirmed dates for this development, but the scheme will need to interact with these works.

It is proposed that these works are completed prior to HS2 opening to the public, and prior to the use of the UK Central development.

Motorway Service Area (MSA)

Whether the MSA gets planning permission or not will have a significant effect on the options the project can proceed with. Option 4, incorporating the proposed MSA junction and a western link to the A45, is likely to be strongly favoured by SMBC and the major businesses. This option would provide maximum future resilience. However, it will cost significantly more than the HE Delivery Plan estimate and the local parish councils have indicated concern regarding proximity to their respective villages and use of Green Belt land.

Legal Constraints

A significant amount of land may be needed for the scheme, which will need to go through a DCO process.

Outside Factors
Growth of long distance traffic on the strategic highways network.

Public Commitments

The Road Investment Strategy (RIS) published in March 2015 includes "**M42 J6 Junction Improvements**' as one of the schemes announced as part of the Autumn Statement 2014.

The scheme was also mentioned in the Highways England Delivery Plan 2015-2020, as one of thirteen schemes to start construction in the Midlands which will:

Introduce Smart motorways around the M42/M40 interchange to provide better access to the A45, Birmingham Airport, and the new High Speed 2 railway station.

Table 3A: Next Steps for Schemes Announced in December 2014

M42 Junction 6 – We will be developing the options in more detail and preparing the scheme for **public consultation in 2016**, this will take into account planned station developments linked to High Speed 2. We anticipate being able to **recommend a preferred route in early 2017**. We are planning to **start construction in 2020**.

Give the three-point estimate for the Project.
This should show separately the estimated outturn project cost, the programme risk and total cost.

In the Options phase give these estimates for each option listed above under Options and Outputs.
If costs for some options are not available at the start of the options phase include them as they become available.
In the Development phase give the estimate for the preferred option.

Note: The central /most likely outturn project cost estimate plus the central/most likely programme risk figure = the expected outturn cost..
In the Development phase this relates to the preferred option.
In the Options phase there will be a separate expected outturn cost for each option.
Include the assumed construction date used to calculate the Indicative Funding Assumption.

Option	Central/most likely estimate (£)	Range max. (£)	Range min. (£)
Option 1 (Option 11A)	TBC	TBC	TBC
Option 2 (Option 11B)	TBC	TBC	TBC
Option 3 (Option 2P Variant 2)	TBC	TBC	TBC
Option 4 (Option 2Q)	TBC	TBC	TBC
Option 2A (Stage 0 Emerging Option)	442.0m	541.2m	382.9m
Option 2A (Updated estimate from Stage 0 Emerging Option)	451.0m	588.4m	376.3m

Construction is assumed to take place between early 2020 and 2023 inclusive.

Spend Profile (£m) – *Option 2A, Emerging Option from Stage 0*								
15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24
0.7	3.5	5.3	6.4	7.6	29.3	124.2	168.5	96.4

These are high level costs from the Order of Magnitude Estimate prepared by HE Commercial. The estimate and spend profile for Options 2A was provided in September 2015. HE Commercial is expected to provide their estimates for Option 1, Option 2, Option 3 and Option 4 by October 2016.

Currently assumption is that funding from DfT, however there are a number of potential contributions, which will need to be formalised during the options development stage.

SOURCE OF FUNDS
Indicate the assumed source of funding for the project.

Department for Transport	HE Capital Baseline	Other
£250m - £500m (expected cost category)	£282m	

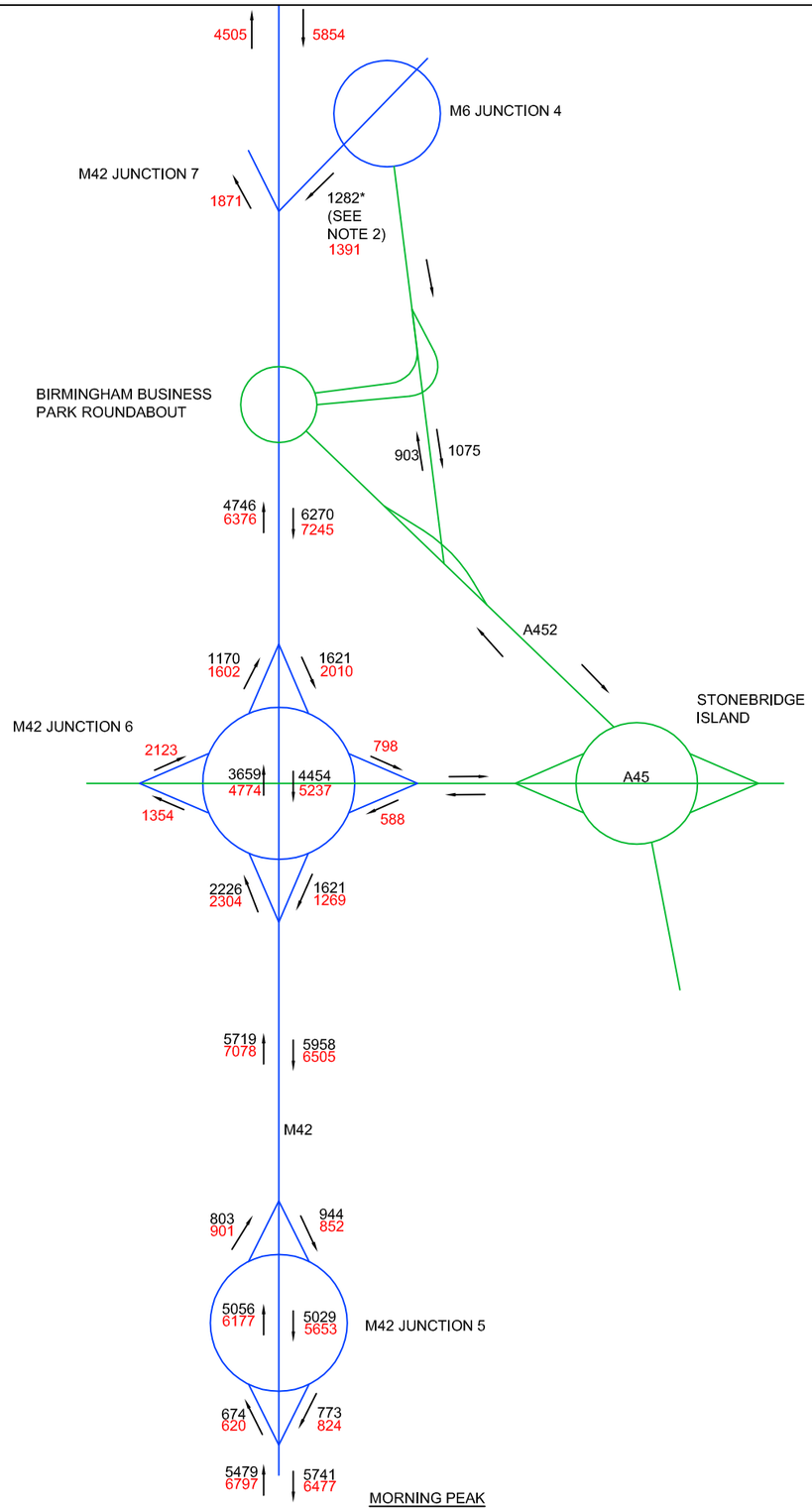
AUTHORISED PHASE BUDGET

Amount	Phase/Stage
£3m	Stage 1

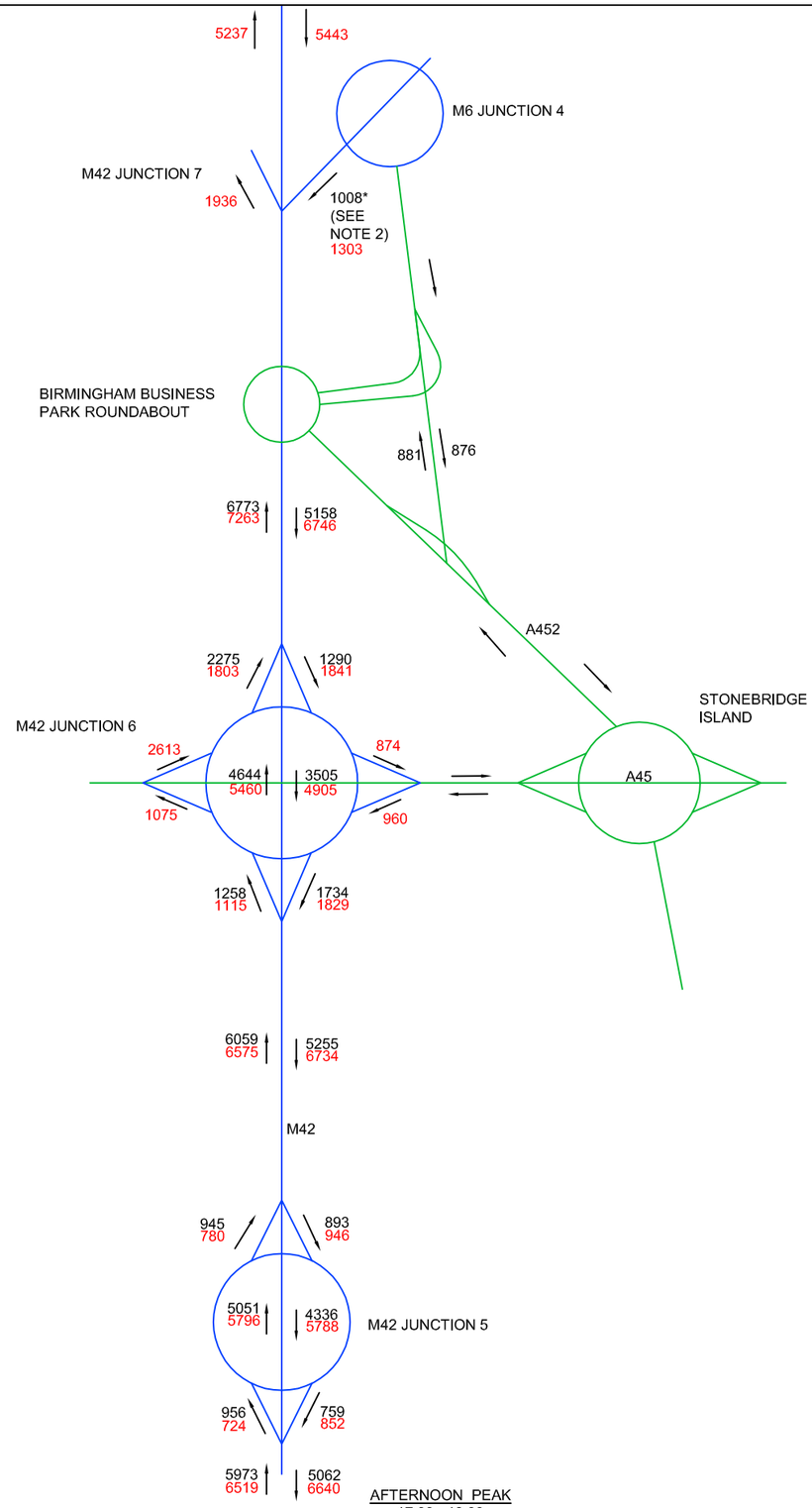
APPROVAL			
AUTHOR The form should either be completed by the Highways England SRO or (for Tier 1 projects) the DfT Sponsor, working with the MP Project Manager. The MP Portfolio Office, Strategy and Planning and Regional Programme Board may also need to be consulted as appropriate.	Gary Stockbridge		
APPROVER The form should be signed off by the Central MP Portfolio Office or (for Tier 1 projects) the DfT Deputy Director.	Name	Signature	Date
	Craig Marshall	[redacted]	8 September 2016

RECORD OF REQUIREMENTS CHANGES			
Identify the updates and changes to the Scheme Requirements. The Scheme Requirements is reviewed at each Stage Gate. Changes to the Requirements are subject to the PCF change control processes and inclusion in the Change Register.	Milestone or Change Event	Date	Version No.

Appendix L – Traffic Flow Schematic



MORNING PEAK
08:00 - 09:00



AFTERNOON PEAK
17:00 - 18:00

NOTES

1. DATA FOR 2016 PEAK FLOWS OBTAINED FROM MOUCHEL SITE SURVEY 26TH FEBRUARY 2016.
2. ADDITIONAL DATA MARKED WITH ASTERISK FROM MOUCHEL SITE SURVEY 17TH MARCH 2016.
3. AM PEAK IS 0800 TO 0900 HOURS
4. PM PEAK IS 1700 TO 1800 HOURS
5. 2031 PRISM DO MINIMUM FLOWS TAKEN FROM 2016 RUN USING PRISM V4.1 AS COMMISSIONED BY MOUCHEL.

KEY

1000 2016 PEAK FLOWS

1000 2031 PEAK FLOWS (PRISM)

Revision	Amendment	Drawn/Designed	Checked	Approved	Date

Project
WEST MIDLANDS AUTUMN STATEMENT 2014
M42 JUNCTION 6 IMPROVEMENTS

Drawing Title
TRAFFIC FLOW SCHEMATIC AM & PM PEAKS 2016 & 2031 (DO NOTHING)

Office
KNIGHTS HOUSE, 2 PARADE
SUTTON COLDFIELD
WEST MIDLANDS, B72 1PH
www.mouchel.com

Client
Working on behalf of highways england

Scale	Designed / Drawn	Checked	Approved	Authorised
NTS	DM	GM	GM	
Original Size: A1	Date: SEP 16	Date: NOV 16	Date: NOV 16	Date

Status: SUITABLE FOR INFORMATION

Drawing No: Project | Originator | Volume
HE551485 - MOU - VTR
M42_J6 - SK - CH - 0003
Location | Type | Role | Number

Suitability: S2

Revision: P01

filepath: W:\Highways\TRANSPORT JOBS\51071038 M42 J6 RIP Stage 1\16 Drawings\16_04 Drawings Working\Sketches\HE551485\MOU\VTR\M42_J6SKCH0003.dwg
by: James Clift
plot date: 15/12/2016 12:36:45