M60/M62/M66 Simister Island Interchange

TR010064

ENVIRONMENTAL STATEMENT

CHAPTER 3 ASSESSMENT OF ALTERNATIVES

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Planning Act 2008

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

M60/M62/M66 Simister Island Interchange

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ENVIRONMENTAL STATEMENT
CHAPTER 3 ASSESSMENT OF ALTERNATIVES

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CONTENTS

LIST OF PLATES

LIST OF TABLES

3 Assessment of alternatives

3.1 Introduction

3.1.1 Schedule 4 (2) of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the 'EIA Regulations') states that an Environmental Statement must provide a *'description of the reasonable alternatives (for example in terms of development design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects.'* This chapter outlines the alternative design options that have been considered during the development of the Scheme.

3.2 Assessment methodology

3.2.1 The options appraisal process is summarised below:

- **Strategy, shaping and prioritisation (Stage 0):** At this stage initial analysis and appraisal are conducted to assess the viability of transport scheme solutions to the problem (see Section 3.3 of this chapter for further details).
- **Options identification (Stage 1):** At this stage traffic modelling and economic and environmental assessment is undertaken on a number of options. The objective of this stage is to identify which options to take forward to options consultation with the public (see Section 3.3 of this chapter for further details).
- **Option selection (Stage 2):** At this stage the public are consulted on the recommended options from Stage 1. Refinements are then made to the option designs, traffic modelling and economic and environmental assessments following feedback from the consultation. At the end of this stage a Preferred Route Announcement (PRA) is made to announce the decision on which option to progress (see Section 3.3 of this chapter for further details).
- **Preliminary design (Stage 3):** This stage involves developing the preferred option to the required level for undertaking an Environmental Impact Assessment (EIA) and applying for a Development Consent Order (DCO), if required. Alternative ways of delivering the preferred option have been explored throughout this stage (see Section 3.4 of this chapter for further details).

3.3 Reasonable alternatives studied

Strategy, shaping and prioritization – Stage 0

Initial improvement options identified

3.3.1 A package of improvements was considered to provide potential resolution to the congestion at M60 J18 based on the following:

- A free flow link between the anti-clockwise M60 and eastbound M62.
- Roundabout gyratory improvements to provide additional capacity for other movements.
- Lengthening the free flow link between the M66 and M62.
- Lengthening the M60 westbound entry slip road.
- A package of additional signage and technology.
- Other free flow movements that would address the junction congestion issues.

3.3.2 A total of 148 improvement options, formed from different combinations of 30 highway elements, were identified to provide potential resolution to the congestion at M60 J18.

3.3.3 A Preliminary Environmental Risk Assessment (PERA) was undertaken, but given the very large number of options, and that despite the number of options they were all within the same very restricted geographical area and as such the environmental context for the risk assessment was essentially the same, a single PERA was undertaken for the improvement scheme as a whole, not a separate PERA for each individual option. The detailed impacts of the Scheme would vary depending upon exactly which option was assessed and the resulting changes to traffic flows and volume, therefore the risk assessment adopted a worst-case scenario approach.

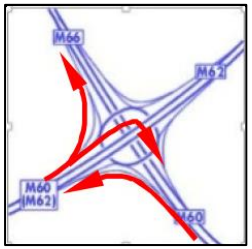
3.3.4 The PERA concluded that it was possible that there could be significant air quality impacts, associated with increased concentrations of nitrogen dioxide (NO_2) at receptors already experiencing very high concentrations, and that the mitigation measures required to address air quality, noise and landscape issues may exceed the planned programme and budget.

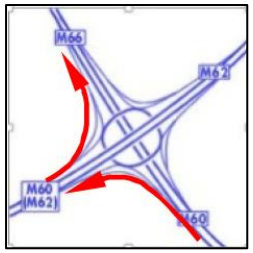
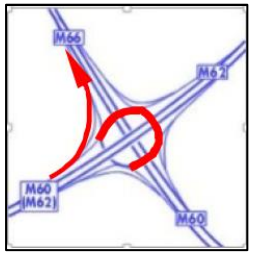
Sifting to eleven options

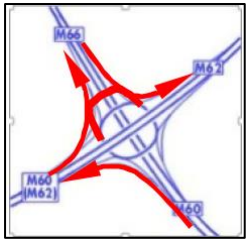
3.3.5 A sifting process was then undertaken which reduced the number of options to be considered at a Value Management Workshop in October 2015 to eleven. Providing a free flow link between the anti-clockwise M60 and eastbound M62 and lengthening the free flow link between the M66 southbound and M62 eastbound would only cater for some of the lowest turning movements at M60 J18 and so all except one of the options including these elements, were discarded.

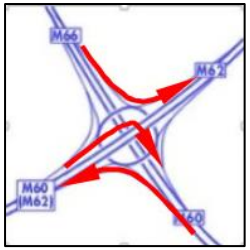
3.3.6 An Early Assessment and Sifting Tool (EAST) was completed for each of these eleven options. EAST is a decision tool developed to quickly summarise and present evidence on options in a clear and consistent format. It provides decision makers with relevant, high level information, including a 'local environment' rating, to help them to form an early view on how options perform and compare. Traffic modelling data was not available at the time that the tool was completed, therefore a worst-case scenario, with no improvement in noise levels or air quality, was assumed for all options. The eleven options considered are listed in Table 3.1, together with the local environmental rating and considerations identified in the EAST for each one.

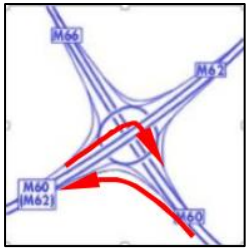
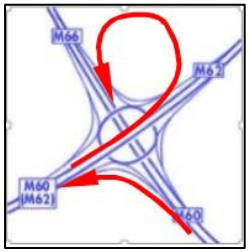
Table 3.1 Options presented at the Value Management Workshop in October 2015

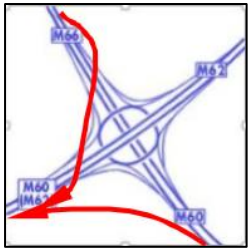
Option number	Option name	Option schematic	Brief description	Local environment rating and considerations (from the EAST)
003	Eastbound (EB) to Northbound (NB) Slip Amendments, EB to Southbound (SB) 3-lane Gyratory Improvement, NB to Westbound (WB) Free flow Link Amendment		The option combines upgrading the existing M60 mainline between J17-18 to 5 lane smart motorway (SM) all lane running (ALR), on the M60 eastbound approach to J18 an alternative double lane drop diverge layout would allow a free flow link to the M66 northbound carriageway in addition to a dedicated connection to the existing J18 gyratory. The gyratory would be upgraded to include a further structure over the M66 (confined within the existing gyratory). The new structure would allow a new 3 lane section to allow for traffic travelling from the eastbound on the M60 to southbound on the M60. The new junction would introduce a three phase set of traffic lights. The option also provides an improved link connecting the M60 northbound to the M60 westbound. The solution would include a two lane merge onto the mainline, seeking to maximise the free flow capacity of the junction.	Red/Amber rating • Any changes in noise or air quality are likely to be at a few properties only, not widespread changes. • Option is within an Air Quality Management Area (AQMA) and Noise Important Area (NIA). • Negative impacts on natural and urban environment associated with visual impact of new structures, potential impacts on unknown archaeology outside of highway boundary, impacts on Cowl Gate Farm and loss of agricultural land.

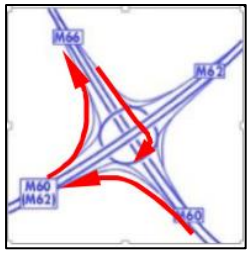
Option number	Option name	Option schematic	Brief description	Local environment rating and considerations (from the EAST)
010	EB to NB Slip Amendments, NB to WB Free flow Link Amendments		The option combines upgrading the existing M60 mainline between J17-18 to 5 lane SM-ALR, on the M60 eastbound approach to J18 an alternative double lane drop diverge layout would allow a free flow link to the M66 northbound carriageway in addition to a dedicated connection to the existing J18 gyratory. In addition the option provides an improved link connecting the M60 northbound to the M60 westbound. The solution would include a two lane merge onto the mainline, seeking to maximise the free flow capacity of the junction.	Red/Amber rating • Any changes in noise or air quality are likely to be at a few properties only, not widespread changes. • Option is within an AQMA and NIA. • Negative impacts on natural and urban environment associated with potential impacts on unknown archaeology outside of highway boundary, impacts on Cowl Gate Farm and loss of agricultural land.
013	EB to NB Slip Amendments, Gyratory Improvements		The option combines upgrading the existing M60 mainline between J17-18 to 5 lane SM-ALR, on the M60 eastbound approach to J18 an alternative double lane drop diverge layout would allow a free flow link to the M66 northbound carriageway in addition to a dedicated connection to the existing J18 gyratory. The existing gyratory would be upgraded to accommodate 5 lanes through the junction. This would involve widening the existing two overbridges and reducing the lane widths through the junction.	Red/Amber rating • Any changes in noise or air quality are likely to be at a few properties only, not widespread changes. • Option is within an AQMA and NIA. • Negative impacts on natural and urban environment associated with potential impacts on unknown archaeology outside of highway boundary, impacts on Cowl Gate Farm and loss of agricultural land.

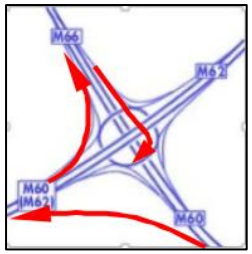
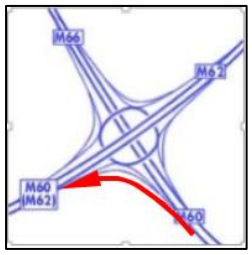
Option number	Option name	Option schematic	Brief description	Local environment rating and considerations (from the EAST)
014	EB to NB Slip Amendments, Gyratory Extension, SB to EB Slip Amendments, NB to WB Free flow Link Amendments		The option combines upgrading the existing M60 mainline between J17-18 to 5 lane SM-ALR, on the M60 eastbound approach to J18 an alternative double lane drop diverge layout would allow a free flow link to the M66 northbound carriageway in addition to a dedicated connection to the existing J18 gyratory. The existing gyratory would be extended to increase the capacity (particularly stacking space for M60 EB to M60 SB movement). The existing entries onto the gyratory would be modified to accommodate the movement, the north and east sections of the gyratory would be four lanes and the south and west sections of the gyratory would be five lanes. The junction would be fully signalised. A dedicated left hand free flow link would be provided connecting the M66 southbound with the M62 eastbound, comprising a lane drop lane gain arrangement. In addition the option provides an improved link connecting the M60 northbound to the M60 westbound. The solution would include a two-lane merge onto the mainline, seeking to maximise the free flow capacity of the junction.	Red/Amber rating • Any changes in noise or air quality are likely to be at a few properties only, not widespread changes. • Option is within an AQMA and NIA. • Negative impacts on natural and urban environment associated with loss of land designated as Area of Special Landscape Value, visual impact of new structures, potential impacts on great crested newts, potential impacts on unknown archaeology outside of highway boundary, large impacts on (or loss of) Cowl Gate Farm, severance of public right of way and loss of agricultural and golf course land.

Option number	Option name	Option schematic	Brief description	Local environment rating and considerations (from the EAST)
055	EB to SB 3-lane Gyratory Improvement, SB to EB Slip Amendments, NB to WB Free flow Link Amendments		The option combines upgrading the existing M60 mainline between J17-18 to 5 lane SM-ALR. The gyratory would be upgraded to include a further structure over the M66 (confined within the existing gyratory). The new structure would allow a new 3 lane section to allow for traffic travelling from the eastbound on the M60 to southbound on the M60. The new junction would introduce a three-phase set of traffic lights. A dedicated left hand free flow link would be provided connecting the M66 southbound with the M62 eastbound, comprising a lane drop lane gain arrangement. The option also provides an improved link connecting the M60 northbound to the M60 westbound. The solution would include a two-lane merge onto the mainline, seeking to maximise the free flow capacity of the junction.	Red/Amber rating • Any changes in noise or air quality are likely to be at a few properties only, not widespread changes. • Option is within an AQMA and NIA. • Negative impacts on natural and urban environment associated with loss of land designated as Area of Special Landscape Value, visual impact of new structures, potential impacts on great crested newts, potential impacts on unknown archaeology outside of highway boundary, severance of public right of way and loss of agricultural and golf course land.

Option number	Option name	Option schematic	Brief description	Local environment rating and considerations (from the EAST)
060	EB to SB 3-lane Gyratory Improvement, NB to WB Free flow Link Amendments		The option combines upgrading the existing M60 mainline between J17-18 to 5 lane SM-ALR. The gyratory would be upgraded to include a further structure over the M66 (confined within the existing gyratory). The new structure would allow a new 3 lane section to allow for traffic travelling from the eastbound on the M60 to southbound on the M60. The new junction would introduce a three-phase set of traffic lights. The option also provides an improved link connecting the M60 northbound to the M60 westbound. The solution would include a two-lane merge onto the mainline, seeking to maximise the free flow capacity of the junction.	Red/Amber rating • Any changes in noise or air quality are likely to be at a few properties only, not widespread changes. • Option is within an AQMA and NIA. • Negative impacts on natural and urban environment associated with visual impact of new structures and potential impacts on unknown archaeology outside of highway boundary.
103	EB to SB loop NE of Junction, NB to WB Free flow Link Amendment		The option combines upgrading the existing M60 mainline between J17-18 to 5 lane SM-ALR. The route provides a loop road in the northwest quadrant of J18. Three structures are required to take the route over the gyratory and M66 mainline, and the diverge from the M66 southbound mainline would require realignment. The option also provides an improved link connecting the M60 northbound to the M60 westbound. The solution would include a two-lane merge onto the mainline, seeking to maximise the free flow capacity of the junction.	Amber rating • Any changes in noise or air quality are likely to be at a few properties only, not widespread changes. • Option is within an AQMA and NIA. • Negative impacts on natural and urban environment associated with potential impacts on unknown archaeology outside of highway boundary.

Option number	Option name	Option schematic	Brief description	Local environment rating and considerations (from the EAST)
118	SB to WB Free flow Bypass, NB to WB Free flow Long Bypass		The option combines upgrading the existing M60 mainline between J17-18 to 5 lane SM-ALR. A two-lane free flow link would be provided connecting the M66 southbound traffic with the M60 westbound merge. A further free flow link would be introduced to connect M60 northbound traffic with M60 westbound traffic. The route would cross through an underpass beneath Simister lane (subject to maintaining minimum headroom). Following the merge of the two link roads, the three-lane section would reduce to become a two-lane gain on the M60 westbound mainline.	Red/Amber rating • New bypasses move traffic closer to receptors, screening effect of embankment on noise from main carriageway is unknown without modelling. • Option is within an AQMA and NIA. • Negative impacts on natural and urban environment associated with loss of land designated as Area of Special Landscape Value, visual impact of new structures and embankments, potential impacts on great crested newts, potential impacts on unknown archaeology outside of highway boundary, large impacts on Cowl Gate Farm, severance of public right of way and loss of agricultural and golf course land.

Option number	Option name	Option schematic	Brief description	Local environment rating and considerations (from the EAST)
122	SB to WB Off-slip and Gyratory Amendments, NB to WB Free flow Link Amendments, EB to NB Slip Amendments		The option combines upgrading the existing M60 mainline between J17-18 to 5 lane SM-ALR, on the M60 eastbound approach to J18 an alternative double lane drop diverge layout would allow a free flow link to the M66 northbound carriageway in addition to a dedicated connection to the existing J18 gyratory. The gyratory would be upgraded to include a new 3 lane hamburger link to be run in parallel with the existing gyratory to accommodate the SB to WB traffic flow. The junction would remain as a two-phase set of traffic lights. The option also provides an improved link connecting the M60 northbound to the M60 westbound. The solution would include a two-lane merge onto the mainline, seeking to maximise the free flow capacity of the junction.	Red/Amber rating • Any changes in noise or air quality are likely to be at a few properties only, not widespread changes. • Option is within an AQMA and NIA. • Negative impacts on natural and urban environment associated with potential impacts on unknown archaeology outside of highway boundary, impacts on Cowl Gate Farm and loss of agricultural land.

Option number	Option name	Option schematic	Brief description	Local environment rating and considerations (from the EAST)
123	SB to WB Off-slip and Gyratory Amendments, NB to WB Free flow Long Bypass, EB to NB Slip Amendments		The option combines upgrading the existing M60 mainline between J17-18 to 5 lane SM-ALR, on the M60 eastbound approach to J18 an alternative double lane drop diverge layout would allow a free flow link to the M66 northbound carriageway in addition to a dedicated connection to the existing J18 gyratory. The gyratory would be upgraded to include a new 3 lane hamburger link, a signalised roundabout which takes major through traffic movements from the circulatory carriageway and routes them directly across the central island, to be run in parallel with the existing gyratory to accommodate the SB to WB traffic flow. The junction would remain as a two-phase set of traffic lights. A two-lane free flow link would be introduced to connect M60 northbound traffic with M60 westbound traffic. The route would cross through an underpass beneath Simister lane (subject to maintaining minimum headroom). The section would merge onto the M60 westbound mainline as a single lane gain.	Red/Amber rating • New bypass moves traffic closer to receptors, screening effect of embankment on noise from main carriageway is unknown without modelling. • Option is within an AQMA and NIA. • Negative impacts on natural and urban environment associated with visual impact of new structures and embankments, potential impacts on unknown archaeology outside of highway boundary, impacts on Cowl Gate Farm and loss of agricultural land.
133	NB to WB Free flow Link Amendments		The option combines upgrading the existing M60 mainline between J17-18 to 5 lane SM-ALR, with an improved link connecting the M60 northbound to the M60 westbound. The solution would include a two-lane merge onto the mainline, seeking to maximise the free flow capacity of the junction.	Red/Amber rating • Any changes in noise or air quality are likely to be at a few properties only, not widespread changes. • Option is within an AQMA and NIA.

Option number	Option name	Option schematic	Brief description	Local environment rating and considerations (from the EAST)
				• Negative impacts on natural and urban environment associated with potential impacts on unknown archaeology outside of highway boundary.

3.3.7 As shown in Table 3.1, the local environment rating for each option was Red/Amber, with the exception of Option 103, which was assigned an Amber rating due to fewer negative impacts on the natural and urban environment.

Shortlisting of five options

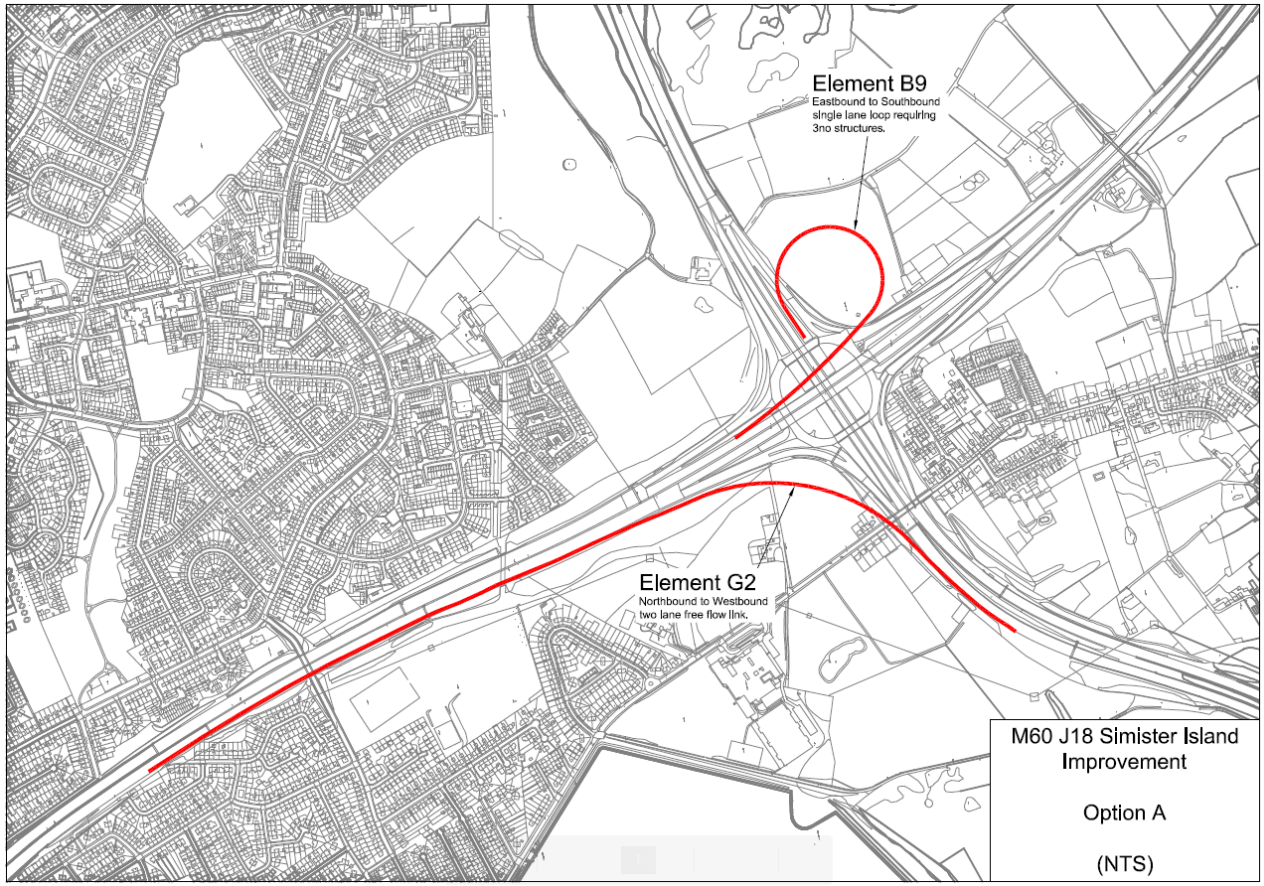
3.3.8 A Value Management Workshop took place in October 2015. The key aims of the workshop were to identify the key opportunities for value enhancement, discuss the opportunities and impact of each on the project objectives and the project team's approach to their delivery, discuss the cost savings or alternatives, and thereafter produce action plans for value enhancement. At the Value Management Workshop it was recommended that four options should be taken forward for consideration during the next stage on the basis of providing good value for money. Later in October 2015, it was decided that a fifth option, which had been considered at the workshop, should also be taken forward.

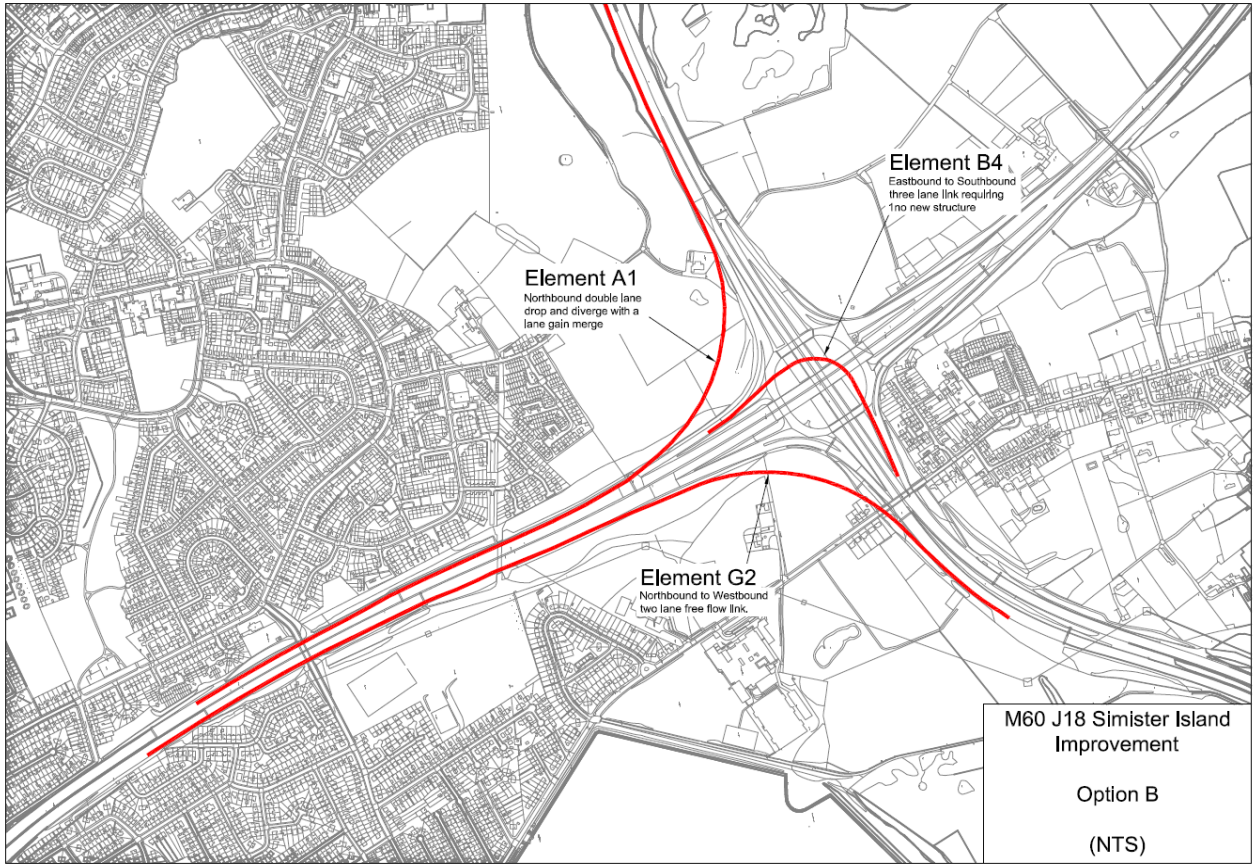
3.3.9 By the end of Stage 0, five options were therefore shortlisted for further assessment during Stage 1. These five options were:

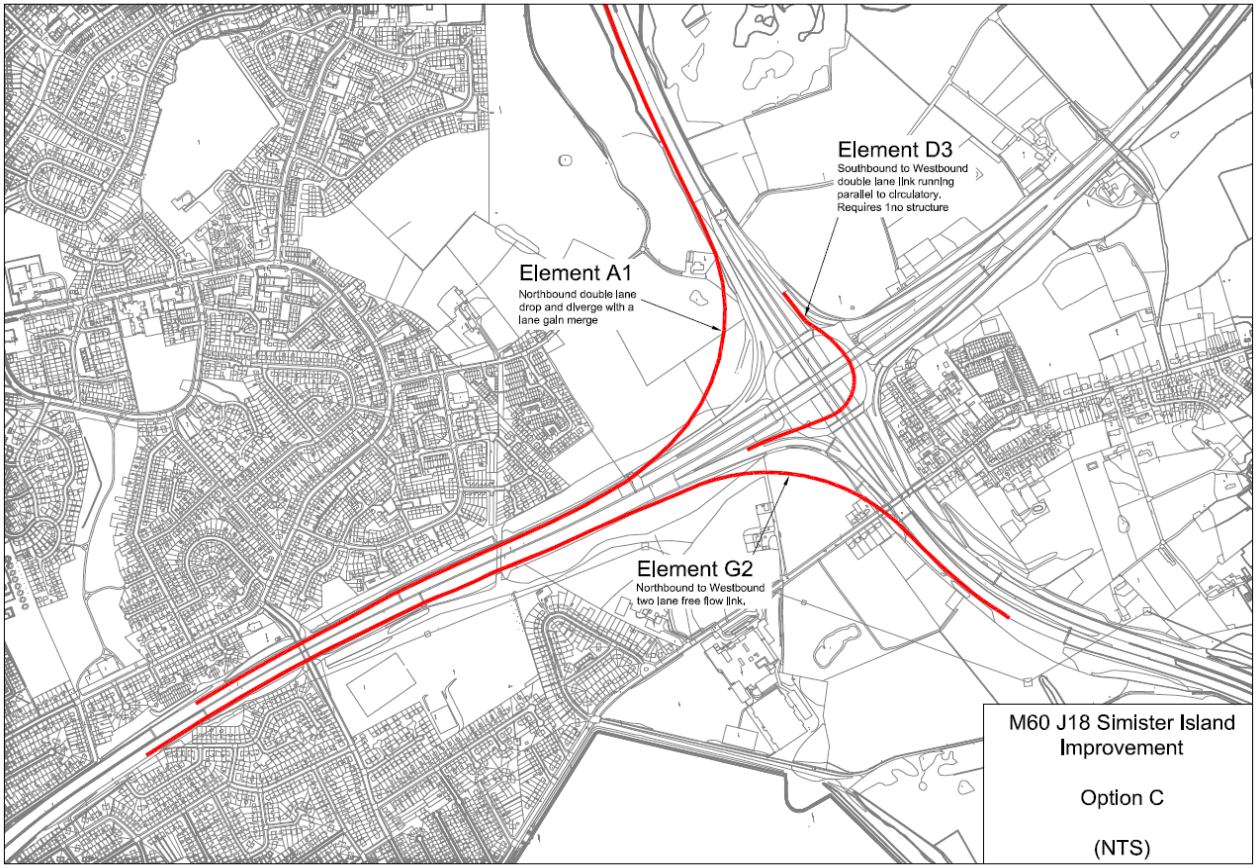
- Option 103 (re-named Option A)
- Option 003 (re-named Option B)
- Option 122 (re-named Option C)
- Option 013 (re-named Option D)
- Option 133 (re-named Option E)

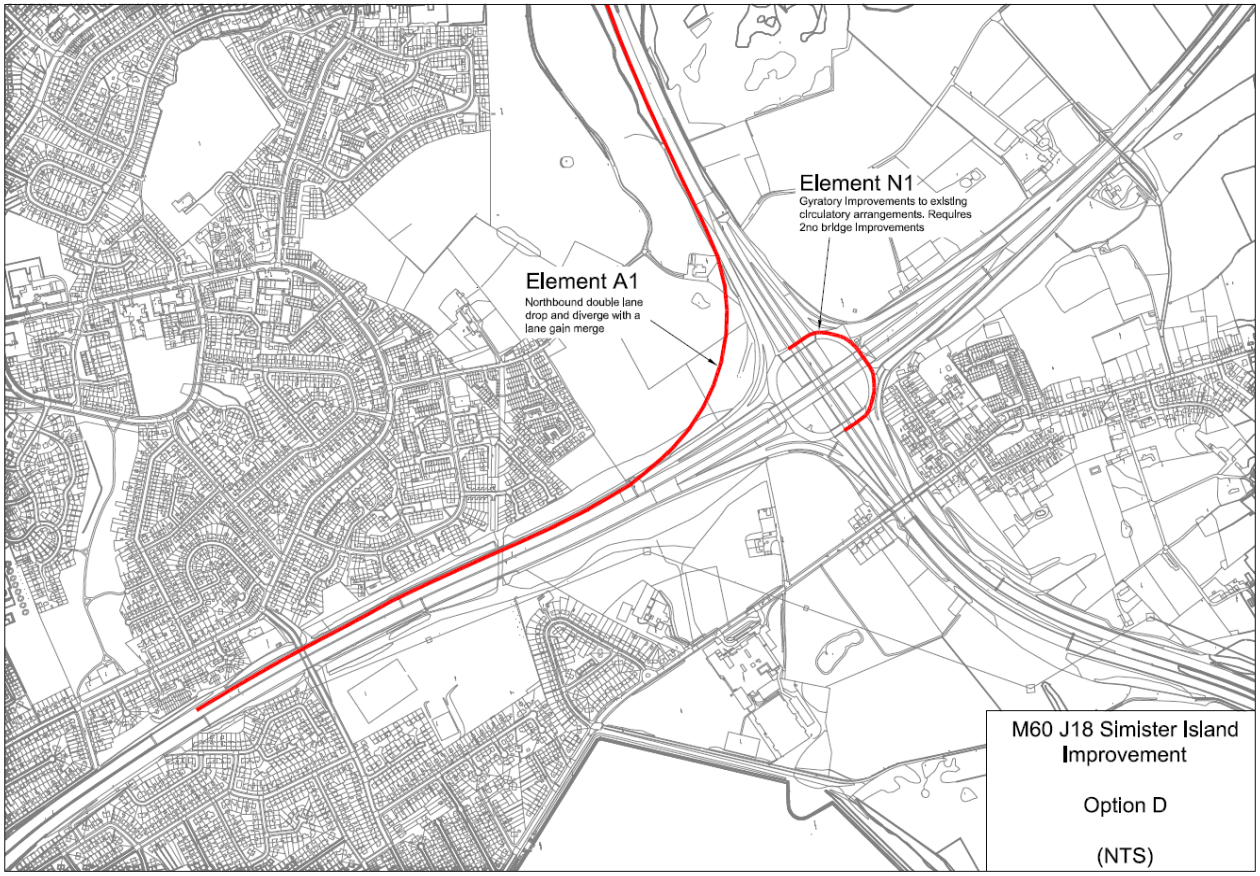
3.3.10 Table 3.2 describes the elements that made up the above options. The five options did not include amending the M60 between J17 and J18 from a 4-lane Controlled Motorway with hard shoulder to a 5-lane ALR motorway with no hard shoulder. Controlled Motorways have three or more lanes with variable speed limits, but retain a traditional hard shoulder.

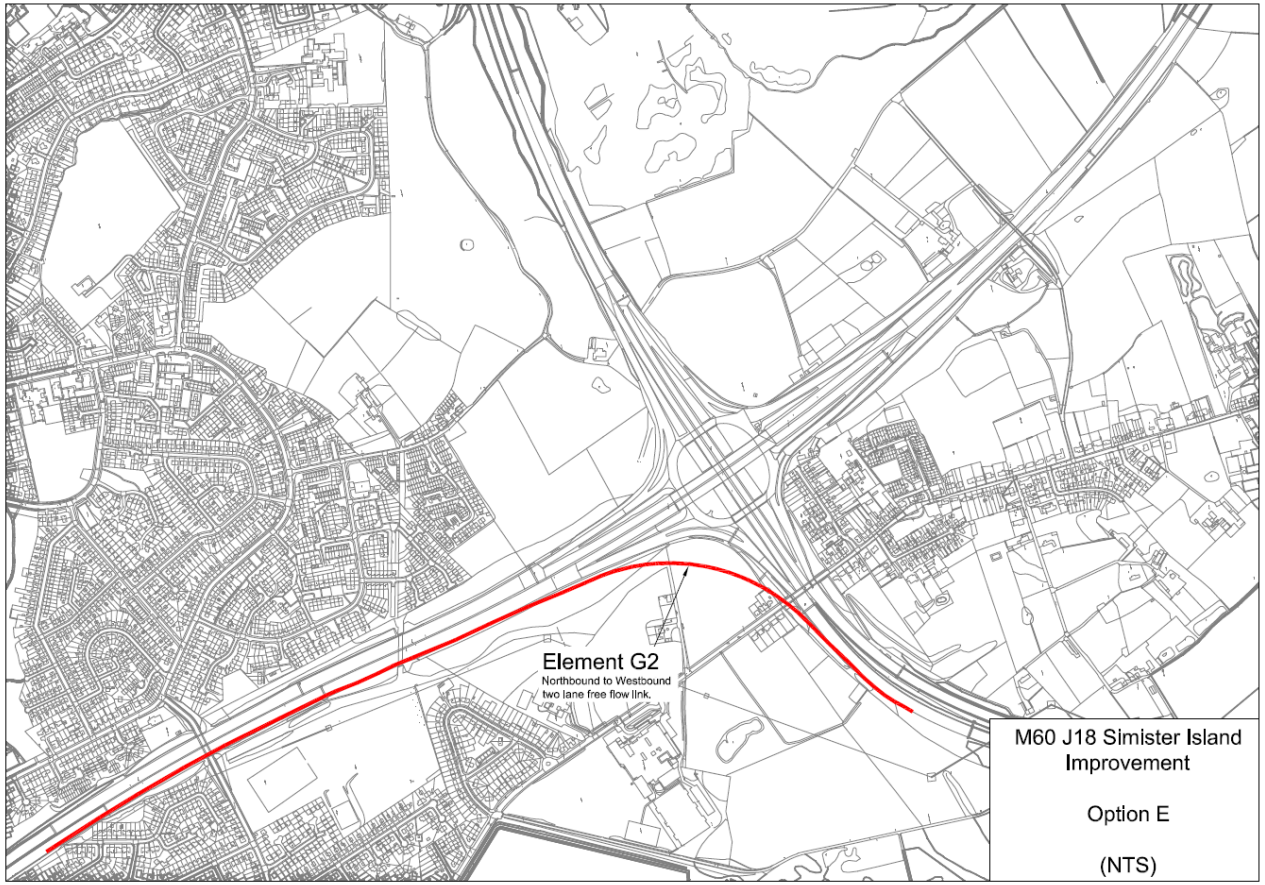
Table 3.2 Shortlisted Stage 0 options and the elements they comprised

Option	Option schematic	Elements
103 (A)		B9: M60 EB to M60 SB two-lane loop interchange link. G2: M60 NB to M60 WB two-lane interchange link with improved diverge and merge.

Option	Option schematic	Elements
003 (B)		A1: M60 EB to M66 NB two-lane interchange link with improved diverge and merge. B4: new three-lane signalised link inside roundabout circulatory for M60 EB to M60 SB. G2: M60 NB to M60 WB two-lane interchange link with improved diverge and merge.

Option	Option schematic	Elements
122(C)		A1: M60 EB to M66 NB two-lane interchange link with improved diverge and merge. D3: new three-lane signalised link inside roundabout circulatory for M66 SB to M60 WB. G2: M60 NB to M60 WB two-lane interchange link with improved diverge and merge.

Option	Option schematic	Elements
013 (D)		A1: M60 EB to M66 NB two-lane interchange link with improved diverge and merge. N1: widening of roundabout circulatory on north, east and west parts to five lanes.

Option	Option schematic	Elements
133 (E)		G2: M60 NB to M60 WB two-lane interchange link with improved diverge and merge.

Options identification – Stage 1

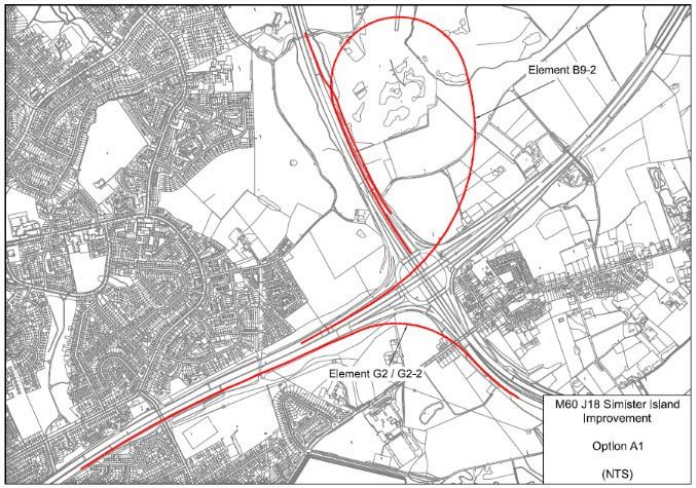
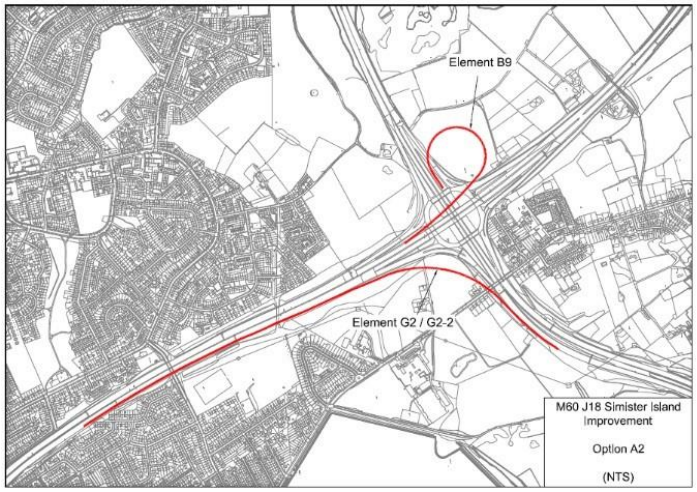
Initial review of the options brought forward from Stage 0

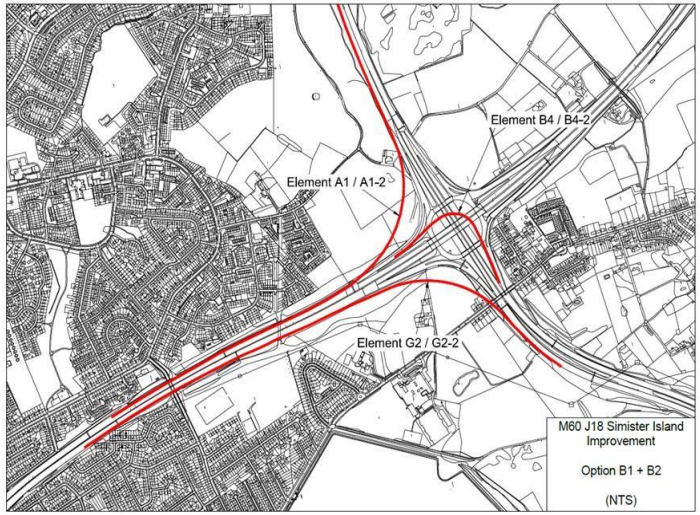
3.3.11 An initial review of the five options brought forward from Stage 0 was undertaken at the start of Stage 1 to identify which should be taken forward for further consideration during Stage 1. This review comprised three steps:

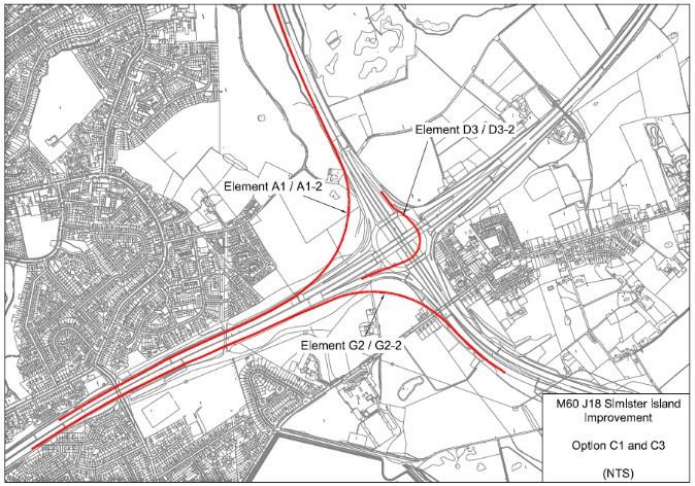
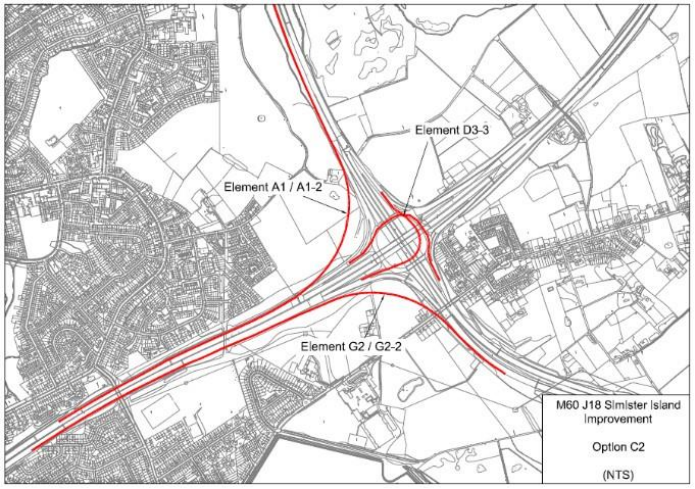
- One of the five options, Option 133 (renamed Option E) had very limited benefits and contribution to meeting the Scheme objectives so was discounted immediately.
- Highway elements identified during Stage 0 but not included in the five options carried forward were also reviewed again to check whether there would in fact be any merit in including any of them in the options to be considered further in Stage 1. This exercise identified four elements to be brought back into consideration:
  - B9-2: M60 EB to M60 SB 2-lane large loop
  - B4-2: new 2-lane signalised link inside roundabout circulatory for M60 EB to M60 SB
  - D3-2: widening of M66 SB roundabout approach to 3 lanes combined with D3, new 2-lane signalised link inside roundabout circulatory for M66 SB to M60 WB for both controlled and ALR M60 motorway
  - D3-3: widening of roundabout northern bridge for M60 EB to M60 SB combined with D3, new 2-lane signalised link inside roundabout circulatory for M66 SB to M60 WB for both controlled and ALR M60 motorway.
- In addition to the review of the highway elements as described above, work was also undertaken to review the option of changing the M60 between J17 and J18 from a 4-lane Controlled Motorway with hard shoulder to a 5-lane ALR motorway with no hard shoulder. As a result of this work two sub-options were identified for each option (excluding Option E, which had already been discounted) for the M60 between J17 and J18:
  - A 4-lane Controlled Motorway with a hard shoulder i.e. no change
  - A 5-lane ALR motorway with no hard shoulder.

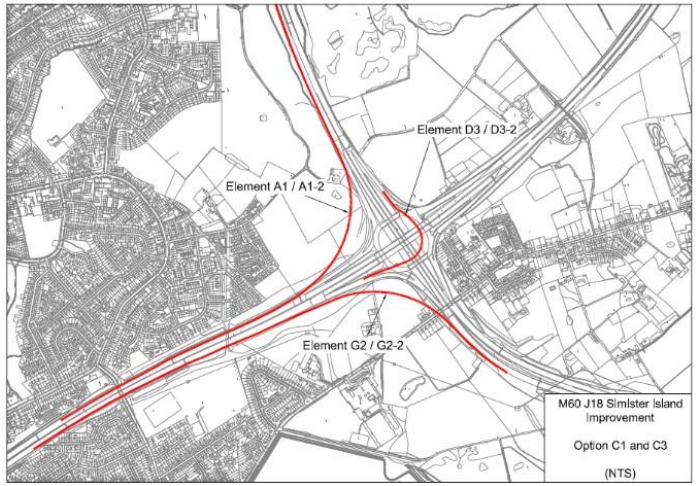
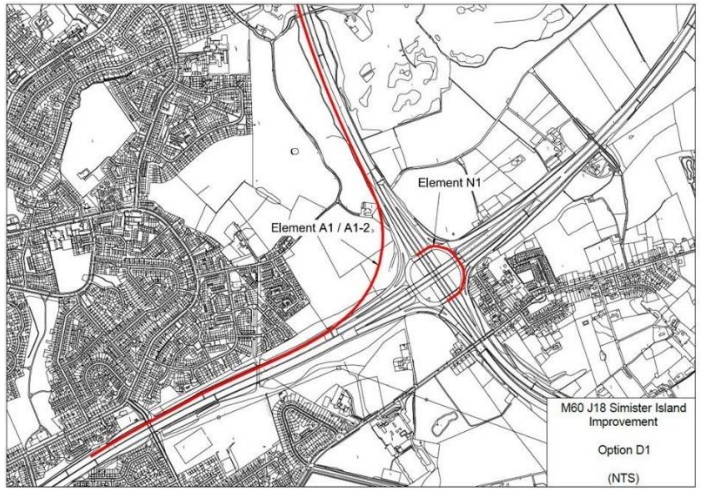
3.3.12 Following these initial review steps a total of eight options were identified for further consideration during Stage 1, as summarised in Table 3.3.

Table 3.3 Options identified for further consideration during Stage 1

Option	Option schematic	Elements
A1		Element B9-2: M60 EB to M60 SB 2-lane large loop interchange link for both controlled and ALR M60 motorway. Element G2: M60 NB to M60 WB 2-lane interchange link with improved diverge and merge for controlled M60 motorway. Element G2-2: as element G2 but for ALR M60 motorway.
A2		Element B9: M60 EB to M60 SB 2-lane small loop for both controlled and ALR M60 motorway. Element G2: M60 NB to M60 WB interchange link – see Option A1. Element G2-2: as element G2 but for ALR M60 motorway.

Option	Option schematic	Elements
B1		Element A1: M60 EB to M66 NB 2-lane interchange link with improved diverge and merge for controlled M60 motorway. Element A1-2: as element A1 but for ALR M60 motorway. Element B4: new 3-lane signalised link inside roundabout circulatory for M60 EB to M60 SB for both controlled and ALR M60 motorway. Element G2: M60 NB to M60 WB interchange link – see Option A1. Element G2-2: as element G2 but for ALR M60 motorway.
B2		Element A1: M60 EB to M66 NB interchange link - see Option B1. Element A1-2: as element A1 but for ALR M60 motorway. Element B4-2: new 2-lane signalised link inside roundabout circulatory for M60 EB to M60 SB for both controlled and ALR M60 motorway. Element G2: M60 NB to M60 WB interchange link – see Option A1. Element G2-2: as element G2 but for ALR M60 motorway.

Option	Option schematic	Elements
C1		Element A1: M60 EB to M66 NB interchange link - see Option B1. Element A1-2: as element A1 but for ALR M60 motorway. Element D3: new 2-lane signalised link inside roundabout circulatory for M66 SB to M60 WB for both controlled and ALR M60 motorway. Element G2: M60 NB to M60 WB interchange link – see Option A1. Element G2-2: as element G2 but for ALR M60 motorway
C2		Element A1: M60 EB to M66 NB interchange link - see Option B1. Element A1-2: as element A1 but for ALR M60 motorway. Element D3-3: widening of roundabout northern bridge for M60 EB to M60 SB, combined with new 2-lane signalised link inside roundabout circulatory for M66 SB to M60 WB for both controlled and ALR M60 motorway. Element G2: M60 NB to M60 WB interchange link – see Option A1. Element G2-2: as element G2 but for ALR M60 motorway.

Option	Option schematic	Elements
C3		Element A1: M60 EB to M66 NB interchange link - see Option B1. Element A1-2: as element A1 but for ALR M60 motorway. Element D3-2: widening of M66 SB roundabout approach to 3 lanes combined with new 2-lane signalised link inside roundabout circulatory for M66 SB to M60 WB for both controlled and ALR M60 motorway. Element G2: M60 NB to M60 WB interchange link – see Option A1. Element G2-2: as element G2 but for ALR M60 motorway.
D1		Element A1: M60 EB to M66 NB interchange li–k - see Option B1. Element A1-2: as element A1 but for ALR M60 motorway. Element N1: widening of roundabout circulatory on north, east and west parts to 5 lanes including widening of both roundabout bridges.

3.3.13 An Options Workshop was held in January 2018 to confirm the problems to be solved and objectives to be met by the Scheme, share details of the development of options, assess options against objectives and make recommendations on which options to be considered further. It was decided at this Options Workshop that Options A1, A2, C1 and C2 should be taken forward for detailed appraisal. The justification for this decision is summarised in Table 3.4. All of these options included five lane ALR between M60 J17 and J18.

3.3.14 The design of the options was based on forecast 2023 opening year traffic flows. The traffic operation of the four options was assessed using a traffic model. Impact on land and property, utility equipment, traffic signs and signals requirements, structures, earthworks requirements and environmental impact and effects on maintenance were also considered.

Table 3.4 Options taken forward for further consideration in Stage 1

Option	Take forward?	Justification
A1 and A2	Yes	Provides free flow for highest peak hour traffic flows (M60 EB to M60 SB). Frees up capacity for roundabout. Moves significant traffic flow away from properties in Simister village close to the roundabout.
B1 and B2	No	Does not provide free flow for highest peak hour traffic flows (M60 EB to M60 SB). New route through roundabout for M60 EB to M60 SB has low radius and limited visibility. Requires 3-way signals and results in reduced green time which reduces roundabout capacity.
C1 and C2	Yes	Separates M60 EB to M60 SB from M66 SB to M60 WB within roundabout. Frees up capacity for M60 EB to M60 SB within roundabout. Option C2 provides 3 lanes for M60 EB to M60 SB around whole of roundabout circulatory.
C3	No	Requires amendment of the segregated left turn lane M66 SB to M62 EB but does not provide any significant additional benefit compared to Option C1. Requires M66 SB to M60 WB traffic to split at the roundabout entry with 1 lane to the circulatory and 2 lanes to the new route within the circulatory potentially leading to driver confusion and a safety issue.
D1	No	Does not provide free flow for highest peak hour traffic flows (M60 EB to M60 SB. 5 lanes at a signal stop line not recommended – safety issue. Widening of roundabout bridges – buildability issue.

Option	Take forward?	Justification
		Widening of circulatory affects viaduct abutment – requires M62/M60 closure.
E	No	Does not provide free flow for highest peak hour traffic flows (M60 EB to M60 SB). Provides an improvement for only one traffic movement, therefore very limited benefits.

3.3.15 Following the decision to take Options A1 and A2 and C1 and C2 forward for further consideration, these options were further assessed and developed to remove or mitigate problems. These four variants, and the improvements made to the design of these four options during Stage 1, are summarised below.

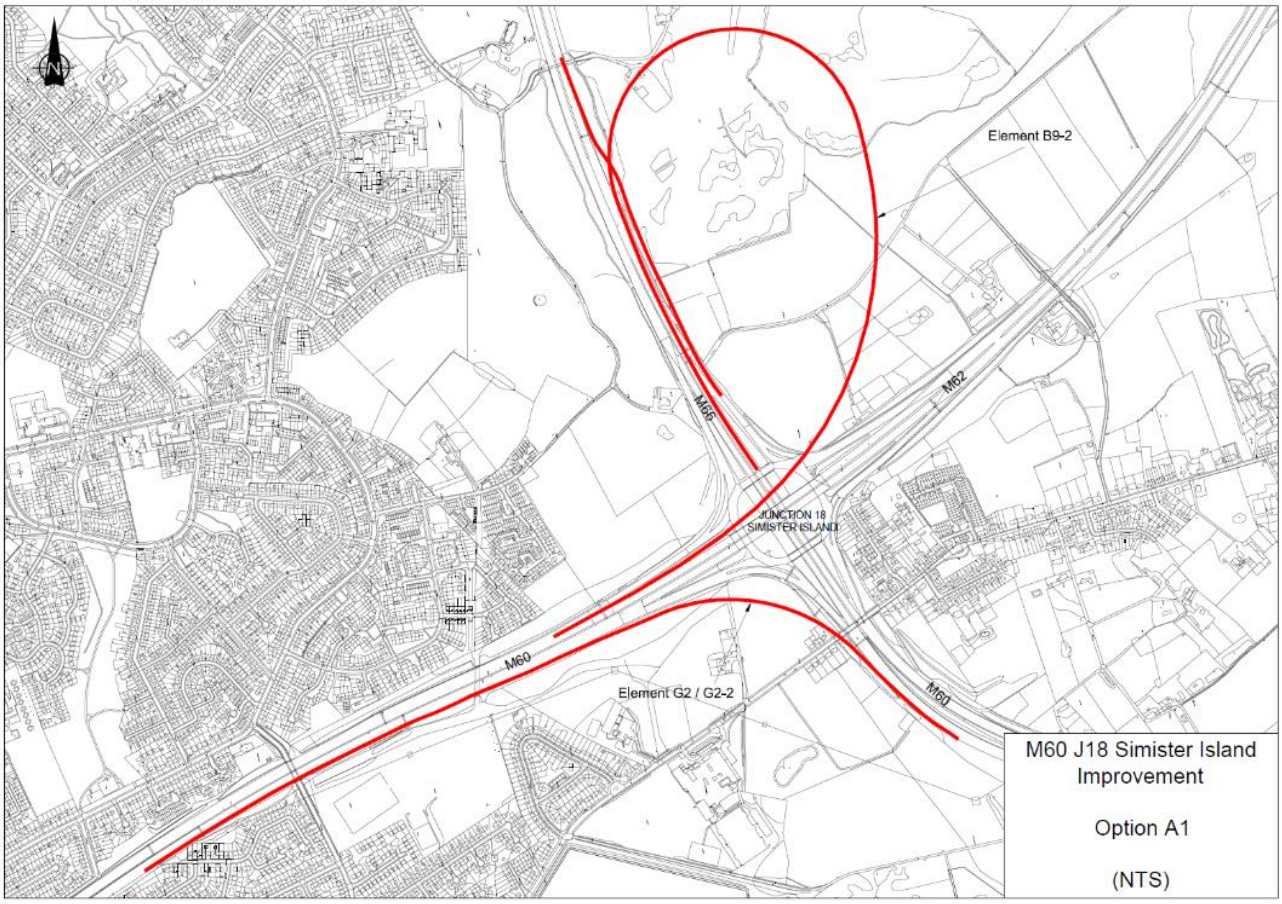
Option A1

3.3.16 Option A1 (Plate 3.1) comprised a revised free flow link in the form of an interchange link for M60 northbound to M60 westbound traffic (element G2) along with an interchange link providing a dedicated route for M60 eastbound to M60 southbound traffic. Option A1 proposed a large connective loop (known as element B9-2).

3.3.17 The improvements made to Option A1 during Stage 1 were:

- Increasing the loop size to locate the M66 southbound merge upstream of the J18 roundabout north overbridge
- Improving the M60 eastbound diverge layout
- Improving the M60 northbound to M60 westbound interchange link
- Improving the M60 westbound merge layouts
- Closure of the roundabout entry from M60 eastbound and exit to M60 southbound except for emergency and maintenance vehicles

Plate 3.1 Option A1

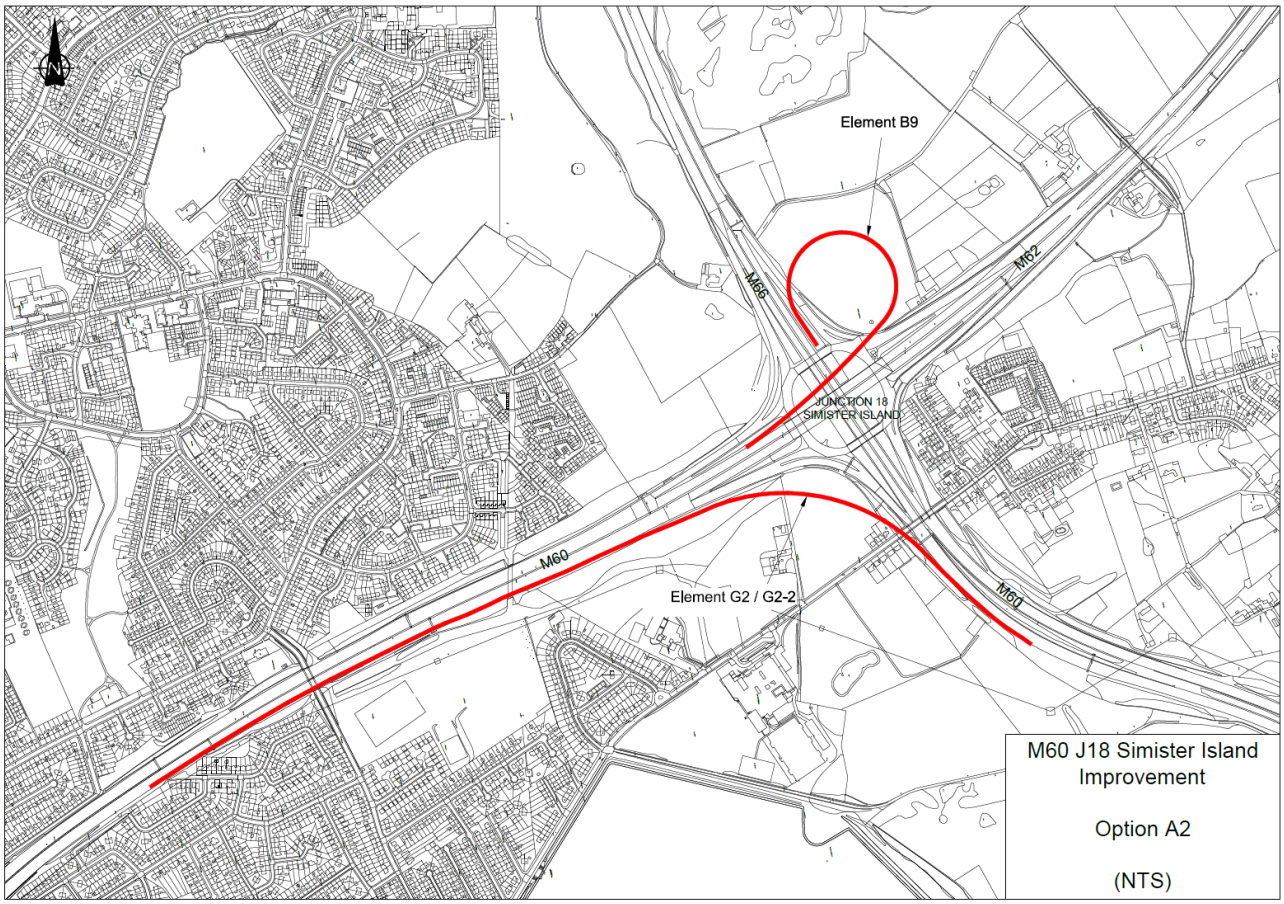


Option A2

3.3.18 Option A2 (Plate 3.2) was similar to Option A1 but had the following differences:

- A small loop (radius of 100m) for the M60 eastbound to M60 southbound interchange link
- The M66 southbound merge is downstream of the J18 roundabout south overbridge
- The M60 eastbound to M60 southbound interchange link is separated from the M66 southbound by the roundabout and viaduct bridge piers
- An overall longer bridge span over the roundabout
- The M66 southbound exit slip road roundabout approach and the free flow left turn to the M62 eastbound require amendment

Plate 3.2 Option A2



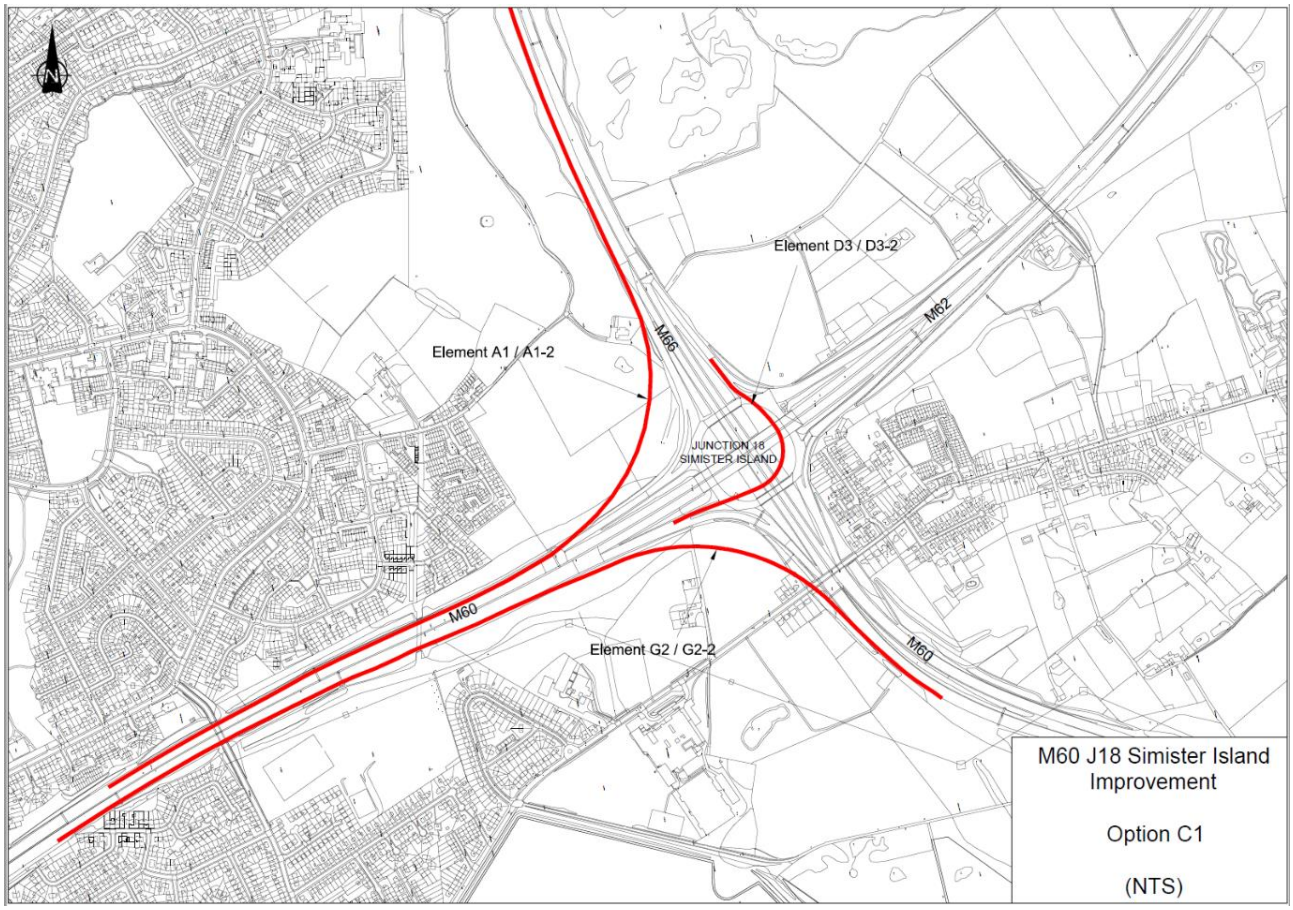
Option C1

3.3.19 Option C1 (Plate 3.3) consists of elements A1, D3 and G2. This option consists of revised free flow links in the form of interchange links for M60 northbound to M60 westbound traffic and for M60 eastbound to M66 northbound traffic. Additionally, a new link would be provided within the existing gyratory to cater for M66 southbound to M60 westbound traffic.

3.3.20 The improvements made to Option C1 during Stage 1 were:

- Improving the M60 eastbound diverge layout
- Improving the M60 eastbound to M66 northbound interchange link and merge with the M66 northbound
- Extending the new route within the roundabout to the entry of the M60 northbound exit slip road and so increasing signals green time
- Improving the M60 northbound to M60 westbound interchange link
- Improving the M60 westbound merge layouts

Plate 3.3 Option C1

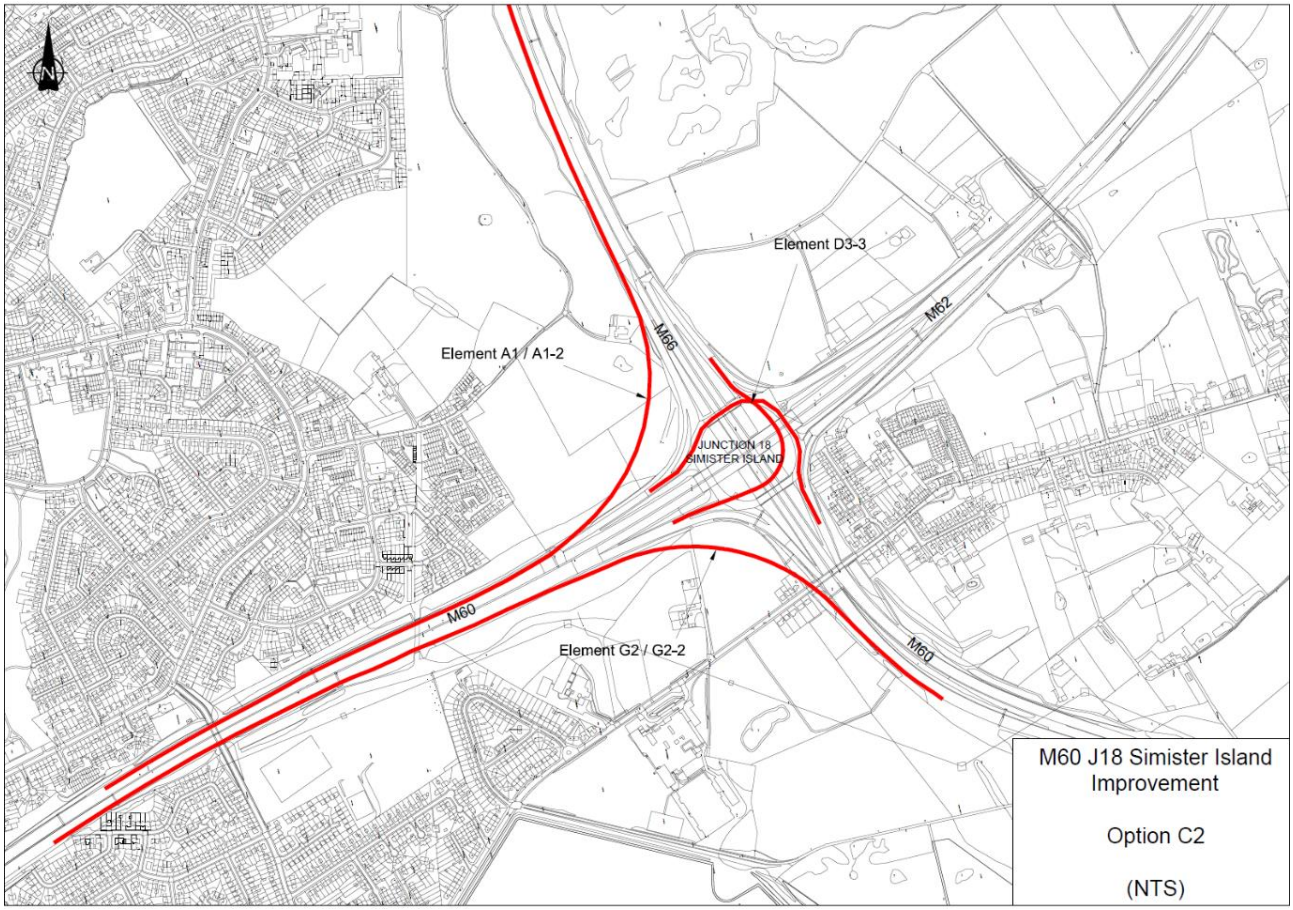


Option C2

3.3.21 Option C2 (Plate 3.4) was the same as Option C1 except for the following differences:

- Widening of the M60 eastbound exit slip road to three lanes
- Widening of the roundabout north overbridge to provide two lanes for the M60 northbound to M62 eastbound physically segregated from three lanes for the M60 eastbound to M60 southbound due to increases in noise in Noise Important Areas
- Eastern side of the roundabout marked for three lanes for the M60 eastbound to M60 southbound
- Roundabout exit to the M60 southbound entry slip road initially marked as three lanes and then narrowed to two lanes

Plate 3.4 Option C2



Summary of Stage 1 conclusions

3.3.22 Environmental assessment undertaken during Stage 1 considered the four selected options in detail. The assessment found that Option A1 was likely to have the largest impact on a number of environmental aspects (particularly noise, landscape, cultural heritage and people and communities), though all options were likely to have significant adverse policy impacts on noise. Table 3.5 summarises the environmental issues and possible significant environmental effects identified for each option.

Table 3.5 Comparison of environmental issues and possible significant environmental effects identified for Options A1, A2, C1 and C2

Key: Light orange fill = possible significant environmental effect identified

Environmental aspect	Environmental issues	Possible significant environmental effects identified for Option			
		A1	A2	C1	C2
Air quality	All options would result in worsening of air quality at sensitive receptors within 200m of the M60 J17 to J18 due to ALR. Options A1 and A2 would have a small magnitude impact at two residential receptors. None of the options are expected to have significant impacts on local or regional air quality but this may change once meteorological conditions are considered during a more detailed assessment.	No	No	No	No
Climate	The impact of all options on climate is considered to be negligible in terms of CO_2 emissions during both construction and operation.	No	No	No	No
Cultural heritage	All options would impact on the setting of the listed Church of St. George and views out of the Registered Park and Garden at Heaton Hall. Option A1 would impact on the setting of four undesignated historic buildings, Option A2 on three buildings and Options C1 and C2 on one building. Option A1 would remove the Hills undesignated farmstead (potentially significant impact), potential archaeological remains and a hollow way. Option A2 would not impact on known remains. Options C1 and C2 would remove the remains of the site of a homestead. All impacts are considered non-significant except the impact of Option A1 on the Hills undesignated farmstead, which may be significant.	Yes	No	No	No

Environmental aspect	Environmental issues	Possible significant environmental effects identified for Option			
		A1	A2	C1	C2
Landscape and visual	For all options the ALR for M60 J17 to J18 is likely to result in landscape and/or visual effects from moving infrastructure and traffic closer to properties. Option A1 would have the greatest landscape impact (moderate adverse) and Options A2, C1 and C2 would have less impact (slight adverse) as the area of Green Belt lost would be smaller and the interchange links would be better screened by the topography. A moderate adverse effect on visual amenity for Options A1 and A2 would be experienced by PRoW users and golfers and for Options C1 and C2 at one residential property.	Yes	Yes	Yes	Yes
Biodiversity	Option A1 has the greatest ecological impact potential as it would result in the loss of potential Great Crested Newt (protected species) breeding ponds. Option A2 does not directly impact on these ponds but, like Option A1, would result in the loss of suitable Great Crested New habitat surrounding the ponds. Option A1 directly affects Castle Brook which may provide habitat for water vole (protected species). Option A2 does not affect Castle Brook. Options C1 and C2 have the lowest ecological impact and result in the loss of low quality semi-improved grassland and broadleaved plantation woodland. All options could affect other protected species (such as bats, badger and reptiles) and further surveys would be undertaken at Stages 2/3 to confirm whether present.	No	No	No	No
Geology and soils	Options A1 and A2 may result in an impact on a Mineral Safeguarding Area which is a policy area. Options A1 and A2 have some potential to affect contaminated land.	Yes	Yes	No	No
Materials	Option A1 is likely to have the largest impact in terms of materials consumption and waste generation. Option A2 would have less impact and Options C1 and C2 would have the least impact.	No	No	No	No

Environmental aspect	Environmental issues	Possible significant environmental effects identified for Option			
		A1	A2	C1	C2
Noise and vibration	There would be significant adverse policy impacts with all options both day and night-time due to increases in noise in Noise Important Areas. Also Option A1 is predicted to produce a moderate magnitude increase in road traffic noise at one receptor, and there would be no moderate magnitude noise increases for Option A2. Options C1 and C2 are predicted to produce a moderate magnitude noise increase at 16 receptors. For all options a minor magnitude noise increase is predicted for receptors adjacent to M60 J17 to J18. For all options noise mitigation (such as barriers) would be required.	Yes	Yes	Yes	Yes
People and communities	There would be potential permanent adverse impacts on the Hills (Option A1), Egypt Farm (Option A1 and to a lesser extent Option A2), Pike Fold Golf Course (Option A1) and Cowl Gate Farm (Options C1 and C2). There is potential to impact agricultural land, particularly from Option A1. Options A1 and A2 have the greater potential and Options C1 and C2 have limited potential to form new visually prominent features during journeys. For Options A1 and A2 users of PRoW would be likely to experience disturbance during construction and a permanent change in amenity during operation.	Yes	Yes	Yes	Yes
Road drainage and the water environment	Option A1 would have the greatest additional impermeable area, result in a loss of ponds and have a direct impact on Castle Brook. None of the options are likely to have significant effects.	No	No	No	No

3.3.23 Table 3.6 summarises the assessment results for Options A1, A2, C1 and C2 with respect to engineering, environment, land acquisition, economics, buildability and programme. The assessment found that Option A2 was forecast to produce the highest journey time benefits followed by Options A1, C2 and C1, and all options were forecast to have a small negative safety impact. (though noting that this is likely to be a pessimistic forecast due to the required rise of national average data to predict future collision frequencies).

Table 3.6 Summary of Stage 1 options identification assessment results

Factor	Comparison of options
Engineering	Option A1 would have the largest engineering input in terms of earthworks and structures followed closely by Option A2 and to a lesser extent by Options C1 and C2. For drainage and pavement Option A1 would have the largest input with Options A2, C1 and C2 having a similar but lesser input. For utility works Option A1 would have the largest impact followed by Option A2 and Options C1 and C2.
Environment	Option A1 is likely to have the largest overall environmental impact followed by Option A2 and Options C1 and C2. The impact on people and communities would be different for each option. None of the options are likely to have significant impacts on local or regional air quality but this may change once meteorological conditions are considered. Options C1 and C2 are likely to have the largest noise impact followed by Option A1 and Option A2. There would be significant adverse policy impacts on noise with all options both day and night-time.
Land acquisition	All four options would require land acquisition, with Option A1 needing the largest area of approximately 19 hectares, Option A2 requiring less than half this area and Options C1 and C2 slightly less than Option A2. Option A1 is likely to have a significant impact on Pike Fold Golf Course and if it is established that the viability of the golf course is in doubt and that sale of the land is blighted then it would be required to acquire the whole of the golf course. Options C1 and C2 would have an impact on Cowl Gate Farm and it has been assumed that the residential property would need to be acquired but the full extent of the impact is yet to be determined.
Economics	Option A2 has the highest benefit cost ratio and represents the best value for money followed by Option C2, and Option C1 has the lowest cost followed closely by Option C2.
Buildability and programme	All options would require comprehensive traffic management with Options A1 and A2 likely to have the greatest impact on traffic because of the scale of new bridge works compared to Options C1 and C2. Temporary working space outside the scheme footprint is likely to be essential particularly for bridge superstructure fabrication or assembling and lifting into position for Options A1 and A2 and to a lesser extent for Options C1 and C2. As ALR for M60 J17 to J18 has been included for all options there is likely to be less opportunity to vary the construction period between options. However, the scale of new bridge works may result in a slightly longer construction period for Options A1 and A2 compared to Options C1 and C2.

3.3.24 At the end of Stage 1, Option A1 and Option C1 were discarded for a number of design, economic, and environmental reasons following their respective assessments (as summarised in Table 3.6). Option A2 and C2 were chosen to be taken forward for further assessment and consideration at Stage 2 due, in part, to their lower environmental impact, particularly when compared to Option A1, which required larger amounts of land-take than the two chosen options.

Option selection – Stage 2

3.3.25 Early in Stage 2, the two remaining options from Stage 1 (Option A2 (renamed Option A2-1) and C2 (renamed Option C2-1)), were developed further and each were split again into two new variants (Option A2-2 and C2-2). These four options were then reviewed to consider which should be taken forward for more detailed assessment during the remainder of Stage 2.

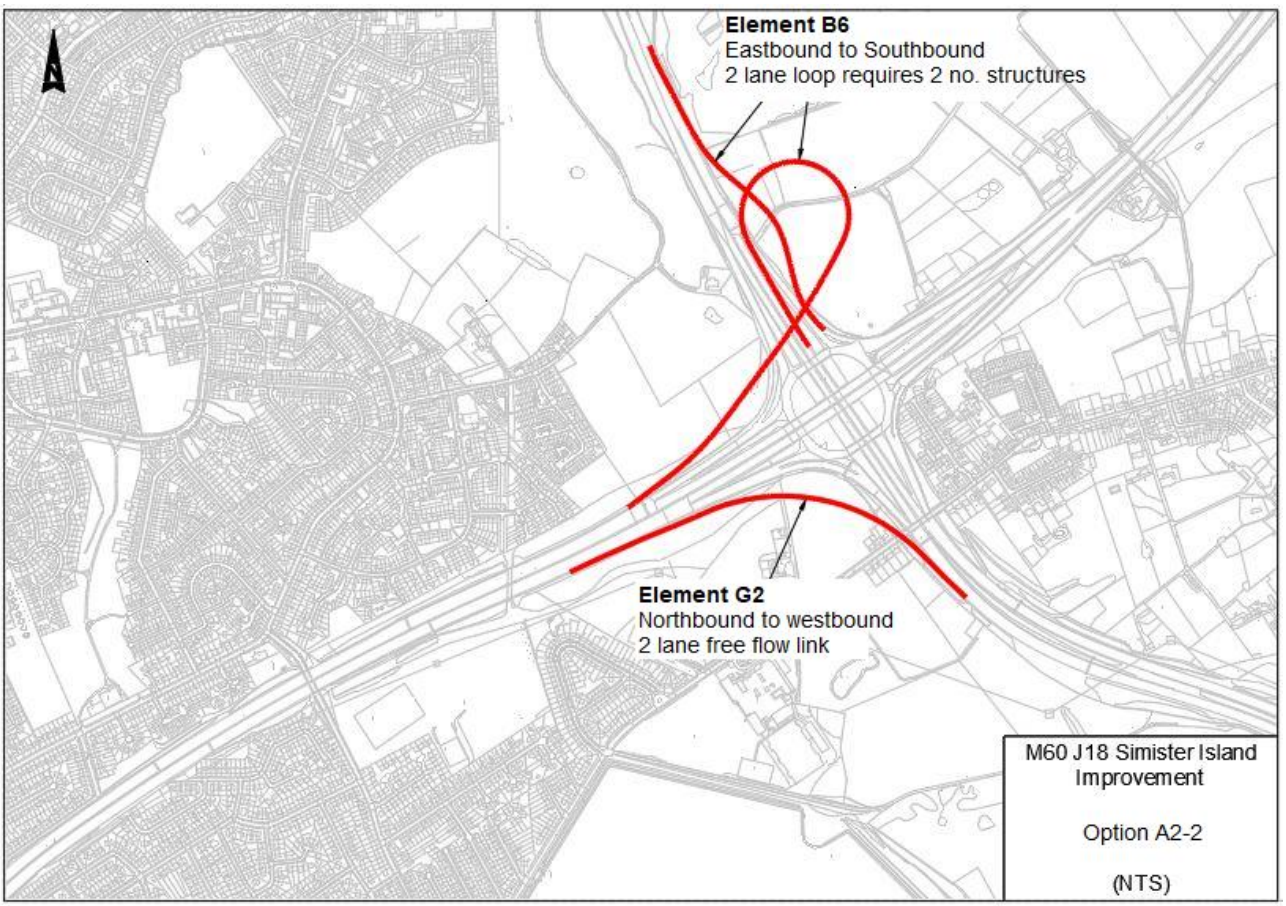
3.3.26 Options A2-1 and C2-1 are already described (as A2 and C2) in Table 3.3 above and are therefore not described again here to avoid duplication. Options A2-2 and C2-2 are summarised below and shown in Plates 3.5 and 3.6.

Option A2-2

3.3.27 Option A2-2 (Plate 3.5) comprises a free flow link for M60 northbound to M60 westbound traffic movements (element G2) along with an interchange link in the form of a connective loop (element B6) which would provide a dedicated route for M60 eastbound to M60 southbound traffic. This option also maintains the ALR element between M60 J17 and M60 J18.

3.3.28 The interchange link would run parallel to the M66 southbound carriageway on the opposite side of the existing bridge piers, supporting both the gyratory and the M62 viaduct. The interchange link would merge with the M60 southbound carriageway to the north of the J18 roundabout with a lane gain. The M66 southbound exit slip road would be realigned to cross over the new interchange link. The existing M60 southbound on-slip road from the gyratory would be closed to general traffic but would be retained for emergency use and for future maintenance activities.

Plate 3.5 Option A2-2



3.3.29 The Stage 2 assessment identified the following benefits and dis-benefits of Option A2-2 compared to Option A2-1 (Table 3.7).

Table 3.7 Benefits and dis-benefits of Option A2-2 compared to Option A2-1

Benefits of Option A2-2	Dis-benefits of Option A2-2
• Easier and safer to construct the interchange link element of the Scheme. • A significant part of the works can be constructed offline, away from existing traffic, and thereby increasing safety and reducing construction dis-benefits. • Shorter structure crossing the M66, saving time to construct and cost. • Reduction in construction time/sequencing should reduce the overall construction programme.	• Longer in length than the Stage 1 variant (by approximately 120m). • The loop moves further north, necessitating the purchase of some land from the golf course and increasing the likelihood of the presence of peat. • Need to reduce the central reserve and lane widths on the M66/M60 northbound and southbound carriageways to allow sufficient width for the 4 lanes southbound through the junction. • Works required to the north west of the junction, where there are potential development opportunities, may result in additional land costs.

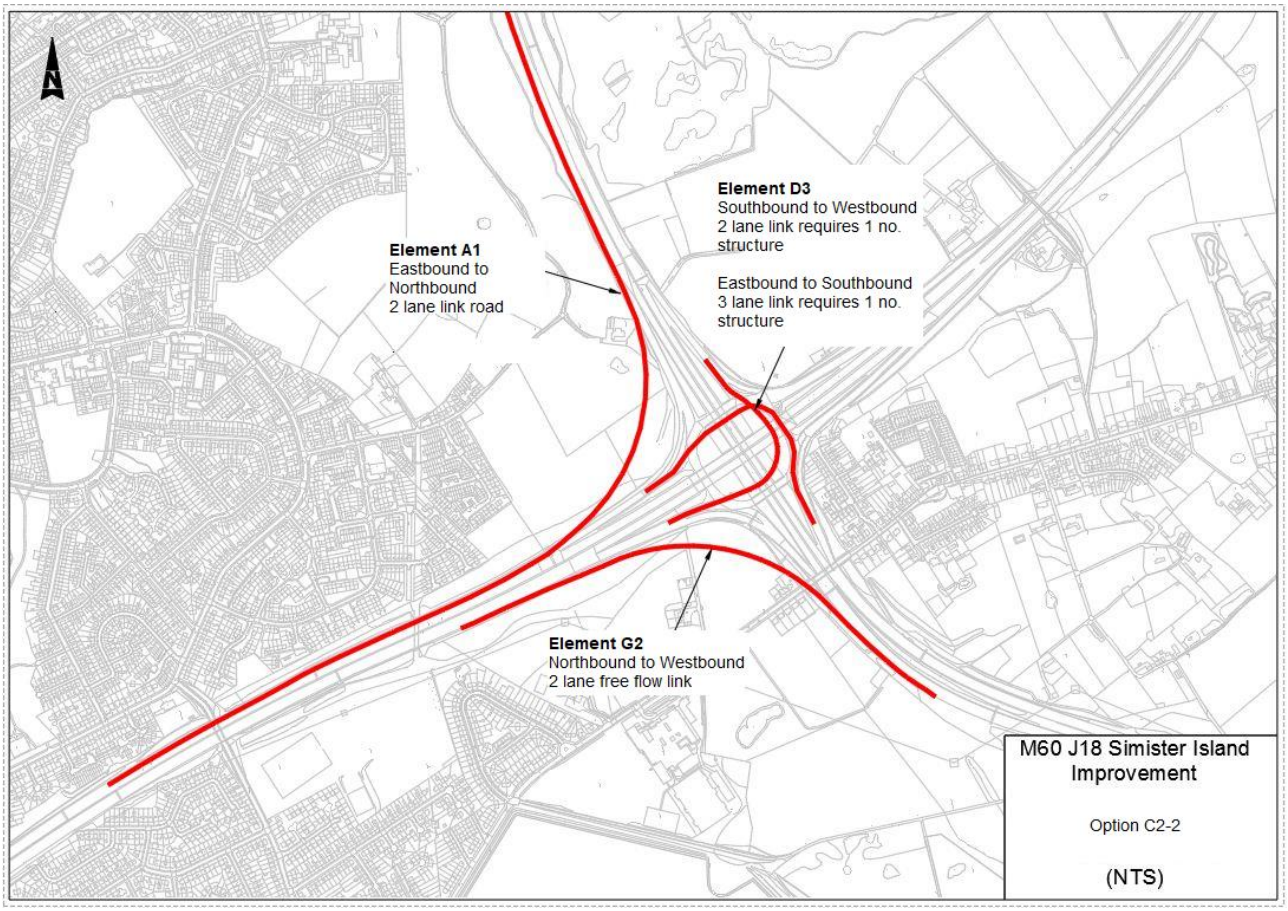
Benefits of Option A2-2	Dis-benefits of Option A2-2
• Some increase in user benefits, compared to Option A2-1. As construction costs are estimated to be similar for the two options, overall value for money is estimated to be slightly higher for Option A2-2. • The M66 southbound off-slip road alignment ties into the existing slip road near to the nosing of the dedicated left turn lane. • No need for retaining structure between the M60/M62 and the M60 eastbound off slip road. • Development of option has avoided the need for widening Sandgate Road bridge and the existing underpass.	• Moving traffic slightly closer to properties in the north west of the junction may have a detrimental impact on noise and air quality. • Additional fill material required for works to the north west of the junction.

Option C2-2

3.3.30 Option C2-2 comprises an M66 southbound to M60 westbound two-lane link which would require one new structure, combined with element D3, a new 2-lane signalised link inside the roundabout circulatory for M66 southbound to M60 westbound. This option also includes element A1, an M60 eastbound to M66 northbound two-lane interchange link with improved diverge and merge and element G2, an M60 northbound to M60 westbound two-lane free flow link. It also maintains the ALR element between M60 J17 and M60 J18.

3.3.31 Element D3 would be at the existing circulatory level and would not be either elevated or below the height of the existing junction. This option has reduced land take than Option C2-1 as a result of amending the M60 eastbound to M66 northbound merge arrangement.

Plate 3.6 Option C2-2



3.3.32 The Stage 2 assessment identified the following benefits and dis-benefits of Option C2-2 compared to Option C2-1 (Table 3.8).

Table 3.8 Benefits and dis-benefits of Option C2-2 compared to Option C2-1

Benefits of Option C2-2	Dis-benefits of Option C2-2
• Removal of buildability and disruption issues associated with widening the existing bridge on the northern section of the roundabout gyratory. • Reduction in land take as a result of amending the M60 eastbound to M66 northbound merge arrangement. • Reduced impact on Cowl Gate Farm. • Initial tests show that there would be some increase in user benefits, compared to Option C2-1. As construction costs are estimated to be similar for the two options, overall value for money is therefore estimated to be slightly higher for Option C2-2.	• Need to renew Hills Lane Bridge.

Benefits of Option C2-2	Dis-benefits of Option C2-2
• Development of option has avoided the need for widening Sandgate Road bridge and the existing underpass.	

3.3.33 A comparison of the four options was undertaken to identify if there was any difference in Likely Significant Effect (LSE) between the options (see Table 3.9).

Table 3.9 Comparison of LSE between Options A2-1, A2-2, C2-1 and C2-2

Key: Light orange fill = LSE identified

Environmental aspect	Option				Design changes which altered significance (where applicable)	Comment
	A2-1	A2-2	C2-1	C2-2		
Air quality	No LSE	No LSE	No LSE	No LSE	N/A	No LSE after mitigation.
Cultural heritage	No LSE	No LSE	No LSE	No LSE	N/A	No LSE after mitigation.
Landscape and visual	LSE	LSE	LSE	LSE	N/A	All options would result in LSE on landscape and visual receptors. These effects would be significant on year of opening, generally reducing by year 15, to slight adverse for Option A2-2 and to negligible for C2-2.
Biodiversity	No LSE	No LSE	No LSE	No LSE	N/A	No LSE after mitigation.
Geology and soils	No LSE	No LSE	No LSE	No LSE	N/A	No LSE after mitigation.
Material assets and waste	No LSE	No LSE	No LSE	No LSE	N/A	No LSE after mitigation.

Environmental aspect	Option				Design changes which altered significance (where applicable)	Comment
	A2-1	A2-2	C2-1	C2-2		
Noise and vibration	No LSE	No LSE	LSE	No LSE	Option C2-2 reduces the radius of the M60 eastbound to M66 northbound interchange link from 360m (as proposed in Option C2-1) to 255m. Since this change would bring this link closer to the M60 J18 roundabout, hence further away from the sensitive receptors to the north-west of this junction, road traffic noise levels are expected to be lower at these receptors than those predicted for Option C2-1. Furthermore, since the options' designs were not yet fully developed in three dimensions at Stage 1, the noise model constructed for that stage assumed all road links and receptors to be located on level and flat ground, therefore not considering any noise screening from terrain changes associated with the Scheme options. However, since topographic data associated with the Scheme was made available at Stage 2, the noise levels predicted at this stage accounted for any screening provided by new embankments and other topographic changes between the proposed links and sensitive receptors. This may have been another contributing factor towards a difference in significance between the variants.	Impacts could potentially be improved with mitigation. Option C2-2 is the best option based on the number of dwellings in non-compliance with policies identified in the Stage 2 assessment for daytime and night-time periods. With Option C2-1, significant environmental effects are expected at 16 dwellings where increases in road traffic noise levels above 3 A-weighted decibels (dB(A)) are predicted. No significant environmental effects are expected with Option C2-2 where the maximum increase in road traffic noise level is predicted to be 2.1 dB(A).

Environmental aspect	Option				Design changes which altered significance (where applicable)	Comment
	A2-1	A2-2	C2-1	C2-2		
Population and human health	No LSE	No LSE	LSE	No LSE	Reduction in significance of effect between C2-1 and C2-2 due to reduced land take on Cowl Gate Farm as a result of design changes to the M60 eastbound to M66 northbound interchange link (Highway element A1). The radius was reduced from 360m to 255m to reduce land acquisition and the impact on Cowl Gate Farm.	No LSE after mitigation.
Road drainage and the water environment	LSE	LSE	LSE	LSE	N/A	LSE before mitigation due to anticipated failures associated with the existing baseline situation, and potentially after mitigation, depending on the type and amount of mitigation required. More information on the extent of failures (and thus effects) would be known at Stage 3 when a Highways England Water Risk Assessment Tool (HEWRAT) assessment is undertaken for routine runoff and its impacts upon water quality.
Climate	No LSE	No LSE	No LSE	No LSE	N/A	No LSE after mitigation.

3.3.34 Due to better buildability, operational safety and estimated value for money for Options A2-2 and C2-2 over Options A2-1 and C2-1, it was decided that Options A2-1 and C2-1 would be discarded, and A2-2 and C2-2 would be taken forward for more detailed assessment during the remainder of Stage 2.

3.3.35 The Stage 2 environmental assessment concluded that, following implementation of mitigation measures, no likely significant effects were anticipated to occur as a result of the two proposed options (Options A2-2 and C2-2) on the Air Quality, Climate, Biodiversity, Cultural Heritage, Geology and Soils, Material Assets and Waste, Noise and Vibration and Population and Human Health environmental aspects. However, likely significant effects were anticipated to occur on landscape and visual receptors and potentially water quality (Road Drainage and the Water Environment) as a result of both proposed options.

Options taken forward to public consultation

3.3.36 With regard to environmental impacts, the Stage 2 assessment concluded that there is little difference between the two options in terms of potential environmental impacts, and that although the additional land take of Option A2-2 means that it has slightly greater impact than Option C2-2 on some areas, particularly for landscape and loss of agricultural land, the difference is not significant enough to have an impact on the choice of preferred option to take forward to Stage 3.

Public consultation

3.3.37 Prior to public consultation and to aid clarity, the option names were changed in 2020 as follows:

- Option A2-2 became the Northern Loop
- Option C2-2 became the Inner Links

3.3.38 A public consultation was held for the Northern Loop and Inner Links options from 22 June 2020 to 17 August 2020. Due to the COVID-19 pandemic the public consultation was carried out remotely. The consultation included posting of a consultation brochure and response form to almost 10,000 addresses, provision of online information, and providing telephone events to replace face-to-face engagement.

3.3.39 Highways England received 817 responses to the consultation, which included responses from the local authorities, impacted landowners and local communities. Highways England received responses from a number of local authorities, including Bury Metropolitan Borough Council, Transport for Greater Manchester, Rochdale Borough Council, Salford City Council, Rochdale Development Authority and Lancashire County Council. Each of these stakeholders expressed the need for improvements at M60 J18, with the majority favouring the Northern Loop option.

3.3.40 625 out of the 817 respondents agreed that there is a need to improve traffic flows through the junction, and there was a clear preference for developing the Northern Loop option over the Inner Links option as a means of achieving this: 397 respondents strongly supported the Northern Loop option compared to 65 respondents who strongly supported the Inner Links option.

3.3.41 Concerns raised by consultees included the following:

- The need to address congestion (162 responses)
- Air pollution (147 responses)
- Safety (133 responses)
- Noise pollution (122 responses)
- Negative impacts on residents (115 responses)
- Losing the hard shoulder (74 responses)
- The carbon footprint (73 responses)
- Negative impact on the landscape (61 responses)
- Avoiding accidents (28 responses)
- Loss of land (25 responses)
- Avoiding confusion for drivers (25 responses)
- The impact on nature conservation (20 responses)

3.3.42 Another key concern was the construction phase impacts on the area and the duration of works.

3.3.43 The comments received in the open question about the Northern Loop option reiterated the view that the Northern Loop option was the more beneficial solution (122 responses) and would improve traffic flows (95 responses). The most frequently received negative comments about the Northern Loop option were about the design being inadequate (108 responses), being against using the hard shoulder (81 responses) and safety issues with potential for accidents (68 responses).

3.3.44 Most of the comments received in the open questions about the Inner Links option were negative. The main concerns were that it does not address congestion or improve the traffic flow (102 responses) and that it was an inadequate solution (85 responses). Some felt there was the potential for accidents (77 responses), that it was too confusing for drivers (75 responses), and there were issues caused by the traffic lights (70 responses). There were also concerns about using the hard shoulder (55 responses) and about lane structure (43 responses).

3.3.45 Table 3.10 highlights key responses from statutory environmental bodies during the Stage 2 consultation. Further information is available in the M60 Junction 18 Simister Island Interchange Report on Public Consultation (Accent, 2020) and Consultation Report Annexes (TR010064/APP/5.2).

Table 3.10 Key responses from statutory environmental bodies during Stage 2 consultation

Stakeholder	Consultation response
Environment Agency	The Environment Agency's response focused on flood risk, water quality and environmental permitting. **Flood Risk:** The Environment Agency sees increased risk on watercourses from the works and the Scheme may require a flood risk activity permit. There is potential to generate additional amounts of surface water, so Highways England will need to ensure that flood risk is not increased elsewhere. The Lead Local Flood Authority should be consulted on the proposals given their statutory role on surface water flood risk.
	Water Quality: The Water Framework Directive (and the associated statutory River Basin Management Plan) stipulates that there should be no deterioration of any waterbody. Measures to meet the overall objective of 'good' ecological status/potential should be addressed where possible. Surface water from the motorway network ultimately flows into the River Roch and River Irk watercourses which are monitored by the Environment Agency for compliance against the EU Water Framework Directive. Baseline evidence shows that they are currently failing to meet their required objectives with diffuse pollution pressures from 'Urban and Transport' noted as a contributing factor. The public consultation document notes that the two shortlisted options for the Scheme are likely to have 'adverse impacts' on the water environment from a water quality perspective. It also states that 'these impacts to be mitigated and options for this will be identified and included in the design for the Scheme as it progresses'. Any mitigation should consider opportunities to address current water quality impacts from the existing network to achieve a more sustainable solution to the final design of the Scheme and/or avoid the need to retrospectively address current outfall problems in the future. These would ultimately cost more in the longer term. Therefore, as part of the further assessment work for the Scheme (including any Environmental Statement) a Water Framework Directive Assessment should be undertaken to inform the scope around this. Opportunities to incorporate environmental best practice in the form of multifunctional and above ground sustainable urban drainage solutions (SUDs) should be adopted where feasible. This would not only address any water quality issues but also provide an opportunity for betterment with regards to biodiversity (net gains).
	Environmental Permitting: This development may require a permit under the Environmental Permitting (England and Wales) Regulations 2016 from the Environment Agency for any proposed works or structures, in, under, over or within eight metres of the bank of Castle Brook and Whitefield 4 Brook which, are designated 'main river'. Some activities are also now excluded or exempt. A permit is separate to and in addition to any planning permission granted.

Stakeholder	Consultation response
Natural England	Natural England had no detailed comments to make about the proposal at this stage but wanted to be consulted in future.
Public Health England (PHE)	PHE commented on the following implications of the Stage 2 options: • Human health and wellbeing • Environmental hazards • Air quality • Noise • Electric and magnetic fields The health of an individual or a population is the result of a complex interaction of a wide range of different determinants of health, from an individual's genetic makeup, to lifestyles and behaviours, and the communities, local economy, built and natural environments to global ecosystem trends. All developments will have some effect on the determinants of health, which in turn will influence the health and wellbeing of the general population, vulnerable groups and individual people. Although assessing impacts on health beyond direct effects from, for example, emissions to air or road traffic incidents is complex, there is a need to ensure a proportionate assessment. This should focus on significant effects of the upgrade. From this standpoint PHE made the following observations:
	Human Health and Wellbeing: PHE wants to see the application for a scoping opinion once the public consultation is complete and the preferred option is announced. At that point, PHE recommends the applicants follow the methodology provided by Design Manual for Roads and Bridges (DMRB) LA 112, when assessing and reporting the effect of the development on population and human health.
	Environmental Hazards: PHE understands that Highways England will wish to avoid unnecessary duplication and that many issues including air quality, emissions to water, waste, contaminated land etc. will be covered elsewhere in their Environmental Statement. The Environmental Statement should summarise key information, risk assessments, proposed mitigation measures, conclusions and residual impacts, relating to human health. Compliance with the requirements of National Policy Statements and relevant guidance and standards should also be highlighted.

Stakeholder	Consultation response
	Air Quality: PHE's position is that pollutants associated with combustion engine-based road traffic, particularly particulate matter and oxides of nitrogen are non-threshold. This means that an exposed population is likely to be subject to potential harm at any level and that reducing public exposures of non-threshold pollutants below air quality standards will have potential public health benefits. PHE supports minimising or mitigating public exposure to non-threshold air pollutants, addressing inequalities in exposure and maximising co-benefits (such as physical exercise). PHE encourages these to be considered during the development design, environmental and health impact assessment, and the development consent.
	Electric and Magnetic Fields: PHE notes that the current proposals do not appear to consider possible health impacts of Electric and Magnetic Fields (EMF). PHE requests that the Environmental Statement clarifies this and if necessary, the proposer should confirm either that the proposed development does not impact any receptors from potential sources of EMF or ensure that an adequate assessment of the possible impacts is undertaken and included in the Environmental Statement.
Bury Metropolitan Borough Council – Environment Team	**Overall view of Scheme:** The Environment Team is neutral about the options for the Scheme but is concerned about the potential impacts on air quality and how these can be mitigated.
	Current junction problems: The junction as it is now is likely to be contributing to high nitrogen dioxide levels on A56 and at the side of M60 between J17 and J18. Monitoring of NO_2 emissions close to residential housing at the side of the M60 between Junction 17 and 18 indicate that objectives for NO_2 were not met in 2019.
	Views on the proposals: The Environment Team is neutral about both options for the junction. The prospect of having 10 lanes of running traffic closer to the above residential properties is of great concern, as would be the impact on air quality for residents of Simister. The Environment Team suggests that Highways England must ensure that any improvements at Junction 17 and 18 have a positive impact on air quality and reduce nitrogen dioxide at nearby properties. The Environment Team will need to see the detailed air quality modelling carried out for the schemes and associated reports. It will need assurances that the project will not undermine proposals in the Greater Manchester Clean Air Plan to meet nitrogen dioxide objectives in the shortest time possible.

Stakeholder	Consultation response
Rochdale Borough Council – Environment	The Council stated that, while there are issues to be assessed in due course through a statutory planning process, it welcomes the mitigation measures proposed to minimise additional impacts of both options in relation to nature conservation, noise and drainage and the water environment. The Council requests additional future proofing in the design of any proposals at Junction 18 to support a new northerly motorway access into the Northern Gateway site around Birch services together with necessary improvements to M66 Junction 3. However, it does not believe that Highways England has not engaged sufficiently to tackle air quality issues and support the Greater Manchester Clean Air Plan work. The Council stated that it will examine the air quality impacts of the selected improvement during the planning process when greater information is available. This, they stated will help them better understand how any scheme supports collective efforts to reduce nitrogen dioxide levels across Greater Manchester. The Council requests early engagement with Highways England on the design of the selected option to assess the timing of any planned work in terms of the Northern Gateway development as well as the impacts of any diversionary routes during the construction period. They stated that restrictions must be in place on several local roads within the Borough to minimise disturbance to residents. They stated that regular meetings with elected Members and communities will therefore be needed. The Council will also want to ensure we have ongoing dialogue with Highways England to ensure any master planning of the Northern Gateway employment site, and its early phases of its delivery, are integrated into the planning of whichever improvement option is taken forward.

Justification for chosen option

3.3.46 Following public consultation in Summer 2020, the Northern Loop option was chosen as the preferred option. When selecting the preferred option, Highways England (now National Highways) considered several criteria, including the scheme objectives, safety, benefits, costs, environmental effects, construction and feedback from the public consultation.

3.3.47 While both options would meet the scheme objectives, the Northern Loop would provide greater capacity improvements and journey time savings for road users when compared to the Inner Links. These benefits, therefore, would be felt for longer into the future, as predicted traffic levels continue to grow and thus ensure that the strategic road network would function efficiently for longer into the future as predicted traffic levels continue to grow. Although more expensive than the Inner Links option, the longer-term benefits offered by the Northern Loop option would provide better value for money.

3.3.48 Due to the complex design, the Inner Links would be more challenging to build, and would require more traffic management and road closures during construction. Concerns were raised during consultation that introducing additional lanes and signals on the roundabout could make the junction more confusing for drivers to navigate, leading to an increased risk of accidents. As the Northern Loop option removes the need for additional lanes and signals going through the junction, the Northern Loop option was considered to be less confusing for drivers.

3.3.49 The Northern Loop option was also widely supported during the public consultation, with over 67% of respondents preferring the Northern Loop.

3.3.50 The PRA was made for the Northern Loop option on 27 January 2021 and the Northern Loop option was progressed to Stage 3 to develop the preliminary design for DCO application (see Section 3.4 for further details).

3.4 Preliminary design – Stage 3

Further Scheme development

3.4.1 During Stage 3 the design was further refined as a result of further studies (including environmental assessment) and public consultation, as explained below. Further details regarding design principles and design development can be found in the Scheme Design Report (TR010064/APP/7.6).

Changes to the design since the PRA

3.4.2 This sub-section describes key changes to the Scheme design since publication of the PRA before the statutory consultation. Further embedded mitigation is described in Chapter 2: The Scheme of this Environmental Statement (TR010064/APP/6.1) and within the relevant aspect chapters (Chapters 5-14) of this Environmental Statement (TR010064/APP/6.1).

Highways design

3.4.3 Table 3.11 lists the main changes to the highway design since the publication of the PRA before the statutory consultation and states the benefits of these design changes.

Table 3.11 Changes to the highway design since the PRA

Element of Scheme	Change since the PRA	Benefits of change to the design
M60 J17 to J18 mainline	• Hard shoulder provision added (see the 'Non-All Lane Running alternatives' section for further discussion). • Lane provisions and cross-sections modified to optimise available verge (which is highly constrained).	• Increases the capacity of the motorway and improves the current coverage of hard shoulder between M60 J17 to J18. • The central reserve has been designed to be as efficient as possible taking into account the requirement for a concrete barrier.
M66 southbound diverge	Vertical alignment changed so that the M66 southbound diverge link goes onto a bridge over the Northern Loop link (rather than under it).	• Significant reduction of earthworks volume required. • Reduction of construction materials required. • Removes the requirement for a retaining wall adjacent to the M66 southbound merge, which would have been difficult to construct and maintain. • Improves safety by providing road users with greater visibility of the road around the loop and on the approach to the slip road prior to merging onto the M60 southbound.
M60 northbound to M60 westbound free flow link	Removed offline link to maintain use of existing M60 northbound to M60 westbound link and update existing link to two lanes. Westbound merge arrangement design was modified so that the merge occurs prior to Haweswater Aqueduct underpass and weaving length to M60 J17 diverge is increased.	• Delivers the same traffic capacity whilst minimising the impact on the environment by reducing the amount of land required to build the Scheme. • Retains the existing gantries on the carriageway. • Improves driver visibility by increasing the width of the verge.
M66 / M60 northbound and southbound	Lane provisions and cross-sections modified, with hard shoulders added, accommodated by reducing the cross-sectional width of the central reserve to a minimum.	• Improves safety for road users.

Non-All Lane Running alternatives

3.4.4 In January 2022 the Secretary of State for Transport responded to the Transport Select Committee's report on the roll out and safety of smart motorways. The key recommendation was pausing the construction of new ALR motorways until five years' safety data is available on the sections opened before 2020. As the Scheme included an element of ALR, the Department for Transport instructed National Highways to consider alternatives to deliver the Scheme without the requirement for ALR. Consequently, an assessment of alternative options to progress the Scheme without an ALR element was undertaken. The purpose of the assessment was to determine if any non-ALR alternative options were viable, with the aim of de-risking the Scheme delivery, allowing the Scheme to progress, while minimising the cost and time impacts of any delay.

3.4.5 Three alternative options (Options 1-3), which focused specifically on the M60 between J17 and J18 to remove the ALR element, including the respective merges and diverges, were assessed. For all options the M66 and junction improvements outside of those that interact with the M60 between J17 to J18 were the same (known as Option 0 – the Scheme including an ALR element). The three alternative options were as follows:

- Option 1 – Controlled Motorway with five running lanes and a "full" hard shoulder (except at Sandgate Road Overbridge and Haweswater Aqueduct) on the M60 corridor between J17 and J18. There would be some permanent land take and disruption to access for some residential properties in order to accommodate a "full" hard shoulder.

- Option 2 – Controlled Motorway with five running lanes and an intermittent hard shoulder on the M60 corridor between J17 and J18 to minimise the impact to the surrounding properties and to remain within the existing highway boundary where possible.

- Option 3 – Controlled Motorway, retaining the existing four lanes on each side and existing hard shoulder arrangement, while providing the M60 J18 improvements as proposed in Option 0 (see paragraph 3.4.12). There would be no highways works to the west of Sandgate Road Overbridge. The attenuation ponds south of Whitefield Golf Course would not be required for this option; instead, an attenuation pond would be constructed on land adjacent to Prestwich Heys Football Club.

3.4.6 The initial environmental (including environmental policy) constraints, risks and opportunities for each option were identified in order to establish if the Scheme would encounter barriers to delivery in respect to scope, programme and budget.

3.4.7 The environmental risk assessment concluded that for all three alternative options there were environmental constraints or policy conflicts which, while potentially significant, could likely be mitigated in most instances but with implications for the programme and/or budget. Summaries of the environmental risk assessment for each option are as follows:

- Option 1 would have the most notable environmental constraints or policy conflicts due to potentially significant effects arising through the permanent land take requirements affecting residential properties located close to the motorway, visual impacts affecting the same receptors (some impacts could not be mitigated to non-significant), noise impacts affecting the same receptors during construction works, particularly at night, and the cumulative impact on health/quality of life on those residents due to disruption to access and loss of amenity. Risk of non-compliance with the National Policy Statement for National Networks (NPS NN) and National Highways' Licence was identified for the reasons stated above. Opportunities to reduce vegetation clearance were identified.

- Option 2 would still have notable environmental constraints or policy conflicts, but these were considered to be less than those from Option 1 as the option kept within the highway boundary where feasible, with reduced land take (no permanent land take affecting residential properties) and less associated disruption to access and vegetation clearance in comparison to Option 1. Risk of non-compliance with the NPS NN and National Highways' Licence was identified, however opportunities to reduce vegetation clearance and impacts on residents were identified.

- Option 3 would avoid potentially significant effects associated with the construction of attenuation ponds south of Whitefield Golf Course as the ponds would not be required for this option. However, there were notable environmental constraints or policy conflicts, such as vegetation clearance and noise impacts associated with other aspects of the option. Risk of non-compliance with policy was identified, as a lack of reduction in congestion could lead to a significant worsening in air quality concentrations at receptors close to the mainline (within an AQMA) which may not be able to be resolved / mitigated within programme or budget. There was also the potential requirement to provide alternative open space of equivalent or better standard due to permanent acquisition of open space adjacent to Prestwich Heys Football Club grounds. Option 3 had a smaller footprint and reduced construction works compared with Options 1 and 2, however this option may not adequately address the key issues associated with the Scheme, such as congestion, and could exacerbate existing environmental issues including air quality. Opportunities to reduce vegetation clearance were identified.

3.4.8 Taking into account the conclusions of the environmental risk assessment, alongside other factors, such as scheme cost, viability (i.e. the benefit cost ratio) programme and deliverability, operational safety, engineering and construction challenges and risks, and legal and statutory process challenges and risks, it was recommended that Option 2 should be progressed at Stage 3. The Scheme design was subsequently modified to include the non-ALR elements proposed by Option 2, and statutory consultation was undertaken (see the 'Statutory consultation' sub-section for further details).

Statutory consultation

3.4.9 Statutory consultation was undertaken between 15 February and 28 March 2023 (6 weeks). National Highways consulted with prescribed consultees as per the requirements of Section 42 of the Planning Act 2008. The consultees included, amongst others, Natural England, the Environment Agency and Historic England, relevant planning authorities and interested parties (e.g. landowners and tenants).

3.4.10 The local community and wider public were also consulted on the Scheme in line with Section 47 of the Planning Act 2008 and section 42 consultees.

3.4.11 A Statement of Community Consultation (SoCC) was produced and published before the statutory consultation. The SoCC outlined how National Highways would formally consult with the local community about the Scheme.

3.4.12 The purpose of the consultation was to seek comments from the local community and statutory consultees on the Scheme. The Preliminary Environmental Information Report (PEIR) (Annex L of the Consultation Report Annexes (TR010064/APP/5.2)) was produced to support the consultation. The PEIR included preliminary environmental information to enable consultees to understand the likely significant environmental effects of the Scheme, and measures identified to mitigate such effects, to help inform their consultation responses.

3.4.13 The statutory consultation included public events, webinars (these were live online events where technical experts talked through the Scheme design and answered any questions), telephone consultation events, a mobile engagement van at multiple locations in the local area, and publication of brochures, reports and other information made available in local community facilities and online.

3.4.14 A supplementary consultation was undertaken between 31 July and 10 September 2023. The purpose of the supplementary consultation was to inform affected stakeholders of the updates and changes to the Scheme since the statutory consultation and allow them to provide feedback. Further details of the design changes that have been made since the statutory consultation can be found in the ‘Changes to the design since the PEIR’ sub-section below and in Section 4.7 of the Consultation Report (TR010064/APP/5.1).

3.4.15 The Consultation Report (TR010064/APP/5.1) and Consultation Report Annexes (TR010064/APP/5.2), submitted as part of the DCO application, summarise the feedback received during the consultations as well as how the project team have considered this feedback in the Scheme design. The Consultation Report (TR010064/APP/5.1) demonstrates how National Highways has complied with the consultation requirements of the Planning Act 2008.

Changes to the design since the PEIR

3.4.16 This section describes the key changes that have been made to the Scheme design since the publication of the PEIR (Annex L of the Consultation Report Annexes (TR010064/APP/5.2)) and the statutory consultation. Further details of the design changes that have been made since the statutory consultation can be found in Section 4.7 of the Consultation Report (TR010064/APP/5.1).

Highways design

3.4.17 Under the Scheme design assessed in the PEIR (Annex L of the Consultation Report Annexes (TR010064/APP/5.2)), to accommodate a hard shoulder along the M60 J17 to J18 mainline, works would have taken place in close proximity to residential properties, at Prestfield Court (Kensington Street), Kenilworth Avenue, and Warwick Close. The works may have been required to take place during the night, and there would have been significant clearance of trees that provide visual screening of the motorway. To remove the requirement for works associated with installation of a hard shoulder near these residential areas and reduce the requirement for clearance of some vegetation on the highways verges (thus avoiding or reducing potential impacts on some residents), the highways design was refined so that hard shoulder provision would be provided further east along the M60 J17 to J18 mainline above the Haweswater Aqueduct underpass instead.

Drainage design

3.4.18 Following the PRA the drainage design was developed further. Five ponds were added to the Scheme design in order to attenuate and treat surface water runoff from the highway. The locations are shown in Figure 2.2: Scheme Design of the Environmental Statement Figures (TR010064/APP/6.2). Consideration of the environmental constraints was an integral part of the design development, as avoidance/minimizing the impact on sensitive habitats is a requirement of the hierarchical mitigation system outlined in paragraph 3.23 of DMRB LA 104 Environmental assessment and monitoring (Highways England, 2020a).

3.4.19 Under the Scheme design assessed in the PEIR (Annex L of the Consultation Report Annexes (TR010064/APP/5.2)), an attenuation pond (named Pond 6 after drainage catchment 6 (see Environmental Statement Chapter 13: Road drainage and the water environment (TR010064/APP/6.1) for further details regarding catchments)) was proposed in land south of Whitefield Golf Course. In addition, a new culvert to the south of the M60 mainline west of J17 was proposed in order to outfall into Bradley Brook. This pond was required for attenuation and water quality treatment, and to ensure that the network accommodates the 30% uplift in rainfall intensity due to climate change. The PEIR (Annex L of the Consultation Report Annexes (TR010064/APP/5.2)) included an assessment of the impacts of construction and operation of Pond 6 and identified impacts on the network of public rights of way within land south of Whitefield Golf Course, temporary construction noise impacts, visual impacts, and potential impact on Philips Park Ancient Woodland (temporary works to construct the new culvert south of the M60 would have taken place within the 15m buffer zone of Ancient Woodland).

3.4.20 A preliminary assessment of flood risk was undertaken on Bradley Brook to determine flood risk should the outfall at Bradley Brook be reopened. The assessment determined that the Bradley Brook watercourse would likely be over capacity in a present day 1% (1 in 100) fluvial flood event as a result of existing surface water run-off and United Utilities discharges, and any additional discharge into Bradley Brook would be anticipated to increase the predicted flooding downstream of the outfall (by approximately 65% in a 1% fluvial flood event).

3.4.21 A water quality assessment was undertaken using the HEWRAT on outfall into Bradley Brook and outfall into the River Irwell (see Environmental Statement Chapter 13: Road Drainage and the Water Environment (TR010064/APP/6.1) for further details). The assessment indicated that water quality treatment for outfall into Bradley Brook would be required, through provision of ponds, whereas with outfall into the River Irwell no water quality treatment would be required, in accordance with DMRB LA 113 Road drainage and the water environment (Highways England, 2020b).

3.4.22 For these reasons, it was determined that runoff should discharge via the River Irwell discharge point, rather than re-open the Bradley Brook outfall. Runoff could be attenuated through the use of oversized drainage pipes (up to 1.2m diameter) in the central reservation of the M60 mainline. This drain would be required from Haweswater Aqueduct underpass westbound, tying into the existing drainage network prior to Bury Old Road overbridge, maintaining the existing outfall east of M60 J16 into the River Irwell. As a result, there was a reduction of the Catchment 6 area of approximately 5.8 hectares of impermeable area, and all works to the west of M60 J17 (including Pond 6) were removed from the design of the Scheme.

Ecological mitigation areas

3.4.23 Additional land has been considered for ecological mitigation to ensure that the Scheme achieved no net loss (as currently required for Nationally Significant Infrastructure Projects (NSIPs)). Additional information regarding the requirement for and selection of land sites for ecological mitigation purposes can be found in Appendix 8.12: Biodiversity Net Gain Report of the Environmental Statement Appendices (TR010064/APP/6.3).

Acronyms and initialisms

Acronym or initialism	Term
ALR	All Lane Running
AQMA	Air Quality Management Area
dB(A)	A-weighted decibels
DCO	Development Consent Order
DMRB	Design Manual for Roads and Bridges
EB	Eastbound
EIA	Environmental Impact Assessment
EMF	Electric and Magnetic Fields
HADDMS	Highways Agency Drainage Data Management System
HEWRAT	Highways England Water Risk Assessment Tool
LSE	Likely Significant Effect
NB	Northbound
NIA	Noise Important Area
NO_2	Nitrogen dioxide
NPS NN	National Policy Statement for National Networks
NSIP	Nationally Significant Infrastructure Project
PEIR	Preliminary Environmental Information Report
PERA	Preliminary Environmental Risk Assessment
PHE	Public Health England
PRA	Preferred Route Announcement
ROS	Rapid Options Study
SB	Southbound
SM	Smart Motorway
SoCC	Statement of Community Consultation
SuDS	Sustainable urban drainage solution
WB	Westbound

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