M42 Junction 6 Improvement Scheme Number TR010027

Volume 6

6.1 Environmental Statement

Chapter 4 – Scheme History and Alternatives

Regulation 5(2)(a)

Planning Act 2008

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

January 2019

Infrastructure Planning

Planning Act 2008

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

M42 Junction 6 Improvement Development Consent Order 202[ ]

6.1 Environmental Statement
Chapter 4 Scheme History and Alternatives

Regulation Number	Regulation 5(2)(a)
Planning Inspectorate Scheme Reference	TR010027
Application Document Reference	6.1
Author	M42 Junction 6 Improvement Project Team and Highways England

Version	Date	Status of Version
1	January 2019	DCO Application

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4 Assessment of alternatives

4.1 Assessment methodology

4.1.1 The Scheme has been subject to a process of staged development and evolution between its inception in 2014 and Development Consent Order (DCO) application in 2019. The main development stages were:

a. identification of the need for the Scheme;

b. initial options identification, assessment and sifting;

c. options development and shortlisting;

d. assessment of shortlisted options to identify viable options for consultation;

e. Consultation and option selection;

f. Preferred Route Announcement (PRA);

g. design development for Statutory Consultation; and

h. continued design development post Statutory Consultation

4.1.2 The approach taken in each of the above stages is described further in Sections 4.2 to 4.4 below. Overarching consideration has included;

a. the long-term effectiveness that design solutions would have in securing and meeting the project objectives, see Chapter 3 The project;

b. the extent to which design solutions could impact both the natural and built environmental features and sites, and the ability to incorporate measures into the design to avoid, reduce or compensate for any adverse environmental effects on these interests;

c. opportunities to include measures within the design to provide environmental enhancement, where feasible and appropriate; and

d. the deliverability, viability – in terms of compatibility with the existing network, practicality and cost of design solutions and their long-term management and maintenance.

4.1.3 The design-development process has been informed by the requirements of the National Policy Statement for National Networks (NPSNN) [REF 4-1], consultation with stakeholders, and iterative environmental assessment. These have collectively influenced:

a. the identification and evaluation of different design options for the Scheme;

b. the selection of a preferred option and its subsequent refinement to reduce, where practicable, the likely significant effects of the Scheme on the receiving environment; and

c. the planned approach to construction, delivery and management of the Scheme.

4.2 Reasonable alternatives studied

4.2.1 Options have been explored and assessed by Highways England as part of the design development of the Scheme. As part of this process, consideration has be given to the following:

a. **delivery** – in relation to the different means of meeting the objectives of the Scheme, such as improving existing roads and junctions, constructing new roads and junctions, or a combination of these measures;

b. **siting and location** – in relation to the selection of different locations for new infrastructure, and the identification of existing infrastructure on the strategic and local road networks requiring improvement;

c. **phasing and scheduling** – in relation to the location, timing and phasing of construction works to avoid environmental sensitivities and reduce community disruption;

d. **landtake** – in relation to identifying areas of land to be used temporarily during construction, permanently to accommodate the Scheme infrastructure and that required for undertaking future maintenance activities;

e. **design input** – in relation to the development of overarching design strategies and the inclusion of particular components, for example lighting and drainage; and

f. **mitigation, compensation and enhancement** – in relation to the use of different measures to address environmental impacts, for example the use of earthworks to contain new and improved sections of road, planting to compensate the loss of ancient woodland, and ecological measures such as bat boxes to provide biodiversity enhancement.

4.2.2 The following sections summarise the reasonable alternatives studied during each stage of the design development process, indicating the main reasons for selection and taking into account their likely effects on the receiving environment.

Identification of the need for the Scheme

4.2.3 Work was initially undertaken by Highways Agency (now Highways England) to define the problem and develop potential solutions to meet the project objectives and to assess the need for the Scheme.Highways Agency identified that the do nothing scenario (i.e. not progressing any highway improvement works) would lead to an exacerbation of the following issues currently experienced on the road network at, and surrounding, M42 Junction 6, which include:

a. **development** – Significant development is planned in the area surrounding M42 Junction 6, which will have a marked impact on the economy, connectivity and accessibility;

b. **congestion** – M42 Junction 6 is noted as being at near-capacity, with current event demands contributing to significant congestion on the M42 mainline and local road network

c. **limitations** – Notwithstanding pressures from future planned development in the area, the level of congestion predicted in the future years means that M42 Junction 6 will likely operate at an unacceptable level of service; and

d. **safety** – Further deterioration in safety is predicted in the future, potentially resulting in increased accident rates in and around M42 Junction 6.

4.2.4 To identify a scheme which would resolve these issues, Highways Agency worked with Solihull Metropolitan Borough Council (SMBC) and identified a number of conceptual designs for M42 Junction 6, comprising the following options. These options are shown schematically on **Figure 4.1** in **TR010027/APP/6.2**:

a. **Option 1** – an initial two-junction solution with a new northern junction and new southern junction on the M42 motorway, with feeder distributer roads to improve the turning movements from the original Junction 6;

b. **Option 1A** – a variation on Option 1 with the northern junction re-positioned further south to improve the weaving length with M42 Junction 7 to the north;

c. **Option 2** – an alternative two-junction solution which retained the use of M42 Junction 6, and provided a new southern junction located between M42 Junctions 5 and 6; with link roads between the junctions parallel to the motorway and links from the southern junction to the A45 Coventry Road (A45) west of Clock Interchange and HS2.

d. **Option 2A** – this retained M42 Junction 6 with some slip road modifications, with the proposed new southern junction moved further south to operate as an integral part of a modified M42 and tie-into a separate development proposal to construct a new Motorway Service Area (MSA);

e. **Option 3** – a multi-level interchange solution to replace the existing M42 Junction 6. This included the incorporation of a number of free-flow connections of the M42 and A45.

4.2.5 Highways Agency and SMBC assessed the conceptual designs; identifying outline costings and a Benefit Cost Ratio(BCR) using a basic traffic model of the junction and M42.A workshop was also held with the main stakeholders in the area to determine which option presented the best solution to take forward

4.2.6 Highways Agency confirmed to the Department for Transport (DfT) that there was a need for a scheme to improve the M42 Junction 6. Option 2A was used as the baseline solution which would improve capacity and resilience by removing traffic from the existing junction while minimising network disruption.

4.2.7 This work informed and led to the inclusion of the Scheme in the Roads Investment Strategy (RIS) 2015-2020 [REF 4-2].

Initial options identification, assessment and sifting

4.2.8 Following inclusion in the RIS, Highways England (previously Highways Agency) undertook further work on the conceptual design (Option 2A). This included reconfirming the need for the Scheme though the use of a more robust traffic model of the wider area and producing a formal order of magnitude cost estimate.

4.2.9 Option 2A, in its original form, was subsequently discounted as the proposal did not offer value for money.Further option identification was then undertaken against the strategic outline business case.

4.2.10 During the options identification stage, options were developed on the basis of improving the junction through adoption of the following principles.

a. adding an additional junction either north, south or both north and south of M42 Junction 6; or

b. reconstruct M42 Junction 6 with improved geometry to allow better free-flow movements; or

c. provide a collection of individual Do Minimum or Do Something improvements, either separately or combined, that could provide traffic relief.

4.2.11 During this process a total of 40 options were identified for strategic assessment. This development included a workshop, held by Highways England in January 2016. The purpose of the workshop was to obtain a broader view of the options and included representatives from SMBC as local highway authority, and Birmingham City Council and the National Exhibition Centre (NEC).

4.2.12 In order to assist their appraisal and differentiation, these options were allocated into the following themes as shown in **Table 4.1**

Table 4.1: Initial development of options

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**

4.2.13 Each option within these groups was initially assessed to determine its viability and relative performance using a broad range of criteria. The criteria were structures impact, geotechnical impact, environmental impact, buildability impact, highways design impact, traffic impact (connectivity and resilience) and impact on overhead electricity pylons. Each criteria was assessed on a qualitative basis as a means of comparing each option, with each criteria weighted equally.

4.2.14 As a result of the initial assessment the following broad conclusions were reached regarding the five themes:

a. **Theme 1 North and South Junction** – were generally low performing in terms of benefit versus cost, presented weaving issues and would result in a large environmental footprint;

b. **Theme 2 Southern Junction** – generally performed well and offered good connectivity, but required offline construction and therefore presented environmental issues;

c. **Theme 3 Interchange** – offered very good connectivity and resilience but for which major buildability issues were recorded, particularly in relation to the impact on major stakeholders, significant costs and the construction and maintenance of structures;

d. **Theme 4 North Junction** – produced low benefits, did not meet the RIS brief, presented weaving issues on the M42 and had significant impact on major stakeholders, but presented reasonably few environmental issues. They also performed well due to their reduced number of structures and geotechnical impacts; and

e. **Theme 5 Do Minimum** – which attracted different scores and generally did not address the RIS brief or address the traffic congestion, with the exception of one option (comprising a localised widening option), which scored reasonably well.

4.2.15 The process of assessment and sifting of options from initial development to Preferred Route announcement is described in detail in subsequent paragraphs.A high level graphical summary is provided in **Figure 4.2** below.

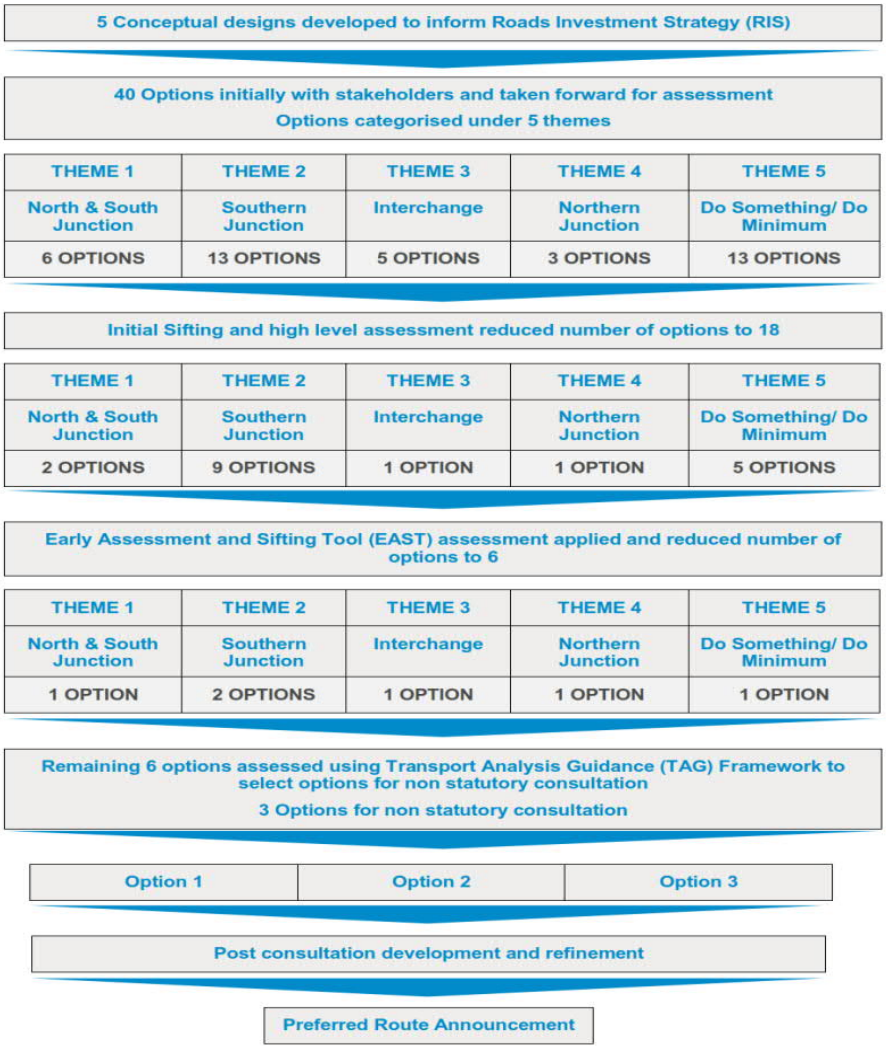

Figure 4.2: Options assessment and sifting process

4.2.16 An initial sifting exercise was then undertaken, which resulted in 22 options being discounted, the main reasons for which related to:

a. the outcomes of initial traffic modelling;

b. conflicts with the HS2 rail alignment

c. geometrical constraints;

d. severance of communities;

e. impacts on businesses and other assets;

f. reductions in land development potential; and

g. their relationship to (and potential impact upon) the proposed MSA development.

4.2.17 Further detail on the development, assessment and initial sifting of these options is provided in Section 4 and Appendix F of the Scheme Technical Appraisal Report (TAR) [REF 4-3]. A summary of the initial sifting, extracted from Section 4.2.1 of the TAR is included below. Detailed assessment tables supporting the summary table below, as extracted from Appendix F of the TAR [REF 4-3], is also included below.

Table 4.2: Initial high-level assessment of options

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 slips	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 severance 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**

OPTION	LAYOUT	DEVELOPMENT	COMMENT	PROGRESS
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, 2L & 2M	New South junction	All similar layouts but with eastern link variations	Links to A45 East Way, 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 & National Motorcycle Museum (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 option only)*
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, 9 &10	Do Minimum	Adjustments to A452 island to Birmingham Business Park (BBP) within HS2 enabling works	HS2 track geometry would not facilitate changes	**NO**
11	Do Something	5 lanes All Lanes Running 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**

OPTION	LAYOUT	DEVELOPMENT	COMMENT	PROGRESS
15	Do Minimum variant	Free-flow link under NEC access	May need combined with other variants	**YES**

Options development and shortlisting

4.2.18 Following initial sifting, the following 18 options were taken forward to the next round of appraisal 1D, 1E, 2A, 2B, 2D, 2G, 2H, 2J, 2K, 2L, 2M, 3D, 4B, 5-5A, 7, 11, 14 and 15. These options are shown schematically on **Figure 4.3** in **TR010027/APP/6.2**.

4.2.19 These options were compared to establish their relative performance using DfT's Early Assessment and Sifting Tool (EAST) [REF 4-4], a qualitative assessment tool which enables options to be ranked in an order of viability and relative performance in a clear and consistent format. Whilst the tool does not provide a recommendation of preferred option, it does provide high-level information on how options perform and compare.

4.2.20 For early stage assessment, only the strategic and economic categories of EAST [REF 4-4] 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.

4.2.21 These options were compared to establish their relative performance against the EAST [REF 4-4] criteria: Environmental and social factors considered in this round of appraisal included: carbon emissions; severance; air quality; noise; natural environment; heritage; and landscape. This was principally undertaken on the basis of the proximity and relationship of each option to identified environmental resources and receptors, for example: the distance between an option and neighbouring settlements, or the potential loss of important features such as woodland and ancient woodland. Consideration was also given to the potential implications on non-motorised users (NMU) in terms of severance of public rights of way (PRoW).

4.2.22 Further details of the EAST [REF 4-4] assessment are also presented in the TAR [REF 4-3] A summary of the EAST assessment, extracted from Section 4.2.2 of the TAR is included in **Table 4.3** below. Detailed assessment tables supporting the summary table below, as extracted from Appendix F of the TAR, are included in Appendix 4.2 in **TR010027/APP/6.3**.

4.2.23 The assessment concluded that options within all five themes could potentially be developed as suitable solutions to meet the Scheme objectives, but that there was considerable design variation across some of the options. The assessment also recorded that some of the individual options may perform better if combined, noting that the southern junction options generally outperformed others.

Table 4.3: EAST assessment

OPTION	COMMENTS
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.
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.
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.
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.
2K, 2L & 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.
3D	Can solve the identified problems but has some undesirable impacts on properties. Good fit, facilitates growth, improves connectivity and strengthens resilience.
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.
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.
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.
11	Alleviates problems along M42. Marginal improvement to performance of junction. Reasonable fit, facilitates growth but does not improve connectivity. Small benefit to optimise assets and resilience.
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.
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.

4.2.24 Based on the assessment, the following options were selected as the best options to represent the five themes, in a further detailed assessment. These options are shown schematically on **Figure 4.4** in **TR010027/APP/6.2**:

a. Option 1E (North + South Junction);

b. Option 2A (South Junction);

c. Option 2K (South Junction alternative);

d. Option 3D (Interchange);

e. Option 4B (North Junction); and

f. Option 11 (Do Something incorporating options 7/15 Free-flow links at Junction 6 and localised M42 widening).

Assessment of shortlisted options

4.2.25 The six remaining options listed above were designed in more detail to enable them to be assessed using the Department for Transport's Transport Analysis Guidance (TAG) framework [REF 4-5] based on the following factors:

a. Environmental;

b. Highways Design/Geometry;

c. Safety;

d. Stakeholder Consultation;

e. Buildability Assessment;

f. Cost Estimates; and

g. Traffic Assessment.

4.2.26 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.

4.2.27 The key environmental constraints were as follows:

a. Air Quality Impact – the impact of each option on air quality from resulting traffic levels and emissions and their proximity to sensitive receptors;

b. Noise Impact – the change in traffic levels also has the potential to increase noise levels at the noise receptors;

c. Ecology Impact – three Sites of Special Scientific Interest (SSSI) were identified within 1km of the M42 corridor; and

d. Heritage Impact a number of cultural heritage assets were identified which may affect a number of the options.

4.2.28 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 Coleshill and Bannerly Pools SSSI near M6 Junction 4 for Options 1E and 4B (those options which included a northern junction). Other significant impacts were the impact to Aspbury's Copse

ancient woodland with a southern junction position, and a noise impact with most of the options near noise important areas. The potential to mitigate these impacts using planting, barriers and low-noise surfacing measures was recorded.

4.2.29 The option with the greatest environmental impact was Option 1E – as it had the largest environmental footprint. Options with the least impact were Option 3D and Option 11, as a large part of these options were contained within or very close to the existing highway boundary.

4.2.30 The **highways design assessment** took into account of compliance with current design standards, impact on land/properties, impact on the local road network and conflict with existing utilities

4.2.31 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 (DMRB) [REF 4-6]. This assessment provided a general overview of safety issues and risks that would impact road users and road workers.

4.2.32 The **Stakeholder assessment** was undertaken through a series engagement meetings held with a number of identified stakeholders. Stakeholders included a variety of interested parties including local parish councils/authorities, local enterprise partnerships, local businesses (Jaguar Land Rover (JLR), NEC and the NMM), developers and the local Member of Parliament. The meetings took the form of a 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. Feedback/opinion was invited from the stakeholders either at the meeting or with subsequent correspondence.

4.2.33 Support for Options 2A and 2K was expressed by the local businesses as the Southern Junction options would have the least impact on businesses and were considered to best address the current operational issues associated with M42 Junction 6, whilst the parish councils favoured Options 4B and 11.

4.2.34 Highways England engaged a construction contractor to undertake a **buildability assessment** on the options proposed. Their assessment took into account buildability factors including earthworks, utilities and structures together with disruption to the strategic and local road network. Impact on the local transport stakeholders, including Birmingham Airport, Network Rail, HS2, the NEC and NMM where substantial changes to structures would be required was also a major factor.

4.2.35 An initial **cost estimate** was prepared for each to give an indication of the likely relative scale of costs.

4.2.36 A **traffic assessment** of the options was carried out using PRISM[1]. This model covered the immediate area around Junction 6 of the M42 including Junction 5-7 mainline, A45 from Damson Parkway (west of Clock Interchange) to Maxstoke

[1] Policy Responsive Integrated Strategy Model - version 4.1 to a 2011 baseline

Lane (east of Stonebridge Island), M6 Junction 4 and a section of the A452. This provided an indicative Transport Users Benefit Appraisal (TUBA) assessment of benefits – net consumer commuting benefits and net business impact - to assist with a ranking of the performance of the options.

4.2.37 The following is a summary of the outcome of the traffic assessments:

a. 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;

b. 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 and NMM;

c. 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; and

d. 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 the Airport Way connector road 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 parking is positioned on the A452. Option 2A performed substantially better than option 2K.

Consultation and option selection

4.2.38 Highways England considered the outputs from all of the TAG assessments, and discussions held with the various stakeholders to determine the best options to proceed to a non statutory Public Consultation. The following conclusions were reached:

a. **North and South Junction** – Option 1E: would result in safety issues between the new northern junction and M42 Junction 7; would result in considerable landtake from all parties including the green belt to the south of Junction 6; would affect three Noise Important Areas (NIAs); would have a direct impact on a SSSI and potentially a scheduled ancient woodland; would provide limited traffic benefits; was excessively expensive and would provide low value for money. The construction would also severely impact the NEC, Birmingham Airport and HS2. The distance between the new northern junction and M42 Junction 7, would require the M42 to be widened to dual 6 lanes, having a major impact on HS2's structure over the M42 in this area - **Option Discounted;**

b. **Southern Junction** – Options 2A and 2K: would provide good traffic benefits; were supported mainly by the businesses in the area; were assessed as being safe in the safety assessment; and would be generally within budget. They produced Medium to High BCR's. However, both options required land take from the greenbelt and dependent on the location of the southern junction impacted a scheduled ancient woodland - **Options Progressed;**

c. **Interchange** – Option 3D: would offer good journey time benefits but would prevent traffic attending the NEC from having direct access from the motorway, and would require the relocation of the NMM. It would have significant buildability challenges and cause major disruption to road users during its construction; was excessively expensive and would provide limited value for money; and would present some maintenance and safety issues - **Option Discounted**;

d. **Northern Junction** – Option 4B: would result in safety issues between the new northern junction and M42 Junction 7; would have a direct impact on a SSSI; would provide limited traffic benefits; though was affordable and minimised the environmental impact of the Scheme. However, its construction would have a significant impact on the NEC and HS2's proposed site. The distance between the new northern junction and M42 Junction 7, would require the M42 to be widened to dual 6 lanes, having a major impact on HS2's structure over the M42 in this area - **Option Discounted**; and

e. **Do Minimum** – Option 11: would provide limited traffic benefits; would result in some disruption to the NEC and NMM during construction; would be within budget; and would be viable in safety terms. However it failed to address the requirements in the RIS brief - **Option Progressed**.

4.2.39 Following these considerations, it was determined that a southern junction option represented the only viable solution to improve the junction in the long term.

4.2.40 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 connector road to substantiate progression towards non statutory public consultation.

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

a. further consultation with stakeholders;

b. removal of the parallel links between the southern junction and Junction 6;

c. removal of the eastern link to HS2 due to insufficient traffic flows/major impact this had on Hampton in Arden and the surrounding landscape and environment;

d. modifications to the western link to the A45/Airport Way connector road;

e. further TUBA testing of options; and

f. additional order of magnitude estimate costings of options.

4.2.42 This further work on variations of the southern junction resulted in the development of two further southern junction options; Options 2P and 2R:

a. 2P – a free flow southern junction with restricted movements enabling traffic to join the M42 in a southbound direction or exit the M42 from a northbound direction. This junction was located as close to Junction 6 as possible, to avoid impact on Shadowbrook Lane overbridge; A new 1.2km link is provided to Clock Interchange passing beneath Church Lane, with a new roundabout north of Bickenhill to provide a connection to Catherine-de-Barnes lane; and

b. 2R – a southern full movement dumbbell style junction on the M42; located at the optimum location between Junctions 5 and 6 which would enable slip roads to the north and south. A new 2.4km link west of Bickenhill direct to Clock Interchange (access to A45 westbound) and spur to Airport Way connector road. Connection to Catherine-de-Barnes lane was maintained via slip roads to the mainline link road.

4.2.43 Ongoing stakeholder consultation had indicated concerns over impact on the green belt and so a variation on Option 2R was developed. This was named Option 2R East with the southern junction as described for Option 2R, 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.

4.2.44 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 had sufficient benefits.

4.2.45 A further GD04 safety assessment [REF 4-6] 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.

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

a. Option 2P;

b. Option 2R; and

c. Option 2R East

4.2.47 These three options were then renamed as **Option 1** (formerly Option 2R), **Option 2** (formerly Option 2R East) and **Option 3** (formerly Option 2P) for ease of reference.

4.2.48 Options 1, 2 and 3 are illustrated on **Figure 4.5** in T**R010027/APP/6.2**.

4.2.49 Highways England promoted these three viable options at a non staturtory Public Consultation between 9 December 2016 and 27 January 2017. A summary of the potential effects of these options was presented in the (non statutory) Public Consultation Brochure [REF 4-7].

4.2.50 The outcomes of the non statutory consultation were presented in a consultation report [REF 4-8] which identified that 64% of respondents preferred Option 1 (including 61% of the residents from Bickenhill), 15% preferred Option 3 and 10% preferred Option 2. 11% expressed no preference on the three options. Support was also received for inclusion of the optional M42 Junction 6 free flow links.

4.2.51 A series of Highways England workshops were held after the non statutory public consultation exercise to evaluate the consultee response, alongside other information gathered from the ongoing assessment and modelling of the Scheme, in order to identify a preferred option for taking forward to the next stage of development.

4.2.52 The workshops considered an objection raised by the Warwickshire Gaelic Athletic Association (WGAA) in relation to the mainline link road component of Option 1, which would affect a number of sports pitches under their ownership. In response, the following three variants to the alignment of Option 1 were developed by Highways England to avoid or reduce impacts on this recreational facility:

a. **Option 1A** – involved the realignment of the mainline link road to the west of the WGAA's grounds, thereby avoiding the facility but in turn would have a direct effect on Bickenhill Meadows SSSI;

b. **Option 1B** – involved the realignment of the mainline link road to the east of the WGAA's grounds, which would impact one of the fields and affect one property in Bickenhill village; and

c. **Option 1C** – involved the realignment of the mainline link road further to the east of the WGAA's grounds, thereby avoiding all of the fields but would have a significant impact on the western side of Bickenhill village.

4.2.53 Options 1A, 1B and 1C are illustrated on **Figure 4.6** in **TR010027/APP/6.2**.

4.2.54 Apart from minimising the impact on the WGAA facilities, Option 1B provided a number of further benefits; including minimising the impacts on local businesses and residents in Bickenhill and the Bickenhill Meadows SSSI.

4.2.55 Options 1A and 1C were discounted due to their adverse impacts on the Bickenhill Meadows SSSI and/or Bickenhill village, and greater complexity in relation to connecting with and crossing the local road network.

4.2.56 More detailed information on the development and assessment of the three options presented for, and feedback from, the non statutory public consultation, as well as the subsequent development of options post consultation is presented in the Scheme Assessment Report [REF 4-9].

4.3 Justification for chosen option

4.3.1 A final assessment of these 4 viable options (Options 1, 1B, 2 and 3) was undertaken in May 2017 to inform the selection of a preferred option to progress to Preliminary Design. The options were assessed against the following criteria:

a. Department for Transport's brief (as set out in the RIS for the 2015 – 2020 period) [REF 4-2]

b. Highways England strategic objectives such as ensuring safety and achieving customer satisfaction;

c. economic assessment;

d. public consultation;

e. environmental effects; and

f. general (such as the number of departures from standards, potential construction issues and future maintenance requirements).

g. scheme objectives as set out in the Planning Statement [**TR010027/APP/7.1**]

4.3.2 Following the assessment, Option 1B was selected as the preferred option based on the following outcomes and considerations:

a. would meet the requirements of the brief set out in the DfT's RIS [REF 4-2];

b. received the largest support at public consultation (as Option 1, prior to the Option 1B variant being introduced);

c. when compared to the other options, Option 1B would have the least impact on green Belt land, private properties and statutory utilities;

d. would have a greater likelihood of receiving planning consent due to the ability to demonstrate policy compliance;

e. would have the fewest departures from highway design standards;

f. would have a reduced impact on the WGAA facility;

g. offered good value for money;

h. the mainline link road would be positioned predominantly in cutting to reduce potential landscape, visual and noise effects, and offered greater scope for mitigation; and

i. would not preclude future potential junction improvement works being undertaken, and would not preclude the development of the MSA.

4.3.3 A summary table of the assessment is contained in Appendix E of the Scheme Assessment Report [REF 4-9], which provides further justification for the selection of the preferred option.

4.3.4 The assessment also identified that there were challenges in providing a southeast free-flow link, adjacent to the NMM at M42 Junction 6 due to: the high number of geometry departures required reducing the safety of this link; the level of disruption that its construction would cause to the NMM; the limited benefits the link would add to the Scheme; and the costs associated with its delivery. This component was accordingly removed from the design.

4.3.5 The north facing slip roads which were part of the proposed Southern Junction designs were also removed, as the junction is too close to Junction 6, and providing them would cause safety and operational issues. The traffic model also showed a very limited usage for these slip roads.

4.3.6 Highways England formally announced the modified Option 1B as their preferred route on 7 August 2017 [REF 4-10].

4.3.7 **Figure 4.7** in **TR010027/APP/6.2** illustrates the design of the Scheme at the point of PRA, the main features of which comprised the following:

a. a new dual carriageway link between the Clock Interchange and a new junction on the M42 north of Solihull Road, allowing traffic travelling northbound to exit the M42 and traffic travelling southbound to join the M42;

b. the new dual carriageway would be to the west of Bickenhill and would generally be below ground level and pass beneath Catherine-de-Barnes Lane, at both the north west and south west corners of Bickenhill;

c. improvements to Clock Interchange and the A45 between Clock Interchange and the M42;

d. free flow links provided around the north west and north east of the M42 Junction 6; and

e. improvements on the south east side of M42 Junction 6, the A45 westbound (east of the M42 Junction 6) and M42 Junction 6 southbound slip roads to improve the performance around this quadrant of the junction.

4.4 Continued development of the preferred option

Preliminary design

4.4.1 Following selection of the preferred option in August 2017, the design of the Scheme continued to be developed and refined in response to the following:

a. the emerging findings of the environmental impact assessment (EIA), traffic modelling and economic appraisal;

b. the outcomes of project team design review workshops;

c. feedback gained from statutory consultation [REF 4-11] held between 9 January 2018 and 9 March 2018, and further targeted consultation held in between 4 September 2018 and 2 October 2018 [REF 4-12];

d. information obtained through intrusive and non-intrusive investigations, surveys, sampling and modelling undertaken as part of the design-development and EIA processes; and

e. engagement with statutory organisations and other stakeholders regarding the form and location of the Scheme, and environmental mitigation requirements.

4.4.2 As with initial design development, a stage approach was adopted. Design work was paused at the following milestones during the preliminary design, in order to enable consultation, modelling and assessment activities to be undertaken and to ensure that the design included people's views and concerns raised.

a. Design Fix – November 2017: this incorporated the preliminary design undertaken between August 2017 and November 2017, and developed the Preferred Route in more detail to understand what detailed assessment work was required, and formed the basis of the statutory consultation exercise held between 9 January 2018 and 9 March 2018;

b. Design Fix – April 2018: this incorporated the design between November 2017 and April 2018, which developed the design further including understanding the outcome from the statutory consultation feedback; and

c. Design Fix – October 2018: this incorporated the period from April 2018 to October 2018, which undertook further design taking into account of feedback from statutory consultation, further targeted consultation held in between 4 September 2018 and 2 October 2018. In addition this also included the emerging outcomes of ongoing surveys and the EIA process; to ensure mitigation appropriate to the assessments were included in the Scheme being promoted.

4.4.3 The following sections summarise the main changes incorporated in the design as the Scheme developed through these design fixes, and the main alternatives that were identified and evaluated, and which have informed the preliminary design described in Chapter 3 The project.

Alternatives and design-development relating to highway engineering works

Barber's Coppice junction

4.4.4 The design of the Scheme at PRA included a roundabout between the mainline link road and Catherine-de-Barnes Lane, adjacent to Barber's Coppice ancient woodland. Following a review of the initial design of this roundabout and the associated off-slip road from the mainline link road, design modifications were made to avoid encroachment into a stand of woodland opposite the property Four Winds, which were then incorporated into the November 2017 Design Fix.

4.4.5 Subsequently, a decision was made to test the assumption that a roundabout was the most appropriate type of junction at this location. This followed statutory consultation feedback received from a number of stakeholders who enquired as to why a simple priority junction was not being promoted in the design.

4.4.6 In response, five options were identified and tested for Barber's Coppice junction:

a. a 3-arm roundabout;

b. a ghost island priority junction[2];

c. a signalised T-junction;

d. an alternative priority junction; and

e. an alternative signalised junction.

4.4.7 Evaluation of these options from a traffic, safety, accessibility and landtake perspective concluded that a roundabout would be preferable as this: did not require the amount of signals and equipment in comparison to the other options; be of a similar form and layout to the existing Catherine-de-Barnes roundabout to the south; would offer greater operational resilience; and would better accommodate access to Birmingham Dogs Home, Solihull Music School and local properties.

4.4.8 The position of Barber's Coppice Roundabout was subsequently moved closer to Catherine-de-Barnes Lane and its diameter reduced at the October 2018 Design Fix in response to consultee feedback and opportunities to reduce agricultural landtake. The vertical alignment of this roundabout was also modified from being positioned in a shallow cutting to being positioned on a slight embankment in order to optimise the highways drainage layout.

Bickenhill junction

4.4.9 Following inclusion of a roundabout junction on Catherine-de-Barnes Lane to the west of Bickenhill within the PRA, a similar decision was made to revisit this design following statutory consultation feedback.

4.4.10 Five options were accordingly identified and tested for Bickenhill junction:

a. a 3-arm roundabout;

b. a priority junction;

c. a signalised junction;

d. a priority 'jug handle' junction[3]; and

e. a signalised 'jug handle' junction.

4.4.11 Evaluation of these options from a traffic, safety, accessibility and landtake perspective concluded that a roundabout would be preferable as this: would provide free flowing conditions during peak times; would be safer for road users; avoided risks associated with any potential failure of signal equipment; would be of a similar form and layout to the existing Catherine-de-Barnes roundabout to the south; and would require less maintenance.

[2] An at-grade junction, usually a T- or staggered junction, within which an area is marked on the carriageway, shaped and located so as to direct traffic movement- TD42/95 DMRB Volume 6 Section 2 [REF 4-13]

[3] A left hand diverging lane loop, which allows right turners to wait off the major road, and to make the crossing movement at right angles DMRB Volume 6 Section 2 [REF 4-13]

4.4.12 Ongoing design-development and statutory consultee feedback led to the position of Bickenhill Roundabout being moved, within the October 2018 Design Fix, approximately 100m south of its original proposed location, in order to improve its connection to St Peters Lane and the mainline link road off-slip.

Clock Interchange

4.4.13 The design of the proposed improvements at Clock Interchange within the November 2017 Design Fix was developed and optimised following a review of the traffic modelling outputs, with improvements made to increase capacity and to reduce delays.

4.4.14 A segregated left turn lane from the mainline link road onto the A45 westbound at Clock Interchange was also introduced following a formal request from SMBC in response to the statutory consultation.

M42 Junction 6 and East Way

4.4.15 The November 2017 Design Fix incorporated a free flow link for A45 eastbound to M42 northbound traffic, a second free flow link for M42 southbound to A45 eastbound traffic, and a link for M42 southbound traffic to join the existing East Way roundabout. It was identified that these works would require the existing East Way overbridge over the M42 motorway to be demolished and rebuilt to accommodate the new links.

4.4.16 Due to concerns over the potential cost and disruptive impact of these works, the design was re-evaluated to determine whether modifications could be made to avoid the need to demolish and reconstruct the overbridge. An alternative design was developed as part of the April 2018 Design Fix, involving the replacement of the proposed M42 southbound to East Way link with a new link from the M42 southbound to a new 3-arm roundabout on East Way. This change in design removed the requirement for bridge demolition at this location.

4.4.17 Modifications were made to the northbound merge arrangement proposed as part of the improvements to M42 Junction 6. Between the November 2017 and April 2018 Design Fixes, the design of the proposed A45 eastbound to M42 northbound free flow link was altered to merge onto the M42 motorway, rather than the existing slip road, in order to improve operational efficiency. These modifications resulted in the length of the merge on this link to be increased and a retaining structure was proposed between the link and the NEC. This structure was subsequently removed in the October 2018 Design Fix and replaced with a steepened earthwork incorporating soil nailing, in order to reduce the extent of land take within the NEC.

4.4.18 Within the November 2017 Design Fix, the existing M42 northbound free flow link to Birmingham Airport was retained in the design; however, as the mainline link road would provide a route between the M42 and Birmingham Airport, a decision was made to close this link which was subsequently reflected in the October 2018 Design Fix.

M42 Junction 5A (southern junction)

4.4.19 The form and location of the proposed M42 Junction 5A on the M42 motorway was subject to optimisation undertaken following PRA.

4.4.20 Between the November 2017 and April 2018 Design Fixes the alignment of the proposed junction's slip roads were refined through adoption of design Departures from Standards and by bringing the slip roads closer to the existing motorway corridor.

4.4.21 Minor layout changes were also made so that the Scheme proposals would not preclude the proposed MSA should this be granted planning consent by SMBC.

Solihull Road overbridge

4.4.22 The principle of maintaining access for Solihull Road was a commitment agreed with SMBC during the options identification and selection stages of the Scheme. The proposed construction approach to demolish the existing overbridge that currently takes traffic across the M42 motorway on Solihull Road and replacing this with a new overbridge enables this commitment to be met, in order to accommodate the proposed south facing slip roads of M42 Junction 5A.

4.4.23 Earthworks proposed in the design of the new overbridge within the November 2017 Design Fix were modified as part of ongoing design-development, the objective being to reduce the extent to which they encroached into Aspbury's Copse ancient woodland. Through the changes to slip road alignment described in 4.4.20 above it was also possible to reduce the span of the new overbridge and reduce landtake within Aspbury's Copse.

4.4.24 Consultation with SMBC undertaken during Preliminary Design identified an aspiration to develop and promote pedestrian facilities along Solihull Road. Accordingly, the design of the new overbridge within the April 2018 Design Fix was developed to include for the possible future provision of a footway along the bridge structure.

Mainline link road

4.4.25 Following statutory consultation, modifications were made between the April 2018 and October 2018 Design Fixes to the alignment, width and position of the mainline link road and its associated junctions, merges and slip roads with Catherine-de-Barnes Lane, the objective being to reduce the amount of permanent landtake required to accommodate these components of the Scheme.

4.4.26 Opportunities to optimise the steepness and profile of the earthworks within the design of the mainline link road were explored as part of the design-development process between the November 2017 and April 2018 Design Fixes. Consideration was given to whether:

a. earth bunds should be incorporated into the design to assist with visually containing parts of the new road corridor and/or to reduce noise impacts; and

b. the backslopes of earthworks should be slackened to soften their appearance within the landscape, or profiled in such a way that they could be returned to full agricultural use.

4.4.27 A review of the emerging findings of the EIA identified no requirement for earth bunds along the corridor. A decision was taken to revise the earthwork gradients presented in the PRA and steepen these to between 1 in 2.5 and 1 in 3 along the mainline link road, in order to minimise landtake requirements. Due to physical and environmental constraints along the corridor, no locations of agricultural handback were incorporated into the design of the mainline link road.

Road lighting

4.4.28 A detailed lighting strategy was developed for the Scheme during the preliminary design which sought to balance:

a. the requirement for carriageway and junction lighting on safety grounds; with

b. the restrictions imposed by Birmingham Airport's safeguarding zone over the introduction of tall lighting columns; and

c. the need to minimise the potential for new sources of lighting to emerge in night-time views within the landscape (and result in visual impact).

4.4.29 The strategy identified that lighting should be installed at locations across the Scheme to maintain road user driving experience, and should be introduced where the number of Personal Injury Accidents would be saved through its inclusion in the design. Lighting proposals were accordingly developed and incorporated into April 2018 and October 2018 design fixes.

Alternatives and design-development relating to drainage infrastructure

Storage and treatment of road runoff

4.4.30 Drainage solutions were incorporated into November 2017 and April 2018 Design Fixes to capture, store, and treat runoff prior to its discharge into existing drainage systems and watercourses.

4.4.31 Two detention basins (ponds) located north-west of M42 Junction 5A and south-east of Clock Interchange were initially proposed as part of a scheme-wide drainage strategy. This solution aligned with the expectations of the Environment Agency; however, following continued engagement with Birmingham Airport, concerns were raised that these features would attract birds to areas within the Birmingham Airport safeguarding zone and increase the risk of aircraft bird strike.

4.4.32 In response, four alternative drainage solutions were identified and evaluated which sought to combine a range of storage and treatment options at different locations across the Scheme:

a. Option 1: attenuation and treatment provided by detention basins at the northern and southern ends of the mainline link road (as presented in November 2017 and April 2018 Design Fixes);

b. Option 2: attenuation and treatment provided by detention basins, but split into two smaller basins with measures incorporated into their design to reduce bird strike risk;

c. Option 3: underground storage tanks with treatment provided through proprietary systems and additional sustainable drainage solution measures in the form of swales; and

d. Option 4: underground storage tanks with treatment provided through proprietary systems only.

4.4.33 Highways England consulted with both Birmingham Airport and the Environment Agency to agree the drainage principles to be applied in and around the Birmingham Airport safeguarding zone. Modifications were accordingly made to the drainage design to accommodate different combinations of these drainage options across the Scheme.

4.4.34 Changes were also made to the location of certain drainage infrastructure based on a combination of landowner discussions, the emerging findings of modelling undertaken as part of the EIA process, the outcomes of statutory consultation, and surveys undertaken of the existing highway drainage infrastructure. The following solutions were developed and incorporated into the October 2018 Design Fix:

a. a combined solution comprising an underground storage tank, reed bed and drainage swale to the south-east of M42 Junction 5A and to the north-west of M42 Junction 5A;

b. a combined reed bed and swale solution to the north-east of M42 Junction 6 and East Way;

c. a combined underground storage tank and swale solution to the south-west of Clock Interchange; and

d. an underground storage tank solution adjacent to Catherine-de-Barnes Lane, adjacent to Birmingham Dogs Home.

4.4.35 Access tracks for future maintenance of the proposed drainage infrastructure were also incorporated into design prior to the October 2018 Design Fix.

4.4.36 The changes enabled some drainage components to be removed from agricultural land and placed on land that would be under the control of Highways England, thereby reducing the overall landtake required for drainage infrastructure.

4.4.37 Following further development of the drainage proposals prior to the October 2018 Design Fix, additional drainage infrastructure was incorporated into the design on land to the south east of Clock Interchange.

Flood compensation

4.4.38 The requirement for flood compensation was reviewed based on the April 2018 Design Fix, specifically in the area surrounding Hollywell Brook to the north-east of M42 Junction 6. In this area potential was identified for localised flooding to occur as a consequence of the Scheme.

4.4.39 Flood modelling subsequently confirmed that no compensation measures would need to be included at this location, or elsewhere within the Scheme.

Bickenhill Meadows SSSI mitigation

4.4.40 Following a review of November 2017 Design Fix, the EIA process identified potential for the scheme to have an adverse impact on Bickenhill Meadows Site of Special Scientific Interest (SSSI), which consists of two separate units located

either side of the mainline link road. The mainline earthworks cutting (up to 10m in depth) and associated works are also in close proximity (within 300 m) of streams that flow through each SSSI unit which may be impacted during the construction and operation phases.

4.4.41 An initial hydrological investigation has been carried out to understand the potential impact on Bickenhill Meadows SSSI and the outcomes of which are considered in assessments reported in Chapter 9 Biodiversity and Chapter 14 Road drainage and the water environment.

4.4.42 The detailed assessment and development of mitigation options is also described in Appendix 14.2 in **TR010027/APP/6.3.**

Alternatives and design-development relating to works affecting private land

Warwickshire Gaelic Athletic Association

4.4.43 As part of the statutory consultation held between 9 January and 9 March 2018, the relocation of the WGAA facility on Catherine-de-Barnes Lane to a potential site on land located south west was included in order to gauge public opinion on the relocation proposal.

4.4.44 Following further design-development and environmental assessment undertaken during between the April 2018 and October 2018 Design Fixes, it was identified that the impacts on the WGAA facility could be mitigated by reconfiguring the existing site and acquiring land adjacent to the facility in order to alter the location and orientation of the existing buildings, pitches and car park. Further information on this approach is provided in the Planning Statement [**TR010027/APP/7.1**]

4.4.45 As this approach was considered proportionate and reasonable, a study was progressed which developed and assessed a number the following possible options for both the relocation and reconfiguring of the WGAA facility:

a. Options to reconfigure the facility using land immediately south of the facility (the southern options);

b. Options to reconfigure the facility using land immediately west of the facility (the western options); and

c. Options to reconfigure the facility using land immediately north of the facility (the northern options).

4.4.46 The assessment focused on appraising the relative advantages and disadvantages of each option against operational, safety, cost, environmental, programme and statutory criteria. Each option was ranked based on their performance against the criteria, and the exercise concluded that the full relocation options be discounted from further consideration in the design on the grounds that the appraisal of options demonstrated that reconfiguring the facility could be delivered using adjacent land.

4.4.47 For the remaining options, the assessment demonstrated that whilst there was not a clear difference between the options:

a. progression of a northern option could potentially impact on Bickenhill Meadows SSSI and would bring development within the facility closer to Birmingham Airport's safeguarding zone; and

b. progression of a western option could impact on an historic landfill site.

c. progression of the southern option would bring the WGAA site closer to an existing residential property.

4.4.48 Throughout the development of relocation and reconfiguration options, Highways England has maintained regular dialogue and discussions with representatives of the WGAA.

4.4.49 As of the October 2018 Design Fix, agreement had not been reached with the WGAA as to the preferred solution. A decision was taken to progress the southern options as part of the Scheme. Five layout options were developed into more detailed layouts based on reconfiguring the WGAA using land to the south of the facility, and subsequently appraised to test their overall viability from a sports perspective.

4.4.50 The reconfigured options being progressed would provide three county size pitches, a new access, new car parking, relocation of a memorial and potentially building new amenities dependent on which option of the configuration is agreed.

4.4.51 As the final decision on which of the southern options will be taken forward is unlikely to be made until agreement is reached with the WGAA, the EIA process has assumed the inclusion of a southern option within the Scheme design, as described in Chapter 5 EIA methodology and consultation, and all land areas are included in the Scheme order limits.

4.4.52 Highways England are committed to working with the WGAA to agree the detail of the southern option, in order to provide a viable reconfiguration of the WGAA facilities as part of the Scheme.

Landowner accommodation works

4.4.53 The design-development process identified that accommodation works would need to be incorporated into the Scheme to enable access to be maintained to agricultural landholdings severed by the mainline link road, south of Bickenhill.

4.4.54 A new private means of access and public right of way was incorporated into the November 2017 Design Fix, running along the western side of the link road commencing north of Barber's Coppice roundabout and terminating at The Haven Caravan Park.

4.4.55 This private means of access would provide vehicle access to the WGAA and number of individual land holdings to the west of the proposed link road.

4.4.56 Proposals were also developed to provide a separate direct access from the Catherine-de-Barnes lane to the WGAA facilities and residential property adjacent to Barber's Coppice roundabout.

Alternatives and design-development relating to non-motorised user provisions

Public rights of way, footways and cycleways

4.4.57 A review was undertaken of the relationship of the Scheme to the existing PRoW network following PRA, which identified a need for measures to be developed to address impacts on NMUs and maintain route connectivity.

4.4.58 A range of measures were incorporated into the design prior to the October Design Fix, informed by the outcomes of statutory consultation and engagement with SMBC. A site presentation and walk over survey was also held with representatives of various local and national stakeholder groups including the Ramblers Association, Cycling UK, Solihull Cycle Campaign, Transport for West Midlands, SMBC, the Royal National Institute of Blind People and two local residents.

4.4.59 As a result of these meetings the following provisions were incorporated into the April 2018 and October 2018 Design Fixes:

a. provision of new sections of PRoW between Shadowbrook Lane and Catherine-de-Barnes Lane to replace existing routes severed by the mainline link road;

b. diversion of the Green Man Trail north of Bickenhill to maintain this important recreational trail;

c. the repurposing of sections of Catherine-de-Barnes Lane between Barber's Coppice Roundabout and Clock Lane as surfaced footways and cycleways, with similar provisions identified between Clock Lane and the A45, to enhance NMU provisions;

d. widening of existing footways along parts of the A45 to the east and west of M42 Junction 6 to allow use by cyclists; and

e. the proposed private means of access described in 4.4.52 and 4.4.53, would also provide facilities for walkers and cyclists and provide for continuation of 3 east west routes severed by the proposed mainline link road

A45 pedestrian footbridge

4.4.60 In response to the proposed removal of existing walkways on Clock Interchange, it was necessary to accommodate an alternative crossing of the A45 into the Scheme design.

4.4.61 A location for this footbridge was initially proposed (November 2017 Design Fix) to the west of Clock Interchange; however, following statutory consultation feedback it was concluded that this would be better positioned to the east of Clock Interchange.

4.4.62 In order to link the residents of Bickenhill, south of the A45, to sites and facilities north of the A45, and to ensure continued connectivity along the Green Man Trail, two potential locations for a new footbridge were identified between Clock Interchange and M42 Junction 6. These locations were immediately east and west of the West Coast Main Line.

4.4.63 A decision was made to include a footbridge immediately west of the West Coast Main Line, at the end of Church Lane, within the April 2018 Design Fix as this location better suited the residents of Bickenhill and the PRoW network and

meant that the structure would not cross the railway line or incur longer journey times.

Mainline link road accommodation bridge

4.4.64 A dual purpose accommodation bridge over the mainline link road, located between Shadowbrook Lane and Solihull Road, was incorporated into April 2018 Design Fix. This was introduced following statutory consultee and landowner feedback, which raised concerns over access to land holdings and the length of diversion that NMUs would experience when making journeys on the PRoW network.

4.4.65 The design of the accommodation bridge was developed to provide pedestrian access over the mainline link road, and to maintain access for farm vehicles, the position of which was refined in the October 2018 Design Fix to improve its connection point with the existing PRoW network either side of the mainline link road.

NMU provision at Airport Way

4.4.66 As the inclusion of a new free flow link between the mainline link road and Airport Way connector road would sever an existing footway/cycleway, the requirement to maintain NMU connectivity at this location was identified and considered as part of the April 2018 Design Fix.

4.4.67 Three options were identified and evaluated:

a. Option A: comprising a subway (underpass) structure beneath the new free flow link, requiring ramps either side to provide connectivity;

b. Option B: comprising an uncontrolled crossing on the new free flow link; and

c. Option C: comprising a controlled crossing on the new free flow link.

4.4.68 Following a review of the options, Option A was incorporated into the design on safety grounds as this solution would provide most appropriate segregation between NMUs and vehicles travelling on the link.

Alternatives and design-development relating to the environment

Aspbury's Copse

4.4.69 As stated in paragraphs 4.4.19 to 4.4.21, the proposed layout of M42 Junction 5A was developed to reduce the impact of the Scheme on ancient woodland at Aspbury's Copse.

4.4.70 In addition to design modifications undertaken to minimise the extent of land required, a mitigation solution was developed as part of an overall landscape and biodiversity mitigation and enhancement strategy to provide compensation through the translocation of soils and the planting of new woodland.

4.4.71 Two potential locations were identified to implement this solution:

a. land adjacent to the southbound carriageway of the M42 motorway, immediately south of the eastern parcel of woodland at Aspbury's Copse; and

b. land between Barber's Coppice ancient woodland and the proposed Barber's Coppice roundabout.

4.4.72 Following a review of both sites, it was identified through consultation with Natural England that using land adjacent to Aspbury's copse would be preferable, as this would reduce the distance across which translocated soils would be moved, and would offer scope for new planting to be contiguous with the existing woodland at Aspbury's Copse. The land required to implement this strategy was incorporated into the April 2018 Design Fix, which was also utilised to accommodate new drainage infrastructure also required at this location.

Alternatives and design-development relating to construction

Overall construction methodology

4.4.73 The development of the overarching construction methodology was based on the following key construction strategy decisions:

a. the need to maintain traffic movements on the existing Catherine-de-Barnes Lane and access to residents and businesses in Bickenhill during construction. The alternative would be to close the through road to Clock Interchange and implement a diversion route during construction of the mainline link road, approximately 24 months duration. A high level assessment of the diversion route available concluded that this would have a severe negative impact on the local communities. The construction sequence has proposed a phasing plan which introduces temporary alignments for Catherine-de-Barnes Lane to enable the construction to take place and maintain vehicular movements;

b. Highways England will work with the other major developments planned in the area (e.g. HS2) to minimise the combined impact of the construction on the local stakeholders and the surrounding area;

c. the construction of the north west free-flow link at Junction 6 would commence following the completion of junction 5A and the mainline link road. Following completion traffic can be transferred to the mainline link road, reducing traffic volumes at Junction 6. The construction of the free flow link and underpass would be constructed in multiple phases to maintain assess to the NEC; and

d. a phased, top-down construction methodology has been selected for the construction of the north west free flow link underpass at M42 Junction 6. The methodology maintains access and egress to the NEC. Alternative options considered included i) phased in-situ construction with soil nailed side slopes and ii) jacked box methodology. The in-situ option was not considered appropriate as it involved the use of considerable temporary works that had the potential to clash with existing services and retaining structures on the A45. The jacked box solution would require considerable working space to either the east or west of the structure to construct the box, jacking slab and reaction wall. Practically this was unfeasible as the area required would have closed the A45 to M42 northbound merge slip road.

Construction compounds

4.4.74 In developing the methodology for construction of the Scheme, an exercise was undertaken to identify the most appropriate location to accommodate a construction compound, a key factor in which was avoiding areas of land within Birmingham Airport's safeguarding zone.

4.4.75 Four potential locations were identified and evaluated:

a. Location 1: land south east of Clock Interchange;

b. Location 2: land north east of M42 Junction 6;

c. Location 3: land within the Birmingham NEC car park; and

d. Location 4: land adjacent to Solihull Road, east of the M42.

4.4.76 The review of these locations identified that Location 1 was preferable as this offered direct access from the A45 and sufficient space to provide a buffer between equipment and activities within the compound and nearby properties whilst avoiding the safeguarding zone.

4.4.77 Location 2 was identified as having good access via East Way; however, the presence of overhead electricity transmission cabling and proximity to properties in Middle Bickenhill were viewed as constraints.This site is also identified for the construction of HS2.The location was discounted from further consideration.

4.4.78 It was determined that Location 3 would offer good access, hardstanding and connectivity to utilities, but this was discounted on the grounds that use of the land may not be able to be secured as part of the Scheme, due to its potential impact on NEC operations and event traffic.

4.4.79 Location 4 was discounted due to the presence of overhead electricity transmission cabling, and as construction traffic would have to travel along Catherine-de-Barnes Lane to reach the compound.

4.4.80 In addition to the main construction compound location, additional satellite compounds are also required at other locations around the site area to support key construction activities. These locations include:

a. North east of Solihull Road for the construction of Junction 5A and Solihull Road overbridges. This area is required for local office and welfare facilities for the construction of the new Junction 5A. The compound will include laydown areas for construction materials and temporary works, including designated areas for stockpiles of topsoil, subsoil and demolition arisings. A hard standing area will be constructed as a temporary platform for the fabrication of steel work for the new Solihull Road overbridge and the bridge beam lifting operations for both Solihull Road and Junction 5A overbridges;

b. land currently used for car parking within the NEC has been identified for the local office and welfare facilities for the construction of the north west free flow link underpass at M42 Junction 6. Laydown areas are required for the storage of piling equipment, temporary works such as formwork and scaffolding, areas for fabrication of reinforcement and precast facing units. Access to the compound would be via South Way and South Car Park Road; and

c. A number of other, smaller, satellite compounds have been identified to support the construction of the Scheme and are located adjacent to the new bridge structures. These areas are identified in Chapter 3 The project.

4.5 References

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