## Document Control

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<th>Project</th>
<th>A66/A689 Tees Valley Strategic Study</th>
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<tr>
<td>Document Title</td>
<td>Stage 0.2 Report – Option Assessment</td>
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<tr>
<td>Document Ref</td>
<td>HE550313-MOU-GEN-SW-REP-Z-011</td>
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<td>Revision</td>
<td>P4.0</td>
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## Revision History

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<tr>
<td>P1.0</td>
<td>12/02/2016</td>
<td>Draft for review and comment</td>
<td>H Achampong, J Best</td>
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<tr>
<td>P2.0</td>
<td>29/03/2016</td>
<td>Updated draft for review and comment (Location 5 appraisals)</td>
<td>H Achampong, J Best</td>
</tr>
<tr>
<td>P3.0</td>
<td>12/08/2016</td>
<td>Updated draft for review and comment (Updated modelling and scope)</td>
<td>H Achampong, J Walsh</td>
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<tr>
<td>P4.0</td>
<td>23/09/2016</td>
<td>Issue for sign off (updated report and conclusions following client group review)</td>
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0. Executive Summary

0.1. Context and Background

0.1.1. Mouchel has been appointed by Highways England to undertake a feasibility study to examine the issues and constraints associated with the A66 (from Teesport to the A1(M)) and the A689 (from the A19 to the A1(M)).

0.1.2. The modal scope of the study is predominantly road-based and considers potential investment proposals on both the strategic and local authority road networks. The geographical area of interest has been defined in the Highways England brief and takes into consideration the Tees Valley region road network.

0.1.3. In addition to examining the issues and constraints associated with the two routes, the study’s purpose is to identify deliverable and affordable opportunities and options for resolving them to:

- Improve links to and between Tees Valley and the wider road network and;
- Increase the economic competitiveness of the Tees Valley region.

0.1.4. Seven specific locations have been identified in the brief for consideration. These are listed as follows:

Location 1: A66(M) and A1(M) Junction 57
Location 2: A66 Darlington Bypass
Location 3: Darlington Northern Relief Road (to be referred to in this document as Potential New Link between A1(M) and A66)
Location 4: A66 South west Stockton-on-Tees to A19
Location 5: A66 from A19 to Teesport
Location 6: A689 Tees Valley
Location 7: A689 County Durham

0.1.5. The study has been undertaken in two stages broadly aligned with the Transport Analysis Guidance (WebTAG) on the Transport Appraisal Process.

0.1.6. Stage 0.1 involved the review of previous studies and work undertaken in the study area, identification of problems along the routes and the generation of a prioritised list of issues.

0.1.7. This second stage seeks to use the prioritised list from Stage 0.1 to identify and sift possible interventions that could assist in tackling the issues and challenges whilst meeting the study objectives.

0.2. Summary of Option Assessment

0.2.1. Information gathered from Stage 0.1, collected from stakeholder engagement, review of existing studies and subsequent outcomes of work undertaken on behalf of Highways England, Tees Valley Unlimited (the Local Enterprise Partnership), local transport agencies and local authorities and some initial transport modelling, has been
used to identify issues and challenges which require attention in order to improve the overall performance of the region's road network.

**Option Identification and Sifting**

0.2.2. The identified issues and challenges used to generate the prioritised list for addressing the specified sites has formed the basis for the development of options.

0.2.3. Traffic modelling strategies have been designed for testing, sifting and refining possible options for further assessment. The base year matrices of the 2015 Tees Valley VOYAGER traffic model have been factored up to establish the opening year (2020) and design year (2035) demand scenarios. The factors used have been derived from TEMPRO growth values for the area.

0.2.4. The option identification process has also looked at how committed and planned highway schemes would complement the interventions identified and the region's network.

0.2.5. Combinations of qualitative assessment, stakeholder engagement, EAST analysis, traffic modelling and preliminary economic appraisal have sifted an initial schedule of options to reach 10 options grouped into 7 option packages for consideration by the client in the definition of future transport strategy for the Tees Valley region. Options have been developed for six out of the seven locations identified in the study brief.

**Option Assessment**

0.2.6. Following sifting, the remaining options and option packages have been assessed to further establish their relative impacts using the Option Assessment Framework (OAF) provided within the ‘Transport Appraisal Process’ Transport Analysis Guidance (WebTAG) Unit, in line with the Transport Business Case criteria.

0.2.7. The examination of impacts has been predominantly qualitative in nature given the availability of the information at this stage.

0.3. **Options / Option Packages Identified**

0.3.1. The options and option packages, identified through qualitative and some quantitative assessment for further consideration, are listed below in order of their assessed beneficial impact on the Tees Valley:

- **Location 4**: A66 Southwest of Stockton to the A19: Priority changes and westbound merges and additional lanes close to Teesside Park, lane gains / drops on the A66 / A135 junction at Elton, an offline link between Queen Elizabeth Way and the A174
- **Location 3**: North of Darlington: New dual carriageway relief road approximately 7.2km in length from J59 A1(M) to A66 / A1150 (route yet to be determined)
- **Location 2**: A66 South of Darlington: New river crossing, offline link and online widening
- **Location 5**: A66 from A19: Grade separated junction or throughabout at A66 / A171 Cargo Fleet Lane with safety measures at Teesport Roundabout.
0.3.2 It is recommended that the examination of proposed interventions at Locations 1 ("Diamond" Junction at A1(M) J57) and 7 (Dualling of the existing single carriageway) be discontinued at this stage, however, the client may wish to revisit these options either as standalone options or packaged with other intervention in consideration of future transport strategies for the Tees Valley region.

0.4. Further Assessment

0.4.1. Although showing a positive indicative BCR, some of these options are relatively high cost, and so there is a need to undertake a value engineering exercise to understand whether there are lower cost alignments, or infrastructure standards, that would reduce the costs without having a significant impact on the forecast benefits.

0.4.2. The options in this study have been identified and assessed with the assistance of a factored traffic model. Do Minimum testing using the VOYAGER traffic model full variable demand matrices should further clarify the scale of the issues for all locations and refinements can be made to the identified schemes. Where applicable, microsimulation modelling should be used to assist in the full assessment of the network’s comprehensive performance and better understand the need for intervention.

0.4.3. The next steps for this work will be outside the scope of this study. The outcome of further assessment will be an emerging recommended package of infrastructure proposals and a number of Strategic Outline Business Cases for the best-performing options, which will be used by Highways England and Tees Valley Combined Authority to define the next stages of the development of the Tees Valley regional transport network. This study will inform strategy for the Tees Valley City Region and for the North of England.
1. Introduction

1.1. Introduction

1.1.1. Mouchel has been appointed by Highways England to undertake a feasibility study to examine the issues and constraints associated with the A66 (from Teesport to the A1(M)) and the A689 (from the A19 to the A1(M)).

1.1.2. The modal scope of the study is predominantly road-based and considers potential investment proposals on both the strategic and local authority road networks. The geographical area of interest has been defined in the Highways England brief and takes into consideration the following routes which have been numbered here for ease of reference (see also Appendix A for a map showing these sites):

Location 1: A66(M) and A1(M) Junction 57
Location 2: A66 Darlington Bypass
Location 3: Darlington Northern Relief Road (to be referred to in this document as Potential New Link between A1(M) and A66)
Location 4: A66 South west Stockton-on-Tees to A19
Location 5: A66 from A19 to Teesport
Location 6: A689 Tees Valley
Location 7: A689 County Durham

1.1.3. The study is unique insofar as it has been commissioned separately to the Highways England / Department for Transport (DfT) strategic feasibility studies being undertaken by the Strategy and Planning Directorate and is, instead, being commissioned locally by the Network Delivery and Development Directorate (NDD). The study will, however, inform strategy for the Tees Valley region and for the North of England.

1.2. Study Purpose & Objectives

1.2.1. In addition to examining the issues and constraints associated with the two routes, the study's purpose is to identify deliverable and affordable opportunities and options for resolving them to:

Improve links to and between the Tees Valley and the wider road network and;
Increase the economic competitiveness of the Tees Valley region.

1.3. Study Stages

1.3.1. This study is being undertaken in two stages, broadly aligned with the Transport Analysis Guidance (WebTAG) on the Transport Appraisal Process. A third stage, outside the scope of this study, will involve more detailed full transport and economic appraisal of the options identified in this report using a validated full variable demand VOYAGER traffic model. Once this work has been undertaken, Strategic Outline Business Cases
and a full Appraisal Specification report can be produced for the better performing options.

1.3.2. Stage 0.1: Review of evidence and identification of problems along the routes (WebTAG Steps 1 to 4b)

- The first stage of this study focussed on reviewing relevant evidence gathered as part of previous studies, establishing the extent of transport modelling activity undertaken to date and future requirements, identifying and reporting known transport issues in the region and providing a prioritised list of issues to be taken into Stage 0.2. A summary of the conclusions from the Stage 0.1 report is given in Chapter 2 of this report.

1.3.3. Stage 0.2: Work to finalise the range of proposals that could address the problems along the routes (WebTAG Steps 5 to 9)

- Once the current and future problems along the routes have been identified, a range of proposals that could address the priority issues are developed and assessed. Transport modelling has been used during this stage in order to assist option development.
- This report – Option Assessment – is the main output of the second stage and will assist the client in selecting options for further investigation that will support strategic objectives for the Tees Valley region.

1.4. Stage Objectives

1.4.1. This second stage seeks to use the prioritised list from Stage 0.1 to identify and sift interventions that tackle the issues and challenges whilst meeting the study objectives. The following steps are involved:

- Identification of options / interventions
- Sifting process to determine potential options using Early Assessment and Sifting Tool (EAST)
- Further appraisal of potential options addressing the issues with the highest priority using traffic modelling to inform development of interventions / options for the rest of the region
- Detailed appraisal of resultant potential schemes using the Option Assessment Framework (OAF) provided within the ‘Transport Appraisal Process’ Transport Analysis Guidance (WebTAG) Unit, in line with the Transport Business Case criteria.
- Production of an Option Assessment Report (OAR) identifying the better performing options which will require further assessment outside the scope of this study.
2. Summary of Stage 0.1 Findings

2.1. Introduction

2.1.1. The Stage 0.1 Summary Report presented the findings of the first of the feasibility stages to unpick and understand work done to date, to comprehend the current and future transport issues along the routes and to provide a prioritised list of challenges to be taken into the next stage. The report also set the direction for the remainder of the feasibility study and informed the scope and limitations of future work.

2.1.2. The geographic area of interest was defined in the study brief and took into consideration the sites identified in the study brief.

2.2. Strategic Context

2.2.1. Following the 2013 DfT White Paper “Action for Roads”, the Highways Agency undertook a number of feasibility studies to investigate and develop options for routes with known constraints. Subsequent to the successful completion of these studies, Highways England proposes to follow this approach to improve the strategic road network in order to realise their long term aim: a mile – a minute network with no unplanned disruption and a consistent customer experience.

2.2.2. The Tees Valley contributes over £10 Billion to the national economy. The ambition to substantially grow the economy, articulated within the Strategic Economic Plan, (2014) is to build on Tees Valley’s strengths (advanced process industries, manufacturing, a skilled workforce and good transport links) to create 25,000 jobs (net) and generate an additional £1 Billion GVA per annum over the next decade.

2.2.3. Excellent strategic transport links are integral to achieving Tees Valley’s economic growth ambitions. The strategic road network in Tees Valley plays a vital role in moving people and goods within the region, to the rest of the UK and internationally through Hartlepool / Teesport and Durham Tees Valley Airport.

2.3. The Current Situation

2.3.1. The Tees Valley region has dispersed and multiple concentrations of housing and industry. Passenger rail connections are acceptable on north / south routes through the region (although the East Coast Mainline - ECML is capacity constrained) and east / west routes inter-region.

2.3.2. Freight, however, suffers and the lack of appropriate sea container gauge rail lines restricts the use of rail for freight connections to Teesport, a key centre of economic activity and trade for the region.

2.3.3. Equally, Durham Tees Valley Airport is constrained by the lack of rail and suitable road connections. Although linked to the strategic road network, the airport is accessed from
a heavily constrained section of the A66 and journeys from the southbound A1(M) have to use local urban routes (A167 and A1150) to access the airport through Darlington.

2.3.4. This lack of appropriate southbound road access to the wider Tees Valley region from the A1(M), and to / around Darlington, is a key limiting feature of current regional connectivity (this is mainly due to the limited access slips from the A1(M) to A66 (M) at Junction 57, and the predominantly single carriageway form of all south-east bound routes from the A1(M) at Junctions 58, 59 and 60).

2.3.5. Inter-urban road congestion and safety issues are prevalent in many locations in the region but are especially problematic in the southern A66 corridor (Darlington to Teesport). Peak flow tidal traffic volumes indicate hot spots in many locations (including the junctions / roundabouts on the A66 south-east of Darlington and the A1150 and A167) and there are several accident clusters (including the A1(M) Jn 57 links, the junctions / roundabouts on the A66 south-east of Darlington and the junctions and links on the A1150 and A167).

2.3.6. Another key consideration is the presence of housing close to or on key routes in the Tees Valley area, but in particular around Darlington, on the A66, A1150 and A167. This raises environmental concerns, creates strategic and local vehicle conflict, generates tension with non-motorised network users and constrains the scope for road improvements. It also has a major societal impact as roads designed for local traffic are being used as ‘rat-runs’ for strategic traffic.

2.4. Future Considerations

2.4.1. Vehicle use in the region is expected to increase over future years as are population numbers, housing and activity at Teesport. Much of this increase will be fuelled by the strategic growth aspirations of the region’s development sponsors.

2.4.2. Increased vehicle use will have an impact on routes which are at or near capacity and these constraints need to be addressed or they will stifle economic development and competitiveness of the region.

2.4.3. Efficient rail, sea and air networks are also vital to connect these dispersed locations and to make the region prosper now and in the future.

2.4.4. The ambition for the Tees Valley region is for it to continue to develop its multiple economic centres, rather than focussing growth in one particular large conurbation; future proofing road connectivity through interventions is, therefore, key to sustaining this model.

2.5. Prioritisation of Challenges

2.5.1. The report outlined the priority of the challenges at each of the seven sites identified for consideration in the study brief and placed the issues on the A66 corridor ahead of the A689 corridor.

2.5.2. The order of priority is listed below:

- Location 2: A66 Darlington Bypass
2.5.3. Locations 1, 2, and 3 form the highest priority for intervention in the study area. It is likely, however, that improvements to Locations 1 and 2 will be packaged together and that either this package or the option for Location 3 will be sufficient to address the capacity and safety challenges. Optioneering has been undertaken in this Stage 0.2, supported by traffic modelling, to identify the most appropriate intervention.

2.5.4. The better performing intervention will have an impact on the wider study area by changing traffic patterns and drawing additional traffic in to the A66 corridor. It is also expected that these interventions will influence the priorities for Location 4 where constraints will be exacerbated, and environmental challenges along the A66 corridor will potentially increase.

2.5.5. Location 5 is, itself, another strategically important, but heavily constrained, route for commuters and freight. Options proposed for Location 4 may, however, deliver benefits to this section of the A66.

2.5.6. Conversely, conditions along the A689 could improve as a result of traffic rerouting and this could alleviate environment and safety challenges and also release capacity to accommodate development related growth.

2.5.7. Therefore, the challenges for Locations 4, 6 and 7 need to be addressed taking in to account potential interventions at Locations 1, 2 and 3. Location 5 may be addressed in isolation.

2.6. Next Steps

2.6.1. The Stage 0.1 Summary Report outlined activity to be undertaken in Stage 0.2, which involves further investigation into the priority issues in the identified areas and identification of possible options.

2.6.2. The next chapters of this report describe the activity that has been undertaken in Stage 0.2.
3. Assessment Methodology

3.1. Introduction

3.1.1. This chapter gives an overview of the processes taken to identify and sift potential options for the study area, namely option identification, option sifting and option assessment.

3.1.2. The overarching objectives of the study are as shown in Table 3-1.

Table 3-1: A66 & A689 Tees Valley Strategic Study Objectives

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<td>Improve network resilience and connectivity, for local, regional, and international journeys.</td>
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<td>Better accommodate intra-regional flows.</td>
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<td>Improve infrastructure to better serve Teesport.</td>
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<tr>
<td>Accommodate the forecast increase in traffic levels following the proposed development of new housing and employment sites.</td>
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<tr>
<td>Capitalise on the current improvements to north-south journeys on the A1(M) and A66, by improving network resilience and connectivity on the A66 and A689 for the benefit of east-west trips.</td>
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3.2. Option Identification

3.2.1. Information gathered from Stage 0.1, which was collected from stakeholder engagement, review of existing studies and subsequent outcomes of work undertaken on behalf of Highways England, Tees Valley Unlimited (the Local Enterprise Partnership), local transport agencies, local authorities, and some initial transport modelling, has been used to identify issues and challenges which require attention in order to improve the overall performance of the region’s road network.

3.2.2. The identified issues and challenges used to generate the prioritised list for addressing the specified sites formed the basis for the development of options.

3.2.3. In line with step 5 of WebTAG, a range of interventions were identified. This was focused on the sites identified for consideration in the study brief, as per the prioritised list put forward to seek to address the region’s transport challenges.

3.2.4. As indicated in Chapter 2, Locations 1, 2 and 3 emerged as forming the highest priority for intervention in the study area. Therefore, options for all three locations have been assessed in more detail to identify an intervention that best meets the study’s objectives and the region’s aspirations. The better-performing intervention(s) at these locations will
have an impact on the wider study area by changing traffic patterns and drawing additional traffic in to the A66 corridor.

3.2.5. Options for Locations 1, 2, 3 and 7, at the region’s western gateway, were first identified and assessed to determine their impact on the wider strategic network.

3.2.6. The need for intervention at Locations 4, 5 and 6 has been subsequently explored.

3.2.7. The option identification process has also looked at how committed and planned highway schemes would complement the intervention identified and the region’s network.

3.3. Option Sifting

3.3.1. WebTAG states that following the generation of options, ‘it is possible that some options will have been identified which do not represent sensible solutions’. As such, it is important to conduct an initial sift of the options, in order to identify any ‘showstoppers’ which are likely to prevent an option progressing at a subsequent stage in the process.

3.3.2. According to the guidance, the process involves not progressing options that:

- would clearly fail to meet the key objectives identified for intervention;
- do not fit with existing local, regional and national programmes and strategies, and do not fit with wider government priorities; and
- would be unlikely to pass key viability and acceptability criteria (or represent significant risk) in that they are unlikely to be:
  - deliverable in a particular economic, environmental, geographical or social context;
  - technically sound;
  - financially affordable; and
  - acceptable to stakeholders and the public.

3.3.3. Assessment and development of proposals have been based on the following:

- Qualitative Assessment / Pre-Sift (including initial Client Project Board Engagement)
- Early Assessment and Sifting Tool (EAST) analysis
- Traffic Modelling using the new 2015 Tees Valley Region VOYAGER model
- Economic Appraisal using TUBA (Transport User Benefit Appraisal) v.1.9.6
- Stakeholder Engagement.
3.3.4. Discussions have been held with TAME to agree this approach and subsequent model application to test strategies.

3.3.5. At each stage of assessment, the options have been considered in the context of historic, committed and planned development in the Tees Valley region and from a national perspective.

3.3.6. This section sets out the methodology adopted to conduct the sifting of the options that have been identified. The methodology is broadly aligned with WebTAG ‘Step 6: Initial Sifting’.

3.3.7. Each location has been assessed independently against the site-specific issues and challenges present, so the scoring across the schemes cannot be directly compared as each section starts from a different base.

3.3.8. A qualitative assessment of the scale of the impact of each option against the route challenges and objectives and also against set deliverability and feasibility criteria has been undertaken.

3.3.9. This approach has reduced the initial list of options by removing those that do not make significant contributions to meeting the defined objectives, resolve the identified problems, or are not deliverable or feasible. This provides a useful audit trail for the options considered and discounted at an early stage. The table in Appendix C1 outlines the results of this process.

3.3.10. In order to further refine the number of options to be assessed, the Department for Transport’s (DfT) Early Assessment and Sifting Tool (EAST) has been used to comparatively examine the options generated.

3.3.11. EAST is a decision support tool that has been developed to quickly summarise and present evidence on options in a clear and consistent format using a spreadsheet. Detailed evidence often required to support funding applications is not needed; EAST allows a view to be taken on the best evidence available whilst remaining consistent with Transport Business Case principles.

3.3.12. Where possible, available information gathered during Stage 0.1 of this study has been used and also from previous studies on the region’s network, although for some criteria data is not yet available and as such engineering judgement has been utilised to derive a score. Other criteria have required assumptions to be made as it has not been possible to apply previous experience.

3.3.13. The results from the EAST assessment are presented in a tabular format for each location. EAST does not provide a method for obtaining an overall score for an intervention and therefore doesn’t provide a means of directly ranking them.

3.3.14. A key to the categorisation is depicted in Table 3-2.
Table 3.2: EAST Scoring Categorisation

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Strategic</th>
<th>Economic</th>
<th>Managerial</th>
<th>Financial</th>
<th>Commercial</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Scale of impact</td>
<td>Fit with wider objectives</td>
<td>Fit with other objectives</td>
<td>Degree of consensus</td>
<td>Economic Growth</td>
</tr>
<tr>
<td></td>
<td>1: Low</td>
<td>1: V High &gt;4</td>
<td>1: 0-1 mths</td>
<td>1: Low</td>
<td>1: Not Afforable</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>2: High 2-4</td>
<td>2: 1-6 mths</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>3: Med 1.5-3</td>
<td>3: 6-12 mths</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>4: Low 1-1.5</td>
<td>4: 1-2 yrs</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>5: High</td>
<td>5: Poor &lt;1</td>
<td>5: 2-5 yrs</td>
<td>5: High</td>
<td>5: Affordable</td>
</tr>
<tr>
<td></td>
<td>6: 5-10 yrs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>7: 10+ yrs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3.3.15. Traffic modelling has enabled the examination of the impacts of interventions using a validated traffic model and has informed the development of options to address lower priority issues. Appendix E presents analyses of the Stage 0.2 traffic modelling tests.

3.3.16. In Stage 0.2 of the study, the base year matrices of the 2015 Tees Valley VOYAGER traffic model, including committed and planned developments such as the A19 RIS Widening scheme, have been factored up to establish the opening year (2020) and design year (2035) demand scenarios. The factors used have been derived from TEMPRO growth values for the area.

3.3.17. The seven sites, outlined as specific considerations in the study brief, have been subjected to an incremental test regimes as shown below and in Appendices B1 and B2. The Model Flow diagram reflects the approved modelling strategy included within the Outline Appraisal Specification Report (ref.:HE550313-MOU-GEN-SW-TN-TR-015) which has been designed for testing and sifting the interventions connecting to the A1(M) and generating options for the issues to the west of the region.
A66 & A689 Tees Valley Strategic Study: Model Flow Diagram: Initial Testing

Note 1: ‘This’ figure is intended as an overview of the growth factors and includes highway and other planned infrastructure such as the A369-RIS Widening Scheme.
Note 2: Once the outcome of D52 and D53 is known, the appropriate test network will be used as the basis to Develop the options in Locations 4, 5 and 6.
Note 3: Options 4, 5 and 6 modelled against 50% as a default scenario.

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>D52</td>
<td>Future Reference State (with additional infrastructure)</td>
</tr>
<tr>
<td>D53</td>
<td>A689 (A1:M) J7 and A689 Darlington Bypass (supplementary schemes) Locations 1 &amp; 2</td>
</tr>
<tr>
<td>D54</td>
<td>Potential New Link from A689/A1 to A66 at Upper Barden Roundabout</td>
</tr>
<tr>
<td>D55</td>
<td>A689 Darlington Location 6</td>
</tr>
<tr>
<td>D56</td>
<td>A689 Tees Valley Location 6 and EAST LHR</td>
</tr>
</tbody>
</table>

11
A66 & A689 Tees Valley Strategic Study: Model Flow Diagram: Follow-on Testing

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**Note:** Full details of changes are detailed in the Model Flow Diagram. All recommendations have been reviewed and amended where necessary.

**Options:**
- Option 1: Future Reference Case
- Option 2: Impact of Growth
- Option 3: Impact of Development

**Stages:**
- Stage A: Baseline Model
- Stage B: Forecast Model
- Stage C: Policy Model
- Stage D: Impact of Growth Model
- Stage E: Impact of Development Model

**Recommendations:**
- Option 1
- Option 2
- Option 3

**Further Information:**
- For detailed analysis, please refer to the option assessment report.

---

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3.3.18. The baseline (Do Minimum) test is referred to as DS1.

3.3.19. DS1 has also been used to assess the location considered to be potentially independent of the other interventions:
   Location 5: A66 from A19 to Teesport

3.3.20. The interventions connecting with the A1(M) have been modelled in two independent tests (DS2, and DS3) to then enable the generation of options and assessment of all seven intervention areas.

3.3.21. DS2 and DS3 determine which of the options it will be most beneficial to pursue at the western gateway to the A66 corridor:
   Location 1: A66(M) and A1(M) Junction 57
   Location 2: A66 Darlington Bypass
   Location 3: Potential New Link between A1(M) and A66

3.3.22. The appropriate test network from the above tests has been used as the basis to develop the interventions in the east - in and around Stockton, Middlesbrough and Tees Valley:
   Location 4: A66 South-west Stockton-On-Tees to A19

3.3.23. The A689 corridor is assessed in a similar way using DS4 to examine intervention at the western end of the route first:
   Location 7: A689 County Durham
   Location 6: A689 Tees Valley (potentially based on DS2 or DS3 if DS4 determines that there is not a need for an intervention at Location 7)

3.3.24. The Roads Investment Strategy (RIS) funded widening of the A19 between Norton and Wynyard, closest to Locations 4 and 6, is proposed to be developed before 2020. This scheme is considered to be likely to have a significant impact on the region’s future network. As such, these developments have also been included to the modelling flow for each option / option package.

3.3.25. In order to better understand the impact of the proposals identified on the wider study area, options have been packaged together where beneficial and an Order of Magnitude Estimate (OME) has been produced for each package.

3.3.26. Preliminary cost benefit assessment has been used to enable a comparison of the indicative value for money provided by each of the proposed route options. The chosen tool for this exercise is TUBA (Transport User Benefit Appraisal), a computer program developed for the Department for Transport to undertake the appraisal of highway schemes and multi-modal transport studies.

3.3.27. TUBA undertakes a matrix-based appraisal using trip, time and distance and cost matrices as inputs. Costs associated with the Do-Minimum and Do-Something schemes are also used as inputs. TUBA calculates the user benefits in time, fuel vehicle operating costs (VOC), non-fuel VOC and charge, operator and government revenues and scheme costs. Costs and benefits arising in different years are expressed in terms of their value from the standpoint of a given year known as present value year. Summing the present
values of costs and subtracting these from the present value of benefits gives the ‘net present value’ of the scheme.

3.3.28. TUBA Version 1.9.6 has been used to perform the economic analysis, which has 2010 as the base year for economic parameters. This means that value of time, value of fuel, etc. are defined in 2010 prices.

3.3.29. Absolute values such as Benefit Cost Ratios (BCR) may change, although it is expected that this tool will provide a stable platform for comparing the performance of the various schemes at this stage in the study.

3.3.30. The standard TUBA ranking is as follows:

- Poor Value for Money (VfM) if the BCR is less than 1.0
- Low VfM if the BCR is between 1.0 and 1.5
- Medium VfM if the BCR is between 1.5 and 2.0
- High VfM if the BCR is between 2.0 and 4.0
- Very High VfM if the BCR is greater than 4.0

3.3.31. The views of key stakeholders were sought at the start of this study to gather evidence on the issues highlighted in the brief. As part of the option development and sifting process, this engagement has been continued and feedback taken into account with any suggested measures raised included in the sifting process.

3.3.32. The outputs from the first round of traffic modelling tests were presented to key stakeholders at a Stakeholder Engagement workshop on 23rd November 2015.

3.3.33. Their feedback and recommendations has then been incorporated into the optioneering process.

3.3.34. A record of the Stage 0.2 Stakeholder Engagement Workshop can be found in Appendix D.

3.3.35. Testing Progression

3.3.36. Following Tests DS1-4 and the stakeholder engagement activity, a second round of testing has been undertaken to establish the benefits of these proposals, explore a number of alternative scenarios and confirm the validity of the choice of option to pursue at the western gateway to the Tees Valley region.

3.3.37. New network information became available during the development of the options to the east of the region which has enabled further refinement of the results and the opportunity has been taken to re-run DS1 – the Do Minimum test.

3.3.38. This second round of traffic modelling or follow-on testing has subsequently been undertaken and is described below. Appendix B2 shows this modelling flow.

3.3.39. The interventions connecting with the A1(M) modelled in two independent tests – DS3 and DS7 to confirm which of the options is most beneficial and enables the highest flows into the region.

- DS3 has been re-run for the new link road option at Location 3 with an additional enhanced junction detail
- DS7 has been run to assess the benefits of an alternative scenario option for the A66 Darlington Bypass

3.3.40. The most beneficial option has then been used to test the benefits of the remaining options for the region in:
- Test DS5 – options developed for the A66 corridor in Location 4 (South-west Stockton-On-Tees to A19) and
- Test DS6 – options developed for the A66 corridor in Location 5 (from the A19)

3.4. **Option Assessment**

3.4.1. For each location, sifting using EAST is expected to result in one or two options being identified as better performing and included for further assessment. The WebTAG states that these potential options should be assessed against the Transport Business Case criteria using the Option Assessment Framework, provided within the WebTAG Unit.

3.4.2. Following sifting and option development using traffic modelling and stakeholder engagement, the remaining options have been assessed using this framework. The assessment areas for consideration are as shown in Table 3-3.

3.4.3. Each of the following location chapters identifies the remaining options. The assessment of options will be summarised in Chapter 10. Detailed option assessment tables can be found in Appendix F.
### Table 3-3: Option Assessment Areas

<table>
<thead>
<tr>
<th>Assessment Area</th>
<th>Consideration</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strategic Fit</strong></td>
<td>Regional Transport and Spatial Strategy and Local Objectives Fit</td>
</tr>
<tr>
<td></td>
<td>National Policy Alignment</td>
</tr>
<tr>
<td></td>
<td>Regional Policy Alignment</td>
</tr>
<tr>
<td></td>
<td>Local Policy Alignment</td>
</tr>
<tr>
<td></td>
<td>Scheme Objectives Fit</td>
</tr>
<tr>
<td></td>
<td>Network Resilience and Connectivity</td>
</tr>
<tr>
<td></td>
<td>Intra-regional Flows</td>
</tr>
<tr>
<td></td>
<td>Serving Teesport</td>
</tr>
<tr>
<td></td>
<td>Traffic from New Development</td>
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<tr>
<td></td>
<td>Link to A1(M) and A19 improvements</td>
</tr>
<tr>
<td><strong>Value for Money</strong></td>
<td>Impact on the Economy</td>
</tr>
<tr>
<td></td>
<td>Business Users and Transport Providers</td>
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<tr>
<td></td>
<td>Reliability</td>
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<tr>
<td></td>
<td>Regeneration</td>
</tr>
<tr>
<td></td>
<td>Wider Impacts</td>
</tr>
<tr>
<td></td>
<td>Impact on the Environment</td>
</tr>
<tr>
<td></td>
<td>Noise</td>
</tr>
<tr>
<td></td>
<td>Air Quality</td>
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<td></td>
<td>Greenhouse Gases</td>
</tr>
<tr>
<td></td>
<td>Landscape</td>
</tr>
<tr>
<td></td>
<td>Townscape</td>
</tr>
<tr>
<td></td>
<td>Historic Environment</td>
</tr>
<tr>
<td></td>
<td>Biodiversity</td>
</tr>
<tr>
<td></td>
<td>Water Environment</td>
</tr>
<tr>
<td></td>
<td>Impact on Society</td>
</tr>
<tr>
<td></td>
<td>Non- Business Users</td>
</tr>
<tr>
<td></td>
<td>Physical Activity</td>
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<td></td>
<td>Journey Quality</td>
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<td>Accidents</td>
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<td>Security</td>
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<td></td>
<td>Access to Services</td>
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<td>Affordability</td>
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<tr>
<td></td>
<td>Severance</td>
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<tr>
<td></td>
<td>Option Values</td>
</tr>
<tr>
<td></td>
<td>Public Account Impacts</td>
</tr>
<tr>
<td></td>
<td>Cost to Broad Transport Budget</td>
</tr>
<tr>
<td></td>
<td>Indirect Tax Revenues</td>
</tr>
<tr>
<td></td>
<td>Indicative Benefit Cost Ratio</td>
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<tr>
<td></td>
<td>Cost to Private Sector</td>
</tr>
<tr>
<td></td>
<td>Indicative Net Present Value</td>
</tr>
<tr>
<td></td>
<td>Indicative Economic BCR</td>
</tr>
<tr>
<td><strong>Financial Case</strong></td>
<td>Capital and Revenue Costs</td>
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<tr>
<td></td>
<td>Outturn Cost to Implement</td>
</tr>
<tr>
<td></td>
<td>Operating and Maintenance Costs</td>
</tr>
<tr>
<td></td>
<td>Funding Assumptions</td>
</tr>
<tr>
<td></td>
<td>Funding Allocation</td>
</tr>
<tr>
<td><strong>Delivery Case</strong></td>
<td>Likely Delivery Agents</td>
</tr>
<tr>
<td></td>
<td>Stakeholder Acceptability</td>
</tr>
<tr>
<td></td>
<td>Public Acceptability / Interest</td>
</tr>
<tr>
<td><strong>Commercial Case</strong></td>
<td>Route to Market</td>
</tr>
</tbody>
</table>
3.4.4. In line with WebTAG, the appraisals have used a 7 point scale of impacts in providing a (largely) qualitative assessment of the scale of impacts. The scale is as indicated in Table 3.4. Based on available evidence, the level of impact of the intervention has been scored using this scale.

Table 3-4: Option Assessment Scoring

<table>
<thead>
<tr>
<th>1 = Large Adverse</th>
<th>2 = Moderate Adverse</th>
<th>3 = Slight Adverse</th>
<th>4 = Neutral</th>
<th>5 = Slight Beneficial</th>
<th>6 = Moderate Beneficial</th>
<th>7 = Large Beneficial</th>
</tr>
</thead>
</table>

3.4.5. A preliminary indication of Benefit Cost Ratio from each of the scheme options, and in some cases, package of options, has been made using outline cost estimates produced to provide an indication of the potential costs of each scheme.

3.4.6. The remainder of this report considers each location and assesses the options generated to address specific and general issues and opportunities.

3.4.7. Plans of all the options and a spreadsheet showing the sifting results of each can be found in Appendix C1.
4. Location 1: A66(M) and A1(M) Junction 57 & Location 2: A66 Darlington Bypass

4.1. Context

**Overview**

4.1.1. The general consensus from the option identification process is that options for the two sites would need to be implemented in conjunction with each other in order to generate positive benefits on the network. They have therefore been considered together throughout Stage 0.2 and, for assessment purposes, are considered as a package of options.

4.1.2. Concerns identified at Locations 1 and 2 were high on the prioritised list of issues defined in Stage 0.1.

4.1.3. Location 1 commences at the A1(M) Junction 57 with the A66(M). The route continues along the A66(M) for 1.8 miles east until it reaches Stapleton Roundabout connecting with the A66 to the east and Stapleton Bank to the south. The A66(M) is two lane motorway in each direction for the majority of its length but reduces to single carriageway continuing east onto the A66 beyond Stapleton Roundabout moving into Location 2.

4.1.4. Location 2, the A66 Darlington Bypass, is predominately single carriageway along its length. It commences as a continuation of the A66(M) at Stapleton Roundabout and runs around the south and eastern outskirts of Darlington for 5.5 miles before reaching the A66/A1150 Roundabout near Little Burdon. Along the route there are five at-grade roundabouts of varying size, the first being Blands Corner between the A66 and A167, the second Neasham Roundabout with Neasham Road, the third Morton Palms with the A67, the fourth, the roundabout with the B6279 and the fifth at Little Burdon. The route also crosses three railways, one being the ECML.

**Existing Issues and Challenges**

4.1.5. Connectivity between the Tees Valley, Leeds and Manchester is considered critical by the region’s key stakeholders. Junction 57 on the A1(M) has no north facing slip roads therefore any traffic wanting to access the Tees Valley from the north leaves at Junctions 58, 59 or 60. This causes stress on the local road network in Darlington and is considered a constraint on development across the Tees Valley and a constraint on growth for Durham Tees Valley Airport which hopes to increase its competitiveness.

4.1.6. Moving into Location 2, the Grade II listed Blackwell Bridge and the A66 through Blackwell Village to the A167 Blands Corner roundabout restricts traffic flow. The roundabouts at A167 Blands Corner, Morton Palms (Yarm Rd/A67), Little Burdon (A66/A1150) and the Arena (Neasham Rd) are also heavily constrained.

4.1.7. Geneva Wood is a 25 year old plantation site of predominately Scots Pine. Roe deer are frequently seen, along with gold crest, coal tit, fox, sparrow hawk and unconfirmed...
sightings of crossbill. There is potential for impact due to its proximity but is dependent on the design of the intervention options.

4.1.8. There are 5 Grade II* and 29 Grade II listed buildings along the intervention extent, the closest of which is the Grade II Blackwell Bridge, carrying the existing A66 over the River Tees – again there is a potential for impact due to proximity.

4.1.9. There is potential for flooding around the urban areas of Blackwell and Stapleton and where the A66 crosses the River Skerne.

4.2. Development of Options

Option Identification

4.2.1. The constraints outlined above have restricted the range of viable solutions that can be identified for these locations.

4.2.2. The options that have been identified for the two locations are summarised in Table 4-1. They are the least intrusive but still represent a demonstrable impact on the road network and its setting.

Option Sifting

4.2.3. On identification, Option 1.2 was considered not to be practical as the A66 (M) and its associated infrastructure would require considerable alteration which would be uneconomic. Thus, it has been discounted.

4.2.4. Options 1.1, 2.1, 2.2 and 2.3 described above have subsequently been run through the EAST. A summary of the results for the remaining options under consideration is found in Table 4-2 below. A key to the numbers and colour designation used is provided in Table 3-2.

4.2.5. The summary in Table 4-2 indicates Option 2.1 as having a marginally less positive impact on the issues for consideration. This option has been discounted following the EAST analysis. Both Options 2.2 and 2.3 involve significant intervention but present better scorings. Therefore, both have been packaged together with Option 1.1 and put forward for modelling to be assessed in more detail to determine the better performing options to compare against options at Location 3.

4.2.6. The results of the modelling of these options (DS2) find that both have responded well to the congestion issues locally and to the need to assist in unlocking development potential to the south and east of Darlington but have limited impact on the wider area.

4.2.7. Preliminary TUBA calculations categorise both option packages as having a ‘medium’ level of benefit.
### Table 4-1: Summary of Options for Location 1 - A66(M) & A1(M) Junction 57 and Location 2 – A66 Darlington Bypass

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
<th>Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objectives for Locations 1 and 2:</strong> to improve access from the A1(M) to the Tees Valley region to assist in unlocking development potential to the south and east of Darlington and to reduce the impact of the route on adjacent settlements.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>1.1</strong></td>
<td>New north-facing slip roads on the A1(M) at Junction 57. Alteration of existing south facing slip roads junction to all movements “diamond” junction at J57 A1(M) with dumbbell roundabout layout below the A1 mainline</td>
<td>Reduced congestion at A1(M) Junctions 58 and 59 and along the A68 and A167 Improved journey times Consistent level of provision</td>
</tr>
<tr>
<td><strong>1.2</strong></td>
<td>New north-facing slip roads on the A1(M) at Junction 57. Alteration of existing south facing slip roads junction to all movements “diamond” junction at J57 A1(M) with dumbbell roundabout layout above the A1 mainline</td>
<td>Reduced congestion at A1(M) Junctions 58 and 59 and along the A68 and A167 Improved journey times Consistent level of provision</td>
</tr>
<tr>
<td><strong>2.1</strong></td>
<td>Widening of existing river crossing and southern bypass. Existing route over Blackwell Bridge to be dualled requiring structural work to the listed structure</td>
<td>Increased capacity – reduced congestion Improved journey times Consistent level of provision Widening of a Grade II listed structure Demolition of existing properties on Bridge Road Increased environmental impact on built-up areas on or near the route</td>
</tr>
<tr>
<td><strong>2.2</strong></td>
<td>New river crossing, offline connection bypassing Blands Corner and re-joining existing A66; Upgrade of A66 to dual carriageway from A66(M) to A66/A1150 Roundabout near Little Burdon. Route crosses the River Tees on a new structure before passing through the south Blackwell area and over the A167 where a new roundabout is proposed to provide connectivity to the existing Blackwell roundabout junction.</td>
<td>Increased capacity – reduced congestion Improved journey times Consistent level of provision Demolition of existing properties south of Bridge Road Reduction in the societal and environmental impact on built-up areas on or near the route</td>
</tr>
<tr>
<td><strong>2.3</strong></td>
<td>New westbound river crossing, offline connection bypassing Blands Corner and re-joining existing A66; Upgrade of A66 to dual carriageway from A66(M) to A66/A1150 Roundabout near Little Burdon. Route crosses the River Tees eastbound on the existing Blackwell Bridge and westbound on a new parallel structure before passing to the south Blackwell area and over the A167 where a new roundabout will connect to the existing Blackwell roundabout junction. Bridge Road to be stopped up.</td>
<td>Increased capacity – reduced congestion Improved journey times Consistent level of provision Demolition of existing properties south of Bridge Road Reduction in the societal and environmental impact on built-up areas on or near the route</td>
</tr>
</tbody>
</table>
Table 4-2: Location 1 - A66(M) & A1(M) Junction 57 and Location 2 – A66 Darlington Bypass EAST Assessment Summary

<table>
<thead>
<tr>
<th>Option</th>
<th>Strategic</th>
<th>Economic</th>
<th>Managerial</th>
<th>Financial</th>
<th>Commercial</th>
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<tr>
<td></td>
<td>Scale of impact</td>
<td>Fit with wider objectives</td>
<td>Fit with other objectives</td>
<td>Degree of consensus</td>
<td>Economic Growth</td>
</tr>
<tr>
<td>1.1</td>
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<td>1</td>
<td>4</td>
</tr>
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<td>2</td>
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<tr>
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<td>2</td>
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<td>3</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>2.3</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>5</td>
</tr>
</tbody>
</table>
Option Assessment

4.2.8. The following option packages have been put forward for further assessment against the Transport Business Case criteria using the Option Assessment Framework.

Locations 1 & 2 Option Package A
- 1.1 “Diamond” Junction at A1(M) J57
- 2.2 A66 New Offline River Crossing, Offline Link and Online Widening

Locations 1 & 2 Option Package B
- 1.1 Diamond” Junction at A1(M) J57
- 2.3 A66 New Parallel River Crossing, Offline Link and Online Widening

4.2.9. Chapter 10 summarises the assessment of the framework’s criteria for each of these packages.

Testing Progression

4.2.10. These option packages have been put forward for comparison with the assessment results of options for Location 3 (potential new link between A1(M) and A66) to determine the better performing option for the Darlington area.

4.2.11. Following the results of the initial assessment, Option 1.1 has been taken out of Package A and Package B for follow-on modelling, as it is considered to lower the benefits offered by the options at Location 2.

4.2.12. Due to the strategic nature of the VOYAGER model, it has not been possible to pick up the subtle differences between Option 2.2 (Offline River Crossing) and Option 2.3 (Parallel River Crossing). Option 2.3 is there modelled as a proxy for both schemes in the DS7 test.

4.2.13. Test DS7 which models Option 2.3 against the updated Do Minimum network shows that the intervention would provide some benefits to local traffic, but only limited benefits to the wider area. The Option has been classified as providing ‘poor’ ViM following the production of a negative BCR through an updated TUBA assessment. The full analysis of this test can be found within the Technical Note for DS7 (ref.: HE550313-MOU-GEN-SW-TN-TR-012).
5. Location 3: Potential New Link between A1(M) and A66

5.1. Context

Overview

5.1.1. The existing road network linking the A1(M) north of Darlington to the A66 commences at the Junction 59 of the A1(M). This section of the route heads south along the A167 for 2.5 miles through Coatham Mundeville and Beaumont Hill before reaching the roundabout with the A1150. The route then continues east along the A1150 which is predominantly single carriageway, around the northern outskirts of Darlington for 2 miles and passes over the ECML before connecting to the A66 at the A66/A1150 Roundabout near Little Burdon to the north east of Darlington. An offline route option may be appropriate to connect the A1(M) to the A66 at this junction.

Existing Issues and Challenges

5.1.2. The A167 north of the roundabout with the A1150 is a WS2 carriageway however, it has now been sterilized with central pedestrian refuges on safety grounds. Between this roundabout and the A1(M) there are numerous accesses on the eastern side of the carriageway and the vertical geometry is below current standards. The existing A1150 is a single carriageway in a dense urban environment constrained by property frontages and it passes over the ECML. This existing corridor is expected to be at or near capacity in both the opening year (2020) and design year (2035) and serves both local and strategic traffic.

5.1.3. There are 8 Noise Important Areas. Changes in traffic could have impact on noise levels within these areas.

5.1.4. Redcar Field is a Site of Special Scientific Interest (SSSI) and contains a range of fen vegetation types not found at any other site in County Durham. There is a potential for impact depending on the alignment of the intervention.

5.1.5. Drinkfield Marsh is a Local Nature Reserve (LNR) large shallow 2-hectare lake, bordered by common reed and bullrush. There are a variety of birds and animal life. Depending on the alignment of the intervention there could be an impact on the LNR.

5.1.6. Coatham Mundeville is a medieval village with a fishpond and areas of rig and furrow which could be impacted due to the proximity of the existing A167 road.

5.1.7. There are 62 nationally important Listed Buildings, 2 Grade I (high value) and 60 Grade II (medium value) within 1km of the intervention extents at Location 3. Consequently, there is a potential for impact on Listed Buildings within Great Burdon.

5.1.8. Tees US Low Worsall (GB103025072593) is designated by the Environment Agency under the Water Framework Directive. It is considered as 'Poor Potential Ecological
Status' and overall 'at risk'. Barmpton Quarry is Active landfill and there is potential for impact depending on route of the offline options.

5.1.9. An offline route option between junction 59 of the A1(M) and A66/A1150 Roundabout near Little Burdon would need to cross the ECML and various watercourses including the River Skerne.
5.2. **Development of Options**

*Option Identification*

5.2.1. The proposed route of the new link is yet to be determined and will be subject to a route selection process. The alignment options that have been explored here offer an opportunity to investigate the feasibility of a new offline link. They are summarised in Table 5-1.

*Option Sifting*

5.2.2. Stakeholders have been consulted during the development of the proposed alignment options to identify the most appropriate route. Options 3.1 and 3.2 have been chosen to take forward for further assessment.

5.2.3. The remaining two options described above have been run through the EAST. A summary of the results for the options under consideration is found in Table 5-2. A key to the numbers and colour designation used is provided in Table 3-2.

5.2.4. Following identical scoring between the two options, engagement with Highways England and key local stakeholders was sought to determine the potential option that best meets local objectives and aspirations. The proposed alignment of Option 3.1 has been identified as having the potential to create a more appropriate amount of development land to support the area’s economic growth. This option has consequently been modelled.

5.2.5. The test results for Option 3.1 (DS3) indicate that the proposed new link would provide significant benefits to road users within the Location 3 alignment corridor and across the wider network. The addition of the A19 Norton to Wynyard widening RIS scheme is shown to further improve projected performance of the option.

5.2.6. Preliminary TUBA calculations from the initial modelling exercise categorise Option 3.1 as having a 'high' level of benefit. It is considered that further benefits may be delivered if this option is considered with intervention at Location 4 on the A66 around Stockton. Follow-on testing has been undertaken to further corroborate this (see 5.2.10-12 below).
Table 5-1: Summary of Options for Location 3 – Potential New Link between A1(M) and A66

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
<th>Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objective for Location 3:</strong> to improve access from the A1(M) to the Tees Valley region to assist in unlocking development potential to the north of Darlington and to relieve congestion on the existing corridor – A1150/A167 to A66/A1150 Roundabout near Little Burdon.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>3.1</strong></td>
<td>New dual carriageway relief road approximately 7.2km in length from J59 A1(M) to A66/A1150; Includes the stopping up of A167 at J59 of A1(M); Proposed structures over the ECML just south of Brafferton Lane and over the River Skerne north of Brafferton Lane, south of Ketton Lane and west of Bishopton Lane</td>
<td>Continuous dual connection for the A66 between the A1(M) and Teesport</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Attraction of strategic traffic away from local road network</td>
</tr>
<tr>
<td></td>
<td>Reduction in the societal and environmental impact on built-up areas on or near the A1150 and A167</td>
<td></td>
</tr>
<tr>
<td><strong>3.2</strong></td>
<td>New dual carriageway relief road approximately 6.9km in length from J59 A1(M) to A66/A1150; Includes the stopping up of A167 at J59 of A1(M); Proposed structures over the ECML just south of Brafferton Lane; Runs to the east of Barmpton Lane</td>
<td>Continuous dual connection for the A66 between the A1(M) and Teesport</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Attraction of strategic traffic away from local road network</td>
</tr>
<tr>
<td></td>
<td>Reduction in the societal and environmental impact on built-up areas on or near the A1150 and A167</td>
<td></td>
</tr>
<tr>
<td><strong>3.3</strong></td>
<td>New dual carriageway relief road approximately 7km in length from J59 A1(M) to A66/A1150; Includes the stopping up of A167 at J59 of A1(M); Proposed structures over the ECML just south of Brafferton Lane; Runs through Darlington Golf Course</td>
<td>Continuous dual connection for the A66 between the A1(M) and Teesport</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Attraction of strategic traffic away from local road network</td>
</tr>
<tr>
<td></td>
<td>Reduction in the societal and environmental impact on built-up areas on or near the A1150 and A167</td>
<td></td>
</tr>
<tr>
<td>Option</td>
<td>Strategic</td>
<td>Economic</td>
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<tr>
<td>--------</td>
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</tr>
<tr>
<td></td>
<td>Scale of Impact</td>
<td>Fit with wider objectives</td>
</tr>
<tr>
<td>3.1</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>3.2</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>
Option Assessment

5.2.7. Option 3.1 has been taken forward for further assessment against the Transport Business Case criteria using the Option Assessment Framework. Chapter 10 summarises the assessment of the framework’s criteria for each of these packages.

Option Progression

5.2.8. As outlined in the modelling strategy in Chapter 3, the modelling outcomes of DS2 and 3 at Locations 1, 2 and 3 have been compared to inform the identification of options for Location 4. The new link road option proposed for Location 3 indicates better performance than the slip road and dualling option packages for Locations 1 and 2. To this end, the link road option has been taken forward as the basis for generating options for Location 4.

5.2.9. It should be noted, however, that none of the options for Locations 1, 2 or 3 can be demonstrated as providing a completely comprehensive solution to the challenges around Darlington. In seeking to enhance the effectiveness of the link road proposal, design development work has been undertaken as part of this study to investigate introduction of a grade-separated dumbbell roundabout at the A66/A1150 Roundabout near Little Burdon allowing the unrestricted flow of traffic along the A66 at and adding to the capacity of the junction.

5.2.10. The option’s effectiveness could also be enhanced if the limits of the intervention at Location 3 were to be extended to incorporate the dualling of the A66 between Morton Palms and the A66/A1150 Roundabout near Little Burdon roundabout. A re-run test of the Do Minimum scenario using the new network information that includes committed and planned developments, has helped to further clarify the scale of the issues for all three locations.


5.2.12. The intervention has shown to provide large benefits locally and across the wider area, especially when compared to the results of the DS7 test at Location 2. The BCR for this option is categorised as providing ‘medium’ VfM. As such, DS3 with the additional junction improvement has been selected as the better performing option and has been carried forward as the basis of subsequent tests.
6. Location 4: A66 South-west Stockton-on-Tees to A19

6.1. Context

Overview

6.1.1. The A66 south west of Stockton-on-Tees heading east towards the A19 is a mix of two and three lane dual carriageway with 6 grade separated junctions. This section of the route commences on the A66 at the Elton interchange and continues for approximately 5 miles where it reaches the junction with the A19. The route consists of a number of lane gain/lane drops between junctions and passes over the Surtees Bridge crossing the River Tees approximately 2.5 miles from the Elton Interchange.

6.1.2. Highways England has installed Ramp Metering on the A66 slip roads at Teesside Park to assist in reducing congestion.

Existing Issues and Challenges

6.1.3. This section of the A66 acts as a general constraint to development across the southern part of Stockton and in Thornaby. Long-term traffic forecasts indicate that additional junction and mainline capacity is required to meet the development aspirations of the locality and of the wider region.

6.1.4. Teesside Park is built on marshland. There have been significant highway interventions to combat subsidence on the access road which have remedied the medium term subsidence problem. There are water mains crossing the A66 on piled rafts which are not subsiding, resulting in undulations in the carriageway.

6.1.5. There is currently a National Grid high voltage overhead electricity cable that passes over the A66 just before the Elton Interchange and a rail overbridge just west of the A1027 Yarm Road Interchange.

6.1.6. There are 16 Defra Noise Important Areas in this location.

6.1.7. Stainsby Beck Catchment (Tributary of Tidal Tees) – GB103025072180 is designated by the Environment Agency under the Water Framework Directive and is considered as 'Bad Ecological Status' and overall 'at risk'.

6.1.8. A large floodplain lies to the south of the A66 and west of the Old River Tees, existing flood defences are in place here providing protection to the Teesside Retail Park. A second area of potential flooding (Flood Zone 2 and 3) exists where the A66 crosses Hartburn Beck.

6.1.9. Historic and active landfill sites exist adjacent to and at a distance from the existing A66. There is increased potential for pollutant source-path-linkage with a number of sites adjacent to the road.
6.2. Development of Options

Option Identification

6.2.1. Options proposed for this location have been summarised in Table 6-1.

Option Sifting

6.2.2. To meet the stated objectives, stakeholder engagement has been deployed to identify the most appropriate options for Location 4. Option 4.3 has been chosen in favour of the Option 4.2 alternative as it is considered to respond better to the capacity and weaving issues.

6.2.3. The remaining options described in Table 6-1 have been run through the EAST. A summary of the results for the options under consideration is found in Table 6-2. A key to the numbers and colour designation used is provided in Table 3-2.

6.2.4. Option 4.5 has scored marginally worse than the other options, however, the potential benefits offered by this option to both Locations 4 and 5 have prompted the decision to take it forward for further assessment.

6.2.5. Following the EAST analysis, the options have been packaged together as follows to deliver optimum performance and benefits at this location and for the wider network:

Location 4 Option Package A
- 4.1 A66 West of A19 – Priority Changes
- 4.3 A66 Westbound Merges and Additional Lanes
- 4.4 A66 Lane Gains / Drops – Elton Junction to A135 (Bowesfield Lane)

Location 4 Option Package B
- 4.1 A66 West of A19 – Priority Changes
- 4.3 A66 Westbound Merges and Additional Lanes
- 4.4 A66 Lane Gains / Drops – Elton Junction to A135 (Bowesfield Lane)
- 4.5 Offline link between Queen Elizabeth Way to A174
### Table 6-1: Summary of Options for Location 4 - A66 South-west Stockton-on-Tees to A19

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
<th>Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objective for Location 4: Reduce congestion and improve network resilience</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 4.1 | A66 West of the A19: Priority changes and the use of an additional lane between Teesside Park and the A66EB / A19 diverge | Reduced congestion  
Increased capacity  
Reduced weaving volume between Teesside Park traffic and A66 eastbound to A19 traffic |
| 4.2 | A66 Westbound (alternative option): Near-reversal of the existing arrangement by providing Type E (lane gain) and Type B (parallel) merges for A19SB and A19NB traffic respectively | Reduced congestion  
Improved segregation of traffic flows  
Will address weaving issues |
| 4.3 | A66 Westbound (alternative option): Provision of a Type E (lane gain) merges for both the A19NB and A19SB traffic, maintaining the three 3.25m lanes through the Teesside Park junction in the WB direction. | Reduced congestion  
Increased capacity  
Improved segregation of traffic flows  
Will address weaving issues |
| 4.4 | Elton Junction to A135 (Bowesfield Lane) Provision of a lane gain / drop arrangement to act as an extension to the current lane gain / drop arrangements at Surtees Bridge and beyond to increase link capacity on the A66 Elton and A66 Makro  
An interim layout Type H improvement is proposed at this location as a short term solution to address current and near-future issues. The lane gain /lane drop option proposed for Elton Junction to A135 (Bowesfield Lane) in this study will necessitate the conversion of the interim layout to layout Type E, but is intended to ensure the route’s robustness to 2035. | Increased capacity  
Additional land take |
| 4.5 | Offline link between Queen Elizabeth Way and the A174 | Completion of dual carriageway connection between A66 and A174  
Attraction of A19S/A66W traffic away from A66  
Increased use of the A174;Potential benefits for Location 5 |
### Table 6-2: Location 4: A66 Southwest Stockton-on-Tees – EAST Assessment Summary

<table>
<thead>
<tr>
<th>Option</th>
<th>Strategic</th>
<th>Economic</th>
<th>Managerial</th>
<th>Financial</th>
<th>Commercial</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Scale of impact</td>
<td>Fit with wider objectives</td>
<td>Fit with other objectives</td>
<td>Degree of consensus</td>
<td>Economic Growth</td>
</tr>
<tr>
<td>4.1</td>
<td>2</td>
<td>3</td>
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<tr>
<td>4.4</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>4.5</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>4</td>
</tr>
</tbody>
</table>
6.2.6. In order to further test the benefits of these interventions and their impact on the network, tests additional to the stated modelling programme have been undertaken which model Location 4 Options 4.4 and 4.5 with DS1 (Do Minimum) to assess their standalone benefits. These tests assist in informing the sequencing of intervention on the network – work which will be undertaken in work further to this study.

6.2.7. The test results for Option 4.4 with the Do Minimum scenario indicate that the proposed lane gain / drop arrangement would provide significant benefits to road users southwest of Stockton and across the wider network.

6.2.8. The test results for Option 4.5 with the Do Minimum scenario indicate that the proposed new link would also provide substantial benefits to road users southwest of Stockton, south of Middlesbrough and across the wider network.

6.2.9. The addition of the A19 widening scheme to these standalone scenarios is shown to further improve the projected performance of both options.

6.2.10. Work is underway to investigate the creation of a new Tees Crossing in Location 4. It should be noted that this will also have an impact on the network around Stockton.

6.2.11. Preliminary TUBA calculations categorise Options 4.4 and 4.5 as having a ‘very high’ level of benefit. It is thought that further benefits may be delivered if these options are implemented as a package alongside Options 4.1 and 4.3. This packaged intervention may also address issues associated with Location 5 by drawing traffic away from the heavily-constrained section of the A66 going through Middlesbrough.

Option Assessment

6.2.12. The option packages have been put forward for further assessment against the Transport Business Case criteria using the Option Assessment Framework.

6.2.13. Chapter 10 summarises the assessment of the framework’s criteria for each of these packages.

Testing Progression

6.2.14. Traffic modelling test DS5 described in 3.3.36 designed to establish the benefits of intervention at Location 4 has used Option 4.4 which scores relatively well on all assessments and has been shown to produce the highest benefits on the network.

6.2.15. The modelling results for Location 4 are summarised within the Technical Note for DS5 (ref.: HE550313-MOU-GEN-SW-TN-TR-013).

6.2.16. The intervention is shown to provide significant benefits to trips passing through the area and should be considered for further study. The indicative BCR for this option is categorised as providing ‘medium’ VfM.
6.2.17. In the second round of testing, the individual benefits of Option 4.4 have been calculated by discounting the costs and economic benefits of DS3 (the new link road to the north of Darlington with the Do Minimum). The preliminary BCR resulting from this calculation is categorised as providing a ‘high’ VFM.

6.2.18. It is recommended that Options 4.1 and 4.3 be tested using microsimulation modelling in subsequent assessments in order to further establish the comprehensive benefits of the identified package of options for Location 4.
7. Location 5: A66 from A19 to Teesport

7.1. Context

Overview
7.1.1. The A66 east of the A19 to Teesport is operated and maintained by Middlesbrough Borough Council and Redcar and Cleveland Council. This section of the A66 passes straight through the centre of Middlesbrough for 3 miles. This is a very dense urban environment and part of the route is elevated on viaduct. There are five grade separated junctions on this section. The A171 serves as a key entry point to Middlesbrough from the south and east, and joins the A66 at Cargo Fleet Roundabout. This junction is at grade and is partially signalised, with the operation of the signals optimised through the introduction of MOVA control. From Cargo Fleet Roundabout this section of the A66 continues east for 2.5 miles towards the roundabout with the A1053, Grangetown. There are three signalised junctions and two at grade roundabouts on this section.

Existing Issues and Challenges
7.1.2. The A66 passes straight through the centre of Middlesbrough with closely spaced junctions and substandard weaving lengths. Approximately 1 mile of the A66 is carried on a viaduct with dense development at either side.

7.1.3. There is currently a National Grid high voltage overhead electricity cable that passes over the A66 at Cargo Fleet Roundabout.

7.1.4. There are 13 Historic and 4 active Landfill sites adjacent to or in close proximity to the A66. There is increased potential for pollutant source-path-linkage with a number of sites adjacent to the road.

7.1.5. The current year traffic model indicates that the elevated section of the A66 will be close to or over capacity by the study years (2020 and 2035). This link, however, is key to the region’s strategic aspirations for the A66 which seek to support projected growth at Teesport and to contribute to the economic future of the north of England.

7.2. Development of Options

Option Identification
7.2.1. The macro-simulation capabilities of the factored Voyager strategic traffic model has meant that modelling test DS1 has not been subtle enough to identify sufficient evidence for intervention on this heavily constrained link.

7.2.2. The factored nature of the model does not allow for incorporation of any specific development information or the projected unitised growth at Teesport. The Stage 0.2 modelling approach may underestimate future traffic demands.

7.2.3. The Stage 0.2 stakeholder workshop has however defined the strategic importance of this section of the A66 and the key role that the whole route is to play for the Northern Powerhouse.

7.2.4. Due to the elevated nature and the surrounding urban environment of this route through Middlesbrough town centre, there is little scope for physical intervention works. It is proposed that the offline solution – linking Queen Elizabeth Way and the A174 – put forward as part of Location 4’s option package B (A66 Elton to A174) be considered as a possible solution to issues identified at Location 5. It is hoped that if its alignment, speed limit and signing strategy can be optimised, this link will attract a significant proportion of A66 through traffic, particularly if the new link road intervention at Location 3 north of Darlington is implemented.

7.2.5. The use of variable message signs which would encourage traffic to use the A174 rather than the A66 has been considered and has not been ruled out, although the lack of connections and the congested nature of the available side road network (A171 and A172) does not lend itself to suitable strategic diversions.

7.2.6. Anecdotal evidence demonstrates that there are two areas of specific concern. The A66 / A171 roundabout which suffers from excessive congestion and the A66 / Tees Port roundabout which suffers from excessive entry speed and overturning high-sided vehicles.

7.2.7. The options that have been identified to address these areas of concern are summarised in Table 7-1. More targeted modelling output which will be possible courtesy of a full variable demand Voyager traffic model, may result in the identification of additional options that will be assessed accordingly.

Option Sifting

7.2.8. The options identified for Location 5 have been run through the EAST. A summary of the results is found in Table 7-2. A key to the number and colour designation used is provided in Table 3-2.

7.2.9. Table 7-2 indicates that Options 5.1 and 5.2, proposed as alternative solutions to the issues identified by the client for the A66/A171 Cargo Fleet roundabout, generally receive
similar scorings with the throughout option (Option 5.2) scoring marginally better despite the proposal's limited flexibility.

7.2.10. Option 5.3 is shown to score less well than the other two options for this location on the strategic elements on the EAST but scores marginally better on the remaining elements presenting itself as a low cost option which will address localised issues.
### Table 7-1: Summary of Options for Location 5 - A66 from A19 to Teesport

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
<th>Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>5.1</strong></td>
<td>A66/A171 (Alternative 1) Grade Separated Junction</td>
<td>Increased capacity&lt;br&gt;Reduced congestion</td>
</tr>
<tr>
<td><strong>5.2</strong></td>
<td>A66/A171 (Alternative 2) Throughabout</td>
<td>Increased capacity&lt;br&gt;Reduced congestion</td>
</tr>
<tr>
<td><strong>5.3</strong></td>
<td>A66 / Teesport Roundabout: safety measures</td>
<td>Reduced ‘through’ visibility&lt;br&gt;Reduced approach speeds&lt;br&gt;Increased safety&lt;br&gt;Return to design standards</td>
</tr>
</tbody>
</table>
Table 7-2: Location 5: A66 from A19 to Teesport – EAST Assessment Summary

<table>
<thead>
<tr>
<th>Option</th>
<th>Strategic</th>
<th>Economic</th>
<th>Managerial</th>
<th>Financial</th>
<th>Commercial</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Scale of Impact</td>
<td>Fit with wider objectives</td>
<td>Fit with other objectives</td>
<td>Degree of consensus</td>
<td>Economic Growth</td>
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<tr>
<td>5.1</td>
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<td>3</td>
</tr>
</tbody>
</table>
7.2.11. The options for Location 5 have been put forward for further assessment against the Transport Business Case criteria using the Option Assessment Framework.

7.2.12. Chapter 10 summarises the assessment of the framework’s criteria for each of these packages.

7.2.13. As outlined in 3.3.36 of this report, tests DS6a and DS6b undertake the assessment of the Location 5 Options.

7.2.14. The strategic nature of the VOYAGER model prevents the modelling of Option 5.3 due to its size and so only Option 5.1 (Grade Separated Junction, DS6a) and Option 5.2 (Throughabout, DS6b) have been tested. Both options are modelled alongside DS5 (Options 3.1 - the new link road to the north of Darlington and 4.4 - lane gain / lane drop at Elton, with the Do Minimum). The results of this test are detailed within the Technical Note for DS6 (ref.: HE550313-MOU-GEN-SW-TN-TR-014).

7.2.15. For DS6a, adding a grade separated roundabout at A66 / Cargo Fleet Lane gives some benefits to road users, but its high cost means it provides minor economic benefit. The preliminary BCR for DS6a is categorised as providing ‘medium’ VfM.

7.2.16. The individual benefits of Option 5.1 have been calculated by discounting the costs and economic benefits of DS5. The preliminary BCR resulting from this calculation is categorised as providing a ‘neutral’ VfM.

7.2.17. For DS6b, adding an at grade ‘throughabout’ at A66 / Cargo Fleet Lane gives a small amount of benefit to road users but not enough to cover the cost of its construction. The preliminary BCR for DS6b is, however, categorised as providing ‘medium’ VfM due to the lower cost of the scheme.

7.2.18. The individual benefits of Option 5.2 have been calculated by discounting the costs and economic benefits of DS5. The preliminary BCR resulting from this calculation is categorised as providing a ‘poor’ VfM.

7.2.19. However, it may be argued that the VOYAGER model is not the most appropriate tool with which to appraise the Location 5 options. It is suggested that these options, in particular Option 5.3, would benefit from more targeted microsimulation modelling in combination with modelling options using the full VOYAGER variable demand matrices, which may also result in the identification of additional options and further support the need for intervention.
8. Location 6: A689 Tees Valley

8.1. Context

Overview

8.1.1. The A689 through Tees Valley commences at the County Durham/Hartlepool Borough boundary and passes north of the village of Wynyard for 3 miles to meet the A19 Wolviston Interchange. It then continues east past the A19 for 3 miles towards Seaton Carew. The route west of the A19 is dual carriageway and there are 3 at-grade roundabouts of varying size. The junction with the A19 is grade separated. The remit of this study extends as far as A689/Wolviston Road Roundabout.

Existing Issues and Challenges

8.1.2. There are no key highway or structural constraints identified on this section of the network.

8.1.3. There are a number of environmental risks within the intervention extents of Location 6. The location has four Defra Noise Important Areas and has an old railway track-bed which is a popular walking and cycling trail known as the Castle Eden Walkway. This route through Thorpe Wood passes beneath three fine brick-built bridges.

8.1.4. There is ancient woodland associated with North Burns, and the location also contains a small area of meadow, woodland and wetland located to the east of Wynyard Service Station. Both areas have potential for impact due to their proximity.

8.1.5. There is also a large floodplain associated with Greatham Beck and North Burn, which is within the intervention extents for Location 6.

8.2. Development of Options

Option Identification

8.2.1. The VOYAGER traffic model indicates that the existing links associated with Location 6 provide sufficient capacity for the opening and design years under consideration (2020 and 2035) without intervention. Other modelling acquired by Tees Valley Unlimited, however, shows that issues exist at junctions in this area.

8.2.2. It has also been demonstrated that the positive benefits associated with possible intervention works at Location 3 (Potential New Link from A1M to A66) generate traffic displacement from the A689 (circa 5% reduction) which would reduce the need for intervention works at this location.

8.2.3. Due to the fact that the Stage 0.2 traffic model is based on an approach where the existing traffic volumes are increased on a factored basis, rather than incorporating specific development areas, it is envisaged that this factored approach could underestimate the actual future traffic demands. Modelling the same options with a variable demand model may result in different outcomes for this location.

8.2.4. It is understood that Wynyard is an area where additional development beyond a WebTAG compliant growth rate is expected. The future A19 widening and improvement
scheme between Norton and Wynyard is also likely to make the A689 a more attractive option as an A19 to A1(M) connection so traffic volumes are likely to increase. These factors potentially have a significant impact at this location in particular. Therefore, this location should be reconsidered once this localised development has been accommodated into the traffic model.

8.2.5. A number of interventions at this location have been considered in the past, both locally and with input from Highways England. These proposals, linked with a higher development based growth rate, could show significant benefits to the A689 route and/or local developments. Closer investigation into these developments could be considered to determine this possibly employing alternative more detailed modelling methodologies.
9. Location 7: A689 County Durham

9.1. Context

Overview

9.1.1. The A689 County Durham commences at the roundabout at Junction 60 of the A1(M) and is predominantly single carriageway for approximately two miles to the roundabout with the A177, south west of Sedgefield. This section of the route then continues along the A689 to reach a second roundabout with the A177 Stockton Road and is dual carriageway along its length. The A689 passes underneath the ECM5/145 railway bridge which carries the ECML over the carriageway east of Bradbury and then passes over the railway line from Stockton-on-Tees.

9.1.2. The A689, which runs to the north of the Tees Valley, provides an alternative to the A66 from the north, linking the A1(M) to the A19.

Existing Issues and Challenges

9.1.3. The A689 is constrained by the ECML railway overbridge approximately half a mile from the roundabout between the A1(M) (Junction 60) and the A689. The carriageway cross section is approximately 10 metres width below the bridge with 1.8 metre and 2.3 metre verges and a reduced headroom of 4.9 metres. It is anticipated that the road section at this location is too narrow to accommodate a dual carriageway without demolition and reconstruction of the bridge.

9.1.4. There is also a Defra Noise Important Area along the A689. Changes in traffic could have an impact on noise levels within this area.

9.1.5. The River Skerne from Carrs to Woodham Burn - GB103025072430 is designated by the Environment Agency under the Water Framework Directive. It is considered as 'Poor Ecological Potential' and overall 'at risk'.

9.2. Development of Options

Option Identification

9.2.1. The study brief requests that the case for dualling the existing single carriageway at Location 7 (between the A1M J60 and the A177) be investigated.

9.2.2. The current traffic model for the network indicates that the existing links associated with Location 7 provide sufficient capacity for the opening and design years under consideration (2020 and 2035) without intervention.

9.2.3. This section, identified by the brief, represents the only remaining section of single carriageway on an otherwise dual carriageway route between the A1(M) and A19 – presumably due to difficulties with geometry and existing railway crossings - and as such could be interpreted as a limitation to the overall performance to the road. However, the link is generally straight with good overtaking opportunities, high traffic speed and infrequent accesses which allows for considerably higher traffic volumes than single...
carriageway roads in general. One option has been explored for Location 7 which responds to the requirement in the study brief and is summarised in Table 9-1.

**Option Sifting**

9.2.4. The option for Location 7 has been put forward to the EAST and to traffic modelling to further examine its viability. The results are summarised in Table 9-2.

9.2.5. As described in traffic modelling strategy in Chapter 3, Location 7 has been modelled as a dual carriageway in a network which included the intervention work at Location 3, namely the A66 - A1 J59 (Potential New Link from A1M to A66) - Test DS4. It has been modelled with this potential new route because the proposed link road is one of the study area’s better performing options and so has a higher likelihood of implementation. The results showed that the dualling of Location 7 does not attract any significant traffic volumes from the rest of the network and makes no noticeable difference to the remaining network. The addition of the A19 widening scheme, while resulting in increased traffic flows on this link, still delivers the same findings.

9.2.6. It is considered that, given the favourable results that are apparent in the existing network model, that dualling this remaining section of carriageway would not present a positive cost to benefit ratio.

**Option Assessment**

9.2.7. A qualitative assessment of Option 7.1 against the Transport Business Case criteria has also been undertaken using the Option Assessment Framework.

9.2.8. Chapter 10 summarises the assessment of the framework’s criteria for this option.

**Option Progression**

9.2.9. Based on the findings of the assessment of this option to date, it is recommended that it be discounted. The, client may, however, wish to revisit this option when considering possible strategies for the region.
Table 9-1: Summary of Location 7 Option

| Objective for Location 7: The creation of consistent traffic flow between the A1(M) and the A19 to support future development in and around Sedgefield. |
|---|---|---|
| **Option** | **Description** | **Impacts** |
| 7.1 | Dualling the existing single carriageway at Location 7 (between the A1M J60 and the A177). | Consistent traffic flows |
| | | Widening of bridge structure under the ECML |
| | | Increased capacity |

Table 9-2: Location 7: A689 County Durham – EAST Assessment Summary

<table>
<thead>
<tr>
<th>Option</th>
<th>Strategic</th>
<th>Economic</th>
<th>Managerial</th>
<th>Financial</th>
<th>Commercial</th>
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<tr>
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<td>Scale of impact</td>
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<td>Fit with other objectives</td>
<td>Degree of consensus</td>
<td>Economic Growth</td>
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10. Summary of Results

10.1. Introduction

10.1.1. This chapter and Table 10-1 provide an overall summary of the impacts of each option or package of options against the Option Assessment Framework provided within the WebTAG in line with the Transport Business Case criteria. Detail of the assessments can be found in Appendix F.

10.2. Strategic Fit

10.2.1. From Table 10-1, it is clear that, whilst all the options and option packages align with national and regional policy, the option for Location 7 is assessed as having slightly weaker alignment. None of the options impact on local policy.

10.2.2. In terms of specific scheme objectives, the option for Location 7 is assessed as having less positive impacts than the others to improve network resilience and connectivity, better accommodate intra-regional flows and accommodate projected increases in traffic from new development. The option for Location 3 is also assessed as having only slight benefits with regard to better accommodating intra-regional flows.

10.2.3. Option package B at Location 4 scores highest for strategic fit and due to the localised nature of the issues that the options for Location 5 address, they are marked as having the lowest strategic impact.

10.2.4. The scoring in this category for the safety measures option at Teesport roundabout (Location 5) is predominantly neutral as the intervention is not expected to alter the impact of this assessment area.

10.3. Value for Money – Economy

10.3.1. In relation to the economic impacts, Location 4’s option package B is assessed as having the most positive effect. The options for Locations 1, 2 and 3 appear to be the next best selections whilst Option 3 for Location 5 has been given a neutral scoring as it is considered that the intervention will not make any economic impact.

10.4. Value for Money – Environmental

10.4.1. In terms of environmental impacts, all of the options and option packages are assessed as having adverse effects on the majority of the environmental factors. However, whilst these adverse impacts are expected to be mainly slight for options at Locations 1, 2 and 3 and for option package A at Location 4, they are anticipated to be worse for the option at Location 7 and predominantly moderate adverse for the package B at Location 4 – the offline link affecting the benefits of the wider scheme. The three options for Location 5 are scored as having a mainly neutral environmental impact. Option 5.1 (the grade-
10.4.2. Moderate adverse impacts are highlighted for options at Locations 2 and 3 where the historic environment, particularly, Blackwell Bridge and Coatham Mundeville would be affected by proposed interventions.

10.4.3. Option package A for Location 4 is assessed as having the least adverse impact on environmental factors, closely followed by the option packages for Locations 1 and 2. Option package B for Location 4 is assessed as having the most adverse impact.

10.5. Value for Money – Society

Security, Access to Services & Option Value Factors

10.5.1. Table 10-1 shows neutral assessments for all the options and option packages on the security, access to services and option value factors anticipating no change to the current situation.

Non-Business Users, Journey Quality & Accident Factors

10.5.2. Option package B for Location 4 and the Location 3 option score better particularly on the non-business users, journey quality and accident factors.

Severance

10.5.3. Options for Locations 1, 2 and 3 are assessed as having slight adverse impacts on severance due to the effect on local roads in the region of the Blackwell Golf Course (Location 2) and to the closure of routes affecting pedestrians, equestrians and cyclists (Location 3).

Value for Money Summary

10.5.4. Option package B for Location 4 is assessed as having the most positive impact on society factors, closely followed by the option for Location 3. The option for Location 7 has the most neutral impact. Despite Option 5.1 – the grade separated junction proposal - being considered as having moderate beneficial impact for journey times and Option 5.3, which brings the Teesport roundabout back to safety standards, having moderate beneficial impact on accidents, options for Location 5 are, on the whole, scored as having the least positive impact.

10.6. Value for Money – Public Accounts

10.6.1. Table 10-1 presents high-level estimates for the options and option packages, demonstrating that option package B for Locations 1 and 2 has the highest indicative cost (£158m), followed by the option for Location 3 (£144m) and then option package A for Locations 1 and 2 (£62m). With the exception of option package B for Location 4, the
options for Locations 4 and 5 have been estimated to have the lowest indicative costs ranging from £6.7m to £25.4m.

10.7. **Value for Money – Indicative BCR**

10.7.1. At this stage, no private sector contributions have been identified for any of the options.

10.7.2. Very preliminary Net Present Values (NPV) and Benefit Cost Ratios (BCR) have been derived from the TUBA exercise using the high level cost estimates. The indicative BCRs will change as the options and option packages are developed but currently indicate the option for Location 3 and both option packages for Location 4 as offering high benefits and the options for Location 5 as providing the least benefit for the investment required to make the intervention.

10.8. **Financial Case**

10.8.1. Outturn costs have yet to be estimated for the options and option packages.

10.8.2. In terms of funding, all options and option packages have been scored as slight adverse, given the uncertainty over funding routes at this stage.

10.9. **Delivery Case**

*Complexity*

10.9.1. The options for Location 5 are considered to be the simplest to deliver. The logistics of delivering option package A for Location 4 and the option for Location 7 are also not anticipated to be challenging.

10.9.2. Options for Locations 1 and 2 are expected to have the highest degree of complexity associated with their delivery due to construction requirements adjacent to the A1(M) junction and the listed Blackwell Bridge.

*Stakeholder Acceptability*

10.9.3. The options for Location 5 are also scored as being the most acceptable to stakeholders as well due to the fact that they could be considered to respond directly to locally reported issues on the A66.

10.9.4. In terms of stakeholder acceptability, a large adverse impact is estimated for option package B for Location 4 due to the proposed construction of the offline link through woodland in the vicinity of Thornaby and Ingleby Barwick. This option package is ranked as likely to be least acceptable to stakeholders.

*Public Acceptability*

10.9.5. The options proposed for Location 5 are deemed in the appraisal to be the most publicly acceptable. The assessment shows neutral impacts for the option at Location 7 as it is expected that likely public support for work in an existing highway to alleviate congestion
may be balanced by possible opposition from environmental and public transport lobby groups.

10.9.6. The options around Darlington and option package B for Location 4 are considered likely to garner less public support. The impact of the option for Location 3 is scored as moderate adverse as the general public may be opposed to the construction of a new road across open countryside and farmland. The impact for the option packages at Locations 1 and 2 are also scored as moderate adverse as it is expected that there may be opposition to the impact that new construction will have on the listed setting of the Blackwell Bridge and the land take from Blackwell Golf Club. The impact of option package B for Location 4 is classed as large adverse for the same reasons that it scores poorly for stakeholder acceptability - the proposed construction of the offline link close to Ingleby Barwick.

10.10. Commercial Case

10.10.1. All options are deemed to be at an early stage of development, with a number of key steps needing to be negotiated before potential procurement routes could be assessed, including:

- Preliminary / detailed scheme design;
- Public and stakeholder consultation;
- Planning approval;
- Outline Business Case development; and
- Funding approval.

10.11. Summary

10.11.1. The option packages for Location 4 are assessed as having the most beneficial impact on the network. They score well on economic impacts, cost and policy fit. Both, however, score less well on environmental impacts and deliverability and option package B is considered to have the most adverse environmental impact due to the proposed offline link.

10.11.2. The option for Location 3 and option packages A and B for Locations 1 and 2 are identified as having marginally fewer positive benefits than those for Location 4. They score well on scheme objective fit and in the value for money economic and society assessment areas particularly for non-business users, journey quality and accidents. They are also, however, more costly than other schemes and show lower indicative BCRs. The proposals affect listed structures, the ECML and the River Skerne which is expected to lead to adverse environmental impacts, increased complexity and low public acceptability / interest. The new link road option (Location 3) is, however, expected to be better received by stakeholders.

10.11.3. The assessment also shows the options for Location 5 as having benefits but for a smaller part of the network. The Location 5 options are currently considered to be
relatively easy to deliver with fairly neutral impact on most of the assessment areas but show the lowest VfM.

10.11.4. The option for Location 7 is assessed as having the least beneficial impact on the network despite scoring relatively well on the reliability impact and fit with scheme objectives.
## Table 10-1: Summary of Option Assessment

<table>
<thead>
<tr>
<th>Assessment Area</th>
<th>Option Packages</th>
<th>1.1 &amp; 2.2</th>
<th>1.1 &amp; 2.3</th>
<th>3.1</th>
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Route to Market: Not specific route identified
11. Conclusions – Identification of Options for Further Assessment

11.1. Introduction

11.1.1. This report is the output from the assessment of initial options in Stage 0.2. It will provide a short list of options and option packages that should be considered in more detail.

11.1.2. The options in this Stage 0.2 have been identified and assessed with the assistance of a factored traffic model. Do Minimum testing using the VOYAGER traffic model full variable demand matrices should further clarify the scale of the issues for all locations and refinements can be made to the recommended packages.

11.2. Recommendations and Next Steps

11.2.1. The options and option packages identified to be taken forward are as follows:

Location 2 Option A
- 2.2 A66 New Offline River Crossing, Offline Link and Online Widening

Location 2 Option B
- 2.3 A66 New Parallel River Crossing, Offline Link and Online Widening

Location 3 Option 1
- New relief road from J59 A1(M) to A66 /A1150

11.2.2. Although showing a positive indicative BCR, these options are relatively high cost, and so there is a need to undertake a value engineering exercise to understand whether there are lower cost alignments, or infrastructure standards, that would reduce the costs without having a significant impact on the forecast benefits.

11.2.3. In particular, there would be merit in undertaking further alignment appraisal work in Location 3 to consider alternative alignments (and standards) for a new road to the north of Darlington. This appraisal should reflect the most recent work done by Network Rail on the East Coast Route Study, and also be sympathetic to the emerging Local Plan housing proposals within this part of Darlington.

Location 4 Option Package A
- 4.1 A66 West of A19 – Priority Changes
- 4.3 A66 Westbound Merges and Additional Lanes
- 4.4 A66 Lane Gains / Drops – Elton Junction to A135 (Bowesfield Lane)

Location 4 Option Package B
- 4.1 A66 West of A19 – Priority Changes
- 4.3 A66 Westbound Merges and Additional Lanes
- 4.4 A66 Lane Gains / Drops – Elton Junction to A135 (Bowesfield Lane)
- 4.5 Offline link between Queen Elizabeth Way to A174
11.2.4. These options currently show the greatest level of benefit from the work done to date, and further microsimulation modelling is recommended to test the interventions at these locations which feature online improvements that the VOYAGER model is unable to assess.

- Location 5 Option Package A
  - 5.1 Grade-Separated Junction at A66 / Cargo Fleet Lane Junction
  - 5.3 Safety Measures at A66 / Teesport Roundabout

- Location 5 Option Package B
  - 5.2 Throughabout at A66 / Cargo Fleet Lane Junction
  - 5.3 Safety Measures at A66 / Teesport Roundabout

11.2.5. Despite offering fewer benefits to the wider network, the Location 5 options provide positive local benefits and assist in supporting the City Region’s strategic aspirations for Teesport and the onward connections to the east. They should continue to be considered for these reasons.

11.2.6. Given the relative scale of costs, examination of the benefits of a throughabout at the A66 / Cargo Fleet Lane junction should be undertaken as a first stage using microsimulation.

11.2.7. Safety measures at the A66 / Teesport roundabout should concentrate on the issues of turning HGVs at the roundabout, and the possible provision of dedicated turning movements to help separate HGV traffic from other road users.

11.2.8. It is recommended that the examination of proposed interventions at Locations 1 and 7 be discontinued at this stage, however, the client may wish to revisit these options either as standalone options or packaged with other intervention in consideration of future transport strategies for the Tees Valley City Region.

11.2.9. This report will now form the basis of a process to be undertaken by Highways England and Tees Valley Combined Authority which will involve the selection, further analysis and business case assessment for the best performing options and packages to meet their objectives.

11.2.10. The outcome of further assessment will be an emerging recommended package of infrastructure proposals and a number of Strategic Outline Business Cases for the best-performing options, which will be used by Highways England and Tees Valley Combined Authority to define the next stages of the development of the city regional transport
network. The full study and its deliverables will inform strategy for the Tees Valley City Region and for the North of England.
12. Glossary

**Air Quality Management Area (AQMA):** An area identified by a local authority where Defra’s national air quality objectives are unlikely to be achieved.

**Ancient Woodland:** Woodland that has existed continuously since 1600 or before in England, Wales and Northern Ireland (or 1750 in Scotland).

**BCR:** Benefit-Cost Ratio. A measure of a schemes value for money. Calculated by dividing the Present Value Benefits (PVB) by the Present Value Costs (PVC).

**EAST:** Early Assessment and Sifting Tool. A DfT decision support tool that has been developed to quickly summarise and present evidence on options in a clear and consistent format.

**ECML:** East Coast Mainline: The railway link between London and Edinburgh via Peterborough, Doncaster, Wakefield, Leeds, York, Darlington and Newcastle.

**Flood Zone:** Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding.

**Important Area for Noise:** Places that are exposed to the highest levels of noise, according to Defra noise mapping.

**Link Capacity:** The maximum sustainable flow of traffic passing in 1 hour, under favourable road and traffic conditions.

**Local Enterprise Partnerships:** Voluntary partnerships between local authorities and businesses to help determine local economic priorities and lead economic growth and job creation within the local area.

**NPV:** Net Present Value. Calculated by subtracting the Present Value Costs (PVC) from the Present Value Benefits (PVB).

**PVB:** Present Value of Benefits. The stream of benefits over the appraisal period that are converted to 2010 prices and discounted to 2010 to give a present value.

**PVC:** Present Value of Costs. The costs of a scheme over the construction period converted to 2010 prices and discounted to 2010 to give a present value.

**RIS:** Roads Improvement Strategy

**Site of Special Scientific Interest (SSSI):** A conservation designation denoting a protected area in the United Kingdom.

**TAME:** The Traffic Appraisal Modelling and Economics Group (Highways England) supports network improvement by offering expertise in modelling and forecasting for traffic-related data.

**Transport User Benefit Appraisal (TUBA):** a computer program developed for the Department for Transport to undertake the appraisal of highway schemes and multi-modal transport studies.
WebTAG: The Department for Transport's web-based multimodal guidance on appraising transport projects and proposals, commonly referred to as Transport Appraisal Guidance.