

Northern Trans-Pennine Routes Strategic Study

Stage 3 Report



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1. Stage 3 Report (short version)

1.1 Executive summary

- 1.1.1 The Northern Trans-Pennine Routes (NTPR) Strategic Study was announced as part of the first Roads Investment Strategy (RIS) in December 2014. The study forms one of six national strategic studies, including two other studies, the M60 North West Quadrant Study and Trans-Pennine Tunnel Study located in the North of England. There is strong interrelationship between all three northern studies in terms of improving Trans-Pennine connectivity in the North of England.
- 1.1.2 The study aligns with Transport for North (TfN) aspirations to improve connectivity and recent recommendations from the Northern Powerhouse Independent Economic Review (IER) to deliver transformational economic growth across the Northern Region. These include increasing regional productivity and creating 850,000 additional jobs compared to the 'business as usual' scenario.
- 1.1.3 There are a number of major road improvements in the vicinity of the A66/A685 and A69 corridors that will improve the attractiveness of these Trans-Pennine routes. Evidence suggests that currently the routes are underutilised due to real and perceived problems and issues. These include poor journey time reliability, high collision rates, high proportion of heavy goods vehicles and lack of alternative diversion routes. Future growth in traffic levels, particularly related to freight movements, will accentuate these problems unless improvements are implemented.
- 1.1.4 If improvements are not made, delays and levels of congestion on the M62, as the only existing east-west strategic Trans-Pennine route, will continue to increase. For some journeys the A66 and A69 can serve as an alternative and more direct east-west crossing to the M62. For example, from Ferrybridge (A1/M62 junction) to Penrith (M6/A66 junction) the route via the A1 and A66 is approximately 39 miles shorter and 38 minutes less than the alternative route via the M62, M61 and M6.

- 1.1.5 The study commenced in September 2015. Throughout the study a Stakeholder Reference Group has been engaged in the outputs of various stages of technical work. In March 2016 the Stage 1 Report was published providing a robust evidence base of travel patterns and behaviour in the A66/A685 and A69 corridors. The evidence was used to develop intervention specific objectives and establish a case for strategic intervention on each corridor. It was concluded that:

Strategic Case for Intervention on the A66/ A685

- The A66 is a key national and regional strategic link for a range of south north and east west movements, particularly for freight, with commercial vehicles in excess of 20% of total vehicles on most sections of the route compared to typical levels of 15% on motorways. There are no direct rail alternatives for passenger or freight movements along the corridor.
- The A66 is the most direct route between the Tees Valley, North Yorkshire, South Yorkshire, parts of West Yorkshire, the East Midlands, Eastern England and North Cumbria, Glasgow, and much of the central belt of Scotland and Cairnryan (for access to Northern Ireland and the Republic of Ireland).
- For some journeys the A66 can serve as an alternative and more direct east-west crossing than the M62 which is currently the only major east-west crossing of the Northern UK between Derby and Edinburgh. From Ferrybridge (A1/M62 junction) to Penrith (M6/A66 junction) the route via the A66 is approximately 39 miles and 38 minutes shorter via the A1 and A66 than the alternative route via the M62, M61 and M6.
- Despite the strategic importance of the A66, the route between the A1 at Scotch Corner and the M6 at Penrith is only intermittently dualled and still has six separate sections of single carriageway sections in 49.5 miles. A number of these single carriageway sections have above average collision rates for all vehicle types with a higher than expected proportion of collisions involving HGVs (21%-30% compared to 12% nationally by road type).
- The mix of road standards affects the reliability, resilience, safety and attractiveness of the route (real and perceived), meaning that is underutilised as the key strategic east-west link north of the M62 corridor. The high variability in average traffic speeds discourages use of the route by some freight operators. The GB freight model indicates that the A66 could potentially account for 23% of Trans-Pennine HGV freight traffic compared to 13% at present. There are few diversionary routes if incidents occur.

Strategic Case for Intervention on the A66/ A685

- If the route is not improved the performance will inhibit improvements to links between cities and global connectivity, and threaten the transformational growth envisaged by the Northern Powerhouse agenda. GVA is projected to be 15% higher than the business as usual scenario resulting in increased transport activity.
- Interventions on the A66 will therefore meet the study objectives in having a positive impact on travel reliability and network resilience; and
- Improve future national and regional connectivity and promote transformational economic growth in the North of England.

Strategic Case for Intervention on the A69

- The A69 is the most direct route for journeys between Tyne and Wear, Durham and North Cumbria, Glasgow, and much of the central belt of Scotland and Cairnryan (for access to Northern Ireland and Republic of Ireland). The A69 provides an important link for freight traffic between the Tyne ports and South West Scotland. Warwick Bridge has a speed limit of 30mph, representing the one remaining section of the national strategic road network with this speed limit.
- The A69 also performs a key function in integrating communities along the route into the wider North East/North West economy, and providing a vital commuter link to the Tyne and Wear and Carlisle areas. The population in the local area has higher than average skills and qualifications, and 70% of journeys to work are outward commuting from the local area. The area is characterised by high car dependency with 75% of the population reliant on the private car.
- The A69 also supports access to key tourist attractions such as Hadrian's Wall World Heritage Site, Northumberland National Park, Northumberland Dark Sky Park and the Lake District.
- If improvements are not made to the A69 this will constrain the future economic development of the communities and specific development growth areas, such as Carlisle Airport, Newcastle International Airport and Cumbria's Energy Coast. The eastern side of the A69 between Hexham and Newcastle is the most heavily trafficked section of both the A66 and A69 routes with 26,000 annual average daily traffic.

Strategic Case for Intervention on the A69

- The high variability in average traffic speeds discourages use of the route by some freight operators.
- Planned improvements to the rail service between Newcastle and Carlisle will improve public transport accessibility to facilities for communities along the route, but they will not address the strategic objectives of the study.
- A number of single carriageway sections on the route have high collision rates for all vehicle types. The section between Brampton and Carlisle has higher than average collisions with 257 collisions per billion vehicle kilometres compared the national average of 175.
- Interventions will therefore have a positive impact on the economic vitality of local communities and the attractiveness of specific development areas;
- Improve travel reliability and network resilience; and
- Improve regional connectivity and promote economic growth in the North of England.

- 1.1.6 Based on the need for intervention, a long list of potential interventions was developed to improve connectivity on the Trans-Pennine Routes. Through a sifting process a short list of options was produced to meet the agreed study specific objectives. These are detailed in Table 1.8 of this summary report.
- 1.1.7 More detailed assessment and appraisal of interventions was undertaken using compliant DfT techniques and guidance (TAG) including environmental assessments and wider economic impacts. Indicative order of magnitude costs were produced for the interventions.
- 1.1.8 The feasibility work undertaken by this study has shown that the initial strategic and economic cases are positive enough for interventions to be taken forward to the next stage of assessment.
- 1.1.9 The next stage of development of the interventions will benefit from the availability of the North Trans-Pennine Regional Traffic Model, currently being developed, which will be capable of modelling the wider strategic reassignment of traffic. The availability of a North of England Land use model will also allow more detailed analysis of employed and land use changes and capture the wider economic benefits of transport interventions. Both these tools will assist in the refinement of the assessment work carried out to date.

1.2 Wider Strategic Context

- 1.2.1 The first Roads Investment Strategy (RIS), published by the Department for Transport (DfT) in December 2014, sets out a strategic vision for the continued development and improvement of the strategic road network (SRN). As the backbone of the transport system, the highway network carries 90% of passenger journeys and almost 70% of freight trips, but it faces a number of long term challenges, one of which is the need to radically improve east-west connectivity. Historically major transport infrastructure improvements have focused on improving north-south routes. Currently the M62 is the only high standard east-west link across the Pennines between Derby in the South and Edinburgh in the North. This serves as a major barrier to the development of the economies of the North.
- 1.2.2 Building on the feasibility studies produced to inform RIS 1, six strategic studies were announced in 2015 to help inform the development of RIS 2 (2020-2025). This included the Northern Trans-Pennine Routes Strategic (NTPR) Study. The strategic objective of the NTPR Study is to investigate the potential to create a new strategic corridor linking the A1 with the M6 by upgrading one or both of the A66/A685 and A69 and making other improvements along their length. Further aims are to improve east-west connectivity within the North of England, whilst considering the impact that any options may have on wider east-west links between the M62 corridor and the Scottish border, build network resilience and promote economic growth. Two other strategic studies are being undertaken in the northern region. These are the Manchester (M60) North West Quadrant Study and Trans-Pennine Tunnel Study. There is strong interrelationship between all three studies in terms of improving Trans-Pennine connectivity and promoting transformational economic growth in the North of England.
- 1.2.3 Transport for the North's (TfN) Transport Strategy and Investment Plan also identifies the improvement of North of England east-west road links as fundamental to the growth of the North of England economy, and poor Trans-Pennine connectivity has been identified as a major barrier to realise economic growth in the Northern Powerhouse Independent Economic Review (IER). Improvements to the A66/A685 and A69 will positively contribute towards the development of the Northern Powerhouse, which sets out a vision for 'improved east-west major road links to ensure more reliable journey times between major cities within the North' and 'effective road connections to the country's major ports in the North of England'. These include Teesport, Port of Tyne and Port of Liverpool.
- 1.2.4 Current improvements on the A1(M) with Dishforth to Leeming completed in 2012, Leeming to Barton scheduled to open in Spring 2017 and improvements to various sections of the A1(M) around Gateshead and Newcastle will increase the attractiveness of the A1(M) as a strategic route. In turn these north-south improvements will potentially add to the attractiveness of the A66 as a strategic east-west alternative to the M62 for journeys between the east and north west of the UK.
- 1.2.5 Cumbria County Council and Tees Valley LEP are also in the process of undertaking studies to examine connectivity beyond the immediate A69 and A66/A685 corridors. East-west route connectivity is particularly critical for access to Teesport and Durham Tees Valley Airport, providing international connectivity and opening up logistics, freight, container market and aviation-related opportunities for businesses in the

Tees Valley and to attract global investment. The route is also an important link for the chemicals and energy companies located at Wilton, and for a number of the Tees Valley's Enterprise Zones. The key east-west links, including the A66 and A69, are considered to be an unacceptable standard given their strategic importance. East-west connectivity is also an important element in delivering elements of Cumbria's Strategic Economic Plan helping to deliver the economic benefits associated with major energy, nuclear and advanced manufacturing related development in the sub-region. East-west route improvements would also assist improved connectivity between Northern England and Scotland, enhancing the economies of both regions.

1.3 Study Background

- 1.3.1 The Northern Trans-Pennine Routes (NTPR) Study is a strategic study which is jointly sponsored by the Department for Transport (DfT) and Transport for the North (TfN), and undertaken by Highways England on their behalf. The requirement for this study was set out in the first Roads Investment Strategy (RIS), published in December 2014, which announced a programme of six Strategic Studies to explore options to address some of the Strategic Road Network's emerging challenges. The results of these high-level studies will inform RIS 2 (2020-2025).
- 1.3.2 The RIS identified one of its five long-term challenges for the Strategic Road Network (SRN) as:

Improving East-West Connectivity

Rail and road connectivity traditionally links the North and the South, with our main arteries not serving East – West travel as comprehensively. Indeed, there is only one continuous dual carriageway or better link from East to West between Derby in the South and Edinburgh in the North. This serves as a major barrier to the development of the economies of the North. For instance, the lack of adequate Trans-Pennine connectivity must be addressed to realise the desire for a Northern Powerhouse.

- 1.3.3 The RIS Investment Plan announced a number of strategic studies to address these long-term challenges, including:

Northern Trans Pennine

Between Leeds and Manchester in the south and Edinburgh and Glasgow in the north, there is no complete dual carriageway link between the east and west of the country. This is one of the most visible gaps in the UK transport network, and is seen as a barrier to business in the north of England. It also leaves the economy of the north of England heavily dependent on one road – the M62 – to provide strategic east-west connectivity.

There is potential to create a new strategic corridor in the region and link the A1 and the M6. Doing so could help the economies of the North East and Cumbria, as well as improve journeys between England and Scotland.

The two main east-west roads in this area, the A69 and A66, have been partially upgraded over the years. Both roads have a mix of high-quality dual carriageway and single carriageway. This study will examine the case for dualling one or both of these roads and making other improvements along their length. In doing this, we would further help the development of a northern powerhouse.

- 1.3.4 Transport for the North's (TfN) Transport Strategy and Investment Plan also identifies the improvement of North of England east-west road links as fundamental to the growth of the North of England economy, and the lack of Trans-Pennine connectivity has been identified as a major barrier to realise economic growth in the Northern Powerhouse Independent Economic Review (IER). Improvements to the A66/A685 and A69 will positively contribute towards the development of the Northern Powerhouse, which sets out a vision for 'improved east-west major road links to ensure more reliable journey times between major cities within the North' and 'effective road connections to the country's major ports in the North of England'.

1.4 Study Objectives and Scope

- 1.4.1 The A66 and A69 between their junctions with the A1 and the M6 are the primary east-west corridors across the North Pennines region, representing the most direct east-west links across the North of the UK between the M62 corridor and the M8 between Edinburgh and Glasgow. Figure 1.1 shows the strategic importance of the routes, particularly the A66 which provides the most direct strategic link between North East, North West, Tees Valley, North Yorkshire, South Yorkshire, parts of West Yorkshire, the East Midlands, Eastern England and North Cumbria, Glasgow, much of the central belt of Scotland and Cairnryan (for access to Northern Ireland and the Republic of Ireland)



Figure 1.1: Study Area

- 1.4.2 The A66/A685 and A69 are both part of the national Primary Route Network (PRN) which is composed of “roads between places of traffic importance across the UK, with the aim of providing easily identifiable routes to access the whole of the country” (as defined by the Department for Transport). The A66 and A69 are also part of a subset of the PRN, referred to as the Strategic Road Network (SRN). The Secretary of State for Transport is the highway authority for the SRN as it comprises highways of national as well as regional and local importance, which emphasises the national and strategic importance of these routes.
- 1.4.3 In addition to their strategic importance the A66 and A69 also provide vital regional and local links, as commuter links to Tyne and Wear, Carlisle and the Tees Valley and for access to essential services for local residents, work force and visitors. Table 1.3 summarises the various roles of the routes.

- 1.4.4 The strategic objective of the NTPR Study is to investigate the potential to create a new strategic corridor linking the A1 with the M6 by upgrading one or both of the A66/A685 and A69 routes and making other improvements along their length. Further aims are to improve east-west connectivity within the North of England, whilst considering the impact that any options may have on wider east-west links between the M62 corridor and the Scottish border, build network resilience and promote economic growth. Table 1.1 summarises the detailed study objectives:

No.	Study Objectives
1	Understand the current performance and constraints of the existing road infrastructure, and confirm the strategic case for considering further investment.
2	Identify options for a new strategic corridor upgrading one or both of the A66/A685 and A69 and making other improvements along their length.
3	Understand the operational benefits and challenges of the construction of each of the options, including issues with weather related resilience, diversions following incidents, the safety impact on road users and local communities and highway maintenance impacts.
4	Understand the benefits and impacts resulting from the provision of a new strategic corridor - including the benefits and impacts accruing on the M62 and other existing trans-Pennine routes, including local roads - to further inform the strategic and economic case for investment in new road infrastructure in the corridor.
5	Have reference to and reflect wherever possible the key findings of the other northern Strategic Studies (Trans Pennine Tunnel and Manchester(M60) North- West Quadrant). Specifically, understand the interdependencies between the potential options arising from these studies.

Table 1.1: Northern Trans-Pennine Routes Strategic Study Objectives

1.5 Stage 1 Study

- 1.5.1 In March 2016 DfT published the NTPR Stage 1 Report which reported on the assessment of problems and issues in the A66/A685 and A69 corridors, and considered the case for intervention. From the problems and issues identified in the Stage 1 Report, Intervention Specific Objectives as set out in Table 1.2 were developed. These objectives were then used to assess and shortlist potential interventions on each corridor.

Theme	Description
Economic Growth	Support the economic growth objectives of the Northern Powerhouse agenda
	Improve access to regional economic centres and local growth sites served by the A66/A685 and A69
Connectivity	Ensure the improvement and long-term development of the SRN through providing better national connectivity
	Improve the A66/A685 and A69 as strategic connections for freight traffic
	Maintain and improve access for tourism served by the A66/A685 and A69
	Improve (and as a minimum maintain) access to services and jobs for all local road users
Network Performance	Improve journey time reliability for road users
	Reduce the number and seriousness of incidents involving road users, including Non-Motorised Users (NMUs)
	Improve the resilience of the routes to the impact of events such as roadworks and severe weather events
Environment	Reduce the impact of the routes on severance for local communities
	Minimise adverse impacts on the environment and where possible optimise environmental improvement opportunities

Table 1.2: Intervention-Specific Objectives

- 1.5.2 The conclusions from the Stage 1 report were that the A66/A685 and A69 perform a number of local, regional and strategic functions as summarised in Table 1.3:

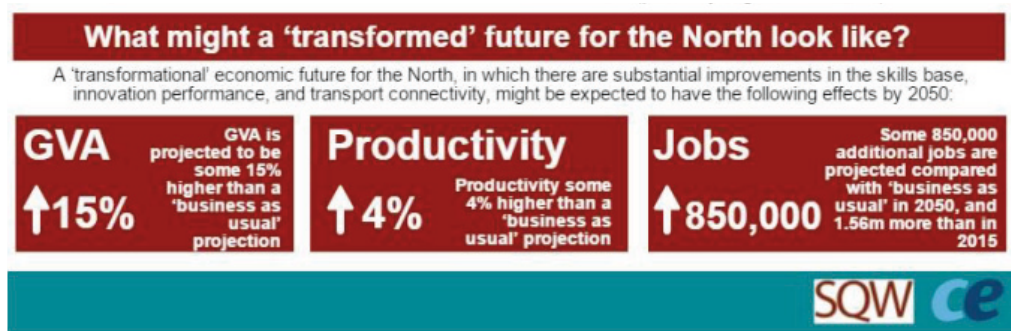
Role	A66	A69
Strategic	<ul style="list-style-type: none"> ■ Acts as a national and regional strategic link for long distance journeys between the south and east of the UK and the north and west of the UK, providing the most direct east west crossing of the Pennines north of the M62. <p>Acts as a strategic link for freight movements between the same areas of the UK and between east coast and west coast ports, with commercial vehicle flows greater than 20% of total flows on most sections of the route, compared to 12% on average for trunk roads.</p>	<ul style="list-style-type: none"> ■ Acts as the major regional road link between Tyne and Wear and North Cumbria/South West Scotland. ■ Provides a key link for freight movements between the same areas and between west coast ports and the east coast ports.
Regional	<ul style="list-style-type: none"> ■ Links local communities along its route, such as Bowes and Brough, and links these communities with destinations to the east and west of the route, such as Darlington and Penrith for access to employment opportunities and other services. ■ Provides links to local and regional tourist destinations. 	<ul style="list-style-type: none"> ■ Provides links between local communities along its route, such as Haltwhistle and Hexham, and links these communities to destinations to the east and west of the route, such as Newcastle and Carlisle for access to employment opportunities and other services. ■ Provides links to local and regional tourist destinations.
Local	<ul style="list-style-type: none"> ■ Both routes help people with their day-to-day activities connecting them with schools, shops, healthcare and leisure facilities as well as other services. They are important to the farming community for the movement of agricultural vehicles. 	

Table 1.3: Roles of the A66/A685 and A69 Corridors

- 1.5.3 The strategic case for improvements is set out in the following section. This discusses pan-regional aspects and then focuses on the individual A66/ A685 and A69 corridors.

1.6 The Strategic Case for Improvements

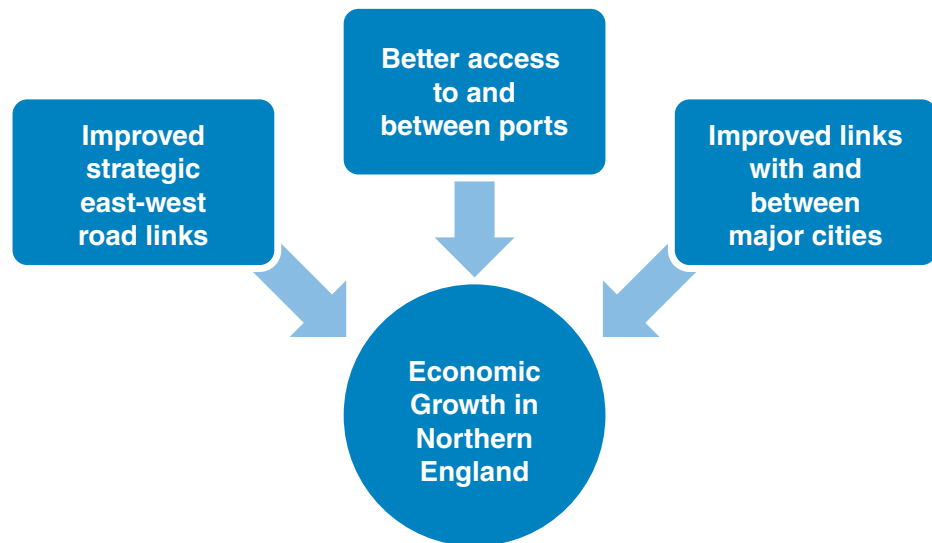
- 1.6.1 The strategic case for improvements in the A66/A685 and A69 corridors is based on the analysis of highway performance and stakeholder feedback which revealed that there are problems and issues which affect the performance of both the A66/A685 and A69 corridors and constrain their role as strategic and regional routes. These problems have a major detrimental impact on the economic performance of Northern England.
- 1.6.2 There are only fourteen A roads and one motorway that run east to west across the Pennines in the whole of the north. To put this in context, there are fewer traffic lanes on A roads crossing the Pennines between Sheffield and Scotland than there are on A roads crossing the Thames between Tower Bridge and Chelsea. With the exception of the M62, all of these roads are single carriageway, or a mix of single and dual.
- 1.6.3 The ambition for the North of England to be a dynamic area of economic growth which complements the London and South East economy and helps to rebalance and grow the national is encapsulated by the vision in the Northern Powerhouse Independent Economic



Source: SQW

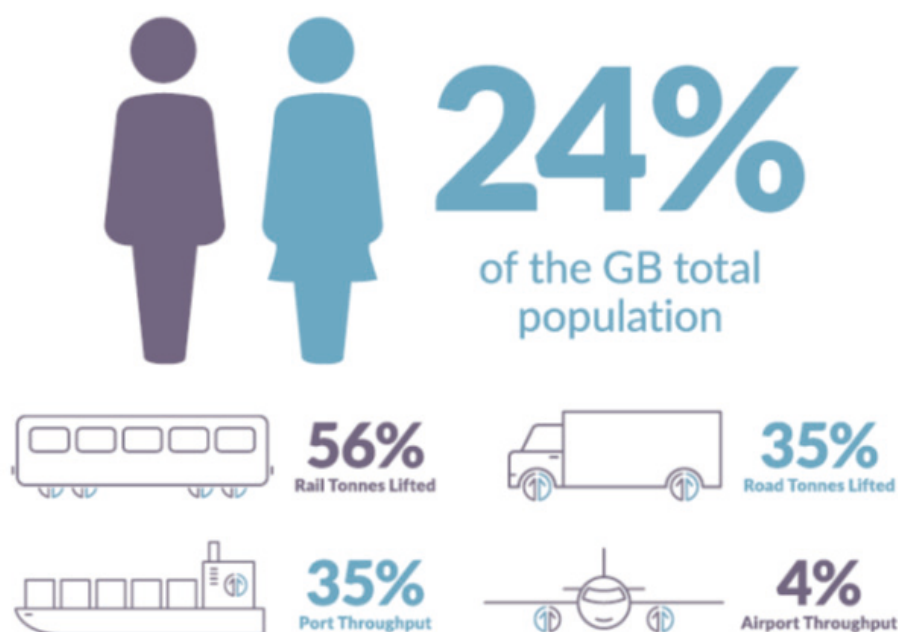
Figure 1.2: Northern Powerhouse – Independent Economic Review Summary

- 1.6.4 The IER sets out a 'transformational' economic future for the North, in which there are substantial improvements in the skills base, in innovation performance, and in transport connectivity, all which are projected to raise the growth rate of the North's productivity, GVA and employment markedly above past trends, helping to close the productivity and prosperity gap compared with the rest of England. By 2050, GVA is projected to be some 15% higher than a 'business as usual' projection - this means that in 2050, GVA is £97bn higher (in 2015 prices) in the 'transformational' scenario than in the 'business as usual' case. Productivity is some 4% higher and some 850,000 additional jobs are projected compared with 'business as usual' in 2050, and 1.56m more than in 2015.



- 1.6.5 Achieving this transformation will require long-term improvements in the various drivers of productivity and output growth, including transport connectivity. The IER finds that poor transport links between key settlements are restricting access to centres of employment and the attractiveness of areas for investment, thereby reducing the agglomeration effects which would help grow its productivity. Addressing transport issues will require “..a new and transformational approach to planning and implementing new transport infrastructure which will enable transformational growth”, including targeted investment in new road infrastructure and enhanced global connectivity through ports and airports.
- 1.6.6 The freight and logistics sector and its supporting industries have a key role to play in achieving transformational levels of economic growth in the North.
- 1.6.7 The North of England is a ‘super region’ for freight that handles around a third of UK road, rail, distribution centre and port activity against a population that only represents 24% of the UK total and is home to several major port, distribution and haulage companies.
- 1.6.8 The Northern transport networks in their current state pose capacity problems and gaps in connectivity exist that urgently require investment. A comprehensive review of the freight and logistics industry in the North of England, including freight demand, traffic flows and assessment of the existing infrastructure was undertaken in TfN’s Northern Freight Study. The study identified that:
- 80% of road freight tonnage in the North is domestic traffic, most of which is relatively short haul and therefore difficult for rail to compete for, which places a heavy burden on the strategic road network.
 - Longer distance flows of freight are dominated by North-South movements. Most currently moves by road, including to remote ports, which may not reflect optimal locational, modal and mileage outcomes. Switching these flows to rail or shipping through Northern ports will require investment in the currently constrained East-West axis in the North to reach ports or rail corridors for southwards movements.

- Forthcoming step changes in Northern port capacity (which include the in progress Liverpool2 scheme plus prospects for a redeveloped and expanded Lift-on/Lift-off (LoLo) terminal on the Tees and broader expansion plans for short-sea LoLo and Roll-on/Roll-off (ro-ro) on the Humber) present an opportunity for the North of England to capture a substantial increase in the share of the ferry and container traffic coming to the UK.
- Currently programmed road and rail transport network upgrades will, at best, keep pace with demand, and do not include drivers to positively change the investment and locational patterns of Northern freight and logistics. Rail freight is forecast to decline under Do Minimum assumptions while road freight (tonnes lifted) is forecast to grow by ~25% by 2043.
- The volume of goods carried by road will increase marginally in the North (particularly across the Pennines) by 32 million tonnes in 2033 (+5% compared to the Do Minimum” scenario). This is largely due to the additional freight movements between Northern ports and new distribution centres – whilst many of these will be rail and water connected, this boost in Northern distribution activity will also create additional HGV movements.



Extract from TfN's Northern Freight Study – The North's contribution to GB freight compared to percentage of GB population.

- 1.6.9 There are current improvements to the SRN, together with studies of other potential improvements in the North of England, which are shown in Figure 1.2. However, most of the existing and committed improvements north of the M62 corridor are on north-south routes. Addressing issues on all sections of the network, particularly those which have regional and/or strategic functions such as the A66/A685 and A69, will maximise the impact of individual interventions and ensure that the cumulative value is higher than the sum of the values of individual schemes. Together all these improvements will contribute to a substantial improvement in transport links across Northern England and between these regions and the rest of the United Kingdom.

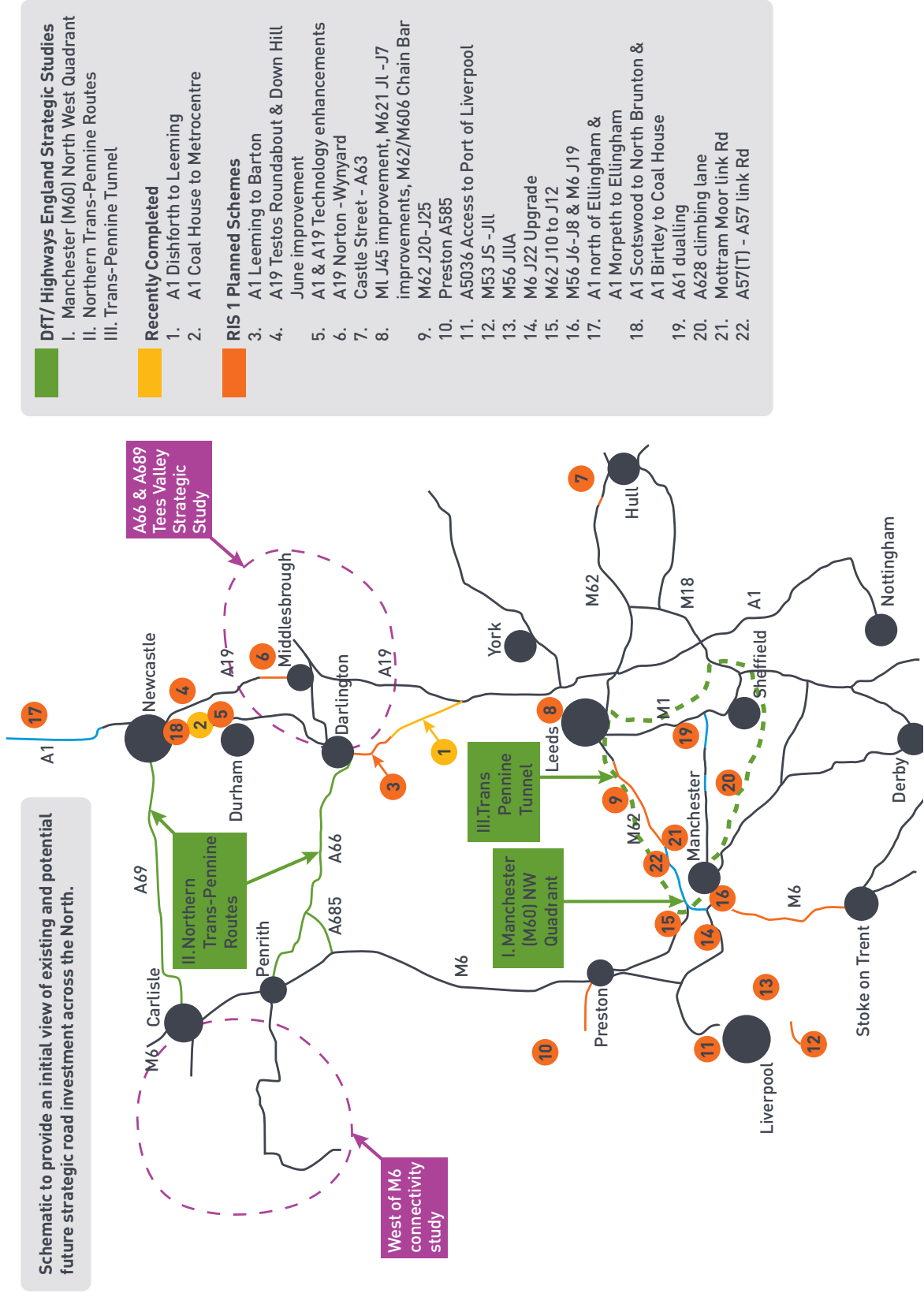


Figure 1.3: North of England Highway Improvements and Studies

1.7 Focus on A66 Corridor

- 1.7.1 The A66 currently serves as a strategic road link for the North of England and as an important national link for north south journeys. It is the most direct route between the Tees Valley, North Yorkshire, South Yorkshire, parts of West Yorkshire, the East Midlands, Eastern England and North Cumbria, Glasgow, and much of the central belt of Scotland and Cairnryan (for access to Northern Ireland and the Republic of Ireland). For some journeys the A66 can serve as an alternative and more direct east-west crossing to the M62. For example, Figure 1.4 shows from Ferrybridge (A1/M62 junction) to Penrith (M6/A66 junction) the route is approximately 39 miles and 38 minutes shorter via the A1 and A66 than the alternative route via the M62, M61 and M6.

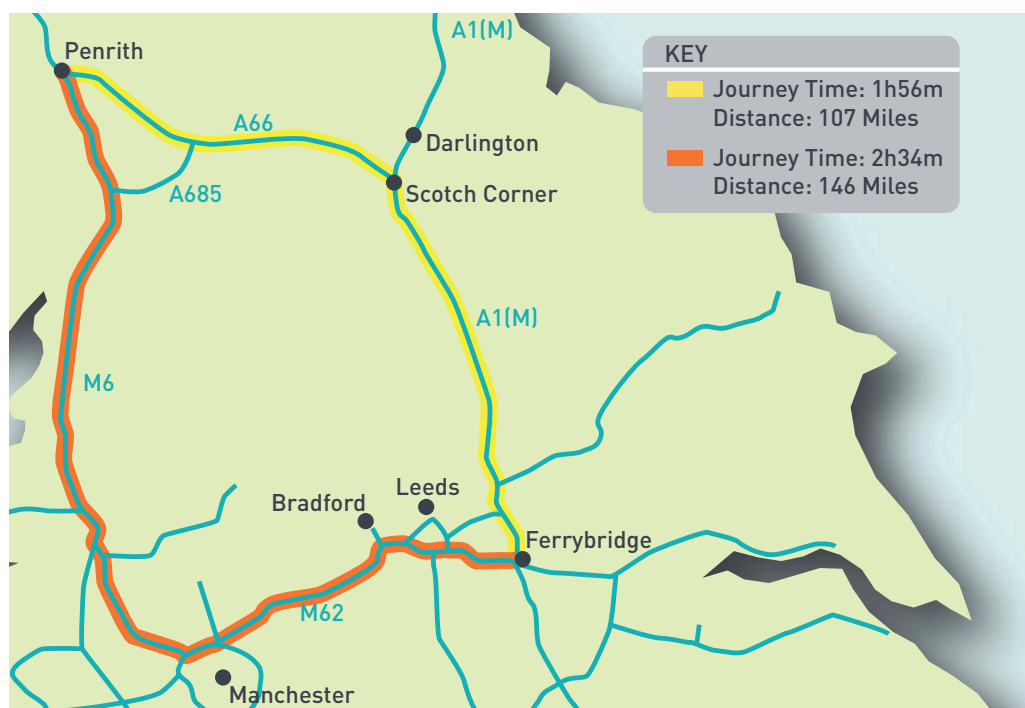


Figure 1.4: Journey Time Comparison – A66 versus M62/ M6 (Source: Google Maps)

- 1.7.2 The A66 has a high freight flow, with commercial vehicles over 20% of total vehicles on most sections of the route between Scotch Corner and Penrith. The typical % HGVs expected (annual average daily traffic) is 15% for motorways, 12% for trunk roads and 8% for principal roads. This demonstrates the high usage of the A66 for HGV traffic in relation to the varied carriageway standards.
- 1.7.3 The expectation is that freight traffic generated in the North of England and Scotland will continue to grow, and that Northern Powerhouse aspirations for the Ports and the economy as a whole will only accelerate this growth. Time savings, shorter distances and more reliable journeys are critical for freight operators and have a direct impact on operating costs and the real economy.
- 1.7.4 Figure 1.5 provides a comparison of origins and destinations for HGVs travelling across the Pennines at three locations, the A66, A69 and M62 from the GB Freight Model. The figure illustrates significant modelled HGV flows using the A66 for strategic connections between the east of England, the North West and Scotland.

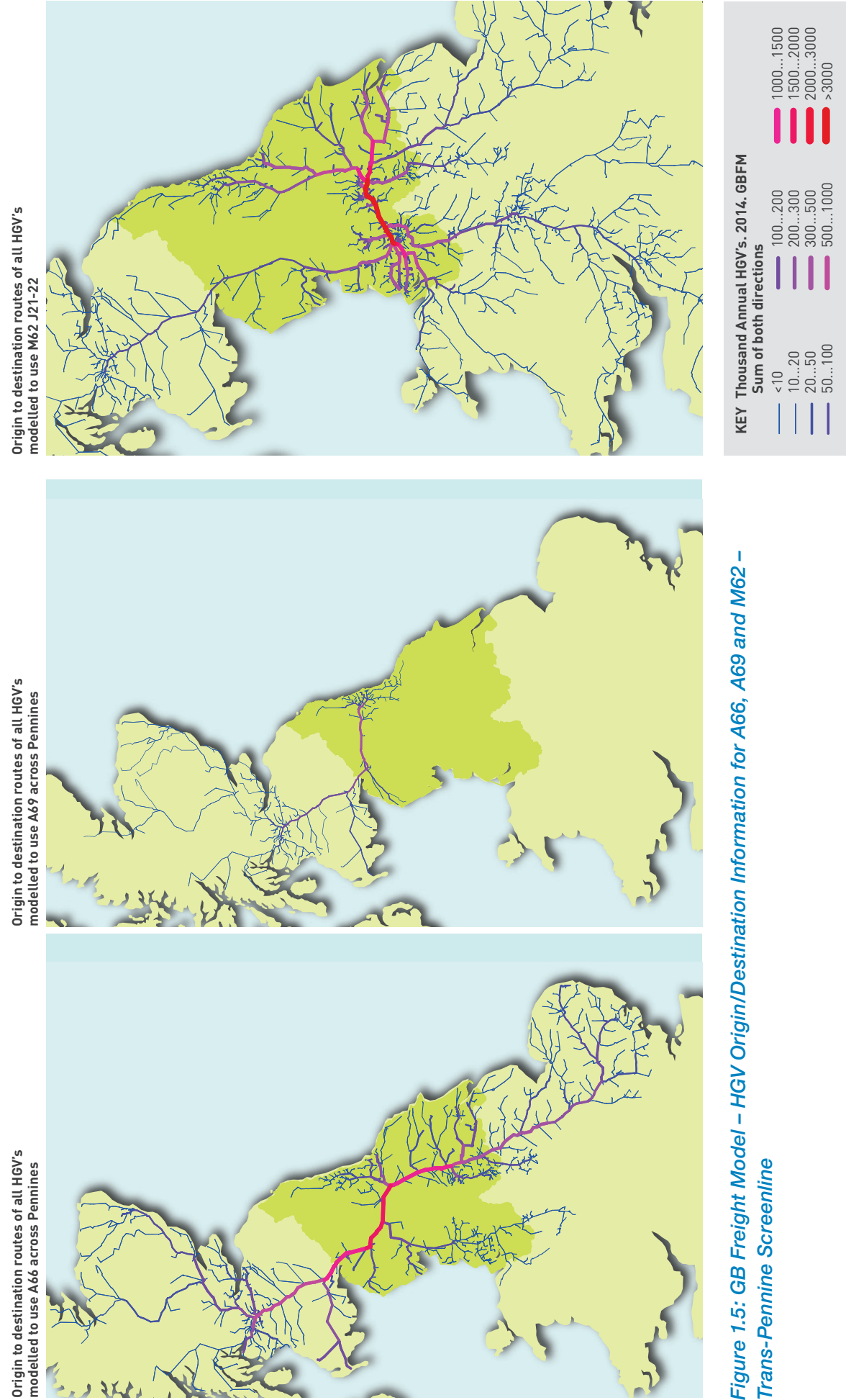


Figure 1.5: GB Freight Model – HGV Origin/Destination Information for A66, A69 and M62 – Trans-Pennine Screenline

- 1.7.6 The existing evidence shows that the A66 is under-utilised given the comparative travel distances and journey times, particularly by freight traffic. The analysis undertaken using the 'GB Freight Model' for the TfN Northern Freight Study, for example, estimates (based on travel distances and journey times) that use of the A66 for Trans-Pennine movements by commercial vehicles should be double the volume of current flows, with those journeys using the M62 instead with the A66 corridor potentially accounting for 23% of Trans-Pennine HGV traffic compared to 13% at present. Consultation with stakeholders confirms that the A66 is used less by freight traffic than it should be, due to the actual and perceived unreliability of the route compared with north-south routes and the M62.
- 1.7.7 The completion of the upgrade of the A1 Leeming to Barton Scheme to three lane motorway standard up to the junction with the A66 at Scotch Corner (due to be completed by Spring 2017) will make the A1/A66 route even more attractive as a strategic route due to reduced journey times and improved safety.
- 1.7.8 Other studies of the A66 east of the A1 between Scotch Corner and Tees Valley and west of the M6 between Penrith and Workington are also being undertaken within a similar timescale to this study, recognising the future importance of an upgraded strategic link between the Tees Valley area, such as Teesport and Port of Tyne as well as west coast ports such as Port of Workington in Cumbria.
- 1.7.9 In addition to its strategic function the A66 is an important access link to local and regional services for communities along the route, particularly as there is minimal alternative public transport provision. Due to its rural nature large areas of the A66 corridor are ranked in the top 5% most deprived in England in terms of barriers to key local services, such as a GP surgery, primary school, supermarket and Post Office and, therefore, are reliant on good highway links to services and employment opportunities. The A66 is also a link to popular local and regional tourism destinations, such as the North Pennines and Lake District.
- 1.7.10 Despite its strategic importance, the current mix of single and dual carriageway standards affects the performance of the A66 and makes the route unattractive, with evidence from operations data and stakeholders showing that:
- There are regular closures along the route due to planned road works for maintenance. For example there were 24 closures for planned works in 2015 between Greta Bridge and Scotch Corner;
 - There are regular closures along the route due to incidents and weather impacts (high winds, flooding and snow). For example in 2012 there were 23 closures due to incidents between Greta Bridge and Scotch Corner;
 - There are sections of the route where there is a higher number of collisions than the national average, particularly between Greta Bridge & Scotch Corner; and Temple Sowerby & Brough;
 - The diversionary routes are either poor or involve long detours, particularly for HGVs due to the weight and height restrictions on the A685;
 - There are local severance issues where the local road network intersects with the mainline carriageway causing delays and road safety issues; and
 - As shown in Figure 1.6 there is a considerable variability in average speeds, making journey times unreliable on all sections of the route.

Speed Variability Westbound AM Peak (mph)

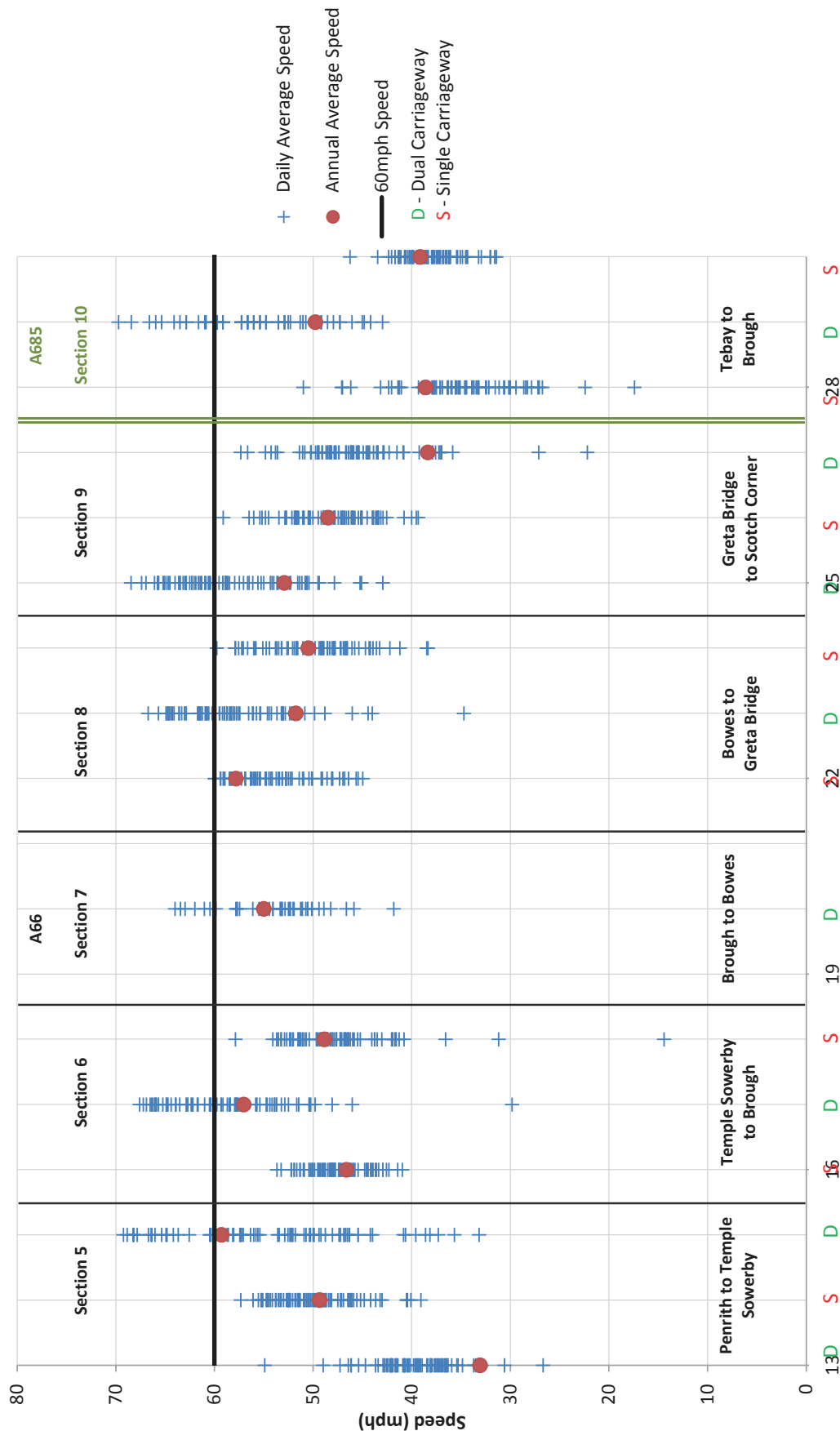


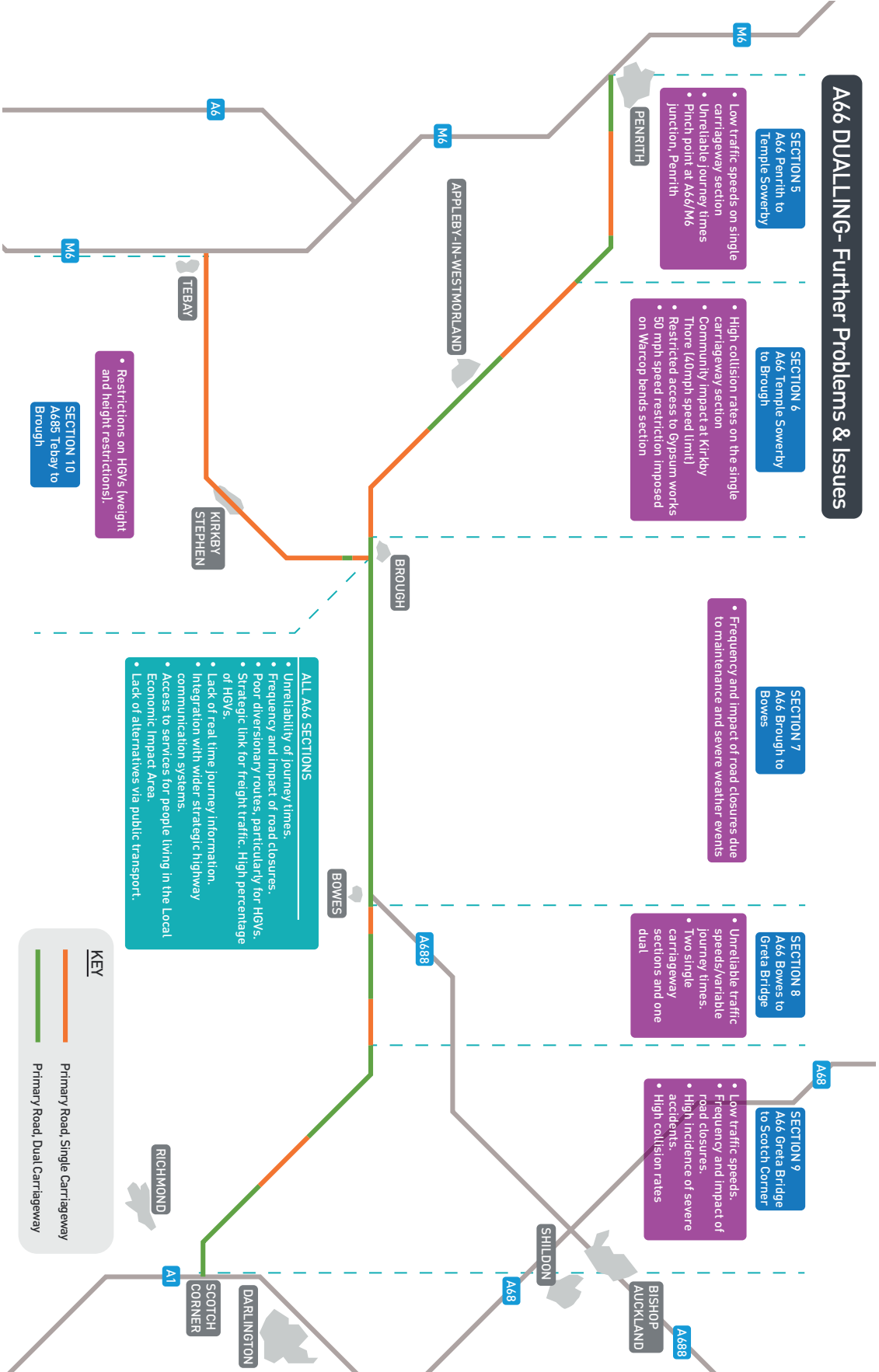
Figure 1.6: Speed Variability on A66 and A685

- 1.7.11 Figure 1.6 illustrates speed variability on the A66 and A685. The information is derived from Highways England - Traffic Master data comparing daily average speeds with annual average speeds for each section. For example on Section 9 - Great Bridge to Scotch Corner single carriageway section the graph shows a range of daily average speeds between 59mph and 39mph with an annual average speed of 48mph.
- 1.7.12 The single carriageway sections of the route make it more difficult to keep the A66 open if incidents occur and, given the quality of the diversionary routes, makes it an unreliable highway link both in actual and perceived terms. This is particularly the case for freight operators for whom route reliability is a key criteria in decisions such as route choice and timing of journeys.
- 1.7.13 Most communities along the route have been by-passed by previous interventions. Kirkby Thore (population 760), where the route runs directly through part of the village, and there are negative environmental impacts, is the only remaining existing settlement on the A66 without a bypass.
- 1.7.14 The A685 between Brough and the M6 at Tebay via Kirkby Stephen is a single carriageway route. There are HGV restrictions at two points around Kirkby Stephen which mean that this more direct route travelling between the North East and North West cannot be used as a through route by HGVs.

1.7.15 Table 1.4 summarises the key current and future route issues in the A66 corridor.

Route No.	Current Issues/Problems	Additional Future Issues/ Opportunities
A66	<ul style="list-style-type: none"> ■ Although the A66 is a particularly important strategic route for freight traffic, journey unreliability does not meet the requirements of an efficient freight industry, causing poor service delivery, unproductivity and higher transport costs. ■ Unreliability of journey times due to impact of slow moving vehicles on single carriageway route sections. ■ Journey uncertainty due to the impact of incidents on single carriageway route sections making it more difficult to keep the route open. ■ High frequency and significant impact of road closures, due to roadworks and bad weather. ■ Poor diversionary routes, particularly for HGVs. ■ Lack of real time journey information exacerbates journey uncertainty issues. ■ Poor access to services and employment opportunities for people living in the local area. ■ Lack of a rail line to provide an alternative public transport link to road. ■ Major environmental constraints, including Special Areas of Conservation, SSSIs and 21 Noise Important Areas along the A66 and A685 corridors. 	<ul style="list-style-type: none"> ■ No major highway improvement schemes committed to the A66/ A685 corridor except for minor works. ■ Capacity and reliability of east-west road connections is a constraint on the future growth of the North of England economy. ■ The completion of the upgrade of the A1 to motorway standard between Leeming and Barton by 2017 will make the A1/A66 route attractive as a strategic route in the future. ■ The extension of the Yorkshire Dales National Park creates additional environmental constraints on potential A685 improvements.
A685	<ul style="list-style-type: none"> ■ Restrictions on HGVs use. 	

Table 1.4: Summary of Key Current and Future Issues in the A66/A685 Corridor



Strategic Case for Intervention on the A66/A685

- The A66 is a key national and regional strategic link for a range of south north and east west movements, particularly for freight, with commercial vehicles in excess of 20% of total vehicles on most sections of the route compared to typical levels of 15% on motorways. There are no direct rail alternatives for passenger or freight movements along the corridor.
- The A66 is the most direct route between the Tees Valley, North Yorkshire, South Yorkshire, parts of West Yorkshire, the East Midlands, Eastern England and North Cumbria, Glasgow, and much of the central belt of Scotland and Cairnryan (for access to Northern Ireland and the Republic of Ireland).
- For some journeys the A66 can serve as an alternative and more direct east-west crossing than the M62 which is currently the only major east-west crossing of the Northern UK between Derby and Edinburgh. From Ferrybridge (A1/M62 junction) to Penrith (M6/A66 junction) the route via the A66 is approximately 39 miles and 38 minutes shorter via the A1 and A66 than the alternative route via the M62, M61 and M6.
- Despite the strategic importance of the A66, the route between the A1 at Scotch Corner and the M6 at Penrith is only intermittently dualled and still has six separate sections of single carriageway sections in 49.5 miles. A number of these single carriageway sections have above average collision rates for all vehicle types with a higher than expected proportion of collisions involving HGVs (21%-30% compared to 12% by road type).
- The mix of road standards affects the reliability, resilience, safety and attractiveness of the route (real and perceived), meaning that is underutilised as the key strategic east-west link north of the M62 corridor. The high variability in average traffic speeds discourages use of the route by some freight operators. The GB freight model indicates that the A66 could potentially account for 23% of Trans-Pennine HGV freight traffic compared to 13% at present.
- If the route is not improved the performance will inhibit improvements to links between cities and global connectivity, and threaten the transformational growth envisaged by the Northern Powerhouse agenda. GVA is projected to be 15% higher than the business as usual scenario resulting in increased transport activity.
- Interventions on the A66 will therefore meet the study objectives in having a positive impact on travel reliability and network resilience; and
- Improve future national and regional connectivity and promote transformational economic growth in the North of England

Table 1.5: Case for Intervention on the A66

Focus on A69 Corridor

- 1.7.16 The A69 serves a predominantly regional and sub-regional function. It is the most direct route for journeys between Tyne and Wear, Durham and North Cumbria, Glasgow, much of the central belt of Scotland and Cairnryan (for access to Northern Ireland and Republic of Ireland). It also provides a link for freight traffic between the Tyne ports and South West Scotland.
- 1.7.17 There are a number of communities along the route that have substantial commuting flows into regions either end of the route, for example between Hexham and Newcastle and between Brampton and Carlisle. These destinations also offer health, education, professional services and retail opportunities which are not always available in the communities along the route and access to these is integral to their future vitality.
- 1.7.18 The Carlisle to Newcastle rail line, provides a public transport alternative to car drivers along the transport corridor for some journeys. However, the current rail service is slow (85-95 mins between Newcastle and Carlisle) and infrequent (1 tph between Newcastle and Carlisle). There are committed improvements from December 2017 for this route as part of the Northern Connect network, providing new trains, improved frequency (2 tph between Newcastle and Carlisle) and comparable end to end journey times to car travel. Given the commuting flows to Newcastle and Carlisle and the attractions of other destinations, such as the Metrocentre at Gateshead, there is the potential for enhanced rail services to improve the public transport accessibility for communities along the corridor.
- 1.7.19 The A69 is also a key regional route for access to tourism facilities, with frontiers of the Hadrian's Wall World Heritage Site and the presence of the North Pennines Area of Outstanding Natural Beauty, Northumberland National Park and Northumberland Dark Sky Park all situated within 2km of the route corridor.
- 1.7.20 The single carriageway sections on the A69 affect journey speeds and reliability. Specific pinch points such as Warwick Bridge (speed limit of 30mph) and the lack of overtaking opportunities, for example the incline at Low Row, have an impact on journey times and reliability.

Speed Variability Westbound AM Peak (mph)

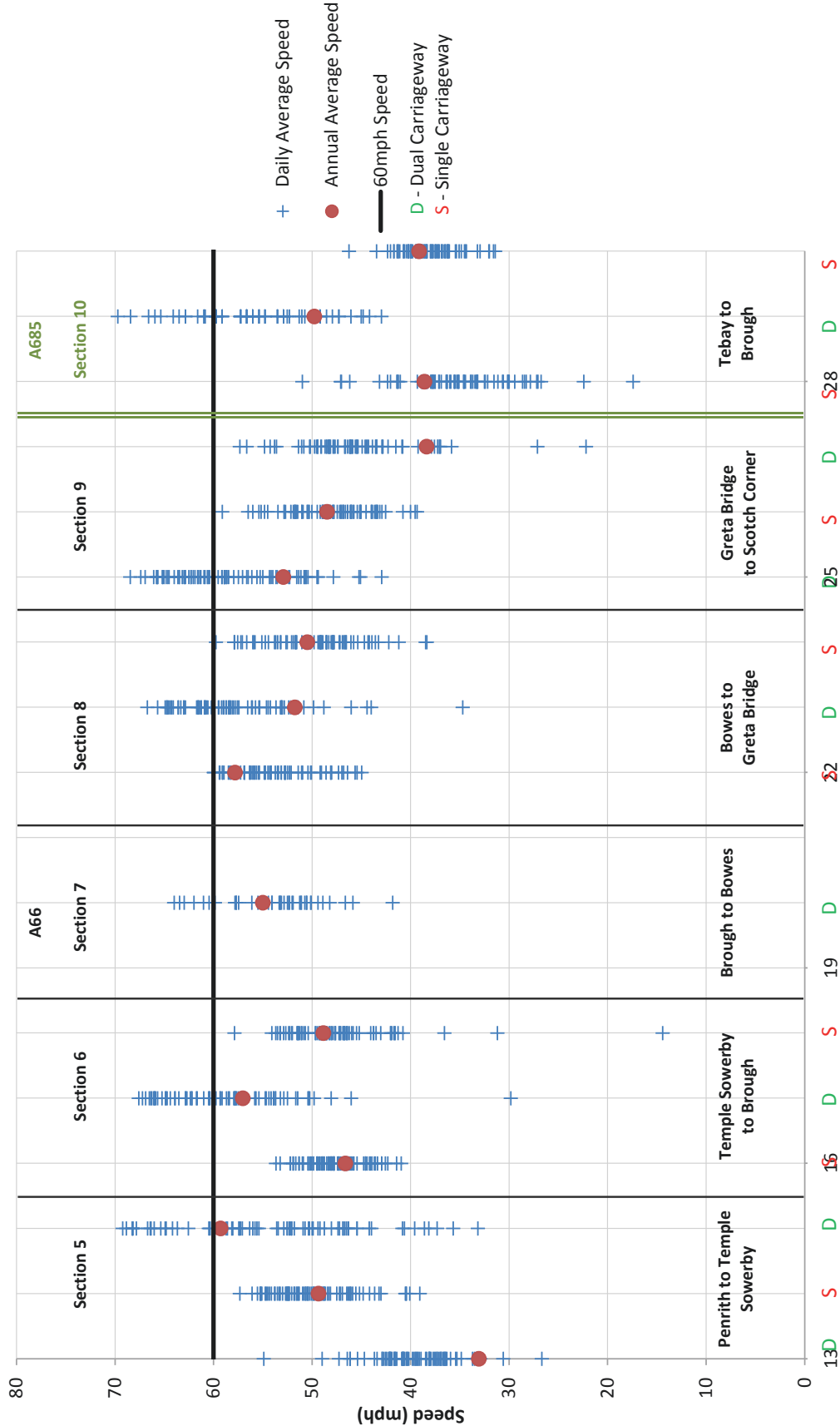


Figure 1.8: Speed Variability on A69

- 1.7.21 Figure 1.8 shows analysis of speed variability on the A69. The results show a wide range of daily average of speeds particularly on single carriageway sections. For example on Section 2 near Greenhead daily average speeds range between 59mph and 42mph with an annual average speed of 51mph.
- 1.7.22 Analysis of collision rate data shows that the section between Carlisle and Brampton has a collision rate higher than the national average for the type of road. The data also shows that the A69 overall has a higher than national average of collisions involving HGVs. There is no evidence to identify a consistent explanation for these findings although anecdotally it is felt that the single carriageway sections, particularly where there is a pinch point such as Warwick Bridge, and lack of overtaking opportunities create frustration and inappropriate driving behaviour.
- 1.7.23 As with the A66, and noted above, the A69 is a vital transport link for communities along its route. Again many communities, such as Brampton and Haydon Bridge have been bypassed by previous interventions but the current route has an adverse impact on Warwick Bridge, which it is the last settlement of any size on the A69 still to be bypassed, and the current route runs directly through this large village.

1.7.24 Table 1.6 summarises the key current and future route issues in the A69 corridor. This is supported by Figure 1.9 which also shows some the issues specific to sections of the A69 corridor.

Route No.	Current Issues/Problems	Additional Future Issues/ Opportunities
A66	<ul style="list-style-type: none"> ■ Unreliability of journey times due to impact of slow moving vehicles on single carriageway route sections. ■ Journey uncertainty due to the impact of incidents on single carriageway route sections making it more difficult to keep the route open. ■ Poor diversionary routes, particularly for HGVs. ■ Lack of real time journey information exacerbates journey uncertainty issues. ■ Access to services and employment opportunities for people living in the LEIA. ■ Current alternative rail link is slow and infrequent and provides only a limited alternative public transport link to road. ■ Major environmental constraints, including frontiers of the Hadrian's Wall World Heritage Site and the presence of the North Pennines Area of Outstanding Natural Beauty, Northumberland National Park and Northumberland Dark Sky Park all situated within 2km of the study corridor 	<ul style="list-style-type: none"> ■ No highway improvement schemes committed to the A69 corridor except for minor works. ■ Capacity and reliability of east-west road connections is seen as a constraint on the future growth of the North of England economy. ■ There are Growth plans for Newcastle International Airport and Carlisle Lake District Airport which will require good highway access. ■ Planned improvements to Newcastle to Carlisle rail link will deliver improved frequencies and new trains. Limitations due to slow line speeds.

Table 1.6: Summary of Key Current and Future Issues in the A69 Corridor

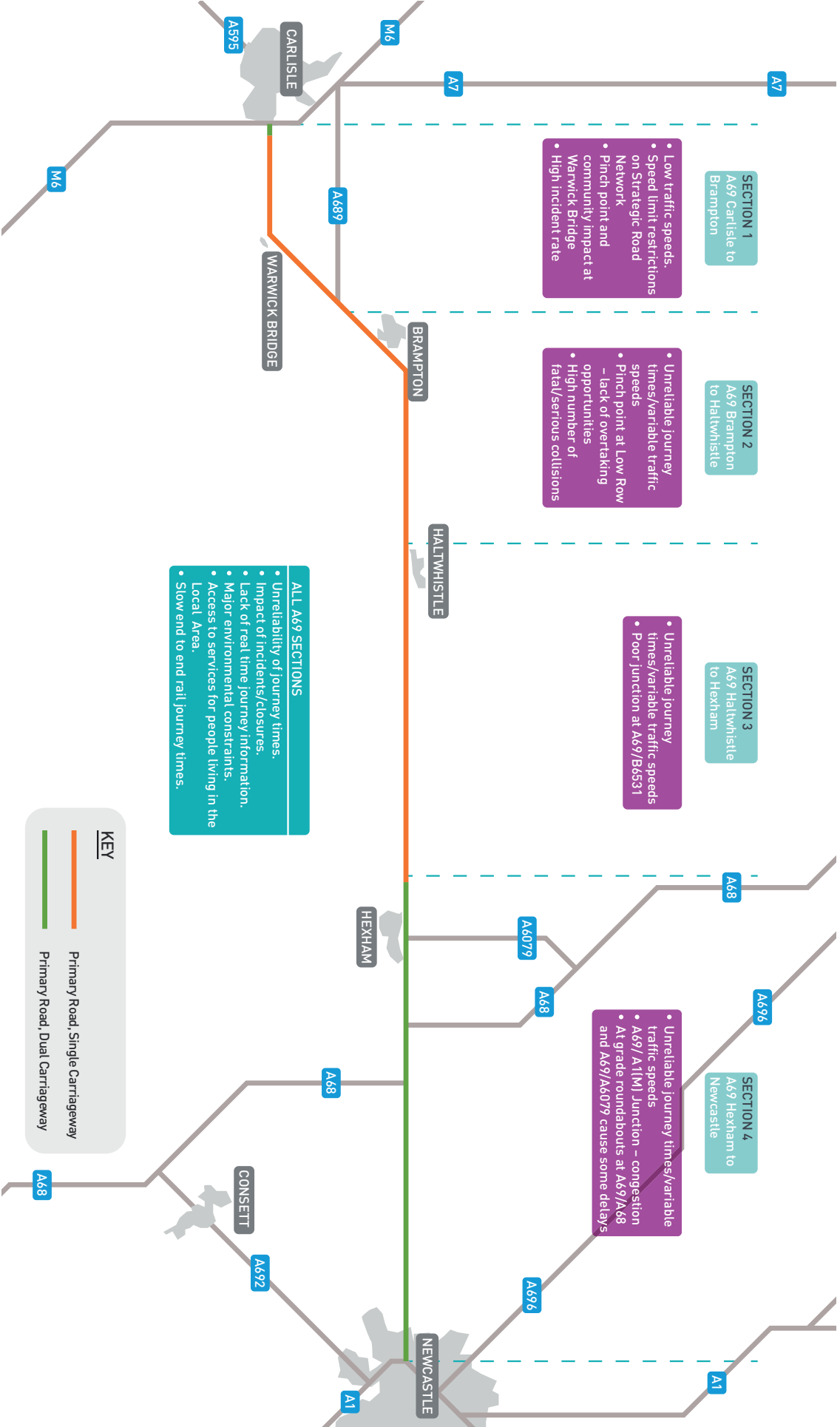


Figure 1.9: A69 Issues

Strategic Case for Intervention on the A69

- The A69 is the most direct route for journeys between Tyne and Wear, Durham and North Cumbria, Glasgow, and much of the central belt of Scotland and Cairnryan (for access to Northern Ireland and Republic of Ireland). The A69 provides an important link for freight traffic between the Tyne ports and South West Scotland. Warwick Bridge has a speed limit of 30mph, representing the one remaining section of the national strategic road network with this speed limit.
- The A69 also performs a key function in integrating communities along the route into the wider North East/North West economy, and providing a vital commuter link to the Tyne and Wear and Carlisle areas. The population in the local area has higher than average skills and qualifications, and 70% of journeys to work are outward commuting from the local area. The area is characterised by high car dependency with 75% of the population reliant on the private car.
- The A69 also supports access to key tourist attractions such as Hadrian's Wall World Heritage Site, Northumberland National Park, Northumberland Dark Sky Park and the Lake District.
- If improvements are not made to the A69 this will constrain the future economic development of the communities and specific development growth areas, such as Carlisle Airport, Newcastle International Airport and Cumbria's Energy Coast. The eastern side of the A69 between Hexham and Newcastle is the most heavily trafficked section of both the A66 and A69 routes with 26,000 annual average daily traffic.
- The high variability in average traffic speeds discourages use of the route by some freight operators.
- Planned improvements to the rail service between Newcastle and Carlisle will improve public transport accessibility to facilities for communities along the route, but they will not address the strategic objectives of the study.
- A number of single carriageway sections on the route have high collision rates for all vehicle types. The section between Brampton and Carlisle has higher than average collisions with 257 collisions per billion vehicle kilometres compared the national average of 175.
- Interventions will therefore have a positive impact on the economic vitality of local communities and the attractiveness of specific development areas;
- Improve travel reliability and network resilience; and
- Improve regional connectivity and promote economic growth in the North of England.

Table 1.7: Case for Intervention on the A69

1.8 Development of Options

Option Generation and Assessment

- 1.8.1 Stage 2 of the study involved the identification, assessment and prioritisation of any potential infrastructure improvements for upgrading one or both of the A66/A685 and A69 routes and making other improvements along their length. A long-list of potential options was identified in an option generation workshop, attended by representatives from each organisation and the integrated delivery team, and checked by the Stakeholder Reference Group (SRG) on 13th April 2016, where a workshop session was held to identify any additional options not previously considered. Potential options were then assessed against intervention-specific objectives (see Table 1.2), developed from the performance issues and constraints of the routes and consultation with the SRG.
- 1.8.2 Option assessment was then undertaken in line with the standard DfT Transport Appraisal Guidance (TAG) in two main stages: application of DfT's Early Appraisal and Sifting Tool (EAST) tool and assessment against Intervention Specific Objectives; and then the more detailed Option Assessment Framework (OAF) to identify the shortlisted options presented in Table 1.8. The original long list of options and subsequent short list of options were discussed with the Stakeholder Reference Group through workshops and comments received. The locations of these shortlisted options are shown in Figure 1.10 and Figure 1.11.

Route	No.	Current Issues/ Problems	Additional Future Issues/Opportunities
A69	1	A69 Dualling	<ul style="list-style-type: none"> ■ Dual all remaining single carriageway sections ■ Dual carriageway bypass of Warwick Bridge ■ Includes Option 2 – Junction Improvement
	1a	A69/A689 Dualling	<ul style="list-style-type: none"> ■ Dual all remaining single carriageway sections ■ Dual A689 instead of the Warwick Bridge section ■ Includes Option 2 – Junction Improvement
	2	Junction Improvement Package	<ul style="list-style-type: none"> ■ Represents an option to improve junctions on existing dualling section at eastern end of the A69 ■ Improvements to A69/B6531; A69/A6079 and A69/A68 Junctions. Currently 'At Grade' to 'Grade Separated'. ■ Could be delivered as stand alone scheme or as part of the A69 dualling options (1 and 1a).
	3	Warwick Bridge By-pass	<ul style="list-style-type: none"> ■ Single carriageway by-pass of Warwick Bridge
	3a	A689 Dualling	<ul style="list-style-type: none"> ■ Dualling of A689 only (alternative to Warwick Bridge by-pass)
A66	4	A66 Dualling	<ul style="list-style-type: none"> ■ Dual all remaining single carriageway sections of the A66 ■ Includes Option 5 – A66/A6 Junction Upgrade to improve existing 'At Grade' junction.
	5	A66/A6 Junction Upgrade	<ul style="list-style-type: none"> ■ Could be delivered as stand alone scheme or as part of the full dualling option (4)
	6	Scotch Corner to Greta Bridge Dualling	<ul style="list-style-type: none"> ■ Dual one section of the A66 ■ Could be delivered as stand alone scheme or as part of the full dualling option
	7	Brough to Temple Sowerby Dualling	<ul style="list-style-type: none"> ■ Dual one section of the A66 ■ Could be delivered as stand alone scheme or as part of the full dualling option
A685	8	Kirkby Stephen By-pass	<ul style="list-style-type: none"> ■ Single carriageway by-pass of Kirkby Stephen

Table 1.8: Shortlisted Options: A69 and A66/A685

Outline Option Costs and Delivery Timeframes

- 1.8.3 High level option costs were produced by Highways England - Commercial (Benchmark). A cost estimate was produced for land and construction costs. The cost estimate included other estimated delivery costs such as unscheduled items, risk adjustments and uncertainty provision. Table 1.9 provides outline costs for each option excluding inflation.

Route	Option No.	Option	Most Likely Cost (excl. Inflation) £m
A69	1	A69 Dualling	£1,501
	1a	A69/A689 Dualling	£1,480
	2	Junction Improvement Package	£84
	3	Warwick Bridge By-pass	£173
	3a	A689 Dualling	£334
A66	4	A66 Dualling	£825
	5	A66/A6 Junction Upgrade	£81
	6	Scotch Corner to Greta Bridge Dualling	£108
	7	Brough to Temple Sowerby Dualling	£404
A685	8	Kirkby Stephen By-pass	£88

Table 1.9: Shortlisted Outline Option Costs: A69 and A66/A685

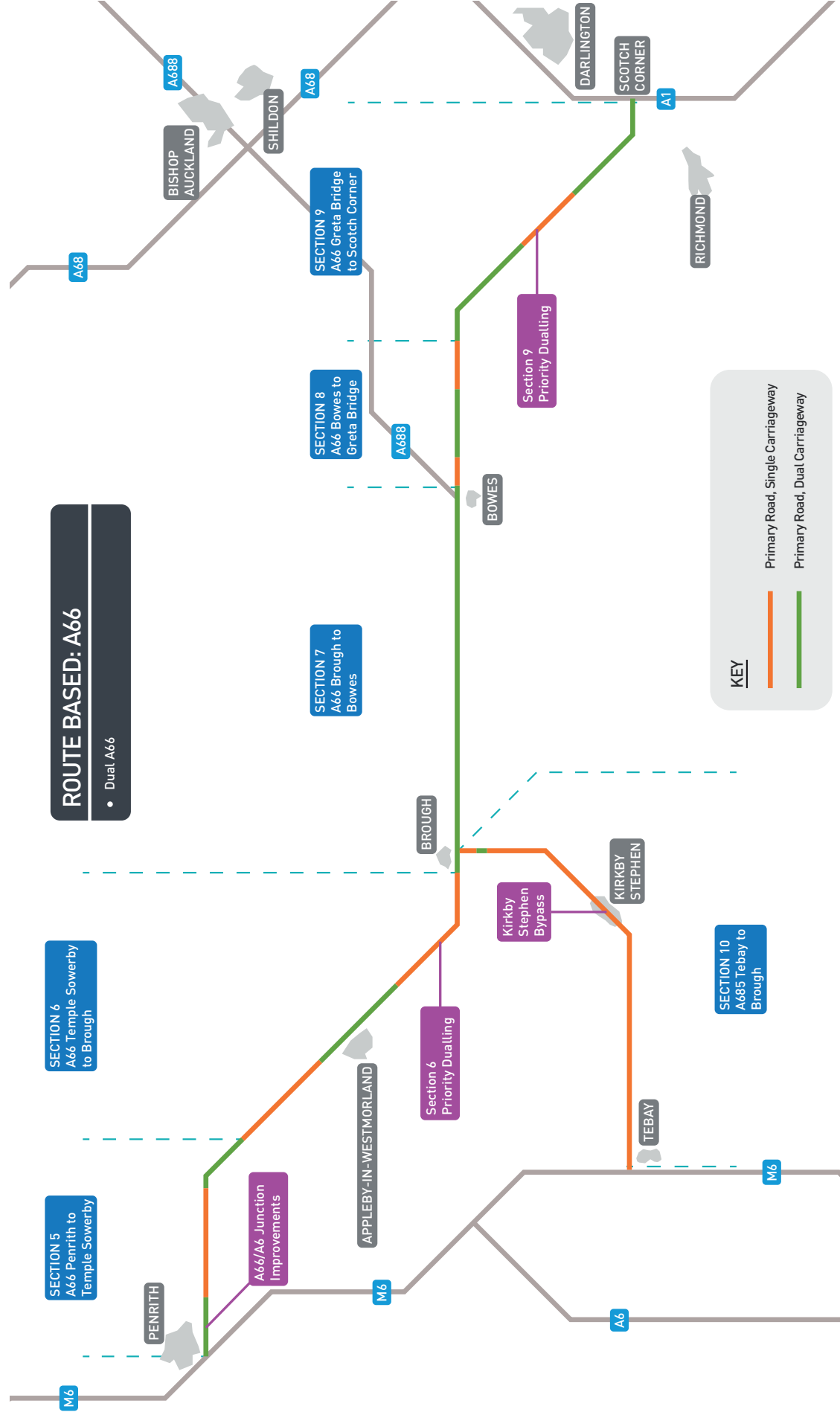


Figure 1.10: Shortlisted Options: A69

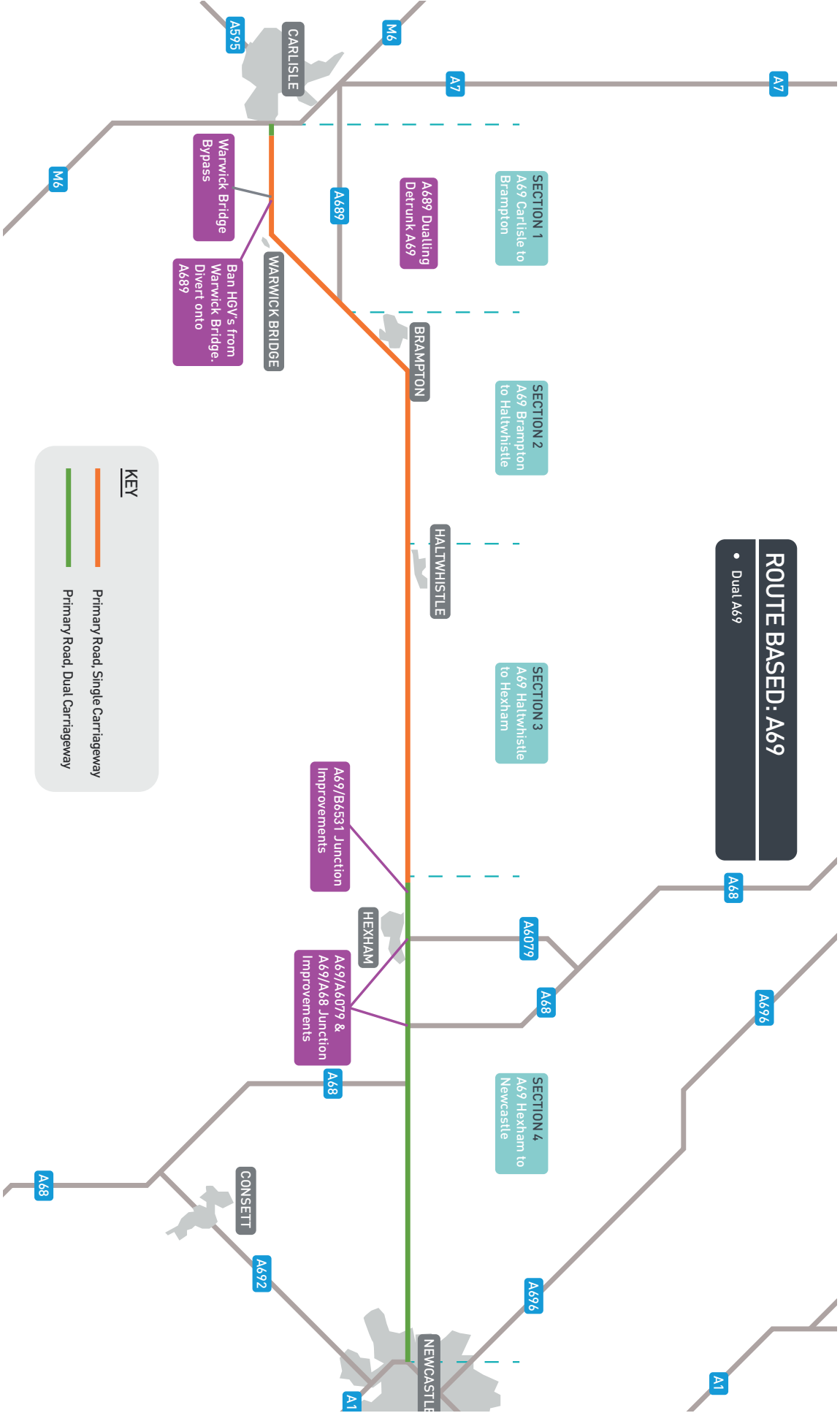


Figure 1.11: Shortlisted Options: A66/A685

1.9 Option Benefits and Opportunities

1.9.1 Following the identification of the shortlisted options more detailed assessment and appraisal of interventions was undertaken using complaint DfT techniques and guidance (TAG) including environmental assessments. These interventions will be assessed in more detail as part of the next stage of the study as additional assessment tools, such as the North Trans-Pennine Regional Traffic Model (NTPRM), become available. The key benefits of the A66/A685 options identified through this assessment are summarised in Table 1.10 and Table 1.11.

Route	No.	Option	Key Benefits
A66	4	A66 Dualling (includes Option 5)	<ul style="list-style-type: none"> ■ Improves journey times, reliability and resilience on the A66 between the junctions with the A1 and M6. ■ Improves strategic, regional and national connectivity, particularly for HGVs, due to the above improvements. ■ Provides a more attractive alternative route to the M62 for some east-west crossing movements. ■ Reduces collisions on the A66 between the junctions with the A1 and M6. ■ Reduces junction delays at the A66/A6 Junction. ■ Reduces severance and improves air quality and noise for Kirkby Thore residents. ■ Improves connectivity between key employment areas of Cumbria, Tees Valley and Tyne and Wear areas. ■ Improves access to key tourist destinations such as the North Pennines and the Lake District. ■ Contributes positively to the future economic growth of the North of England.
	5	A66/A6 Junction Upgrade	<ul style="list-style-type: none"> ■ Reduces delays at the A66/A6 Junction.
	6	Scotch Corner to Greta Bridge Dualling	<ul style="list-style-type: none"> ■ Improves journey times, reliability and resilience on this section of the A66. ■ Reduces collisions on this section.
	7	Brough to Temple Sowerby Dualling	<ul style="list-style-type: none"> ■ Improves journey times, reliability and resilience on this section of the A66. ■ Reduces collisions on this section. ■ Reduces severance and improves air quality and noise for Kirkby Thore residents.

Route	No.	Option	Key Benefits
A685	8	Kirkby Stephen By-pass	<ul style="list-style-type: none"> ■ Slightly improves journey times between the junctions with the A66 and M6. ■ Reduces severance and improves air quality and noise for Kirkby Stephen residents.

Table 1.10: Key Benefits of Shortlisted Options: A66/A685

1.9.2 The key benefits of the A69 options are summarised in 1.11

Route	No.	Current Issues/ Problems	Additional Future Issues/Opportunities
A69	1	A69 Dualling (includes Option 2)	<ul style="list-style-type: none"> ■ Improves journey times, reliability and resilience on the existing single carriageway section between the A69/B6531 Junction and the A69/M6 Junction. ■ Improves inter-regional connectivity, particularly for HGVs, due to the above improvements. ■ Reduces collisions on the above section. ■ Reduces junction delays on the existing dualled section between the A69/B6531 Junction and the A69/A1 Junction. ■ Reduces severance and improves air quality and noise for Warwick Bridge residents. ■ Improves the connectivity of local communities to key employment opportunities in the Carlisle and Tyne and Wear areas. ■ Improves access to key tourist destinations such as Hadrians Wall, Northumberland Dark Sky Park and the Lake District. ■ Contributes positively to the future economic growth of Northern England.

Route	No.	Current Issues/ Problems	Additional Future Issues/Opportunities
A69	1a	A69/A689 Dualling (includes Option 2)	<ul style="list-style-type: none"> ■ Dual all remaining single carriageway sections ■ Dual A689 instead of the Warwick Bridge section ■ Includes Option 2 – Junction Improvement
	2	Junction Improvement Package	<ul style="list-style-type: none"> ■ Represents an option to improve junctions on existing dualling section at eastern end of the A69 ■ Improvements to A69/B6531; A69/A6079 and A69/A68 Junctions. Currently 'At Grade' to 'Grade Separated'. ■ Could be delivered as stand alone scheme or as part of the A69 dualling options (1 and 1a).
	3	Warwick Bridge By-pass (single carriageway)	<ul style="list-style-type: none"> ■ Single carriageway by-pass of Warwick Bridge
	3a	A689 Dualling	<ul style="list-style-type: none"> ■ Dualling of A689 only (alternative to Warwick Bridge by-pass)

Table 1.11: Key Benefits of Shortlisted Options: A69

1.10 Next Steps and Conclusions

1.10.1 The feasibility work undertaken has shown that the strategic case and benefits of some potential options merit further more detailed appraisal of the case for intervention. At the next stage of the study regional modelling tools will be available to undertake a more comprehensive and detailed appraisal of the options, including:

- **Traffic Model** – the Highways England North Trans-Pennine Regional Traffic Model (NTPRM) is currently being developed. This model will provide a tool that can be used for modelling some of the traffic responses to an improved Trans-Pennine strategic link. This would include the transfer of traffic due to improvements on the A1(M) to Scotch Corner and less use of the M62 due to improvements on the A66 and A69.
- **Land Use Model** – the Land Use Transport Interaction Model (LUTIM) has been commissioned by the DfT to assess the individual and combined impacts of the three Strategic Studies for the North. The outputs from this model would include the movements of employment and changes to land use as a result of any transport interventions such as improvements to the A66 and A69.
- **Environmental Impacts** – Currently the environmental impacts are based on a high level desk top assessment identifying known constraints and issues from readily available constraints data. As the study progresses, more detailed research and investigation with regard to the environmental conditions and constraints, including developing carbon assessment tools, will require surveys and environmental monitoring to be undertaken to gather further evidence. This would also include carrying out consultations with relevant environmental bodies and organisations.

1.10.2 As the work progresses there are a number of other studies being undertaken, the outputs of which need to be considered in detail as they are likely to impact on the development of the Northern Trans-Pennine Routes Study. These studies include:

- Trans-Pennine Tunnel Study (TPT);
- Manchester North-West Quadrant Study;
- TfN Freight Study;
- TfN International Connectivity Study;
- DfT Land Use Transport Interaction (LUTI) Study;
- DfT Trans-Pennine Rail Study; and
- Highways England – Route Strategies.

- 1.10.3 In conclusion the Northern Trans-Pennine Strategic Study has identified options for a new strategic corridor, upgrading one or both of the A66 and A69 and making other improvements along their length; improving east–west connectivity in the North of England; and considering the impact any options could have on the wider east-west links such as the M62.
- 1.10.4 The study has identified options that can feasibly be constructed, and can be operated and used safely, and reached conclusions on the strategic, economic, safety, environmental and operational benefits and impacts for each of the feasible options. Some of the options may have significant wider economic costs and benefits, in particular through impacts on the local labour and product markets and the economic geography of the northern transport area. These will be assessed using refined assessment tools as part of the next stages of the study.

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