M54 to M6 Link Road

TR010054

Volume 6

6.1 Environmental Statement

Chapter 3 – Assessment of Alternatives

Regulation 5(2)(a)

Planning Act 2008

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

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

M54 to M6 Link Road

Development Consent Order 202[ ]

6.1 Environmental Statement

Chapter 3 Assessment of Alternatives

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3 Assessment of Alternatives

3.1 Introduction

3.1.1 This chapter has been prepared in accordance with the Design Manual for Roads and Bridges (DMRB) Volume 11, Section 2, Part 4 LA 104 Environmental Assessment and Monitoring (Ref 3.1), the Infrastructure Planning (Environmental Impact Assessment) 2017 Regulations (as amended 2018) (the EIA Regulations) (Ref 3.2) and the National Policy Statement for National Networks (NPSNN) (Ref 3.3). It should be read in conjunction with Appendix 3.1 Alternatives [TR010054/APP/6.3]).

3.1.2 The Scheme has been subject to a process of staged development and evolution. The main development stages were:

- identification of the need for the Scheme;
- options identification;
- options selection;
- preferred route announcement (PRA);
- post PRA design development for statutory consultation; and
- continued design development post statutory consultation.

3.1.3 The need for the Scheme was originally identified in 2001. The Case for the Scheme and NPSNN Accordance Table [TR010054/APP/7.2], and Chapter 2: The Scheme of this ES provides further information on the need for the Scheme.

3.1.4 The options identification and selection stages took place from 2014 up until the PRA in September 2018. Options have been developed based on two general route corridors, one to the east of Featherstone, Hilton and Shareshill and west of Hilton Hall, and a second using the existing corridor associated with the M6 which is to the east of Hilton Hall. The development of options has been based on three general designs originally described as:

- **Option A** – a new link road from M54 Junction 1 to M6 Junction 11, using the existing junction roundabouts and providing no free-flow links to any motorways. This route severed connections to these junctions for the A460, and a mid-point junction around Hilton Lane was included on the new link road to provide a connection for local traffic.
- **Option B** – a new link road from M54 Junction 1 with free-flow connections to the M6 and M6 Toll, bypassing M6 Junction 11.
- **Option C** – provision of the 'missing' slip roads between the M54 and the M6 (eastbound to northbound and southbound to westbound respectively) at M6 Junction 10a, and a free-flow link to the M6 Toll.

3.1.5 Design development has identified a range of alternative route alignments, junction layouts, requirements and positioning of structures, and the standard of the link road.

3.1.6 Public consultation was undertaken in 2014/2015 and in 2017, and has informed options testing, design development and decision-making.

3.1.7 Further design development has been undertaken since the PRA to prepare the design presented for statutory consultation in 2019. This design has been further developed following stakeholder feedback.

3.1.8 The development of the Scheme design as described in Chapter 2: The Scheme, has been an iterative process, with reference to:

- The effectiveness of alternative options in meeting the Scheme Objectives (see Chapter 2, Section 2.2).
- The potential for significant environmental effects, including the ability to avoid, reduce or compensate for adverse environmental effects.
- Opportunities to incorporate environmental enhancement where possible.
- Feedback from consultation with the public and other stakeholders.
- The requirements of the NPSNN and other material policy considerations.
- Viability, deliverability, long-term management and maintenance.

3.1.9 In accordance with the EIA Regulations, Section 3.3 of this chapter provides a description of the main alternatives studied and an indication of the main reasons for selecting the chosen option, including a comparison of environmental effects. This is structured as follows:

- identification of the need for the Scheme;
- a Do-Minimum and Do-Nothing scenario;
- options to the east of Hilton Hall;
- options to the west of Hilton Hall, including:
  - the alignment to the east of Dark Lane; and
  - the alignment of Hilton Lane.
- junction arrangements, including;
  - M6 Junction 11 and M6 Toll Junction T8;
  - M54 Junction 1; and
  - Mid-point junction on the new link road.
- The option to stop up Mill Lane near M6 Junction 11;
- the standard of the link road;
- the location of accommodation bridges;
- design of the structure over the Latherford Brook;
- culvert design at M54 Junction 1;
- input alternatives – including alternative materials, the cut and fill balance, lighting and signage;
- mitigation alternatives; and
- scheduling alternatives.

3.1.10 Table 3.1 notes the range of alternatives covered in this chapter as required by LA 104 and a reference to where this is covered.

Table 3.1: Coverage of LA 104 Alternatives Reporting Requirements

Alternative	Coverage in the Environmental Statement	Relevant Section
1 - technology alternatives: temporary and permanent traffic control measures	Technology alternatives to reduce travel demand were noted in the early identification of the need for the project, including road-user pricing, increased home working and home shopping.	Section 3.3 'Identification of the need for the Scheme'.
2 - design alternatives: of physical elements including structures, and landscaping	Alternative options for junction layouts and junction structures have been identified. Landscaping design has been an iterative process throughout the development of the Scheme. A short summary of how the landscaping design has responded to the assessment is provided.	Section 3.3 'Junction arrangements' and 'Mitigation alternatives'.
3 - size and scale alternatives: seeking opportunities to reduce the size and scale of the development where the project objectives would not be compromised	The size and scale of the Scheme is discussed in relation to the alternative layouts of the junction arrangements, the standard of link road, which affects its footprint and the alternative routes, which affect its length.	Section 3.3 'Junction arrangements', 'Standard of the link road' and 'Options to the east of Hilton Lane'.
4 - demand alternatives: to meet the need through demand management techniques	Demand management techniques aimed at modal transfer and reducing traffic volumes were considered within the multi-modal study, including road-user pricing, offering alternative transport opportunities such as bus routes, rail and metro rail.	Section 3.3 'Identification of the need for the Scheme.'
5 - activity alternatives such as provision of traffic calming instead of a new road	Traffic calming measures were considered within the multi-modal study.	Section 3.3 'Identification of the need for the Scheme'.
6 - location alternatives: selection of different corridors or access routes;	Alternative corridors were identified for the link road.	Section 3.3 'Options to the east and west of Hilton Hall'.
7 - delivery alternatives: alternatives that reflect different means of delivering the desired end point in production terms	Alternative delivery mechanisms were considered within the multi-modal study.	Section 3.3 'Identification of the need for the Scheme'.
8 - scheduling alternatives: programming the activities to avoid periods of enhanced environmental sensitivity, e.g. the consideration of alternative temporary land-take during construction	The chapter notes how the environmental and other constraints have been used to inform the decision on compound locations and programme requirements, therefore no discrete reasonable alternatives are identified.	Section 3.3 'Scheduling alternatives'.

Alternative	Coverage in the Environmental Statement	Relevant Section
9 - input alternatives: use of different materials, lighting strategies or different designs	The chapter notes how the environmental constraints and safety have informed the lighting design, how the iterative design approach has addressed the cut and fill balance and how alternative materials will be considered in future stages.	Section 3.3 'Input alternatives'.
10 - mitigation alternatives: the variety of solutions available to mitigate the adverse consequences of a proposal	The chapter notes how the environmental and other constraints have been used to inform the mitigation strategy; therefore no discrete reasonable alternatives are identified.	Section 3.3 'Mitigation alternatives'.
11 - The 'do minimum' and 'do nothing' scenarios	The Do-Minimum scenario, and the reason why a Do-Nothing Scenario is not relevant to this Scheme is discussed.	Section 3.3 'Do-Nothing and Do-Minimum scenarios'.

3.2 Assessment methodology

3.2.1 Options appraisals have been undertaken following the transport appraisal process, which enables the comparison of options to inform decision-making. This process is undertaken in accordance with the Department for Transport (DfT) online Transport Appraisal Guidance (WebTAG) (Ref 3.4) methodologies, and considers environmental effects, economic benefits, value for money, engineering, safety and social factors. The outputs were reported in Appraisal Summary Tables. Environmental assessments were also undertaken in accordance with the DMRB Volume 11 (Ref 3.5) and supporting Interim Advice Notes (Ref 3.6).

3.2.2 Appraisals and assessments are undertaken with a proportionate approach, in that they are appropriate to the stage in scheme development and the decision being made. Appraisal and assessment methodologies have changed over the course of design development, as has the level of understanding of the environment from increasingly detailed baseline information. Baseline information has been updated over time through survey work and consultation, as noted in Chapters 5 to 15 of this Environmental Statement.

3.3 Reasonable alternatives studied

Identification of the need for the Scheme

3.3.1 The need for a new link road between the M54 and the M6/Birmingham Northern Relief Road (now known as the M6 Toll) was originally identified in 2001 in the West Midlands Area Multi Modal Study (Ref 3.7). This study was commissioned to review the long-term demand for travel in the West Midlands and establish a 30-year framework to deliver an integrated transport system covering all modes of travel, including cycling and walking.

3.3.2 A large number of options comprising behavioural, economic, land use policy and modal interventions were developed and appraised. This included:

- **technology alternatives:** to reduce travel demand, such as road-user pricing, and technological advances to increase home-working, video-conferencing and home shopping;
- **modal alternatives:** to reduce road capacity demand, including rail improvements, bus improvements and a network of metro lines; and
- **activity alternatives:** such as traffic calming measures, work place parking charges and green travel planning.

3.3.3 The study concluded that road, rail, Metro, bus, walking and cycling all have a role in satisfying the future demand for movement of people and goods. A significant change in travel behaviour was noted as a requirement. However, key improvements to infrastructure were still recommended as part of the integrated strategy. This included a link road between the M54 and M6/M6 Toll to improve access to and from the M54 and Telford.

3.3.4 In terms of delivery of the overall strategy an alternative Regional Transport Authority was proposed. The Regional Transport Authority role would have combined the responsibilities of the West Midland Passenger Transport Executive, some local authority and some Highways Agency (now Highways England) responsibilities. However, the study concluded that as the Highways Agency has a national remit, it was best placed for management of the strategic road network and the responsibilities should remain as they are. This same national remit remains with Highways England, and therefore the role for delivery of the Scheme has been retained.

3.3.5 Since the publication of the study report, Highways England has developed a range of alternative options to deliver the link road between the M54 and the M6/M6 Toll.

Do-Nothing and Do-Minimum scenarios

3.3.6 A Do-Nothing scenario is used to understand the performance of the existing road network without any modification in the future.

3.3.7 The Do-Minimum scenario excludes the Scheme, but includes other network improvements that are likely to be implemented. There are several other network improvements in the area that are likely to be implemented, such as improvements to the M6 and the West Midlands Rail Freight Interchange. For this reason, the Do-Minimum scenario has been modelled and assessed, and not a Do-Nothing scenario.

3.3.8 As noted in Chapter 2: The Scheme, the regional and local road network is not adequate to cope with the current high volumes of traffic which exits the motorway network to travel between the M54 and M6 Northbound and the M6 Toll. The Do-Minimum traffic forecasts predict that there would be an increased demand for these east-west travel movements in future years. The Do-Minimum scenario would lead to increased queues and journey delays on the already congested A460 (refer to the Transport Assessment Report [TR010054/APP/7.4] for more details).

Options to the east of Hilton Hall

3.3.9 These options were developed east of Hilton Hall either using the existing M6 between Junction 10a and 11, or to provide a new link road adjacent to the M6, essentially providing the missing slip roads between the M54 eastbound and M6 northbound, and M6 southbound and M54 westbound.

3.3.10 These designs were developed to make best use of the existing highway corridors associated with the M54 and M6, whilst seeking to minimise impacts on ancient woodland, The Hag Biodiversity Alert Site (BAS) and Brookfield Farm Site of Biological Importance (SBI). The alternatives developed east of Hilton Hall are shown on Figure 3.1 [TR010054/APP/6.2] and are described in Table 3.2.

3.3.11 Option C was consulted upon alongside Options A and B in 2014/2015. Option C gained the most stakeholder support at consultation, with 63% of the public showing a preference for this route (Ref 3.9). However, the appraisals demonstrated that Option C was less effective than Options A and B in delivering the Scheme Objectives because it removed less traffic and congestion from the A460.

3.3.12 Further design development was undertaken to explore additional options east of Hilton Hall. In 2017, a 'modified' route was developed (Modified Option C(E)) to position the link road adjacent to the M6. This would have resulted in significant losses of ancient woodland from Burns Wood (west), Spring Coppice and Keeper's Wood ancient woodland and SBI. Modified Option C(W) was developed as a further alternative to avoid ancient woodland. These options were consulted upon in 2017 alongside Modified Option B(W)'. The design development undertaken to address stakeholder concerns for routes west of Hilton Hall was met with support at consultation, with the responses submitted during the consultation period (through questionnaires online or paper questionnaires, or by email/letter) showing the most support for Modified Option B(W) (71%) over Modified Options C(E) and C(W) (8% and 17% respectively) (Ref 3.9).

3.3.13 In comparison to alternatives to the west of Hilton Hall, options east of Hilton Hall have relatively lower construction costs and lower potential for significant effects to the wider landscape, visual amenity, and heritage assets by using the existing highway corridor as far as possible. However, as these are relatively long routes, they do not offer the same journey time savings as routes to the west of Hilton Hall. Traffic modelling shows these alternatives present consistently lower reductions in traffic (and therefore congestion) on the A460, which also reduces air quality and noise improvements from traffic relief along the A460 and results in lower economic benefits.

Table 3.2: Options east of Hilton Hall – descriptions and appraisal

Option description:	Option appraisal:
Option C	
This option provides direct motorway standard links at M6 Junction 10a between the M54 and the M6, to and from the north. The M6 would be converted to all-lane running with no	Option C was presented at public consultation in 2014/2015 alongside Options A and B and received the most support. The environmental appraisal shows this option has low potential for impacts on landscape character, visual

Option description:	Option appraisal:
hard shoulder, and the M54 widened to a dual three lane motorway east of Junction 1. Hilton Park Services would be accessed by new slip roads. The existing M6 Junction 11 would be closed and both of the bridges demolished. New northbound slip roads would be provided to the north of the existing M6 Junction 11 in order to increase the sub-standard weaving length between Hilton Park Services and M6 Junction 11. New local connections would be provided over the M6 around Junction 11.	amenity and to heritage features by following M54/M6 corridor. However, in comparison in Options A and B, Option C would offer poor value for money, requires significant departures from standards which are of concern for road user safety and presents the greatest ecological impact as it would result in the loss and further severance of ancient woodland around Hilton Park Services (northbound). In terms of losses of agricultural land, Options A, B and C would have resulted in over 20 ha of loss of best and most versatile land. Option C would have resulted in a larger loss compared to Option A, but a smaller loss than Option B. Option C also presents the lowest reduction in noise for residents along the A460, as there would be less traffic relief along the route.
Modified Option C(E)	
The option provides a link between the M54 eastbound alongside the M6. This ties into a free flow arrangement at the M6 Toll T8 Junction and provides access to the M6 motorway in both directions. It passes to the west of Hilton Park Services (northbound). The link road crosses under a re-aligned A460 road to the west of Junction 11 (which is retained in its current form).	In 2017, Modified Option C(E) and Modified Option C(W) were developed to make improvements to the performance of Option C. Modified Option C(E) reduced the safety concerns which were inherent in Option C by removing the use of the M6. The option was presented at public consultation in 2017 alongside Modified Option C(W) and Modified Option B(W), and received the least amount of support (8%) (Ref 3.9). This was due to negative impacts on wildlife and the landscape, and impacts on the local equestrian and farming community. This option caused major concerns to Natural England, but received the support of Historic England. In comparison to Modified B(W), traffic modelling shows lower reductions in traffic (and therefore congestion) on the A460, reducing the air quality and noise improvements from traffic relief along this route. The environmental appraisal shows that Option C(E) would result in significant effects to ancient woodland, and would likely fail the NPSNN test for this because there are alternatives that result in significantly less loss of ancient woodland. In terms of loss of agricultural soils, Modified Options B(W), C(E) and C(W) all resulted in larger losses of best and most versatile land than Modified Option B(W) excluding M6 Toll (the Scheme). The option had the worst overall socio-economic impact, and presented the lowest value for money.
Modified Option C(W)	
This option provides a new link road which diverts from the M54 northwards through Hilton Park to the west of Keepers Wood. The route passes under Hilton Lane near to the current motorway overbridge and	In 2017, Modified Option C(E) and Modified Option C(W) were developed to make improvements to the performance of Option C. Modified Option C(W) reduced the safety concerns which were inherent in Option C by removing the use of the M6, and reduced the loss of ancient woodland identified with Modified Option C(E).

Option description:	Option appraisal:
proceeds northwards. North of Hilton Lane the route of Modified Option C(W) is the same as that for Modified Option C(E), passing under a re-aligned A460 to the west of Junction 11 of the M6 and linking to M6 Toll Junction T8.	Modified Option C(W) was presented at public consultation in 2017 alongside Modified Option C(E) and Modified Option B(W). Modified Option C(W) received less general support (17%) than Modified Option B(W) (71%) in terms of overall responses, but was most supported by a number of key stakeholders (Ref 3.9), including South Staffordshire Council (SSC) and local parish councils. Historic England objected to this route due to the impacts on the historic landscape, however Natural England raised no concerns with this route. The environmental appraisal concluded that Modified Option C(W) would result in similar levels of environmental effects to Modified Option B(W), with a reduced impact on landscape and visual by partially using the existing highway corridor. This option would result in less significant noise effects than Modified Option C(E), but less of the noise improvements found with Modified Option B(W). Traffic modelling shows lower reductions in traffic (and therefore congestion) on the A460 in comparison to Modified Option B(W), reducing the air quality and noise improvements from traffic relief along this route. However, in comparison to Modified Option B(W) this option presented higher socio-economic impacts and lower economic benefits than Modified Option B(W)). In terms of loss of agricultural soils, Modified Options B(W), C(E) and C(W) all resulted in larger losses of best and most versatile land than Modified Option B(W) excluding M6 Toll (the Scheme).

Options to the west of Hilton Hall

3.3.14 Options A and B make use of the same corridor west of Hilton Hall, but differ in their relative connections to the motorway network. Alternative alignments have been developed, driven by environmental constraints and stakeholder liaison, where the route passes east of Dark Lane. A full list and description of the reasonable alternatives considered for Options A and B can be found in Table 3.1.1 in Appendix 3.1 [TR010054/APP/6.3]. Alternative alignments for Hilton Lane have also been considered as discussed below.

Link road alignment east of Dark Lane

3.3.15 All of the alternative alignments for Options A and B pass to the east of the residential area of Hilton, with Dark Lane being the closest residential street to the new link road. All of the alternative alignments pass through Hilton Park (a non-designated historic park defined as historic parkland by SSC (Ref 3.8)) and have varying degrees of interaction with the Lower Pool SBI and veteran trees. All options pass to the west of Hilton Hall which is a Grade I listed building located within the vicinity of a number of other listed buildings, including another Grade I listed building, the Conservatory, and the Grade II listed building, the Coach House.

3.3.16 Eastern and western options were initially developed which either passed to the west of Lower Pool SBI close to Dark Lane (western), or passed between Lower Pool SBI and another pond (eastern). The alternative alignments in this location are shown on Figure 3.2 [TR010054/APP/6.2] and are described in Table 3.3.

Table 3.3: Options east of Dark Lane – descriptions and appraisal

Options with this alignment and description:	Distance from:		Option appraisal:
	Dark Lane receptors	Hilton Hall	
Eastern Options Options B(E) / A(E) These alternatives present an alignment that passes between Lower Pool SBI and a pond associated with Hilton Hall.	229 m from centreline[1] of carriageway to nearest property	311 m from centreline[1] of carriageway to Hilton Hall	Environmental appraisals predicted that eastern alignments would result in significant environmental effects for heritage assets through setting impacts on Hilton Hall (and associated assets). Eastern alignments would cross the surviving historic core of Hilton Park and result in the removal of the historic landscape setting, visual intrusion and noise intrusion. The routing of these options through the core of the park leaves minimal scope for mitigation through design. None of the eastern options were predicted to result in significant environmental effects in terms of air quality. Eastern options were more favourable for noise reasons as the link road would be further away from residential properties on Dark Lane and Park Road. Eastern options were predicted to give rise to significant effects on Lower Pool SBI due to habitat loss, fragmentation and isolation of the northern part. Effects on the water environment were not predicted to be significant.
Western Options Options A(W) / B(W) [which was later modified to become Modified Option B(W) and Modified Option B(W) excluding M6 Toll (the PRA alignment)]	A(W) - 30 m B(W) - 38 m from centreline[1] of carriageway to nearest property	A(W) - 314 m B(W) - 312 m from centreline[1] of carriageway to Hilton Hall	Environmental appraisals predicted significant environmental effects for heritage assets through setting impacts on Hilton Hall (and associated assets). Options would cross the western part of Hilton Park resulting in the loss of historic landscape setting and visual intrusion for Hilton Hall and (associated assets). The routing of these options through the outer portion of the park provides opportunities to reduce visual and aural intrusion, although the loss of historic landscape was predicted to remain. Western routes will bring traffic closer to properties along Dark Lane and Park Road. None of the western options were predicted to result in

[1] Distances for options identified prior to the decision on the standard of the link road (listed as the eastern and western options) are measured between the centreline of the carriageway and the closest façade of the nearest property on Dark Lane. The edge of the carriageway would be approximately 12 m closer than these distances. For the post PRA options considered around Dark Lane (B(W)1, B(W)2, B(W)3 and B(W)4), these distances are measured from the edge of the carriageway.

Options with this alignment and description:	Distance from:		Option appraisal:
	Dark Lane receptors	Hilton Hall	
These alternatives present an alignment that passes between Dark Lane and Lower Pool SBI.			significant environmental effects in terms of air quality. Although the western route is closer to the residential area of Hilton, environmental mitigation measures such as fencing would reduce the noise impact on residents. Eastern options were predicted to give rise to reduced effects on Lower Pool SBI compared to the eastern options, as there would be more reduced habitat loss, fragmentation and isolation. Effects on the water environment were not predicted to be significant, although it is noted that the western options result in the lowest amount of loss from the Lower Pool waterbody, which provides surface water attenuation.
Post-PRA Options Around Dark Lane area			
Option B(W)1 This option passes through part of the lower section of Lower Pool.	36 m from edge of carriageway[2] to nearest property	482 m from edge of carriageway[2] to Hilton Hall	The appraisal outcomes for the post-PRA options around Dark Lane are discussed beneath this table in paragraphs 3.3.23 - 3.3.30, and a review of the appraisals which have informed the decision can be found in Appendix 3.2 [TR010054/APP/6.3].
Option B(W)2 This option passes through part of the lower section of Lower Pool.	46 m from edge of carriageway[2] to nearest property	470 m from edge of carriageway[2] to Hilton Hall	
Option B(W)3 This option passes through the lower section	56 m from edge of carriageway[2] to nearest property	461 m from edge of carriageway[2] to Hilton Hall	

[2] Distances for options identified prior to the decision on the standard of the link road (listed as the eastern and western options) are measured between the centreline of the carriageway and the closest façade of the nearest property on Dark Lane. The edge of the carriageway would be approximately 12 m closer than these distances. For the post-PRA options considered around Dark Lane (B(W)1, B(W)2, B(W)3 and B(W)4), these distances are measured from the edge of the carriageway.

Options with this alignment and description:	Distance from:		Option appraisal:
	Dark Lane receptors	Hilton Hall	
of Lower Pool.			
Option B(W)4 This alignment passes through the top section of Lower Pool and to the west of the adjacent pond.	190 m from edge of carriageway[2] to nearest property	325 m from edge of carriageway[2]	
The Scheme alignment			
The Scheme alignment is based primarily on the Modified Option B(W) excluding M6 Toll (the PRA alignment) with an adjustment made post PRA in the Dark Lane area to reflect Option B(W)[2]. This final alignment passes though part of the lower section of Lower Pool in the Dark Lane area.			

3.3.17 Environmental appraisals for the Options A(E)/B(E) and Options A(W)/B(W) predicted significant environmental effects for heritage assets and biodiversity, through setting impacts on Hilton Hall (and associated assets) and the loss of habitat from Lower Pool SBI and habitat fragmentation. None of the eastern or western options were predicted to result in significant environmental effects in terms of air quality. Effects on the water environment are not predicted to be significant, although it is noted that the western options result in the lowest amount of loss from the Lower Pool waterbody, which provides surface water attenuation. Noise increases in excess of 3 dBA were predicted for both alignments, however, these were expected to be mitigatable to an acceptable level as noise barriers or bunds could be accommodated within the Scheme extents.

3.3.18 Option B(W) was identified as the option providing the best opportunity to mitigate any significant heritage effects on the historic parkland and listed buildings, in comparison to the eastern options including Option B(E) and other western options. On the basis of providing the best opportunity to mitigate environmental effects, high value for money and the best improvement for journey times and reliability over the other eastern options and the western options, Option B(W) was taken forward.

3.3.19 Prior to consultation in 2017, Option B(W) was modified (to become Modified Option B(W)) in response to the following stakeholder concerns on this route:

- Consultation with the Member of Parliament and the residents of Shareshill highlighted the perception of visual and noise intrusion where the link road would pass over the existing A460 south of the M6 Junction 11. The Scheme's vertical

alignment was amended to allow the A460 to pass over it at a similar level to existing. This also required some modifications to drainage in this area.

- Consultation in 2014/2015 identified concerns regarding the setting of listed buildings at Hilton Hall. Mitigation measures were identified including mounding / false cutting in the vicinity of Hilton Hall to reduce the impact on the setting of listed buildings at Hilton Hall.

3.3.20 Modified Options C(E) and C(W) were presented for consultation alongside Modified Option B(W) in 2017. Feedback showed a preference for Modified Option B(W). This was supported by the appraisal outcomes which showed that Modified Option B(W) would best deliver the Scheme Objectives by providing the highest value for money associated with the highest level of congestion relief for the A460, accompanied with larger reductions in air quality and noise on this road in comparison to Modified Options C(E) and C(W). Further discussion on the comparison of Modified Options C(E) and C(W) can be found in Table 3.2.

3.3.21 Prior to the PRA, changes were made to the junction arrangement with the M6. The connection to the M6 Toll Junction T8 was subject to other contributions. However, the level of contributions available was not enough to meet the cost of the free-flow link. After assessing that the Scheme still provided value for money and achieved the Scheme Objectives without the link, the Scheme was amended to provide a direct connection to M6 Junction 11 only. This resulted in Modified Option B(W) excluding M6 Toll.

3.3.22 The PRA was made in September 2018. It was decided to proceed with Modified Option B(W) excluding M6 Toll, with details as to how the new link road would connect to the M54 Junction 1 and M6 Junction 11 to be confirmed at a later date.

3.3.23 Since the PRA, a number of further alignments adjacent to Dark Lane moving the link road to the east have been developed, with the aim of improving the balance of the competing environmental impacts. A review of the appraisals which have informed the decision can be found in Appendix 3.2 [TR010054/APP/6.3]. Additional stakeholder engagement with Statutory Consultees has been undertaken to inform the final alignment at Dark Lane presented as the Scheme in this ES.

3.3.24 Whilst none of Options B(W)1-4 (refer to Table 3.3) are predicted to result in significant air quality effects, moving the alignment further away from residential receptors would offer some benefit in reducing overall exposure. Options B(W)2 and B(W)3 offer the best opportunity to do this, reducing exposure during construction and operation for the highest number of receptors. Option B(W)4 would move the carriageway further from Dark Lane, however, it moves the route closer to residents at Hilton Lane. Overall, the number of receptors likely to be exposed to changes in pollutants would be lowest with Option B(W)4, followed by Option B(W)3, Option B(W)2 and then Option B(W)1.

3.3.25 Similarly, noise impacts with the PRA route were expected to be mitigatable to an acceptable level (through the provision of noise barriers), although moving the alignment to the east offers some reduction in noise levels for these receptors. Option B(W)4 moves the noise source away from Dark Lane, but closer to properties at Hilton Lane (approximately 80 m away) with topography likely to make mitigation

ineffective. It would also be more difficult to mitigate any noise impacts for Hilton Park or Hilton Hall because the erection of a noise barrier in the historic parkland would itself have adverse landscape and heritage effects. Option B(W)2 and Option B(W)3 offer the next best opportunity to reduce noise effects for residential receptors in this location.

3.3.26 The position of Option B(W)2 within existing woodland would limit views of the Scheme using existing screening for residential receptors at Dark Lane. This would also be strengthened with additional planting. This is predicted to reduce the visual effects for these receptors from Very Large Adverse in the Year 1 of operation to Moderate Adverse by the Year 15 (the Design Year) (refer to Chapter 7: Landscape and Visual for more details). Woodland around Lower Pool is also expected to screen most views from the grounds of Hilton Hall in Year 1 of operation. Options further west would provide less opportunity to screen views from Dark Lane residences as there would be space limitations, although some screening could be retained. Option B(W)3 would likely retain more existing woodland screening towards Dark Lane than Option B(W)2, but would increase visibility of the Scheme into the historic Hilton Park area. Option B(W)4 would have greater landscape impacts than the other options, as the alignment would pass through an open area of designed parkland, affecting the landscape character of the historic landscape.

3.3.27 Option B(W)4 would allow the retention of a larger area of the Lower Pool waterbody and woodland which are features within the historic parkland area. However, following discussion with Historic England, it was concluded that the heritage value of the Lower Pool and associated vegetation is not sufficient as stand-alone assets for their retention to be favoured over the reduction in severance effects by retaining a larger area of the historic parkland intact. Option B(W)4 would encroach further into the historic parkland, would sever more of it and would be closer to the listed assets around Hilton Hall. The positioning of the link road would be more obvious at this location when viewed from Hilton Hall (and associated assets), would increase noise for receptors in Hilton Pak and would be more difficult to screen with planting without causing further disturbance to the historic landscape. Option B(W)3 is also similar in that it would be more visible from Hilton Hall (and associated assets), but landscape mitigation would reduce the impact once established. Option B(W)2 presents the best opportunity to screen views of the Scheme from heritage assets, and to maintain the historic border of the designed historic feature the Shrubbery aligned towards Hilton Hall.

3.3.28 All options result in the loss of habitat and part of the waterbody from Lower Pool SBI. Options B(W)2 and B(W)3 would result in loss of over 40% and 50% (respectively) of the waterbody, which presents an increase in flood risk, likely requiring additional land to provide additional flood compensation areas. In terms of water quality, impacts to water flows and morphology were considered likely to be mitigatable through design for all options and so all options would likely present a similar change to the water environment to the PRA alignment.

3.3.29 Option B(W)4 would result in the smallest loss of habitat from Lower Pool SBI, but it would result in habitat fragmentation likely to affect protected and notable species (including bats). Additional surveys completed in 2019 have confirmed that Option

B(W)4 would require the removal of between four to seven veteran trees outside ancient woodland which are noted by the NPSNN to be particularly valuable for biodiversity (paragraph 5.32), are identified as an irreplaceable habitat by the NPPF (paragraph 175(c)), and the loss of which should be avoided in accordance with the NPSNN (paragraph 5.32). This would be challenging to justify in the context of other options which avoid their loss and would result in a need for compensatory habitat creation and associated additional compulsory purchase of land for that habitat creation. As veteran trees are irreplaceable, this compensatory habitat creation may be significant. Option B(W)3 would result in the greatest habitat loss and fragment two large portions of woodland including mature trees. Option B(W)1 and B(W)2 would result in a small area of additional loss of habitat compared to the Baseline Option. The habitat loss resulting from Option B(W)2 would be slightly greater than Option B(W)1 and would affect fewer mature trees than the other options.

3.3.30 Overall, Option B(W)2 – moving the alignment 25m to the east from the PRA alignment – presents the best overall balance of benefits and adverse environmental effects.

Alignment of Hilton Lane

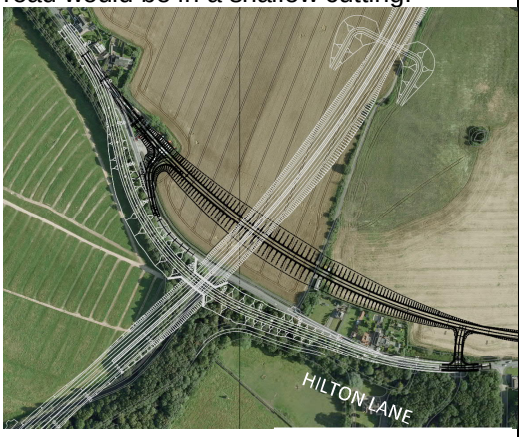
3.3.31 Alternative arrangements have been developed for Hilton Lane since the PRA in order to avoid adverse effects on a large area of woodland (known as The Shrubbery) adjacent to Hilton Lane and on the boundary of Hilton Park. It provides screening to Hilton Hall and the non-designated historic parkland. The Shrubbery forms part of the Lower Pool SBI. The alternative alignments have also been driven by an intent to reduce the impact on the existing alignment of Hilton Lane to improve safety for road users.

3.3.32 Hilton Lane is currently subject to the national speed limit (60 mph).

3.3.33 Table 3.4: outlines the alternative alignments for Hilton Lane that have been developed since the PRA.

Table 3.4: Options for the alignment of Hilton Lane developed post-PRA – description and appraisal

Option description and layout sketch:	Option appraisal:
PRA Alignment – the realignment of 700 m of Hilton Lane to the south of current location, crossing over the link road approximately 6 m above the existing road level. The new link road would be in a shallow cutting.	The option would require a large embankment for Hilton Lane, which is predicted to result in a large visual impact and perceived intensification of highway infrastructure within the landscape character. There would be loss of a significant area of woodland from the Shrubbery, which would remove screening of Hilton Lane from Hilton Hall and associated listed buildings. The embankment has potential to affect the setting of Hilton Hall and associated listed buildings. Noise effects were predicted to be significant adverse for the existing properties on Hilton Lane as a result of this design. The impact of the properties to the east of the Scheme would be mainly due to the introduction of the new link road, where as the impact on the properties to the west of

Option description and layout sketch:	Option appraisal:
	the Scheme would be due to both the introduction of the new link road as well as the increase in traffic on Hilton Lane west of Dark Lane due to the closure of Dark Lane. The realignment of Hilton Lane to the south, would help to minimise these adverse effects at some properties.
Option B(W)HL1 – the realignment of 700 m of Hilton Lane to the north of Hilton Lane, behind existing properties, crossing over the link road approximately 6 m above the current road level. The new link road would be in a shallow cutting. 	The option would require a large embankment for Hilton Lane, which is predicted to result in a large visual impact and perceived intensification of highway infrastructure within the landscape character. The northern position would result in a reduction in the loss of woodland habitat compared to the PRA alignment. The realignment of Hilton Lane would introduce a new prominent structure to the north-west of Hilton Park that has the potential to affect the setting of Hilton Hall, its associated listed buildings and the historic parkland. This option is anticipated to increase the adverse noise effect for properties along Hilton Lane as traffic would be moved from front of the properties to the more sensitive and currently much quieter rear of the properties. This alignment would require the demolition of a residential property to the west of the new link road and result in some properties becoming trapped between the old and new alignments of Hilton Lane, which would have a large impact on the setting of these properties.
Option B(W)HL2 – Reduction of the speed limit on Hilton Lane to 30 mph, to allow an increase in the vertical level over a shorter distance to pass over the new link road on a similar alignment to current design. Hilton Lane would be raised to approximately 3 m above the current road level. The new link road would be in a cutting approximately 5 m deep in the vicinity of Hilton Lane. Designs with 1:3 gradient earthworks slopes and a 70 degree gradient (with a	The lower position of the new link road would reduce the visual impact of this and also reduce the perceived increase in highway infrastructure in the area (compared to the PRA alignment). The northern position results in a reduction in the loss of woodland compared to the PRA alignment, and would help to screen the crossing from wider views. The remaining woodland would continue to provide screening of the Scheme from Hilton Hall and associated listed buildings. However, some views from the historic park to the north-west might still be affected.

Option description and layout sketch:	Option appraisal:
retaining structure) would reduce the footprint of the Scheme. 	There would be no direct impact on properties along Hilton Lane as a result of this option. In terms of noise impacts, this option is anticipated to remove the benefit of the PRA alignment of realigning Hilton Lane further away from the existing properties. However, lowering the vertical alignment of the mainline would likely be beneficial in terms of noise and visual impact to the surrounding area. A soil nailed wall was included for earthworks slopes at 70 degrees to reduce the footprint of the Scheme, loss of agricultural land (best and most versatile) and reduce visual impacts; however, a retained structure would appear out-of-character in the rolling rural landscape and would introduce hard landscaping into a rural context. It would also increase capital costs for the Scheme, therefore 1:3 gradient slopes were preferred.
Option B(W)HL3 – Retain existing Hilton Lane horizontal and vertical alignment and lower the link road in the vicinity of Hilton Lane to pass under the existing carriageway. The new link road would be in a cutting approximately 8 m deep in the vicinity of Hilton Lane. Designs with 1:3 gradient earthworks slopes and a 70 degree gradient (with a retaining structure) were developed to reduce the footprint of the Scheme. 	This option would reduce visual impacts compared to Option B(W)HL2. However, the scale of the deep cutting may be out-of-character for the area and could have an impact on the setting of Hilton Park, Hilton Hall and the associated listed buildings. Lowering the vertical alignment of the new link road is likely to be beneficial in terms of noise and visual impact to the surrounding area. The design would require a departure from standard for Hilton Lane due to the addition of a structure with the alignment geometry that poses a risk of loss of control incidents at this location. Therefore, this alignment poses an increased safety risk compared to Option B(W)HL2. Similarly to Option B(W)HL2, a soil nailed wall was included for earthworks slopes at 70 degrees to reduce the footprint of the Scheme, loss of agricultural land (best and most versatile) and reduce visual impacts; however, a retained structure would appear out-of-character in the rolling rural landscape and would introduce hard landscaping into a rural context. It would also increase capital costs for the Scheme, therefore 1:3 gradient slopes were preferred.

3.3.34 The PRA alignment would have resulted in a number of adverse impacts including the loss of a large area of woodland on the boundary of Hilton Park which forms part of Lower Pool SBI. However, it was taken forward as an indicative layout to be subject to further design iteration after PRA to reduce these impacts.

3.3.35 Option B(W)HL2 was incorporated into the design presented at statutory consultation in 2019. In comparison to the other options, it reduced the extent of realignment for Hilton Lane, and resulted in a lower vertical alignment for the new link and Hilton Lane. The lowering of the speed limit to 30 mph is appropriate for the semi-rural/semi-built up nature of Hilton Lane between the A460 and the last property along Hilton Lane. This would likely reduce noise levels along Hilton Lane in comparison to the PRA alignment. Local residents would also benefit from the visual screening of Hilton Lane from Hilton Hall due to the retention of woodland in this location. Applying the 30 mph limit to Hilton Lane would reduce the safety risk to the road user.

3.3.36 Since the statutory consultation the vertical alignment of Option B(W)HL2 has been further optimised to be more in keeping with the current levels, which would increase forward visibility for drivers that would use this route as seen on the Engineering Drawings and Sections [TR010054/APP/2.10]. The final level would be approximately 1.7 m above the existing ground level, and would require approximately 500 m of Hilton Lane to be reconstructed.

Junction arrangements

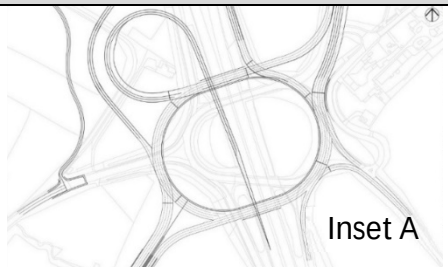
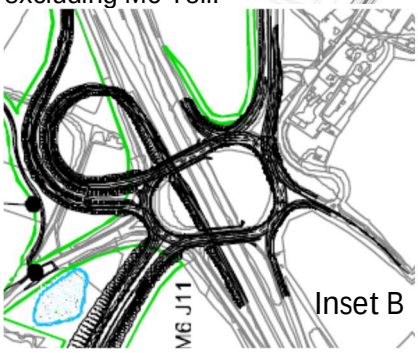
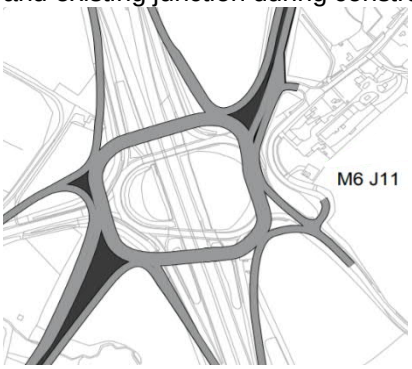
M6 Junction 11 and M6 Toll Junction T8

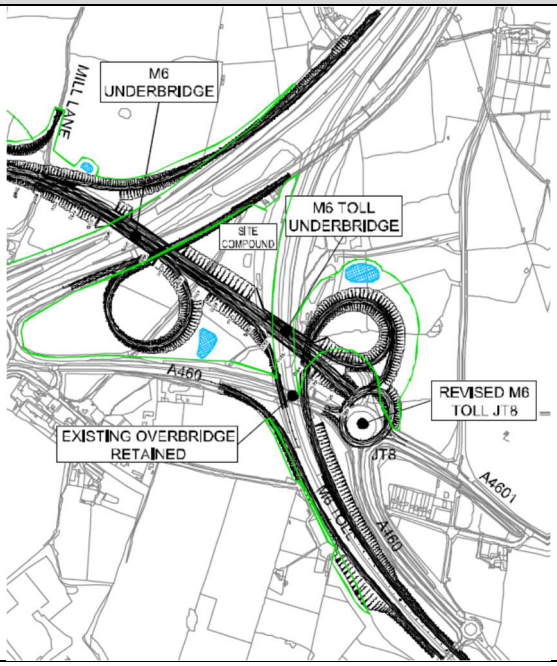
3.3.37 A variety of solutions to connect either into M6 Junction 11 or the M6 Toll Junction T8 have been developed as described in Table 3.5. The connections for each option were as follows:

- A options generally connected to M6 Junction 11 with an additional connection to the M6 Toll Junction T8;
- B options initially connected to the M6 and M6 Toll Junction T8 via free-flow links, bypassing M6 Junction 11, but later connect to the M6 Junction 11; and
- C options connected either directly to the M6 or the M6 Junction 11 (with an additional connection to the M6 Toll Junction T8).

Table 3.5: Options for M6 Junction 11 and M6 Toll Junction T8 – descriptions and appraisal

Option description and layout sketch:	Option appraisal:
M6 Junction 11 - Signalisation This option was developed for Option A, and would require the construction of two new structures parallel to the existing ones, with the junction being signalised. It would sever the connection to the A460 west of the junction, which required the inclusion of a mid-point junction at Hilton Lane. 	This layout creates a conflict between traffic turning right from the M6 northbound off slip and the flow of traffic across to the A460 westbound. This is predicted to cause congestion at the junction.
M6 Junction 11 – M6 Northbound Off-slip Loop This alternative layout (Inset A) was originally developed as an improvement on the signalised option for Option A. It would move the M6 northbound exit slip road to the north, which would then loop back to the junction from the north. This would require two new structures to be constructed, providing four lanes around the junction. The A460 west of the junction would be severed, which required the inclusion of a mid-point junction at Hilton Lane. Development was undertaken to provide an optimised solution (Inset B) which reused existing structures as far as possible. After the decision was taken to terminate the Scheme at M6 Junction 11 and the PRA was made, this alternative arrangement was initially adopted for Modified Option B(W)	The stopping up of the A460 is predicted to result in rat-running through local villages, increase in local journey times, the need for an additional junction at Hilton Lane which would have additional land take and adverse environmental impacts, and additional costs.

Option description and layout sketch:	Option appraisal:
 excluding M6 Toll. 	
M6 Junction 11 – Retaining a Connection to the A460 After the PRA, an alternative layout was developed in order to retain a connection to the A460 on the western side of the junction. The loop for the M6 northbound exit slip was removed and a connection to the A460 provided. The layout has also been developed to include new structures to provide a larger signalised junction and additional lanes to cope with future traffic predictions. This allows the construction of new layout and slip roads 'offline'; reducing disruption to the M6 and existing junction during construction. 	This option reduces land take compared to the M6 northbound off-slip loop layout by removing the loop, and need for a mid-point junction at Hilton Lane. It maintains local road connections as far as possible. The customers of the local businesses located along the A460 would have improved access to these businesses. This option is also expected to reduce rat-running compared to those arrangements where there is no connection to the A460 west of this junction.
Link to M6 Toll Junction T8 Several arrangements for providing free-flow links to the M6 and the M6 Toll Junction T8 were developed. These generally catered for strategic traffic, and required new local connections to reinstate connections to local routes such as the A462 and A460.	Options which by-passed M6 Junction 11 require additional capacity to be provided at M6 Toll Junction T8 and create longer journey times for local traffic. Alternatives such as reducing the link road to a single carriageway after the M6 connections to constrain flows were developed, however traffic modelling showed that two lanes of capacity would be required to avoid congestion

Option description and layout sketch:	Option appraisal:
	and delay. However, the option presented as Option B(W) was found to be viable and would deliver good economic benefits with no congestion issues for strategic traffic.

3.3.38 The options appraisals and consultation carried out in 2017 showed that Option B(W) (See Appendix 3.1 [TR010054/APP/6.3]) presents the best balance of environmental issues associated with alignment and junction arrangements and produces good value for money. This option presented a connection to the M6 Toll Junction T8 at public consultation.

3.3.39 The connection to the M6 Toll Junction T8 was subject to other contributions. However, the level of contributions available was not enough to meet the cost of the free-flow link. After assessing that the Scheme still provided value for money and achieved the Scheme Objectives without the link, the Scheme was amended to provide a direct connection to M6 Junction 11 only. This resulted in Modified Option B(W) excluding M6 Toll.

3.3.40 Modified Option B(W) excluding M6 Toll presents significant economic benefits and a reduction in construction costs. Removing the M6 Toll connection improves the value for money delivered by the Scheme, without additional significant environmental effects. The PRA therefore presented Modified Option B(W) excluding M6 Toll as the preferred route, with an indication that the link road would connect directly into M6 Junction 11.

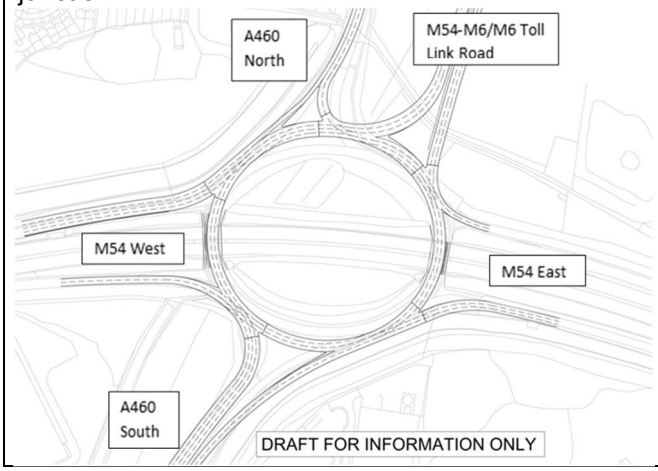
3.3.41 However, the final arrangement at the M6 Junction 11 was not presented at the PRA, as it was still subject to some development. Early options developed to connect into the M6 Junction 11 were aiming to deliver a low cost option, reusing as much of the existing junction and structures as possible. To do this safely, the A460 connection into this junction was proposed to be severed to reduce traffic volumes passing through the junction. This meant alternative local connections would need to be provided over the M6, as well as the provision of the mid-point junction at Hilton Lane.

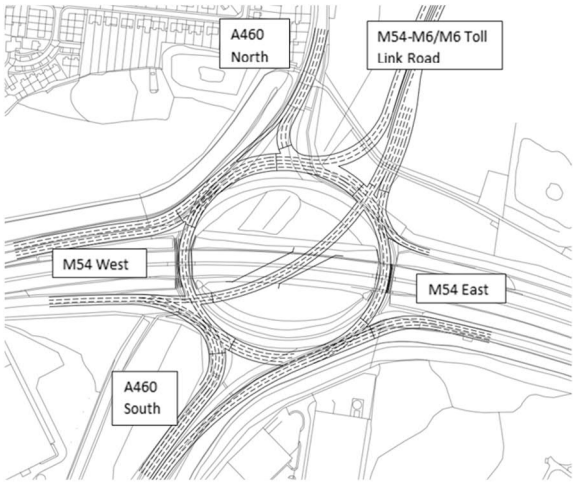
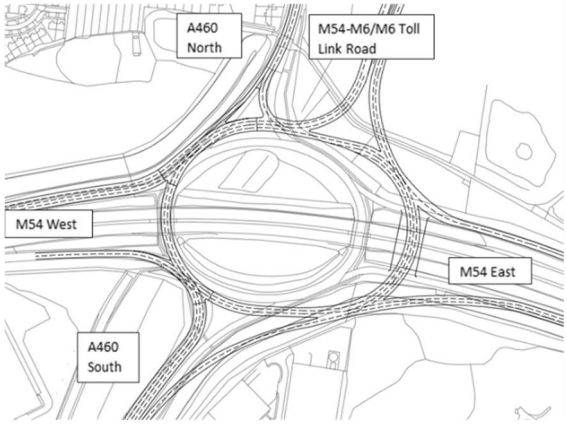
3.3.42 Since the PRA design, the proposed M6 Junction 11 layout has been revised as shown on the Engineering Drawings and Sections [TR010054/APP/2.10] to retain a connection for the A460, which would maintain local connectivity and provide sufficient capacity for predicted future traffic volumes. This has since been consulted upon as noted in the 2018 Report on Public Consultation (Ref 3.9).

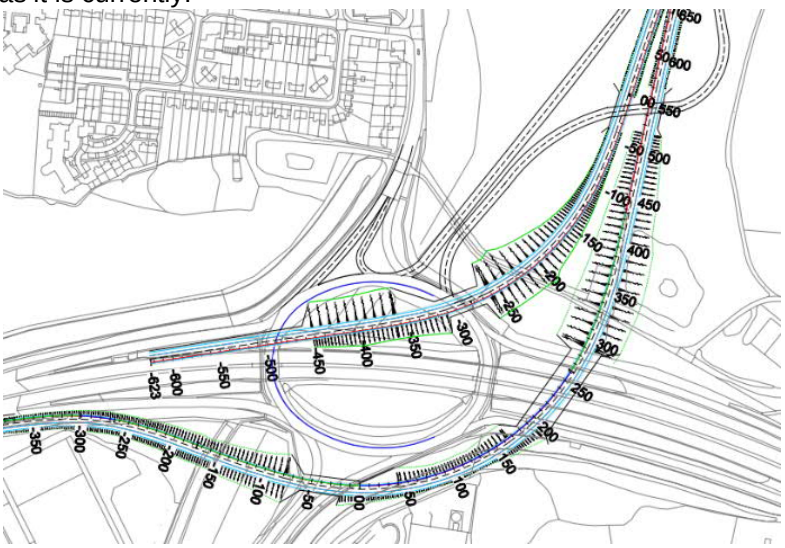
M54 Junction 1

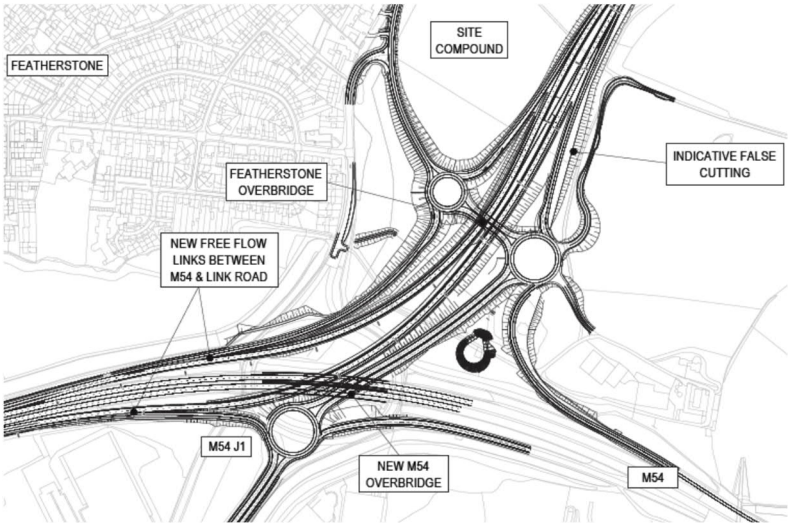
3.3.43 Since the PRA the junction arrangements for the M54 Junction 1 have been validated as described in Table 3.6. Options have ranged from simpler and less expensive modifications to the existing junction, to a replacement arrangement consisting of a series of new roundabouts and structures. Traffic modelling has indicated that there are significant economic benefits to be realised by providing a free-flow connection between the M54 and the new link road, and that options without free-flow links remove any space 'future-proofing' capacity in this junction. Therefore the inclusion of free-flow connections at this junction has been an aim of the design to support the achievement of the Scheme Objectives (Chapter 2: The Scheme).

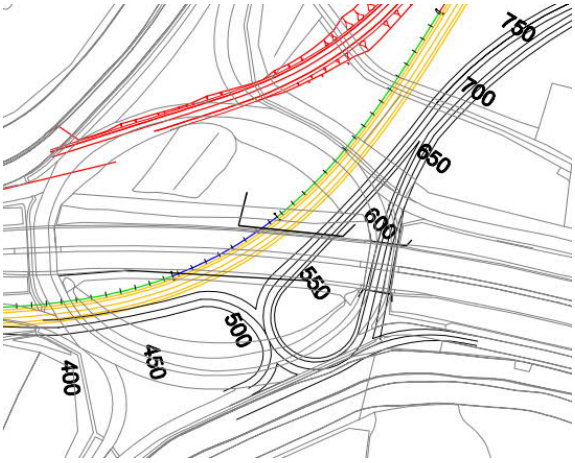
Table 3.6: Post PRA Layouts for M54 Junction 1 – descriptions and appraisal

Option description and layout sketch:	Option appraisal:
At-grade options	
At-grade signalised junction With this option the existing circulatory carriageway would be widened to provide three lanes. The main arms of the junction would be signalised, and the A460 entrance would be a 'give way' junction. This would cause delays for vehicles trying to enter the junction.  	Traffic modelling shows that a simple modification to M54 Junction 1 would not provide sufficient capacity for predicted peak traffic flows, and would provide very little additional capacity for future traffic growth predictions. In comparison to the other at-grade options, the at-grade signalised junction option did not provide the best option in the short or long term.

Option description and layout sketch:	Option appraisal:
Westbound through-lane This option would provide an at-grade through-lane to connect the M54 eastbound to the new link road northbound.  	This option was found to be feasible in that it can provide capacity to cope with peak traffic flows. The layout was found to be the best performing at-grade solution. It would result in lower construction costs than the option to extend M54 Junction 1 eastwards, and provides a similar capacity. However, this layout does not provide any free-flow movement through the junction, and therefore does not meet this design aim to provide this.
Extend M54 Junction 1 eastwards This option would retain existing structures on the western side of the junction, with a new structure built under the M54 further to the east. The new link road would connect to a modified circulatory carriageway and the existing A460 access would be re-aligned to the east to allow sufficient space to accommodate the new link road.  	This option was found to be feasible in that it can provide capacity to cope with peak traffic flows. The layout was the second best performing at-grade solution. However, due to the need to provide a new 5-lane structure under the M54, this option would require more complex and costly construction than the Westbound through-lane option. However, this layout also does not provide any free-flow movement through the junction, and therefore does not meet this design aim to provide this.

Option description and layout sketch:	Option appraisal:
Grade- separated options	
Grade-separated free-flow / Flyover junction This option would include a grade-separated link above the existing junction connecting both the M54 eastbound to the new link road northbound, and the new link road southbound to the M54 westbound. This structure would be approximately 110 m in length, and be approximately 14 m above existing ground level. The connection for the A460 into the junction would be maintained as it is currently. 	Whilst this flyover junction would provide a free-flow arrangement, it would be expected to give rise to significant visual effects due to the height of the new structure required. This option would also result in land take to the south west and east of the junction. This would result in loss of an industrial building at Hilton Cross Business Park, and potential to impact on National Trust-owned land at Moseley Old Hall including an area of ancient woodland. Overall this option is expected to be more expensive and disruptive to construct than the Scheme design due to the significant number of additional structures required.

Option description and layout sketch:	Option appraisal:
Ground-level free-flow (The Scheme arrangement) This design proposes that M54 Junction 1 is rebuilt with the existing junction no longer being retained. The new arrangement would provide free flow movements between the M54 and the new link road in both directions. The free flow links would pass through the junction underneath the M54 approximately at existing ground level. Three new smaller roundabouts connected by short dual carriageway link roads would replace the existing junction and maintain connectivity of the local road network at this location.  	This option provides free-flow links to and from the new link / M54, therefore was found to fully meet the design aim to provide a more free-flowing movement at this junction. Traffic and economic assessments indicated that although there are at-grade junction solutions that are feasible (westbound through lane and extending M54 Junction 1 eastwards); the free flow links at M54 Junction 1 provide spare 'future proofing' capacity at M54 Junction 1 and increase the economic benefits of the Scheme by approximately one-fifth. Construction of this option is anticipated to be relatively complex with the need to install two new structures under the M54. However, based on the benefits that the free-flow links would provide, accompanied by spare future capacity, it was recommended that this option be retained post-PRA.

Option description and layout sketch:	Option appraisal:
Use of existing structures This option follows a similar alignment to the 'Ground-level free-flow' arrangement, but explored an option to reuse an existing structure underneath the M54 for the southbound dual carriageway connection between the proposed roundabouts north and south of the M54. This layout would require the proposed roundabout on the A460 to the south of the M54 to be replaced with a gyratory layout as shown. 	This option would have lower construction costs compared to the Scheme junction layout as it removes the cost of constructing an additional structure. However, there would be limited visibility to the right for vehicles on the M54 exit slip road and as the dual carriageway is downhill it was predicted that there would be a significant increased risk of collisions at this location. It is predicted this layout would cause significant driver confusion and have an adverse effect on safety for road users. This option was not found to be a viable alternative to the Scheme junction layout.

3.3.44 The options considered demonstrate that simple modifications of the existing M54 Junction 1 arrangement do not provide adequate capacity for predicted traffic levels.

3.3.45 Options to introduce free-flow links at-grade and with grade separation have been developed. A flyover above the junction has been discounted due to visual impacts, impacts to business and high costs.

3.3.46 The ground-level free-flow arrangement included in the Scheme arrangement provides free-flow movements in both directions to and from the M54, and additional capacity to accommodate future traffic growth and a lower alignment to reduce visibility.

3.3.47 Since the PRA, the ground-level free-flow arrangement has been adjusted to incorporate engineered retaining structures around M54 Junction 1 to avoid the direct loss of ancient woodland at Whitgreaves Wood (noted as Oxden Leasow Wood on the Ancient Woodland Inventory) (adjacent to the westbound carriageway, west of Junction 1), avoid the loss of a tree belt which screens views of the M54 from Featherstone and allow the retention of an existing noise bund adjacent to the westbound carriageway. The bund is primarily used to protect the National Trust building Moseley Old Hall from road traffic noise. Options included re-grading the existing slopes, providing additional noise barriers on top of the bund to replace the lost height, or replacing the lost bund with a noise barrier. The chosen option has been to amend the design to provide a retaining wall at the toe of the bund, therefore keeping the remainder of the bund intact.

Mid-point junction on the new link road

3.3.48 A key feature of Option A was a mid-point junction for the new link road at Hilton Lane. This was originally proposed as a compact grade-separated junction, an example layout for this from Option A(E) is shown in Plate 3.1.

3.3.49 The need for this mid-junction was identified through traffic modelling, as a result of the stopping up for the A460 at the M54 Junction 1 or M6 Junction 11, or both. Traffic modelling shows that local connectivity would be adversely affected if the A460 did not have its existing connections into these motorway junctions. This would affect local traffic and bus routes.

3.3.50 Development of the junction arrangements as noted in the sections above have led to a design which retains local and strategic connectivity, with links for the A460 at both junctions as shown on the Engineering Drawings and Sections [TR010054/APP/2.10]. This has removed the need for a mid-point junction at Hilton Lane, which would reduce disruption to local journeys and the additional land take requirement.

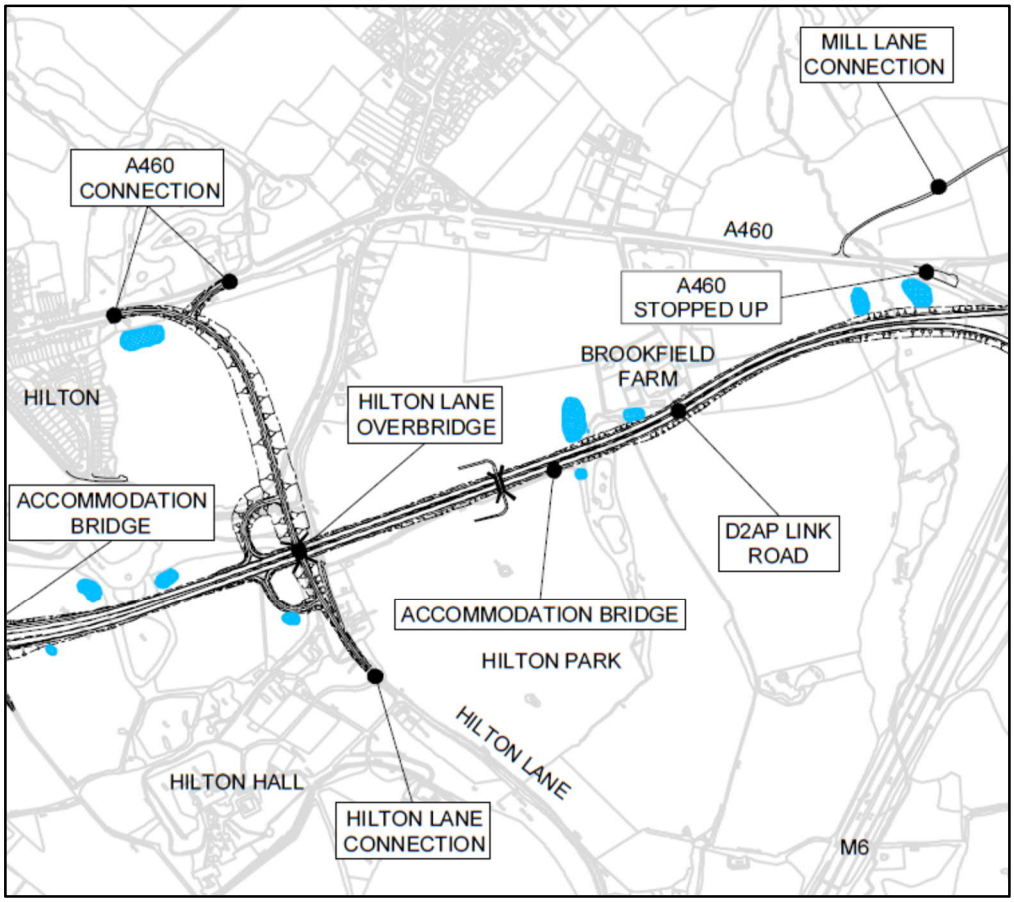


Plate 3.1: Example mid-point junction from Option A(E)

Mill Lane

3.3.51 A proposal to close Mill Lane (close to M6 Junction 11) was consulted upon at the statutory consultation in 2019 (see Appendix 3.1 [TR010054/APP/6.3]). This was introduced as an option in response to local concerns regarding rat-running and large vehicles using local roads. Consultation responses showed that whilst there were concerns for rat-running, there are also concerns regarding local access for residents and businesses. There are several businesses along Mill Lane that in the event of a closure of Mill Lane would need to divert Heavy Goods Vehicles (HGVs) through Shareshill, using roads that are less appropriate for these movements. A decision was made after the statutory consultation feedback to retain access to Mill Lane near M6 Junction 11.

The standard of the link road

3.3.52 The Scheme proposed is a dual carriageway link road to connect the two motorways.

3.3.53 The option to provide a two-lane motorway standard link road for Options B(E) and B(W) was reviewed. A motorway standard link road would be approximately 4.5 m wider than a dual carriageway, increasing the paved area by approximately 9200 m^2 (22%) and land take by approximately 1.6 ha. This would require additional land take from the Green Belt area and loss of best and most versatile agricultural land, before factoring in additional land take for larger surface water attenuation systems to cope with surface water runoff.

3.3.54 A motorway standard arrangement provides some resilience benefits, as the hard shoulder would allow traffic to flow during breakdowns or during some maintenance operations. However, it would be an unusual arrangement for a motorway to terminate at junction (in this case the M6 Junction 11). This was considered to offset the potential safety benefits for a motorway standard link road.

3.3.55 There would be additional costs in construction for a motorway standard link road, although the overall BCR would not be significantly different with either standard.

3.3.56 The dual carriageway standard has been taken forward on the basis that there were no clear safety or economic benefits in a motorway standard, and a dual carriageway would have a smaller footprint resulting in the loss of less agricultural land (best and most versatile) and lower impact on the surrounding environment.

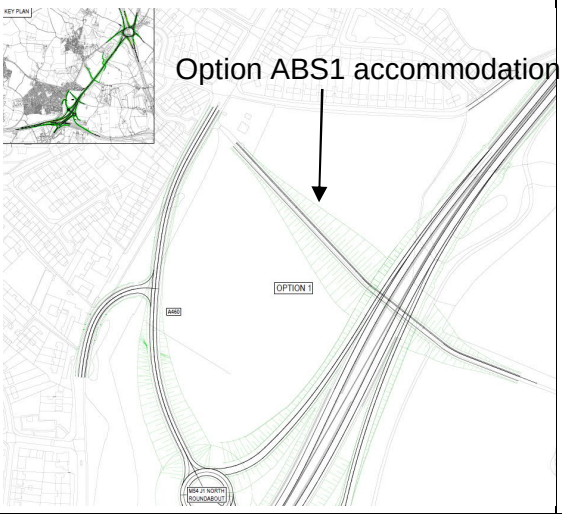
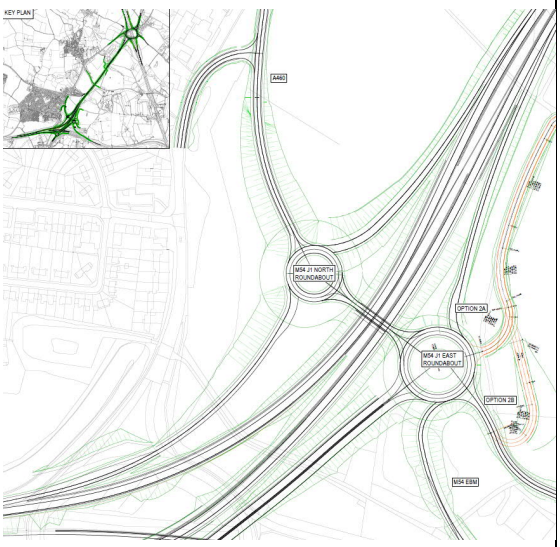
Accommodation bridge locations

3.3.57 In order to provide access where the route severs existing access, accommodation bridges were developed in two locations.

Southern accommodation bridge

3.3.58 Options were developed at the southern end of the link road, to replace an access track which currently links the A460, Hilton Hall and Tower House Farm (see Table 3.7). An alternative to the PRA design to connect the existing access track into the eastern roundabout of the new M54 Junction 1 dumbbell layout was proposed, and later adopted by the Scheme to reduce visual effects and Scheme costs.

Table 3.7: Options for the southern accommodation bridge – description and appraisal

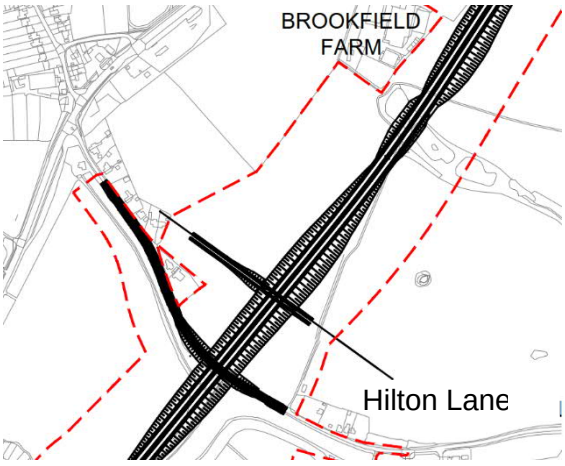
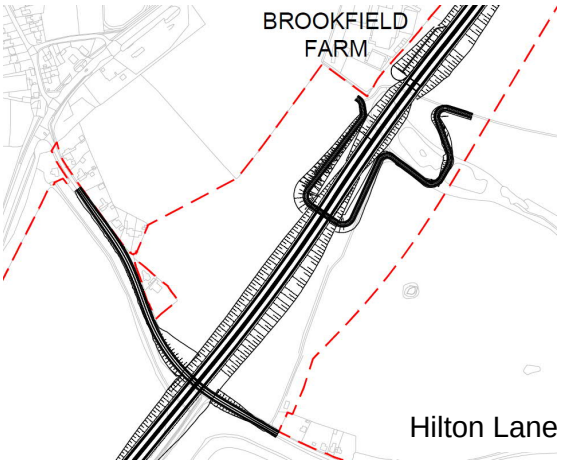
Option description and layout sketch:	Option appraisal:
Option B(W) ABS1 - The PRA design showed an overbridge of approximately 80 m in length following the route of the existing access track.  	**Appraisal:** This option would require the construction of an additional structure and require the import of additional fill material. This would introduce a new feature over the link road, and could have adverse visual effects.
Option B(W) ABS2A (The Scheme layout) – this option would connect the existing access track to the east of the new link road to the eastern dumbbell roundabout.  	**Appraisal:** In comparison to Option B(W) ABS1, there would be a reduced construction cost and reduced quantity of earthworks fill required to be imported. It would also use existing ground levels, avoiding the introduction of another feature into the landscape and result in less land take. However, this option would slightly increase a journey time for vehicle travelling from the east to the A460. It should be noted that this traffic would be light and mostly consist of people requiring access to the fishing ponds and land to the south of Hilton Hall.
Option B(W) ABS2B - this option would connect the existing track to the proposed access route leading to Tower House Farm. The layout for Option B(W) ABS2B is shown on the image for Option B(W) ABS2A above.	**Appraisal:** This option would have similar benefits to Option B(W) ABS2A. However, owing to the topography at this location, a large amount of excavation would be required to construct this access track in cutting. Therefore, the additional costs meant that Option B(W) ABS2A is likely to present better value for money.

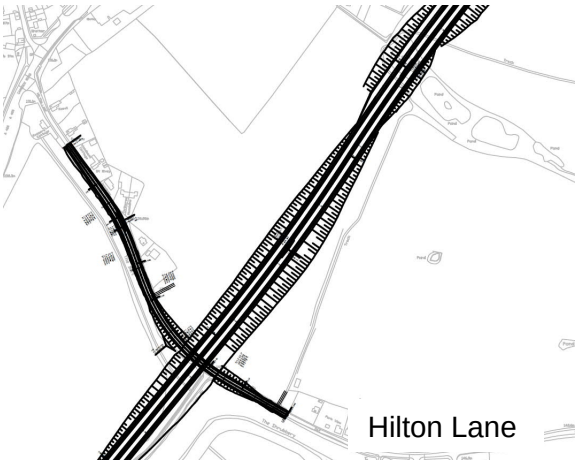
Northern accommodation bridge

3.3.59 An accommodation bridge is included as part of the Scheme to the north, to provide access where agricultural land parcels and the Public Right of Way (PRoW) Shareshill BW1 (a bridleway) is severed. Potential locations considered for this accommodation bridge are noted in Table 3.8.

3.3.60 All options would result in additional journey length (based on a journey from Cheslyn Hay School to Shareshill Post Office), however Option B(W) ABN2 presents the shortest diversion at a 703 m (15.5%) extension. Option B(W) ABN2 would also minimises the impact for agricultural landowners, posing the least disruption to field boundaries.

Table 3.8: Options for the northern accommodation bridge – descriptions and appraisal

Option description and layout sketch:	Option appraisal:
Option B(W) ABN1 (PRA position) - an overbridge across the new link road where the road is at its deepest point in cutting to reduce visual intrusion.  	This option results in a lengthening of Shareshill BW 1 by 766 m (16.95%). Landowners would have to disrupt existing field boundaries to access the bridge.
Option B(W) ABN2 (The Scheme position) - an overbridge in the vicinity of Brookfield Farm, utilising the existing access tracks.  	This option would result in a lengthening of Shareshill BW 1 by 703 m (15.57%). The option would make use of existing access tracks, reducing impact on field boundaries for landowners.

Option description and layout sketch:	Option appraisal:
Option B(W) ABN3 - utilising the new Hilton Lane bridge to provide an access track to the severed land, instead of a separate accommodation bridge.  	This option would result in a lengthening of Shareshill BW 1 by 912 m (20.42%), however it would reduce the amount of construction required. Agricultural equipment would start using Hilton Lane for access over the link road, which could cause some intrusion for properties on Hilton Lane. This could result in operational issues with agricultural machinery using Hilton Lane with live traffic.
Underpass – an underpass was requested by landowners.	Landowners have requested an underpass, rather than a bridge, be provided. However, this was on the assumption that the road would be elevated. The design for the Scheme has the road in cutting at this location, therefore an underpass would need to be very deep, and the nearby ponds would pose a flood risk.

Structure over Latherford Brook

3.3.61 The Latherford Brook is a tributary of Saredon Brook and is designated under the Water Framework Directive (WFD) as 'Saredon Brook from Source to River Penk' (GB104028046740) within the Humber River Basin District. Full details can be found in Chapter 13: Road Drainage and the Water Environment. The Scheme must not cause deterioration of any relevant WFD parameter or prevent the watercourse reaching its future WFD objectives.

3.3.62 The Scheme crosses the Latherford Brook near M6 Junction 11 and would therefore have some impact on the morphology of this waterbody. Initial proposals were to install a culvert under the Scheme to contain the brook. Flood risk modelling showed the minimum size for the culvert would be 3 m x 3 m. Through additional survey and assessment work it was confirmed that a culvert solution of this size would risk non-compliance with the WFD due to adverse effects on the morphology and ecology of the brook. A width of at least 10 m is required to accommodate the primary channel with minimal modification to geometry. Ecological surveys also confirmed a need to provide mammal ledges within any crossing, which would increase the height of a culvert to 750 mm above the highwater level. The Environment Agency has also confirmed that any culvert would need to be buried 600 mm below the current bed level to ensure a 'naturalised' replacement bed can be provided.

3.3.63 These minimum requirements could be provided with a wide culvert. However, the scale and costs of such a structure would not be significantly different to the provision of a single span (bridge) across the Latherford Brook. A bridge structure has therefore been included in the Scheme design for this reason as described in Chapter 2: The Scheme. This would reduce the direct impacts on the watercourse during construction and provide better ecological connectivity. Mammal ledges would be built into the design of this structure.

Culvert design at M54 Junction 1

3.3.64 The design for the Scheme and M54 Junction 1 crosses a watercourse close to Tower House Farm. This is an ordinary watercourse, which is currently culverted underneath the A460. Discussions have been held with the Lead Local Flood Authority (LLFA) and the Environment Agency regarding this watercourse. Permitting for this watercourse will come from the LLFA; Staffordshire County Council.

3.3.65 The design includes a culvert of approximately 182 m in length under the Scheme, with a separate mammal crossing. These are provided separately as there is not sufficient vertical space under the road to provide the additional height in the culvert. As noted in sections above, the layout of the road and the junction has been developed to be as low as possible within the landscape.

3.3.66 During the course of design development, the provision of two culverts with a daylighted section in between was discussed as a potential alternative to reduce impacts on water quality and biodiversity. However, access for cleaning/ maintenance was deemed to be unsafe. Therefore, a single culvert has been proposed for this location.

Input alternatives

Alternative materials

3.3.67 Details on specific alternative materials and likely sources have not been considered at this stage. The main construction materials for the Scheme are expected to be concrete, aggregate, asphalt, soils (see paragraphs 3.3.70 - 3.3.72) and steel.

3.3.68 For aggregates, the Scheme would set a target of 27% use of secondary and recycled aggregates, for those applications where it is technically and economically feasible to substitute these alternative materials for primary aggregates. This target is in accordance with the regional guidelines for the West Midlands, given the location of the Scheme (relatively close to large sources of secondary and recycled aggregate) it is possible to achieve this target in practice.

3.3.69 Alternative materials would be considered in further detail at the detailed design stage. A commitment is made within the Outline Environmental Management Plan (OEMP) [TR010054/APP/6.11] such that the main works contractor will explore recycled or secondary sourced materials, and materials with a low lifecycle embedded carbon and water consumption.

Soils cut and fill balance – vertical alignment iteration

3.3.70 Initial assessments for the Scheme as presented at statutory consultation (Appendix 3.1 [TR010054/APP/6.3]) showed a materials deficit of approximately 90,000 m^3 of material, excluding materials required or released through environmental mitigation, for example false cuttings, bunds, flood compensation areas and pond creation. In order to construct the Scheme, this amount of material would have been imported from within the West Midlands region to minimise travel distances.

3.3.71 However, the design adjustments noted in this chapter have driven the vertical alignment lower to reduce other environmental impacts. The vertical alignment has generally been reduced by a further 0.5 m lower than that presented at statutory consultation. As a result of this minor change, the Scheme does have a slightly larger land take, however there are some visual benefits.

3.3.72 With the inclusion of this adjustment and environmental mitigation requirements in the design, the overall cut and fill balance has changed to an excess of 138,695 m^3. The project design team aim is to achieve a cut-fill balance, however predicted cut and fill for the Scheme is likely to be imbalanced and disposal of material will be required.

3.3.73 The mitigation measures noted in Chapter 10: Material Assets and Waste would help to reduce this deficit further, and ensure that material is segregated for reuse on or offsite wherever possible.

Lighting and signage strategy

3.3.74 The current design does not provide any lighting on the main line of the new link road, except where there is a transition around junctions.

3.3.75 The NPPF states that development should *"limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation"* (paragraph 180(c)). The main reasons for not including lighting are the location of the Scheme in an intrinsically dark area of Green Belt located within the non-designated historic landscape associated with Hilton Hall, lighting would be expected to have a visual impact on the surrounding area, and would also affect local protected species, including bats. Lighting would also increase the carbon footprint of the Scheme in operation, energy requirements and maintenance requirements.

3.3.76 Slip roads and junctions would be lit only.

Mitigation alternatives

3.3.77 The landscape design for the Scheme has been developed since the PRA and has been an iterative process based on stakeholder feedback, the outcomes of the assessment and the need for mitigation. For this reason, discrete alternative mitigation proposals have not been developed as part of the process.

3.3.78 As described in Chapter 2: The Scheme, the approach has been to provide a design in keeping with the local landscape characteristics, whilst incorporating visual screening and replacement habitats to mitigate the effects of the Scheme. The development of the design has seen a few iterations developed in relation to:

- the location of ponds which would be provided to offset the direct loss of waterbodies, and to provide habitat for protected species; and
- the location of woodland planting which would be provided to compensate for the loss of woodland, including ancient woodland at Brookfield Farm SBI.

New pond locations

3.3.79 New ponds for drainage attenuation and ecological mitigation would be provided as part of the Scheme. The design of these ponds was initially developed as large single ponds, but in the interests of providing a design more fitting of the character of the area, smaller ponds have been designed in several locations as shown on the General Arrangement Plans [TR010054/APP/2.5] and the Environmental Masterplan Figure 2.1 to 2.7 [TR010054/APP/6.2]. The final layout and locations were determined in discussion with landowners.

Woodland planting

3.3.80 The Scheme would result in the loss of woodland, including some ancient woodland within the Brookfield Farm SBI and Whitgreaves Wood. Woodland planting for ancient woodland compensation should be near to existing ancient woodland sites, improve existing connectivity or extend existing sites. Therefore, the design has located this adjacent to Brookfield Farm SBI, south of the M6 Junction 11, providing connectivity to the Brookfield Farm SBI and a screening function for the Scheme. This would include additional woodland planting for the creation of wet woodland which would also offset the loss of part of the SBI.

3.3.81 The same principle has been applied for the mitigation of lost woodland habitat from Lower Pool SBI. The potential to provide this new planting to the east of the new link road was explored during the development of the landscape design. However, due to the presence of the designed landscape of Hilton Park and the Shrubbery which is a feature of the historic parkland, on the eastern side of the link, any additional planting would result in adverse effects on these receptors. In turn, the parkland also forms the setting of the Grade I Hilton Hall and associated buildings. The fields identified for pond creation, grassland and woodland planting to the south of Dark Lane and the north of Park Road would provide screening for the residents of this area and is a direct connection / continuation of the Lower Pool SBI woodland habitat. This would replace foraging habitat for bats and other species using Lower Pool SBI.

3.3.82 The Scheme would also infill isolated parcels of land around M54 Junction 1 the southern end of the A460 with woodland, wet grassland, marsh, ponds and a hedgerow with trees to provide screening, replace lost habitat and strengthen landscape integration of road infrastructure.

3.3.83 In response to statutory consultation feedback in 2019 (Ref 3.9), the planting proposals for providing species rich grassland on the embankment verges at M6 Junction 11 as was shown in the Preliminary Environmental Information (PEI) Report (Ref 3.10) were reviewed. The possibility of providing heathland planting was explored, however borehole testing results indicate that the soil is neutral to slightly alkaline. This is at odds with the acidic conditions preferred by heathland. In addition, the fertility of the soil on site is shown as ‘moderate’ as per Soilscape 18

(http://www.landis.org.uk/soilscapes/), whilst heathland prefers areas of low fertility. Therefore, it is not considered that the area around Junction 11 of the M6 is appropriate for heathland habitat, and species-rich grassland has been shown on the Environmental Masterplans (Figure 2.1 to 2.7 [TR010054/APP/6.2]) in this location.

Scheduling alternatives

Construction programme

3.3.84 The outline construction programme has been developed to identify the main phases of construction between 2021 and 2024 (see Chapter 2: The Scheme). The programme at this stage is not sufficiently detailed to show every construction activity, however the general approach to construction and timings for works has been influenced by the outcomes of the environmental assessment and mitigation requirements. This means that discrete alternative programmes have not been developed at this stage.

3.3.85 As is good practice the following recommended mitigation from the environmental assessment would be incorporated into the detailed construction programme as noted in the OEMP [TR010054/APP/6.11]:

- Early undertaking of a programme of archaeological mitigation.
- Restricting vegetation clearance to outside the bird breeding season (February to August, inclusive) where possible.
- Restricting tree pruning works to the optimum period between November to February and July to August (subject to the presence of protected species) where possible.
- Restricting works to ponds and running waterbodies to outside the seasonal spawning and nursery timings of those first present.

Construction compound locations

3.3.86 As noted in Chapter 2: The Scheme, two suitable compound locations have been identified. These have been identified on the basis of:

- The proximity to the works area to avoid unnecessary use of the local road network by site traffic.
- Proximity to utility supplies generally (telecoms, power, water and mains sewer) to avoid major diversions of supplies.
- A reasonably flat area of land of sufficient size.
- Land not in any environmentally designated area.
- Land is currently not subject to constraints such as planning or environmental restrictions.
- Land of low agricultural value.
- Located in areas that would minimise the impact on local residents.

3.3.87 These locations were identified in the design within the PEI Report (Ref 3.10) which was prepared for statutory consultation. Since this point, the compound layout and optimum use of the space available has refined the areas of land likely to be required to reduce effects on field margins. The compound to the west of the M6 Junction 11 would be the main compound, as it is the furthest away from residential areas and provides excellent access to the motorway network. A secondary site compound would be located north of the M54, positioned as far away from the existing A460 as possible to minimise any potential nuisance to the residents of Featherstone and Hilton.

3.4 Justification for chosen option

3.4.1 As discussed in Section 3.3, in order to identify the final design for the Scheme, each element of the Scheme and environmental sensitivities has been considered. This has resulted in a Scheme which provides optimum route and design which:

- limits the loss of ancient woodland on the ancient woodland inventory and ecological habitat losses, and avoids the loss of veteran trees;
- balances the adverse impacts on sensitive residential areas from operational noise with a need to protect the historic character of the area;
- provides a high level of congestion relief for the A460, A449 and A5 (and benefits in terms of noise reductions and improved air quality for residents nearest the A460 Cannock Road), whilst maintaining good local connectivity;
- provides the shortest journey time and the highest benefit to the local economy; and
- has responded to consultation feedback in terms of alignment, design and mitigation to provide a balance between the Scheme objectives and all environmental, social and economic impacts.

3.5 References

Ref 3.1 Highways England (2019) Design Manual for Roads and Bridges (DMRB) Volume 11, Section 2, Part 4 (LA 104) Environmental Assessment and Monitoring

Ref 3.2 The Infrastructure Planning (Environmental Impact Assessment) 2017 Regulations

Ref 3.3. Department for Transport (2014) National Policy Statement for National Networks. Available online at: www.gov.uk/government/publications

Ref 3.4 Department for Transport (DfT) WebTAG methodologies. Available online at: https://www.gov.uk/guidance/transport-analysis-guidance-webtag

Ref 3.5 Highways England (2019) Design Manual for Roads and Bridges Volume 11

Ref 3.6 Highways England Interim Advice Notes (various). Available online at: http://www.standardsforhighways.co.uk/ha/standards/ians/index.htm

Ref 3.7 Government Office for the West Midlands (2001) West Midlands Area Multi Modal Study. Available online at: https://www.gov.uk/government/publications/west-midlands-area-multi-modal-study

Ref 3.8 South Staffordshire Council (2012) A Local Plan for South Staffordshire: Core Strategy Development Plan Document

Ref 3.9 Highways England (2018) Report on Public Consultation

Ref 3.10 Highways England (2019) Preliminary Environmental Information Report