



M6 to A1(M) Corridor Study

Strategic Outline Business Case

FINAL DRAFT | CONFIDENTIAL

Report Number: SPaTS 1-878 M6 – A1(M) **P01 S0**

August 2020

DRAFT

This page is left intentionally blank

DRAFT

Document Control

Document Title	M6 to A1(M) Corridor Study Strategic Outline Business Case M6 to A1(M) Corridor Study Scheme
Author	██████████ (AECOM)
Owner	██████████ (Highways England – Project Manager)
Distribution	██████████ (Highways England – Project Manager) ██████████ (AECOM – Project Manager)
Document Status	Final Draft CONFIDENTIAL

Record of Issue

Rev.	Status	Author	Date	Checker	Date	Approver	Date	Authorised for Issue	Date
V1	Working Draft	KK	13.01.20	FM	15.01.20	-	-	-	-
V2	Working Draft	KK	23.03.20	FM	30.03.20	DA	30.03.20	-	-
V3	Working Draft – <i>Economic and Financial Cases</i>	KK	01.05.20	DA	05.05.20	-	-	-	-
V4	Final Draft	KK	18.05.20	DA	20.05.20	LA	22.05.20	FM	22.05.20
V5	Final Draft	KK	09.07.20	LA	13.07.20	FM	13.07.20	FM	13.07.20
V6	Final Draft <i>(minor amends)</i>	LA	06.08.20	-	-	-	-	-	-
V7	Final Draft <i>(Orange Short amends)</i>	LA	21.08.20	KK	23.08.20	FM	26.08.20	FM	28.08.20

Consulted with

Name	Role

The original format of this document is copyright to Highways England

Contents

1	Introduction	6
1.1	Background	6
1.2	Study Area	7
1.3	Report Structure	7
2	STRATEGIC CASE	8
2.1	Introduction	8
2.2	Business Strategy	8
2.3	Problems Identified	26
2.4	Impact of Not Changing	58
2.5	Objectives	59
2.6	Measures for Success	63
2.7	Constraints	65
2.8	Options	67
2.9	Scope	76
2.10	Interdependencies	79
2.11	Stakeholders and Delivery Partners	80
3	ECONOMIC CASE	83
3.1	Introduction	83
3.2	Options Appraised	83
3.3	Assumptions	83
3.4	Analysis of Monetised Costs and Benefits	85
3.5	Sensitivity and Risk Profile	92
3.6	Non-Monetised Benefits	92
3.7	Appraisal Summary Table	93
3.8	Value for Money Statement	100
4	FINANCIAL CASE	103
4.1	Introduction	103
4.2	Costs	103
4.3	Budgets / Funding Cover	106
5	COMMERCIAL CASE	107
5.1	Introduction	107
5.2	Output Based Specification	107
5.3	Procurement Strategy	107
6	MANAGEMENT CASE	108
6.1	Introduction	108
6.2	Evidence of Similar Projects	108
6.3	Programme / Project Dependencies	109
6.4	Governance, Organisational Structure and Roles	109
6.5	Programme / Project Plan	111
6.6	Assurance and Approvals Plan	112
6.7	Communications and Stakeholder Management	113
6.8	Programme and Project Reporting	114
6.9	Risk Management Strategy	114
6.10	Options	117
7	NEXT STEPS	118

APPENDIX A: ENVIRONMENTAL CONSTRAINTS.....119
APPENDIX B: VALUE FOR MONEY STATEMENT120

DRAFT

1 INTRODUCTION

1.1 Background

Highways England commissioned AECOM to examine the potential for a new strategic highway link across the Pennines, creating an additional link between the M6 and the A1(M). This follows an earlier study, undertaken by AECOM on behalf of Highways England, which reviewed the existing Central Pennines Corridor (CPC) conditions and examined the potential for Trans Pennine highway improvements. In addition, the M6 to A1(M) Corridor was identified within the Transport for the North (TfN) Central Pennines Strategic Development Corridor Strategic Programme Outline Case (SPOC).



The scope of this study is focussed on highway connectivity, with rail connectivity out-of-scope, although the interaction between a new highway link and rail network enhancements is considered (including proposals, such as, Northern Powerhouse Rail).

Across the CPC, the M62 is the only complete dual carriageway Trans Pennine route between the east and west of the country, and within the *Core Study Corridor* identified in **section 1.2**, there are no complete Strategic Road Network (SRN) connections between the M6 and A1(M) at all, with the M65 providing a partial connection only. Consequently, there are limited high quality road connections between the key north-south routes and a new link between the M6 and A1(M) seeks to address Pan-Northern and local highway connectivity challenges, which are perceived to hinder existing economic performance and growth potential. The lack of high-quality public transport accessibility across the *Core Study Corridor* also places greater reliance on the highway network. Without investment to improve transport provision, poor connectivity, delays and congestion in this corridor are likely to continue to hinder economic productivity, labour market access and future growth.

Since the earlier study into the CPC conditions, Climate Emergency declarations and aspirations to reduce car reliance (albeit amongst a growing population and economy which increase travel demand) have become more prominent. Considering the environmental impact of a new road link will be important, particularly with the June 2019 legislation to reach net zero greenhouse gas emissions by 2050 and publication of the 'Decarbonising Transport Setting the Challenge' document in March 2020 which states a Transport Decarbonisation Plan (TDP) will be developed. In addition, the 2035 ban on the sale of new petrol, diesel and hybrid cars will introduce a more sustainable fleet of vehicle on the highway network.

The study is aligned with Stage 0 of the Highways England Project Control Framework (PCF) process, with all stages of that process shown in **Figure 1.1**. This document presents the Strategic Outline Business Case (SOBC).

Figure 1.1: Major Projects PCF Process

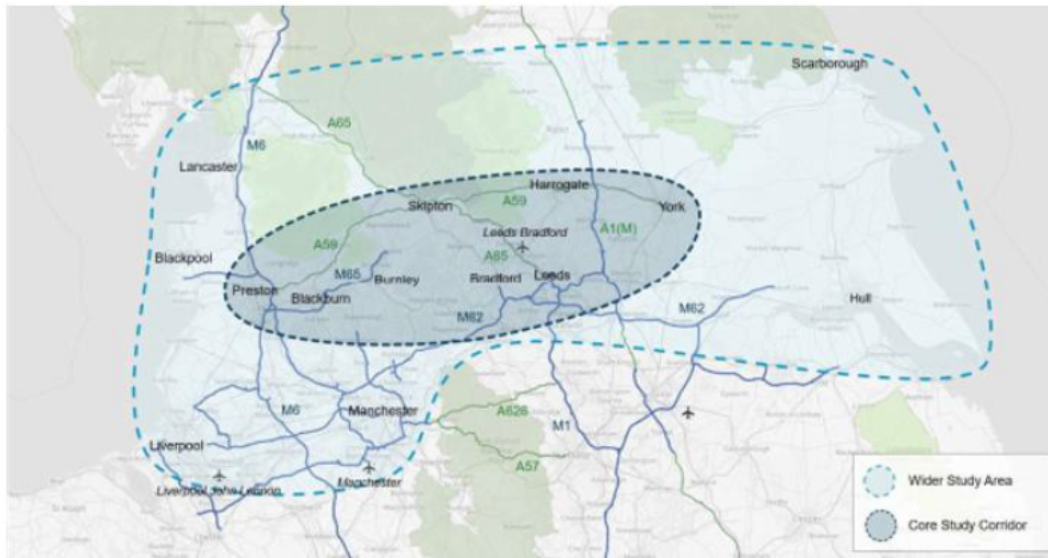
Pre-Project	Options		Development			Construction	
Stage 0	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 6	Stage 7
Strategy, Shaping and Prioritisation	Option Identification	Option Selection	Preliminary Design	Statutory Procedures and Powers	Construction Preparation	Construction, Commissioning and Handover	Closeout

1.2 Study Area

Figure 1.2 presents the M6 to A1(M) study area and illustrates the surrounding transport network and key centres. The study area is comprised of two discrete sections:

- **Wider Study Area:** this takes a similar form to that of the TfN Central Pennines Strategic Development Corridor (discussed further in **section 2.2.2**); and
- **Core Study Corridor:** this focuses on the people, places and businesses between Central and East Lancashire and North and West Yorkshire.

Figure 1.2: M6 to A1(M) Study Area



1.3 Report Structure

This SOBC has been prepared using an evidence-based approach and is structured as follows:

- **Section 2** presents the **Strategic Case** for the scheme. This details the justification for the scheme, identifies the problems that the scheme is aiming to resolve, sets out the key objectives and presents the scheme options;
- **Section 3** details the **Economic Case** and demonstrates the value for money for the scheme, including the impact on the economy, society and environment;
- **Section 4** summarises the **Financial Case** and includes initial cost estimates for the identified options;
- **Section 5** contains the **Commercial Case** which provides a high-level overview of how the scheme could be procured;
- **Section 6** outlines the **Management Case**, including the proposed governance, stakeholder engagement and risks; and
- **Section 7** summarises the **Next Steps**.

Key: The 'call-out' boxes used throughout this report relate to DfT Business Case Guidance (2013) for the appropriate section.

2 STRATEGIC CASE

2.1 Introduction

This section of the SOBC describes the Strategic Case, setting out the policy fit and investment rationale for the project. This is supported by a robust evidence base that considers the current and future transport conditions and issues within the M6 to A1(M) study area, together with the policy fit, enabling development of scheme objectives. Scheme practicalities are also presented, including the identification of key stakeholders, constraints and interdependencies and have been used to support the option assessment process.

In line with DfT guidance¹, the subsequent sections in this chapter cover the following areas:

- Business Strategy;
- Problems Identified;
- Impact of Not Changing;
- Objectives;
- Measures for Success;
- Constraints;
- Options;
- Scope;
- Interdependencies; and
- Stakeholders and Delivery Partners.

2.2 Business Strategy

This provides the context for the business case by describing the strategic aims and responsibilities of the organisation responsible for the Proposal. At SOBC stage, this should be completed.

Highways England operate, maintain and improve England's SRN, which comprises the motorways and major trunk roads. This represents only 2% of all roads in England by length, but these roads carry approximately one-third of all traffic by mileage and two-thirds of all Heavy Goods Vehicle (HGV) traffic. Consequently, this network forms the economic backbone of the country and is relied on by communities and businesses across the country.

Highways England's ambition is to ensure major roads are more dependable, durable and safe with their work seeking to ensure the road network is:

- **Free-flowing:** where routine delays are infrequent and journeys are reliable;
- **Safe and Serviceable:** where no one should be harmed when travelling or working; and
- **Accessible and Integrated:** so people are able to choose their mode and can move safely across and alongside roads.

In addition to the above, Highways England also aim to support economic growth with a modern and reliable road network as well as ensuring activities result in a long-term and sustainable benefit to the environment. This SOBC has been produced to help Highways

¹ The 'call-out' boxes used throughout this report relate to DfT Business Case Guidance (2013) for the appropriate section.

England with the development of a potential intervention between the M6 and A1(M) via the PCF process.

This section outlines the key policy documents that are driving change around the M6 to A1(M) study area, and those which the improvements are anticipated to support. These include national, sub-national and regional documents which are presented in **Figure 2.1**.

Figure 2.1: Policy Review

National		Sub National		Regional	
Transport Investment Strategy (TIS): Moving Britain Ahead	Creation of the Major Road Network (MRN): Government Response	Strategic Transport Plan	Central Pennines Strategic Development Corridor	Lancashire Strategic Economic Plan: A Growth Deal for the Arc of Prosperity	Lancashire Strategic Transport Prospectus
Road Investment Strategy (RIS)	Industrial Strategy: Building a Britain Fit for the Future	Northern Powerhouse Independent Economic Review	Enhanced Freight and Logistics Analysis Report	Leeds City Region Strategic Economic Plan 2016-2036	West Yorkshire Combined Authority Transport Strategy 2040
Highways England Strategic Business Plan 2015-2020	Decarbonising Transport – Setting the Challenge	The Potential of Northern Powerhouse Rail		York, North Yorkshire and East Riding Strategic Economic Plan	A Strategic Transport Prospectus for North Yorkshire

2.2.1 National Policy

Transport Investment Strategy (TIS): Moving Britain Ahead, *Department for Transport (2017)*

The Transport Investment Strategy (TIS) identifies four key aspects for future investment decisions and these are:

- To create a more reliable, less congested, and better-connected transport network that works for the users who rely on it;
- To build a stronger, more balanced economy by enhancing productivity and responding to local growth priorities;
- To enhance our global competitiveness by making Britain a more attractive place to trade and invest; and
- To support the creation of new housing.

The strategy describes the heavy reliance on the road network for the easy movement of people and goods around, and between, regional economies. The ability to have confidence in journey times is also evident in the strategy, regardless of the journey purpose. Forecast traffic growth of 19-55% on England’s roads by 2040 is stated² and this increased demand will impact congestion levels on the highway network. Transport connectivity and reliability can reduce costs to businesses and affect trade, particularly on routes connecting major industrial hubs to international gateways.

² This considers different scenarios and is forecast for across England.

The TIS states that improvement in the condition, capacity and connectivity of the network will be fundamental in order to improve the core capability of the network. Upgrading the network so it is better able to cope with demand can help to ease congestion; delays and bottlenecks on the highway network result in incidents having a greater impact which further reduces reliability. Creating new links enhances the connectivity of the network with access between existing, and planned, housing and employment sites to better connect people and places.

Investment in the transport network will need to consider the alignment with the aspects described above and a joined-up approach to decision-making to ensure interventions work effectively.

Relevance to the M6 to A1(M) SOBC

Investment to improve connectivity between the M6 and A1(M) is aligned with the TIS by ensuring that the SRN supports:

- enhanced accessibility to major employment destinations;
- reduced congestion and improved safety;
- reduced Trans Pennine journey times for all users;
- improved journey time reliability on the highway network;
- complementary strategic development locations identified by the Lancashire, Leeds City Region and York, North Yorkshire and East Riding Local Economic Partnerships (LEPs); and
- delivery of value for money for government.

A joined-up approach to decision-making will be particularly pertinent for the M6 to A1(M) given this will pass through multiple regions and authorities.

Road Investment Strategy (RIS), *Department for Transport (2014)*

Government developed a RIS that set out a long-term programme of improvements to the SRN with funding allocated accordingly. The first RIS (RIS1) included a long-term vision for the SRN, outlining how DfT and Highways England will create smooth, smart and sustainable roads, with high level objectives for Road Period 1 (2015-20).

RIS1 presents five long-term challenges for the SRN, namely:

- **Access around major cities** – major cities are anticipated to be the drivers of the greatest growth yet some have serious congestion in the periphery which will be exacerbated with growing urban populations;
- **Connecting outlying areas** – regional growth can be helped by providing better links from outlying regions to the centre of the country to help businesses compete nationally and internationally;
- **Improving east / west connectivity** – road and rail connectivity traditionally links the North and South, with main arteries not serving East-West as comprehensively;
- **Radial versus ring** – cross-connections are missing in some places resulting in it being difficult to travel between places that are geographically close; and

- **Building a smarter network** – new developments and technology innovations are likely to fundamentally change the way we use and operate our roads.

In March 2020, RIS2 was published which sets out performance standards, planned enhancements, and available funding during the 2020-25 period. RIS2 is focused on six key outcome areas, designed to emphasise the needs of those who rely on Highways England's road network:

- **Improving safety for all** – The safety of anyone interacting with the SRN is the first priority, informing all aspects of the design of RIS2, with measures designed to first prevent the occurrence of road collisions, and secondly to prevent injuries or minimise their severity;
- **Fast and reliable journeys** – Highways England has recognised a wealth of evidence that journey time is the most important influence on driver satisfaction across all road users, and aims to mitigate congestion through effective road management policies, and respond to unpredictable issues quickly and appropriately;
- **A well-maintained and resilient network** – An increasing volume of maintenance and renewal work is needed in response to ageing SRN infrastructure, requiring good practice asset management to minimise costs and ensure effective operation;
- **Being environmentally responsible** – The development and operation of the SRN impact a range of environmental factors, such as noise, greenhouse gases, air quality, and biodiversity, leading RIS2 to aim to secure positive impacts where possible and mitigate negative effects;
- **Meeting the needs of all users** – In addition to raising user expectations by providing a future-proofed network through maintenance, renewals and enhancement, RIS2 aims to keep road users aware during evolving situations that may impact them, such as incidents or poor weather;
- **Achieving real efficiency** – For Road Period 2 (2020-25) and beyond, RIS2 intends to continue to demonstrate a high level of efficiency through faster, predictable delivery of schemes.

In particular, the M6 to A1(M) Strategic Study is referenced in the RIS2 publication, highlighting the potential for improved connectivity between communities in East Lancashire and West Yorkshire, more resilient links to Leeds Bradford Airport (LBA), and the relief of the M62.

Relevance to the M6 to A1(M) SOBC

The RIS highlights that the current SRN needs to be improved due to a lack of capacity, funding issues reducing the ability to plan long-term, local communities being affected by air and noise pollution, and limited up-to-date customer information to make their journeys more reliable. An improvement in highways connectivity between the M6 and A1(M) would therefore seek to address the key challenges for the SRN by enhancing east-west connectivity and better connecting cities, towns and villages to support regional growth.

The RIS2 publication clearly highlights the multi-faceted potential benefits of improved connectivity between the M6 and A1(M), which aligns with the key outcome areas of reliability, resilience and meeting the needs of all types of road users.

Strategic Business Plan 2015-2020, *Highways England* (2014)

In order to meet the requirements of the RIS, Highways England has produced a Strategic Business Plan, which describes how Highways England will deliver the investment plan and achieve the Performance Specification to 2020. The Performance Specification outlines the following eight areas that will be Highways England's focus:

- making the network safer;
- improving user satisfaction;
- supporting the smooth flow of traffic;
- encouraging economic growth;
- delivering better environmental outcomes;
- helping cyclists, walkers, and other vulnerable users of the network;
- achieving real efficiency; and
- keeping the network in good condition.

The Business Plan refers to a transformation of national roads via (i) modernising core motorways and upgrading some of the most important major routes to provide more capacity and better connections, (ii) maintaining the network safely and efficiently with minimal impact on drivers and communities, and (iii) operating the network to keep traffic moving and customers better informed.

Five key outcomes are presented:

- supporting economic growth;
- safe and serviceable network;
- more free-flowing network;
- improved environment; and
- more accessible and integrated network.

The Plan describes how two-thirds of freight is carried on motorways and major A roads highlighting the importance of this network to business and the economy. It is noted that there is a need to work with the freight and logistics sectors to better understand their needs and ensure the network supports movements to key economic hubs, including ports, airports and freight distribution centres.

Relevance to the M6 to A1(M) SOBC

Tackling congestion and delay, and providing better connections is at the forefront of Highways England's plans to provide a modern network that supports a modern economy. The Plan recognises that many English towns and cities have grown in response to demographic changes and as a consequence, in certain locations, the

network itself has inadvertently become a barrier to vehicles and other users safely accessing the highway network and/or key economic centres. The M6 to A1(M) Corridor is adjacent to existing and proposed strategic housing and employment development opportunities. Improvements seek to provide a more accessible and integrated network along this corridor, whilst supporting the economic growth of towns and cities, and therefore the aims are aligned with the Plan.

With regards to the environment, the Plan recognises the significant contribution road transport has to greenhouse gas emissions as well as the impact on air quality, noise, biodiversity, wider landscape, flooding and water quality. Considerations during design and construction can help to reduce the environmental impact as well as quieter road surfacing and species protection.

Creation of the Major Road Network: Government Response, *Department for Transport* (2018)

In December 2017, the Government launched a consultation setting out a proposal to create a Major Road Network (MRN) across England. In creating the MRN, the Government had five central policy objectives. These are:

- Reduce congestion – alleviating local and regional congestion, reducing traffic jams and bottlenecks;
- Support economic growth and rebalancing – supporting the delivery of the Industrial Strategy, contributing to a positive economic impact that is felt across the regions;
- Support housing delivery – unlocking land for new housing developments.
- Support all road users – recognising the needs of all users, including cyclists, pedestrians and disabled people; and
- Support the SRN – complementing and supporting the existing SRN by creating a more resilient road network in England.

Following this consultation, in December 2018 it was announced that the Government would go ahead with its proposals for the creation of the MRN, albeit with some alterations, and released guidance for the submission of investment proposals from sub-national transport bodies. Whilst the MRN map has not been published by DfT, the proposed network includes a number of A-roads within the *Core Study Corridor* including the following major routes: A56, A59, A63, A64, A65, A629, A646, A650, A658, A660 and A6120. In addition to these A class roads, the proposed MRN also includes the section of the M65 between Junctions 10 and 14.

Relevance to the M6 to A1(M) SOBC

The MRN identified by DfT includes a number of the roads within the *Core Study Corridor* and enhancements to the highway network between the M6 and A1(M) would support the MRN objectives to reduce congestion, support the SRN and support economic growth / rebalancing; thereby contributing to greater resilience for east-west movements across the *Core Study Corridor*.

Industrial Strategy: Building a Britain Fit for the Future, HM Government (2017)

This long-term strategy provides a policy framework against which major private and public sector investment decisions can be made.

To create an economy that boosts productivity and earning power throughout the UK, this strategy identifies five foundations of productivity:

- Ideas: the world's most innovative economy;
- People: good jobs and greater earning power for all;
- Infrastructure: a major upgrade to the UK's infrastructure;
- Business Environment: the best place to start and grow a business; and
- Places: prosperous communities across the UK.

With regards to Infrastructure, the strategy describes the importance of high quality infrastructure being essential with efficient transport systems connecting people and employment opportunities, as well as goods from suppliers to markets.

Relevance to the M6 to A1(M) SOBC

This strategy provides a framework for investment decisions, and an intervention to improve connectivity between the M6 and A1(M) is aligned with the vision for a major upgrade to the UK's infrastructure to help boost productivity and therefore support the movements of people and goods within the *Wider Study Area*.

Decarbonising Transport Setting the Challenge, Department for Transport (2020)

In March 2020, Government set out plans for the development of a Transport Decarbonisation Plan (TDP). The TDP, due to be published later in 2020, will detail "*what government, business and society will need to do to deliver the significant emissions reduction needed across all modes of transport*".

Six strategic priorities are identified:

- Accelerating modal shift to public and active transport;
- Decarbonisation of road vehicles;
- Decarbonising how we get our goods;
- Place-based solutions for emissions reduction;
- UK as a hub for green transport technology and innovation; and
- Reducing carbon in a global economy.

Relevance to the M6 to A1(M) SOBC

Proposals to upgrade the highway network between the M6 and A1(M) will need to consider the content of a TDP, due to be published later this year, which seeks to achieve net zero emissions across all modes by 2050. Measures identified for the strategic priorities could have a considerable impact on the project.

2.2.2 Sub National Policy

Strategic Transport Plan, *Transport for the North* (2018)

TfN is the voice of the North of England for transport – a statutory body of elected leaders and a partnership of business leaders from across the whole of the North of England who collectively represent all of the region's 15 million citizens.

Under the Local Transport Act 2008, amended by the Cities and Local Government Devolution Act 2016, TfN has been established as the first Sub-National Transport Body in England, with the purpose of developing and implementing a transport strategy and investment programme for the North of England.

TfN's aim is to plan and ensure the development of new infrastructure and the delivery of the improvements needed to truly connect the whole of the North with resilient, reliable, efficient transport connectivity, driving economic growth and supporting the creation of a Northern Powerhouse. In February 2019, TfN published the Strategic Transport Plan (STP) for the North, which sets out the case for strategic transport infrastructure investment through to 2050. This followed a draft plan produced in January 2018 and the final STP is now a statutory document.

This plan presents a vision of a thriving North of England where modern transport connections drive economic growth and support an excellent quality of life. The role of TfN is to identify and plan the transport infrastructure required and this plan sets out the case for transport investment to 2050. By 2050, the plan states the North could have an additional 850,000 jobs and generate almost £92 billion additional Gross Value Added (GVA), over and above business-as-usual trends. Four objectives are presented to achieve the vision:

- **Objective 1:** Increasing efficiency, reliability and resilience in the transport system;
- **Objective 2:** Transforming economic performance;
- **Objective 3:** Improving inclusivity, health, and access to opportunities for all; and
- **Objective 4:** Promoting and enhancing the built, historic, and natural environment.

Relevance to the M6 to A1(M) SOBC

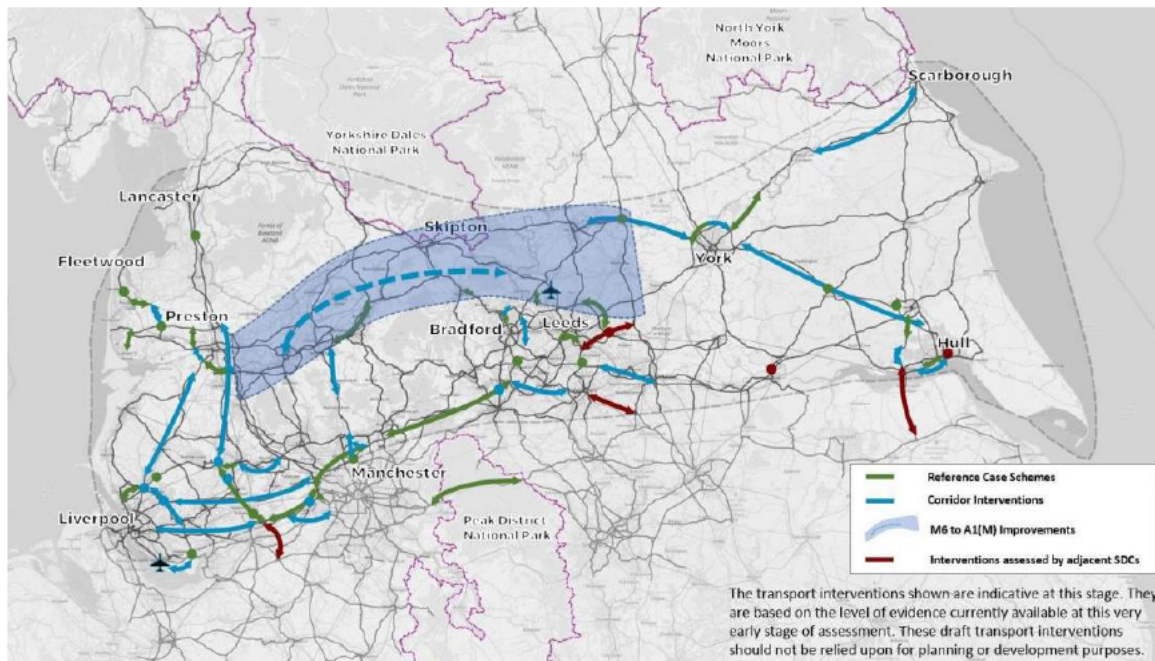
Investment in the M6 to A1(M) Corridor has synergy with the objectives set out in the TfN STP with mutually supportive aspirations relating to economic growth, efficient and reliable transport journeys and access to opportunities across the North with enhanced connectivity.

Central Pennines Strategic Development Corridor (CPC), *Transport for the North* (2019)

The CPC is one of seven Strategic Development Corridors (SDCs) identified within the TfN STP. The CPC SDC aims to improve strategic east-west connectivity for the North's important economic centres and assets in North Yorkshire, West Yorkshire, East Riding and Hull and Humber through to Greater Manchester, Lancashire and Liverpool City Region. To realise this vision for the corridor, a number of key transport interventions within the CPC are proposed. These include schemes from an initial reference case, interventions that overlap with adjacent SDCs and new proposals for the corridor. The key road interventions put forward are

illustrated in **Figure 2.2**, and this shows the clear aspiration of TfN to improve east-west connectivity, particularly between East Lancashire and North and West Yorkshire.

Figure 2.2: CPC Reference Case and Strategic Outline Programme



Source: Central Pennines Strategic Development Corridor: Strategic Programme Outline Case (2019).

Relevance to the M6 to A1(M) SOBC

The STP identifies seven SDCs, with the Central Pennines one of these. The identification of an improvement between the M6 to A1(M) would directly support the CPC as it seeks to improve strategic east-west connectivity for some of the North's economic centres and assets in North Yorkshire, West Yorkshire, East Riding and Hull and Humber through to Greater Manchester, Lancashire and Liverpool City Region.

Northern Powerhouse Independent Economic Review (NPIER), *Transport for the North* (2016)

In 2014, the vision of a Northern Powerhouse to achieve transformational economic growth across the North of England and address a performance gap with the rest of the country was outlined. This vision was followed by the 'One Agenda, One Economy, One North' report which put forward the aspiration for "a North which has a vibrant and growing economy, acts as a magnet for inward investment, and which capitalises on the strengths of Northern cities to build a Northern Powerhouse".

In 2016, the NPIER followed up the vision by identifying drivers that underpin performance and the opportunities for pan-Northern activity that could deliver economic outputs. It found a clear performance gap with respect to productivity in the North, compared to other parts of the UK, and identified the lack of agglomeration, poor connectivity and transport links as key factors hindering the economic development of the North.

The document presents a vision of economic transformation for the North and this focuses on rebalancing the UK economy and increasing international competitiveness. It concluded that, under the transformational scenario, by 2050 the North could:

- Achieve a projected GVA that would be £97 billion higher than the ‘business as usual’ scenario;
- Have 850,000 more jobs than under the ‘business as usual’ scenario, with 1.5 million new jobs in total; and
- Achieve 4% higher productivity than in a business as usual scenario.

The NPIER identifies distinctive capabilities where the North is seen as highly productive and competitive at national and international scales. As shown in **Table 2.1**, these include four Prime Capabilities and three Enabling Capabilities, which support the Prime Capabilities.

Table 2.1: Capabilities of the North (NPIER)

Prime Capabilities	Enabling Capabilities
Advanced Manufacturing and Materials	Financial and Professional Services
Health Innovation	Logistics
Energy	Education (<i>with a focus on higher education</i>)
Digital	

Figure 2.3 shows the spatial distribution of the Prime Capabilities of the North. The figure also shows that there are number of these assets located within the *Wider Study Area*. Several of these are within the *Core Study Corridor*, with clusters most notably in Lancashire, the Leeds City Region and around York. For example, Lancashire hosts a number of major employers in the advanced manufacturing, whilst York has a health innovation cluster. Analysis of employment by sector, in section 2.3.6, will explore these trends further.

To enhance these capabilities and stimulate agglomeration benefits, the report highlights the need to improve connectivity, both between and within cities. It is acknowledged that growth of Prime and Enabling Capabilities would likely lead to increased demand for business-to-business travel within the North, throughout the UK, and internationally through global gateways (i.e. ports and airports), indicating a further need to strengthen transport links to accommodate growth.

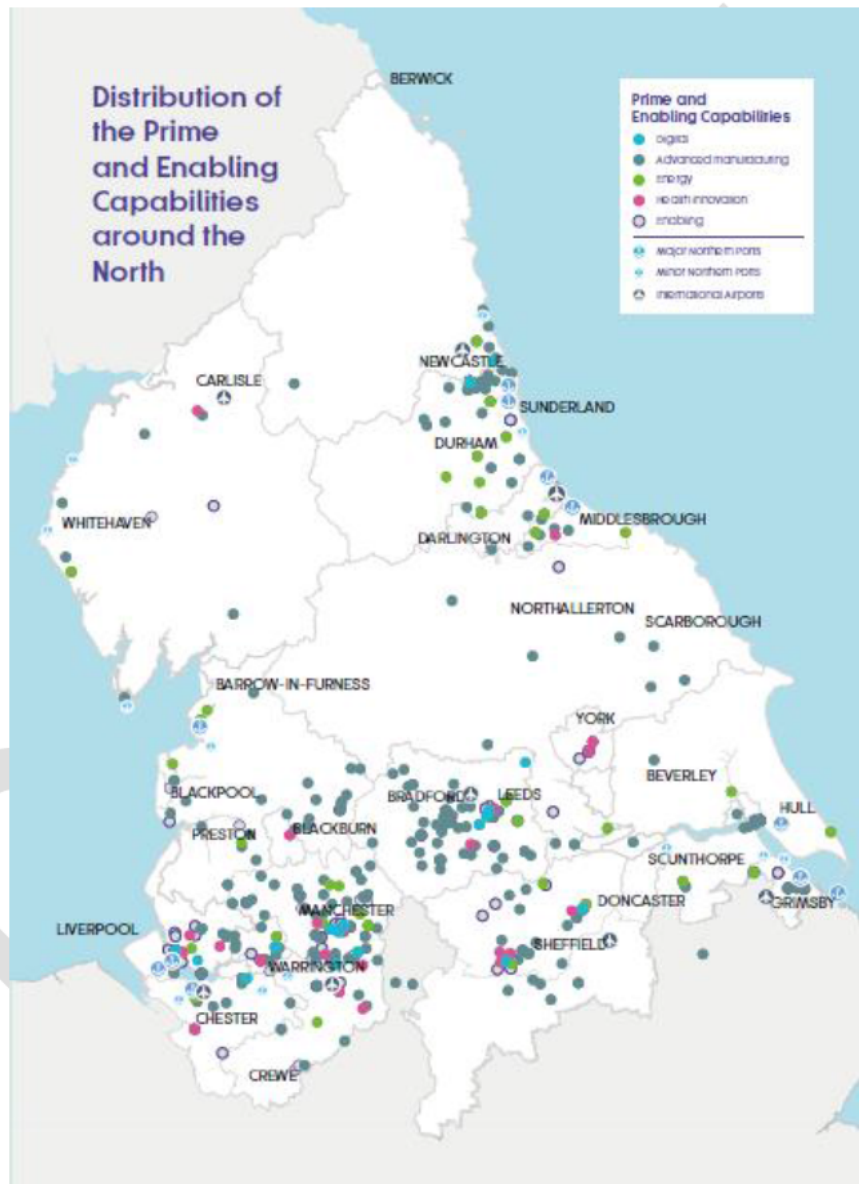
Relevance to the M6 to A1(M) SOBC

Both the *Wider Study Area* and *Core Study Corridor* capture several concentrations of Prime Capabilities, as well as Enabling Capabilities. With regards to Prime Capabilities, there is a clustering of advanced manufacturing in Lancashire as well as West Yorkshire. The NPIER described the strengths in advanced manufacturing, particularly materials and processes, in the North with a need to draw on the expertise of major companies located in the North to develop this capability further.

Investment in strategic highway improvements within the *Core Study Corridor* could address connectivity issues to increase the ‘pull factor’ of the area, particularly around

Enterprise Zones (e.g. Samlesbury Aerospace Enterprise Zone and those across West and North Yorkshire). This would include improved attractiveness for investment, business growth and living opportunities. It would also support a more resilient transport system capable of meeting changing travel and logistic trends, with access to major towns/cities as well as ports and airports. This would enhance the competitiveness of the area, particularly to those locations that suffer from limited reliability, restrained agglomeration and dispersed supply chains.

Figure 2.3: North's Prime and Enabling Capabilities in Relation to Study Areas



Source: Strategic Transport Plan, TfN (2019).

Enhanced Freight and Logistics Analysis Report, *Transport for the North* (2018)

This report considers freight travel patterns across the North by road, rail, air, coastal shipping and inland waterways. Based on the growth identified in the NPIER, there is a need for

investment in infrastructure to accommodate growth whilst also being mindful of the implications for sustainability and air quality.

The report highlights the results of the Great Britain Freight Model (GBFM) adapted to include NPIER growth forecasts for 2050. This predicts a 61.8% increase in tonne km by road, 52.9% increase in tonne km by rail and 11.6% increase in tonne km by waterway.

To achieve the desired economic growth, two key approaches are identified (i) reduce the demand for infrastructure and/or (ii) increase the capacity of the transport infrastructure. Three key focus points are presented:

- Maximise the use of existing assets and prioritise their use for the greatest value they bring to the North;
- Ensure the North has a modal mix delivering the most effective investment in infrastructure, technology and policy; and
- Ensure the North has the skills and can utilise available data to plan for the future.

Relevance to the M6 to A1(M) SOBC

Forecast growth in freight will have implications for movements within the *Core Study Corridor* and the ability to accommodate this increased demand will be critical to the freight and logistics sector as well as the potential consequences for other journey purposes on the network associated with significant freight growth on the network.

An intervention between the M6 and A1(M) would support the “increasing capacity of the transport infrastructure” approach.

The Potential of Northern Powerhouse Rail, *Transport for the North* (2019)

Northern Powerhouse Rail (NPR) is a major rail programme which aims to make movement easier between the region’s towns and cities, thereby unlocking economic potential of the North. The proposed programme includes new and significantly upgraded railway lines and the primary objective for NPR is to boost economic growth and close the north-south productivity gap. NPR will reduce journey times between key towns and cities with greater frequency of services. The rail improvements are expected to be a catalyst for communities with the improved connectivity supporting people across the North and drive regeneration initiatives.

Relevance to the M6 to A1(M) SOBC

There is some geographic overlap between NPR and highway improvements between the M6 and A1(M) as well as strategic synergy with both projects seeking to improve connectivity to deliver benefits to both people and the economy. Nevertheless, with the exception of Leeds and Bradford, NPR provides limited connectivity benefits for many towns along the *Core Study Corridor*, particularly those in Lancashire. Whilst there are opportunities for the two projects to work in tandem to expand the opportunities for road and rail movements across the North for people and freight, both projects focus on two different markets: NPR serves trips between major cities and urban hubs, whilst the M6 to A1(M) is focussed on connectivity within a defined corridor connecting smaller towns (in more dispersed origins and destinations).

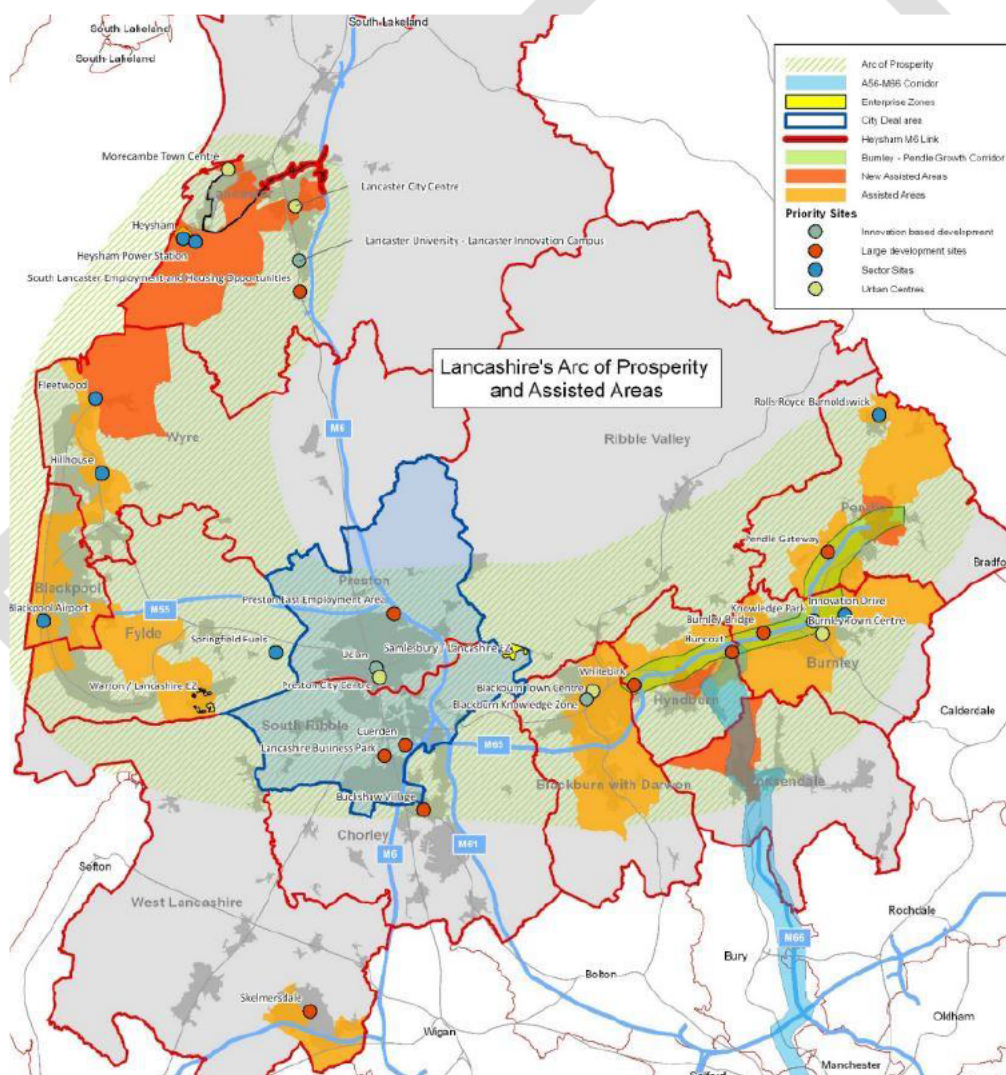
2.2.3 Regional Policy

Lancashire Strategic Economic Plan: A Growth Deal for the Arc of Prosperity, Lancashire County Council (2014)

Aspirations within this Strategic Economic Plan (SEP) include the delivery of 50,000 new jobs, £3 billion additional economic activity and 40,000 new houses between 2014 and 2021. There is a focus in building on the existing strengths within the key growth sectors of aerospace, automotive, energy and health science.

A key component in achieving these aspirations is the Arc of Prosperity (**Figure 2.4**). The Arc captures some of the highest concentration of the region's industrial hotspots, strategic development sites, clusters of high value activity and internationally recognised centres of research and innovation. It is estimated the Arc currently generates around 75% of Lancashire's wealth and will accommodate 90% of the county's forecasted additional employment opportunities.

Figure 2.4: Lancashire's Arc of Prosperity



Source: Lancashire Strategic Economic Plan: A Growth Deal for the Arc of Prosperity, Lancashire County Council (2014).

The SEP notes that the M65 Growth Corridor forms a key part of the Arc, supporting approximately 80% of East Lancashire jobs and has the potential to generate almost 10,000 new jobs and over £500 million in GVA alone. The SEP suggests that improved cluster-based development along this corridor would help promote a greater diversity in economic activity, which could boost the competitiveness of key growth sectors. This in turn would enhance local economic resilience, accelerate growth opportunities and unlock development / commercial sites.

To achieve these ambitions, the need to address long standing local and regional connectivity issues through targeted transport investment is emphasised. Improved links could bring forward development opportunities along the M65 Growth Corridor, better connect businesses to wider markets, local supply chains and workforces, and improve the appeal of the area as a prosperous place to live, work and do business.

Relevance to the M6 to A1(M) SOBC

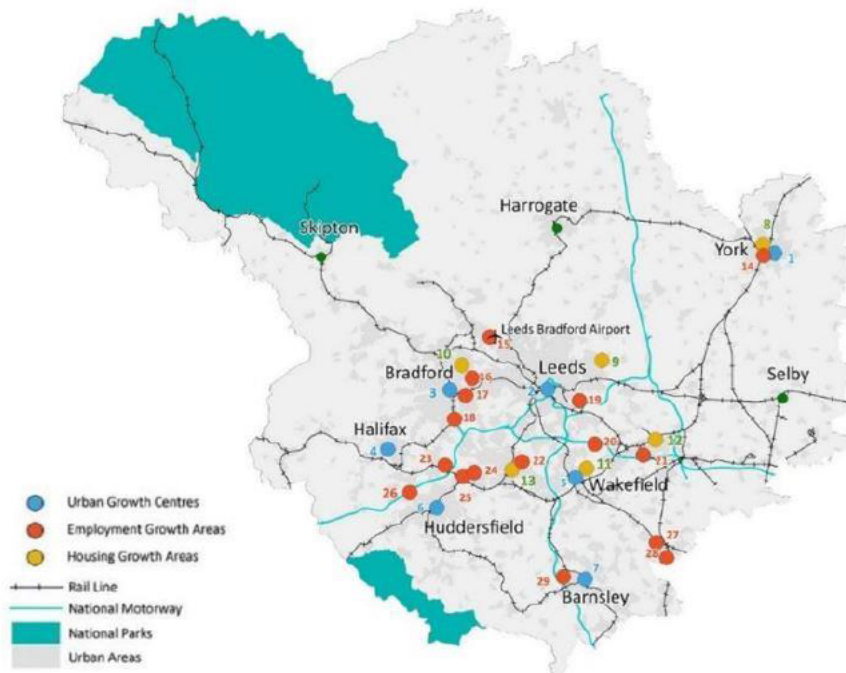
The SEP identifies the need to address connectivity and transport issues, with a focus towards unlocking the potential of the M65 Growth Corridor. Strategic highway improvements across the *Wider Study Area* would directly support this by improving the directness, reliability and resilience of the local and regional road network; thereby creating better connections between residents and businesses for the movement of people and goods within, and beyond, Lancashire.

Leeds City Region Strategic Economic Plan 2016-2036, Leeds City Region Local Enterprise Partnership (2016)

The vision for the SEP includes 10,000-13,000 new homes per year (from 2016), more than 35,700 new jobs and an additional £3.7 billion of annual economic output by 2036. This includes growth in the key sectors of financial and professional services, financial technology, health digital, and manufacturing and bespoke engineering.

Underpinning these aspirations is the place-based approach of Spatial Priority Areas, which focuses on an integrated 'whole-place' view of infrastructure needs and opportunities. The sites are categorised into urban, employment and housing growth areas (**Figure 2.5**). It is recognised that successful development will require coordination between activities (e.g. transport, employment, business and housing), as well as maximising local supply chain and employment opportunities from major developments.

Figure 2.5: Leeds City Region Spatial Priority Areas



Source: Leeds City Region Strategic Economic Plan 2016-2026, Leeds City Region Local Enterprise Partnership.

To achieve the identified aspirations, addressing current transport challenges is a key priority. These challenges include congestion, intra City Region connectivity and underinvestment in strategic transport infrastructure. To do so, the focus of future transport investment for the region is divided into five key themes:

- Radial improvements;
- Ring road improvements;
- Key development areas and corridors;
- Improved motorway access; and
- Improvements between major centres (e.g. Leeds-Bradford, Huddersfield-Halifax).

The SEP also aspires to an efficient, well-maintained and resilient highway network that will provide new or improved access to unlock development and, where possible, move traffic away from town and city centres.

Relevance to the M6 to A1(M) SOBC

Strategic highway improvements across the *Wider Study Area* could provide the infrastructure needed to support the delivery of Spatial Priority Areas, particularly those that sit within the *Core Study Corridor*, most notably Leeds Bradford Airport.

Intervening could also significantly address the identified transport issues, such as congestion, connectivity and underinvestment as well as support the five transport themes identified.

York, North Yorkshire and East Riding Strategic Economic Plan, York, North Yorkshire and East Riding Local Enterprise Partnership (2014)

The SEP for York, North Yorkshire and East Riding specifies a vision to make the area “*the place in England to grow a small business, combining a quality business location with a great quality of life*”. It identifies aspirations for 20,000 new jobs, £3 billion in growth, enhanced connections between students and business and doubling the housing build between 2014 and 2021. To achieve this, five priorities are identified:

- Profitable and ambitious small and micro businesses;
- Global leader in food manufacturing, agri-tech and bio-renewables;
- Inspired people;
- Successful and distinctive places; and
- A well-connected economy.

Driving these aspirations are spatial place-based projects where growth will be targeted and of particular pertinence to the M6 to A1(M) are the sites situated along the A59 in Skipton, Harrogate and York.

To realise these ambitions, transport priorities for the SEP are outlined and include (i) a need to improve east-west connectivity within and beyond the SEP, (ii) managing urban traffic, traffic congestion and pinch points, and (iii) enhancing the reliability of current transport networks.

Relevance to the M6 to A1(M) SOBC

Strategic highway improvements within the *Wider Study Area* could support these aspirations by strengthening east-west connectivity and improving the resilience and reliability of the highway network, as well as enhancing the connectivity for those travelling within the region and to international markets, for all journey purposes.

Growth sites located within the *Core Study Corridor* are likely to significantly benefit from highway improvements, particularly sites on key corridors in Skipton, Harrogate and York. Improvements are likely to also enhance connectivity between the SEP area and Leeds.

Lancashire Strategic Transport Prospectus, Lancashire Local Enterprise Partnership (2016)

This prospectus identifies long-term strategic transport requirements to support the Northern Powerhouse vision, highlighting the key opportunities and constraints on Lancashire growth over the next twenty years. More immediate interventions needed to stimulate potential are also outlined, including the M65 Growth Corridor. This is presented as an investment priority for the region due to its essential role in connecting people and businesses within, and beyond, Lancashire.

Relevance to the M6 to A1(M) Study SOBC

Strategic transport improvements within the *Core Study Corridor* and *Wider Study Area* will help to alleviate the constraints to Lancashire growth by providing greater east-west connectivity and widening the travel catchment for residents, businesses and visitors. The prospectus highlights the significance of the M65 Growth Corridor in connecting people and businesses, and these east-west movements will also be supported by an investment in the M6 to A1(M) Corridor.

West Yorkshire Combined Authority Transport Strategy 2040, West Yorkshire Combined Authority (2016)

The vision includes a need to enhance business success and people's lives by providing modern, world-class, well-connected transport that makes travel around West Yorkshire easy and reliable. The strategy is structured around six core themes:

- Inclusive growth, environment, health and well-being;
- Road network;
- Places to live and work;
- One system public transport;
- Smart future; and
- Asset management and resilience.

It is noted that the existing transport system is under pressure with investment in road and rail networks not keeping pace with population and economic growth which has resulted in congestion and delays on the highway, overcrowding on public transport and a lack of resilience. With regards to freight, the strategy notes 93% of goods are transported by road whilst just 7% are by rail.

With regards to roads, the strategy describes how better performance and more capacity is needed to serve the growing economy. Reference is made to the Central Pennines Corridor work being undertaken by TfN with the combined authority working with TfN and Highways England. The strategy refers to increasing the capacity on the SRN and MRN to improve journey times, reliability and resilience across the region. This is considered particularly important as anticipated growth is unlikely to be accommodated by schemes that are currently planned, so the performance of the highway network is expected to worsen in the future.

Relevance to the M6 to A1(M) Study SOBC

The vision presented within this strategy has synergy with the aspirations of the M6 to A1(M) study with regards to increasing the capacity on the SRN and MRN to improve journey times, reliability and resilience. The importance of investment in the transport network to support the anticipated growth is emphasised and improvements between the M6 and A1(M) will seek to contribute to this mitigation of increased in demand as well as facilitating more movements to unlock growth.

A Strategic Transport Prospectus for North Yorkshire, North Yorkshire County Council (2017)

This prospectus outlines how the County Council intends to work with the Government, TfN and Northern City Regions to improve transport connections and, therefore, allow North Yorkshire to contribute to, and share, the economic benefits of the Northern Powerhouse. A need to improve east-west connectivity (including Trans Pennine links) is one of three key strategic transport priorities, with specific reference made to enhancing the reliability and journey time on key corridors, such as the A64 and A59. With regards to freight and logistics, the document recognises the need to consider beyond the strategic transport network and address freight issues at local origins and destinations.

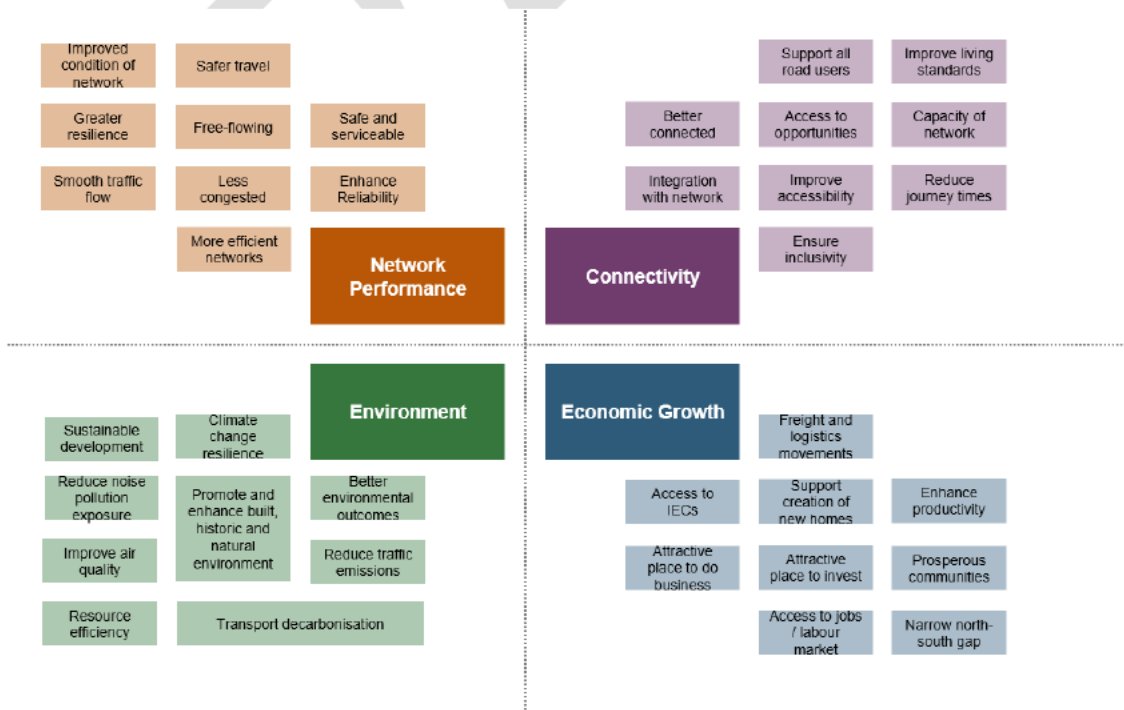
Relevance to the M6 to A1(M) Study SOBC

The aims of the M6 to A1(M) investment resonate with the prospectus in that there is a need to improve east-west connectivity as well as the reliability and journey times on the key road network. The prospectus also highlights the A64 and A59 are key corridors for North Yorkshire so an intervention should seek to consider the potential to improve connectivity to and along these routes.

2.2.4 Summary

The common themes identified within the strategy and policy review are summarised in **Figure 2.6** and this will provide an important direction for the identification of objectives and options for the M6 to A1(M) Corridor.

Figure 2.6: Policy and Strategy Key Themes



The TIS refers to the need for a more reliable, less congested and better-connected transport network, which is also shared by aspirations of Highways England for a free-flowing, safe and serviceable, accessible and integrated SRN. These highlight the need to improve the

performance of the highway network to enhance connectivity and this is also aligned with the TfN STP, with the *Core Study Corridor* largely aligned with the CPC which is one of the SDCs. The CPC seeks to improve strategic east-west connectivity linking important economic centres and assets in the North. An intervention between the M6 and A1(M) seeks to improve connectivity and boost reliability and resilience of east-west movements across the North through a number of conurbations.

The TfN STP recognises the lack of capacity, reliability and resilience of east-west connectivity is a constraint to the Northern economy. With the *Core Study Corridor* passing through a number of regions, it is particularly important to ensure the highway network is able to support and facilitate economic growth. This is a common theme within the objectives at a national, sub-national and regional level with transport investment identified as an important contributor to economic growth and attracting investment by strengthening connectivity and reducing congestion. An intervention between the M6 and A1(M) would improve connectivity and build resilience for east-west movements to facilitate quicker and more reliable journeys supporting economic growth across a number of regions within the Northern Powerhouse. This would contribute to the closing of the productivity gap between the north and south, and support the 'levelling-up' agenda of Government.

Highways England recognise the need for long-term and sustainable environmental benefits, with the TfN STP including an objective to promote and support the built and natural environment. Therefore, the improvements will need to have due consideration for the environmental impact and seek to minimise adverse effects, particularly with the March 2020 announcement of a TDP being published later this year and the June 2019 legislation to reach net zero greenhouse gas emissions by 2050.

2.3 Problems Identified

This describes the problem identified and the evidence base underpinning it. It also considers if there is justification for Government intervention. At SOBC stage, this should be completed.

This section presents the transport and accessibility and socio-economic conditions across the *Wider Study Area*, with a particular focus on Trans Pennine movements and the *Core Study Corridor*. Understanding these aspects will help to draw out the transport challenges and barriers to shape the identification of objectives for an intervention. The subsequent sections cover the following:

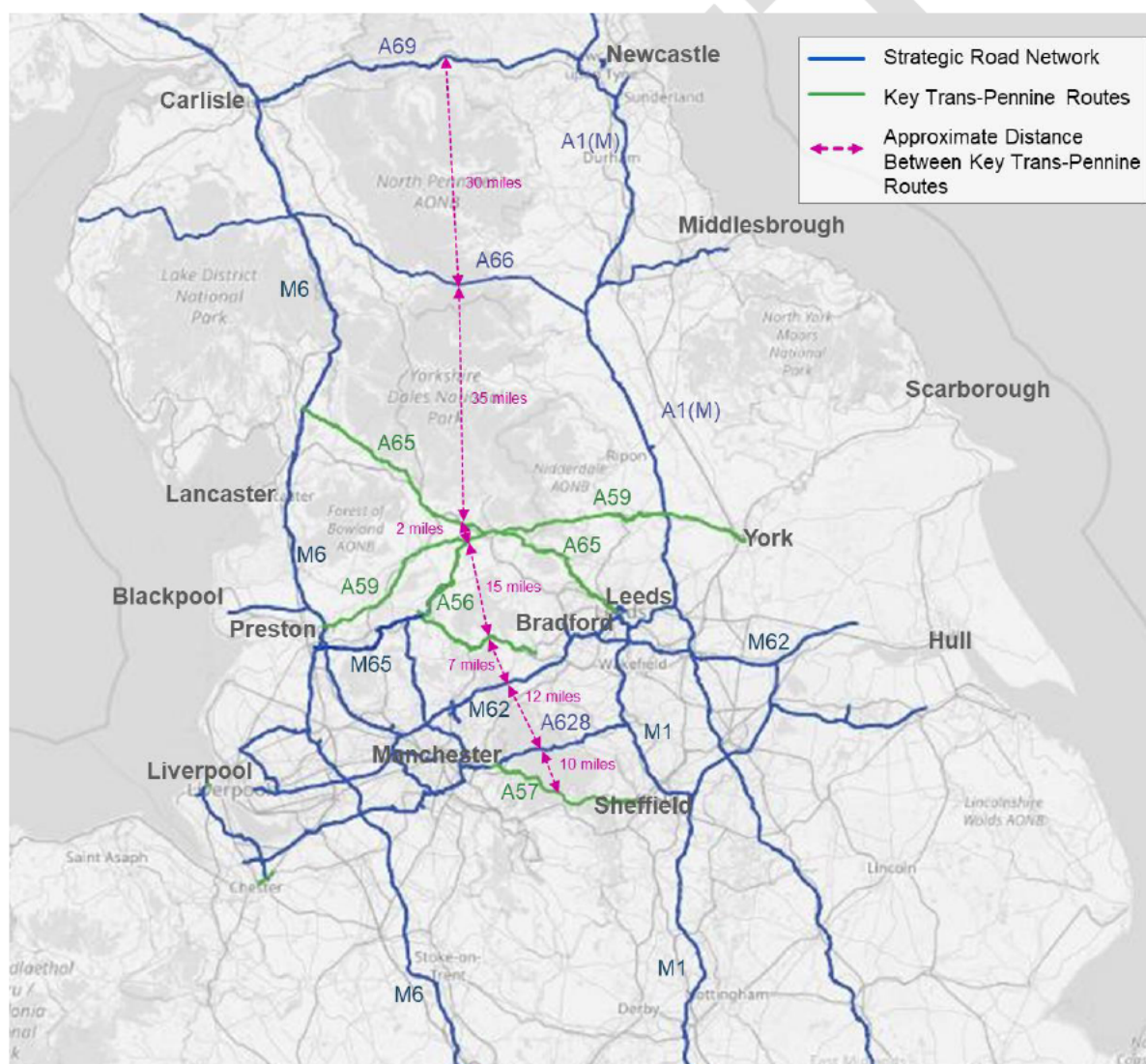
- Transport Network;
- Traffic Flows, Compositions and Journey Times;
- Travel Trends;
- Accidents;
- Resilience; and
- Socio-Economic Characteristics.

2.3.1 Transport Network

This section introduces the existing transport network within the *Wider Study Area* and *Core Study Corridor*. With an emphasis on highway movements for this M6 to A1(M) study, **Figure 2.7** illustrates the existing highway network and the paucity of Trans Pennine connections. Commentary is subsequently provided on the key roads of pertinence. An overview of the airports, rail provision, bus and coach services and freight and seaport movements is also included.

Figure 2.7 shows the spatial distribution between existing Trans Pennine routes with many separated by large distances. Although Central and Southern Trans Pennine routes are relatively close in distance, many have lower capacity and are characterised by challenging topography (such as the A59 and A65).

Figure 2.7: Highway Network



Highway

The Strategic Road Network (SRN) is comprised of motorways and trunk roads (the most significant A roads) administered by Highways England. Several routes within the *Wider Study Area* are part of the SRN, including the A1(M), M6, M61, M62 and M65 (between Preston and

Junction 10). The M6 and A1(M) provide north-south connectivity to the west and east of the *Wider Study Area* respectively, with several east-west routes providing connectivity (of varying extents) between the M6 and A1(M). As described in **section 2.2.1**, DfT have also identified a MRN which forms a middle tier comprising the country's busiest and most economically important local authority A roads, sitting between the national SRN and the local road network.

Within the Major Roads Report³, TfN have also identified a MRN for the North which connects 200 Important Economic Centres (IECs) across the North. This network is defined as “*most economically important to securing the North's productivity and growth; both now, and in the future*”. **Figure 2.8** shows the TfN MRN and highlights this includes a number of the routes within the *Core Study Corridor*.

Further detail on traffic flows, speeds and journey times on the highway network is provided in **section 2.3.2**.

Figure 2.8: TfN MRN



Source: Major Roads Report Strategic Transport Plan Evidence Base, TfN (2018).

Airports

Three major airports are situated within the *Wider Study Area*: LBA, Liverpool John Lennon (LPL) and Manchester (MAN). Flights from LBA and LPL provide access to similar destinations, with short-haul flights primarily to Europe. Meanwhile, MAN is the third busiest

³ https://transportforthenorth.com/wp-content/uploads/Roads-Report_updated_Jan2018.pdf

UK airport and has a much wider destination market, with direct short and long-haul flights to Europe, North America, South America, Asia and the Middle East.

With flights to a greater variety of destinations and a larger number of flights each day, MAN attracts passengers from a wider geographic catchment compared with LBA and LPL. An estimated 22 million people are within a two-hour travel time of MAN⁴, reflecting its location within the North West as well as close proximity to Yorkshire and the Midlands. Meanwhile for LBA, departing passengers predominantly travel from the Leeds City Region (69%), with some demand coming from East and South Yorkshire, whilst LPL primarily acts as key airport for passengers across the Liverpool City Region. This demonstrates LBA and LPL attract a tighter clustering of passengers, generally serving their respective side of the Pennines. The dominance of the car for accessing all three airports is evident, with 89% of all passengers arriving by car at LBA in 2014, 73% at LPL in 2014, and 75% at MAN in 2016.

LBA is particularly pertinent to this study as it sits within the *Core Study Corridor* and the West Yorkshire Transport Strategy considers it a major asset for leisure and tourism, supply chain and business markets within West Yorkshire. The airport is also identified as a major site for economic and development growth. Although LBA is a major asset within the *Core Study Corridor*, surface access experiences constraints by all modes to some extent. Demand for the surrounding highway network exceeds capacity resulting in congestion and delays at key junctions at peak periods as the routes provide accessibility to Leeds and Bradford, as well as the airport. This situation is likely to be exacerbated with increasing airport passengers placing greater demand on the highway network. Meanwhile, existing public transport alternatives to the airport are poor because there is no rail station on site and local bus services are often overcrowded and unreliable due to highway congestion. Limited east-west road and public transport connectivity across the *Wider Study Area*, particularly from Lancashire, is also perceived to restrain the full potential of the LBA passenger catchment and logistics market. Previous studies have suggested that passengers and workers that are geographically closer to LBA are opting for competing airports in the region as they are seen to have more direct and quicker transport connectivity⁵.

In Spring 2019, Leeds City Council and WYCA consulted on proposals regarding surface access improvements in this area. Feedback from the consultation showed support for a proposed parkway rail station on the existing Leeds-Harrogate line but there was no clear support for any of the road options⁶, and as such it has been proposed that these options are no longer progressed and that no further work is undertaken on them⁷. Furthermore, since the consultation, Leeds City Council has declared a Climate Emergency committing the city to become carbon neutral by 2030, leading to a range of sustainability-focused proposals, including a new parkway station and Park and Ride facilities, which are to be taken to public consultation. A North West Leeds Employment Hub has also been proposed north of LBA⁸ which would benefit from improved connectivity to the airport and support the economic growth in this area.

⁴ Sustainable Development Plan: Surface Access Plan, Manchester Airport Group (2016)

⁵ Central Trans Pennine Corridor East – West Connectivity, Cushman & Wakefield and SYSTRA (2017)

⁶ https://www.yourvoice.westyorks-ca.gov.uk/airport?utm_source=leedsgov&utm_medium=website&utm_campaign=connecting_baphase1

⁷ <https://www.leeds.gov.uk/parking-roads-and-travel/road-improvement-schemes/airport-link-road>

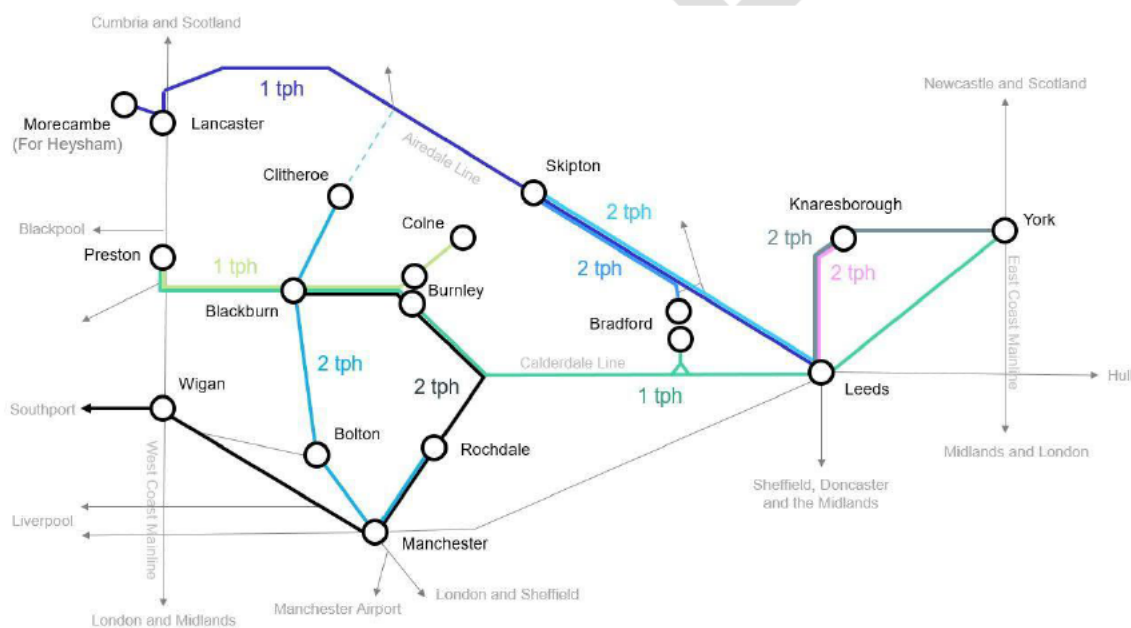
⁸ <https://news.leeds.gov.uk/new-north-west-leeds-employment-hub-and-airport-connectivity-plans-to-be-considered-by-senior-councillors/>

The findings presented suggest there is a general need for strategic highway improvements across the *Core Study Corridor* to improve access to the major airports within the *Wider Study Area*. This is particularly evident for LBA for this study, which lies within the *Core Study Corridor* and is identified as a key growth asset for the Leeds City Region, but surface access challenges could be discouraging passengers and freight from utilising this airport and lead to them choosing to travel further (to other airports) as a consequence. This has wider strategic impacts on traffic demand on the whole network, economic growth of local areas and environmental impacts of increased surface access travel.

Rail

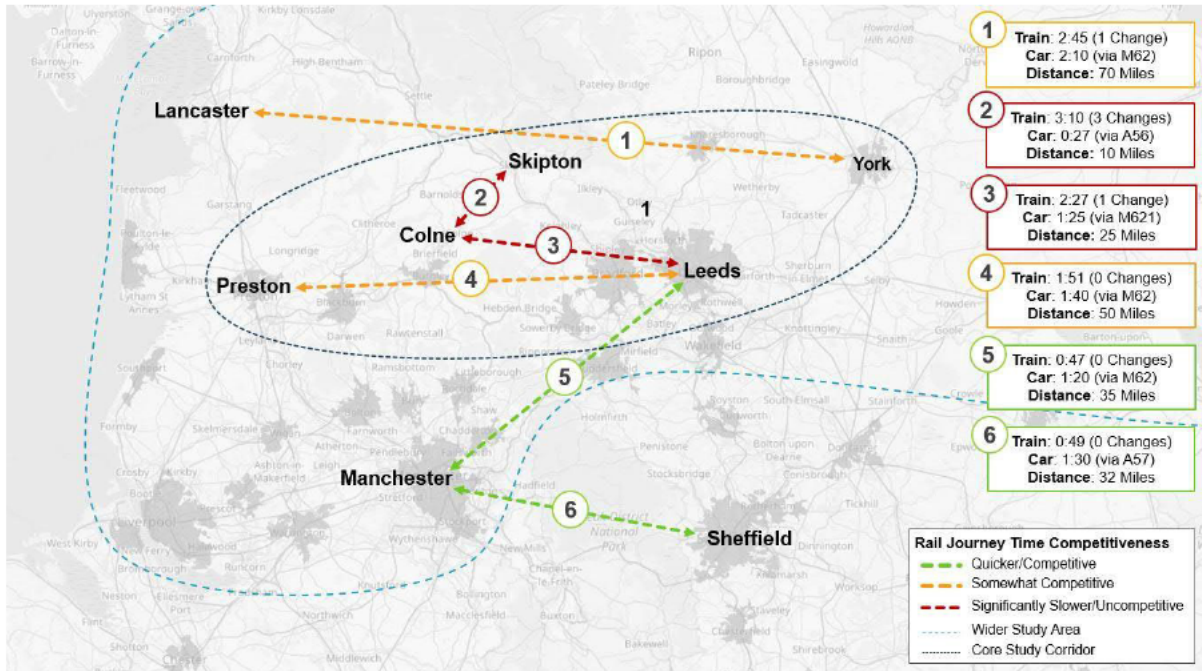
An overview of the rail network is provided in **Figure 2.9**. This highlights there are several large rail stations (e.g. Manchester, Preston, Leeds, Liverpool) providing rail accessibility across the UK via a number of rail lines with varying frequency. It highlights the *Core Study Corridor* has infrequent services, many have frequent stops which provide a broad passenger catchment but slower journey times. The map demonstrates the connectivity within each region but limited and slow direct rail services between East Lancashire and West Yorkshire which reduces the attractiveness of rail as a viable option to the car.

Figure 2.9: Rail Services



A comparison of car and rail journey times has also been undertaken for the *Wider Study Area* for the morning peak, using National Rail journey time data and Googlemaps for typical car journey times (**Figure 2.10**). The results show rail is quicker between the major conurbations to the south of the *Wider Study Area* but within the *Core Study Corridor*, rail journeys can be significantly slower than the car with the rail journey time between Leeds and Colne one hour longer than the typical car journey time via the M621. Whilst it is acknowledged there may not be major demand for these rail movements, this indicates east-west movement by rail across the *Core Study Corridor* is generally uncompetitive with the car with regards to journey times and frequency. This places greater demand on the highway network for these movements, and the need to improve highways connectivity in the *Core Study Corridor*.

Figure 2.10: Rail and Car Journey Time Comparison (Morning Peak)



Bus and Coach

Buses typically operate local services within the vicinity of an individual urban hub, although some services also extend between major cities and smaller towns and villages. Lancashire and West Yorkshire have significantly different rates of bus usage, recording 34.6 and 62.3 passenger journeys on local bus services per head in the 2018/19 period⁹. For comparison, the average across all local authorities was 52.8 in the North West, and 55.4 in Yorkshire, which could suggest that the provision of bus services within the more rural areas such as Lancashire is weaker than in the urban areas of West Yorkshire, which includes Leeds and Bradford. This is supported by data for other urban local authorities around the study area, with Merseyside and York recording 72.4 and 76.5 journeys per head respectively.

In addition, the data shows declining bus patronage trends; over the ten-year period to 2018/19 the number of passenger journeys per head in both the North West and Yorkshire has decreased by 21%. This is consistent with the North East and Midlands regions, but the southern regions see substantially smaller reductions (2-13%), and in the case of the South West, a slight increase (2%).

Longer distance routes, such as Trans Pennine journeys, are fulfilled by coach services rather than local buses. These routes are generally less frequent than local buses, running once per hour or less, and have a limited number of stopping points at major cities. Within the study area the majority of coach journeys utilise the M62 for east-west travel, generally using Manchester and Leeds as connecting hubs, most likely due to the substantial number of passengers travelling to or from these cities. However, this does mean that some journeys will take indirect trips, with Trans Pennine travellers as far north as Lancaster having to travel via

⁹ Table BUS0110a Passenger Journeys on Local Bus Services per head by Local Authority, DfT

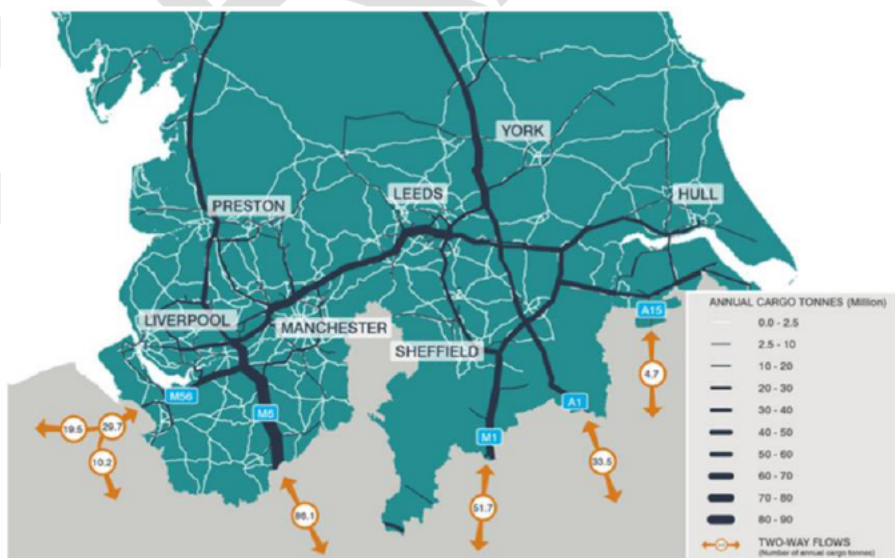
Manchester, likely due to a combination of low demand and low connectivity in the northern part of the corridor.

Freight and Sea Ports

During 2014/15, 178mn tonnes of freight was transported through ports in the North which was almost two-fifths of the total in Great Britain¹⁰. Freight is therefore a notable trip generator within the *Wider Study Area*. Some of the busiest seaports in the UK are located within the *Wider Study Area*, including the Humber ports (Hull, Grimsby, Immingham) and the Mersey Ports and Heysham. These are seen as significant contributors to freight activity across the region and consequently increase the demand on road and rail movements. A network of inland waterways across the North has the potential to improve inter-modal freight connectivity, but not east-movements across the Pennines. Key road and rail freight movements across the North have distinct north-south and east-west flows. For roads, this includes a high dependency on the M1 / A1(M) and M6 either side of the Pennines and the M62 axis for east-west movements. For rail, the dominant north-south movements occur along the east and west coast mainlines respectively, whereas for Trans Pennine movements, several possible routes are available, albeit these are relatively slow and constrained by capacity on the network for both passengers and freight with no direct W12 gauge cleared route.

The SPOC for the Central Pennines SDC highlights the growth in Regional Distribution Centre activity within the corridor which is largely attributable to site availability and connectivity to the SRN. The M62 is specifically referred to as a route which has experienced a significant increase in local freight distribution and **Figure 2.11** also demonstrates the road freight dependency on the M62 for east-west connectivity. Whilst the A66 traffic flow has the highest proportion of HGVs (**section 2.3.2**), the M62 carries the highest number of HGVs, comprising two thirds of the total freight crossing the Pennines.

Figure 2.11: Road Freight Annual Cargo Tonnes (2016)



Source: Enhanced Freight and Logistics Analysis Report, TfN (2018).

¹⁰ Central Pennines: Strategic Development Corridor Strategic Programme Outline Case, TfN (2019)

Despite the strength and extent of the freight industry across the North, freight transport networks in their current condition require investment to address existing constraints on performance and to support future growth. Some of the key challenges include:

- 80% of road freight tonnage in the North is domestic short haul traffic which means rail is unable to compete and this increases the reliance on the highway network.
- Heavy concentration of freight activity on a relatively small proportion of the road and rail networks, particularly the M62. As a result, this creates competition for highway network capacity between freight, local and commuting traffic, increasing the risk of delay and disruption to supply chains. East-west road connectivity is identified as a constraint in the TfN Enhanced Freight and Logistics Analysis Report with reliance on the M62 as the only major motorway route across the Pennines and reduced reliability during adverse weather or incidents.
- Unexpected delays interfere with planned schedules and late deliveries can result in missing slots and customer penalties / fines. Disruption to supply chains and the industry also reduces its appeal and competition with international competitors and investments.
- Differing needs of road freight, compared with commuting / business movements, with the delivery of retail, consumer goods and e-commerce goods notably more intensive at night rather than during the day. Consequently, supply chains are reliant on transport networks that are efficient, resilient and responsive.
- Vehicle emissions is also a challenge for road freight with the need to consider how the sector affects transport emissions during the Climate Emergency, particularly with the modelled increase in freight demand.

Summary of Existing Transport Network

The existing transport network within the *Core Study Corridor* highlights several problems across transport modes. The highway network has limited local east-west connectivity between the eastern extent of the M65 and A65, whilst the M62 is the only Trans Pennine route that is part of the SRN. With regards to alternative east-west routes, the A59 is situated 22 miles north of the M62 and the A66 a further 35 miles north. To the south of the M62 options within a similar distance include the A628 (12 miles south) and A57 (22 miles south).

Rail services within the *Core Study Corridor* are infrequent and rail journey times are often notably slower than highway. Meanwhile, existing surface access, by all modes, to LBA is considered poor, although there are proposals to improve connectivity.

A third of the UK's road, rail, distribution centre and port activity is undertaken in the North of England and this highlights the reliance on the transport network to facilitate these movements. For domestic short-haul movements, road is, and will remain, the dominant mode.

A new strategic highway link between the M6 and A1(M) will need to consider the interaction with the local highway network as well as the integration with the wider transport network.

2.3.2 Traffic Flows, Compositions and Journey Times

Traffic Flows

A review of observed vehicle flow data across the key Trans Pennine routes has been conducted to understand existing capacity and demand. Annual Average Daily Traffic (AADT) data from typical Trans Pennine route locations was collated from the Highways England WebTRIS Portal and the DfT Local Roads Traffic Count Portal for 2017. It is important to note these figures present the annual average so do not distinguish any traffic impacts that derive from seasonality, weekends and public holidays.

Figure 2.12 summarises the AADT data on the Trans Pennine routes. Unsurprisingly, the M62 is the dominant Trans Pennine route, with the largest volume of traffic of the routes. The M62 carries 103,000+ vehicles per day, compared with less than 33,000 vehicles per day on parallel routes. This demonstrates the high dependency of the M62 for east-west movements and reflects the connectivity it provides between several key cities and their regions (i.e. Liverpool, Manchester, Leeds). Furthermore, the 2017 South Pennines Route Strategy states four times more journeys are made between West Yorkshire and Manchester than South Yorkshire and Manchester highlighting the significance of this highway connectivity¹¹.

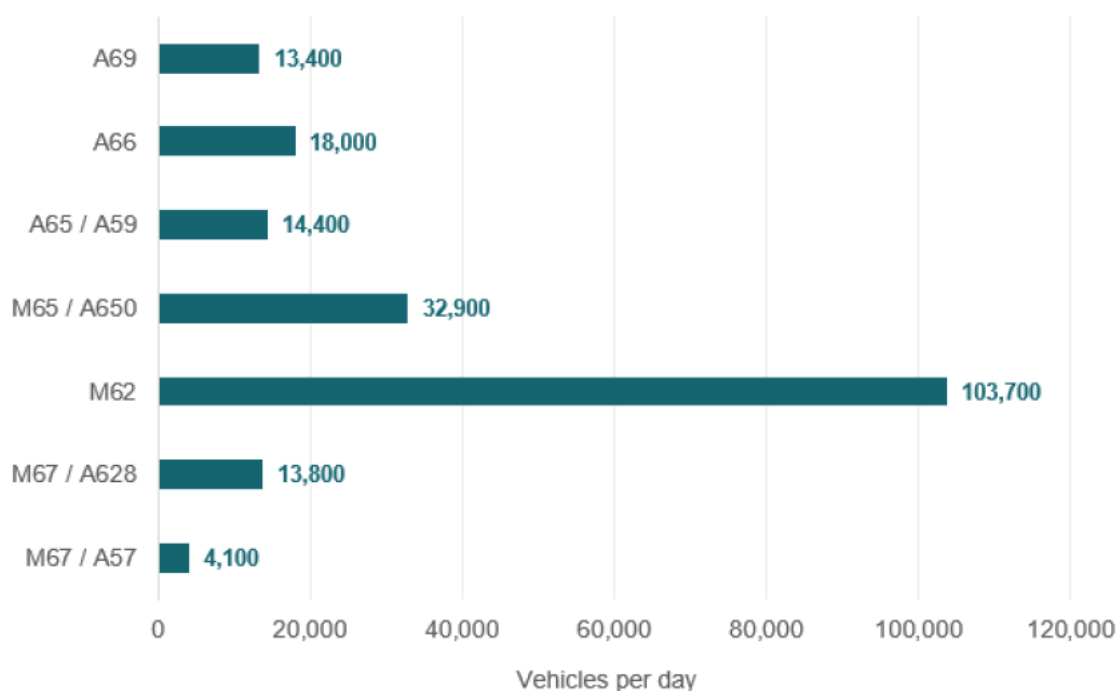
The alternative routes have significantly lower volumes, for example the M65 / A650 has approximately a third (32%) of the M62 demand, whilst the other alternatives have less than a fifth of the M62 demand. The M65 / A650 is, therefore, a significant Trans Pennine corridor (following the M62) with an AADT nearly double that of the next route (the A66, which is currently being investigated for potential dualling¹²).

These alternatives are characterised by localised increases in vehicle flows nearer urban areas (e.g. Harrogate and Burnley). This is likely to reflect the lower capacity and indirect nature of the routes which are predominately utilised by local traffic, rather than strategic inter-region movements. Although there are some instances of longer distance east-west traffic observed on these routes, these corridors are generally less competitive than the M62 with regards to capacity and journey times.

¹¹ South Pennines Route Strategy, Highways England (2017)

¹² <https://highwaysengland.co.uk/projects/a66-northern-trans-pennine/>

Figure 2.12: Trans Pennine AADT (2017)

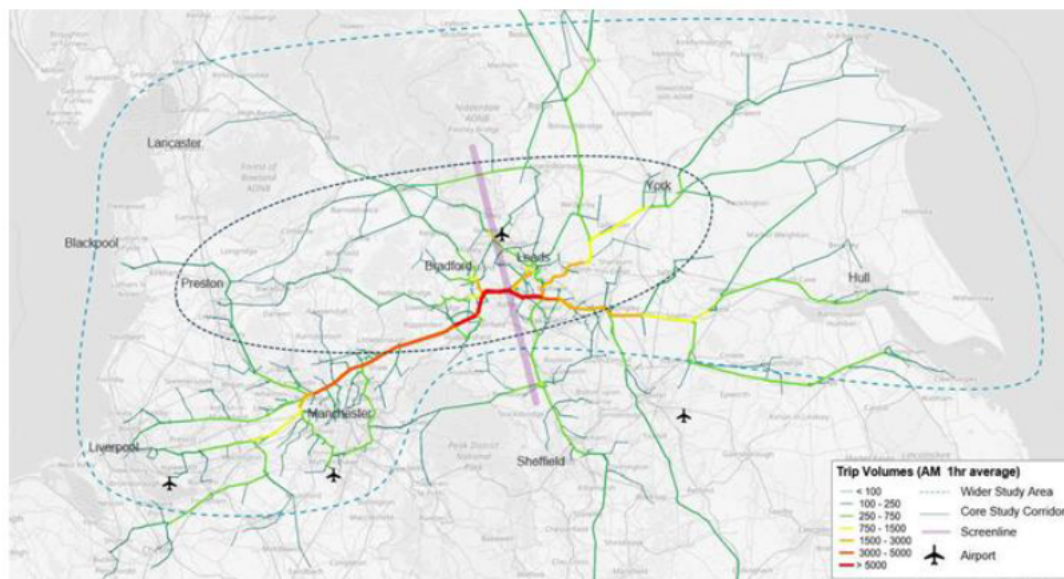


Source: WebTRIS Portal; DfT Local Roads Traffic Count Portal (2017).

Traffic routing analysis has been conducted to understand the distribution of journeys for vehicles using existing Trans Pennine routes, through a review of Highways England's Trans-Pennine South (TPS) Regional Transport Model (RTM). This enabled the analysis of origins and destinations for traffic travelling through the *Core Study Corridor*. The outputs are not directly observed flows but have been extracted from a validated model representing the average March 2015 Morning Peak (using an hourly average from 07:00 to 10:00). **Figures 2.13 to 2.15** illustrates the distribution patterns following the analysis of traffic routing across the selected screenline (identified within the diagram). The analysis, which captures all major routes, shows the catchment of traffic typically remains within *Wider Study Area*.

Figure 2.13 presents the analysis for Trans Pennine routes and shows highest traffic volumes between major conurbations, most notably Manchester and Leeds. The M62 stands out as the dominant route choice for vehicles making east-west movements, with high flows between Manchester, Bradford, Leeds, York and Goole. It is likely this reflects the capacity of the M62 to handle larger volumes of traffic compared with alternative routes. Other Trans Pennine routes (such as the A65, A59 and A628) do carry some east-west traffic, but this is of a much lower quantity than the M62. The map shows greater spatial distribution to the east of the Pennines, with flows to York, Hull, Scarborough, Immingham and along the M1 and A1(M), whilst to the west of the Pennines, flows were more concentrated to Greater Manchester, Liverpool and Preston.

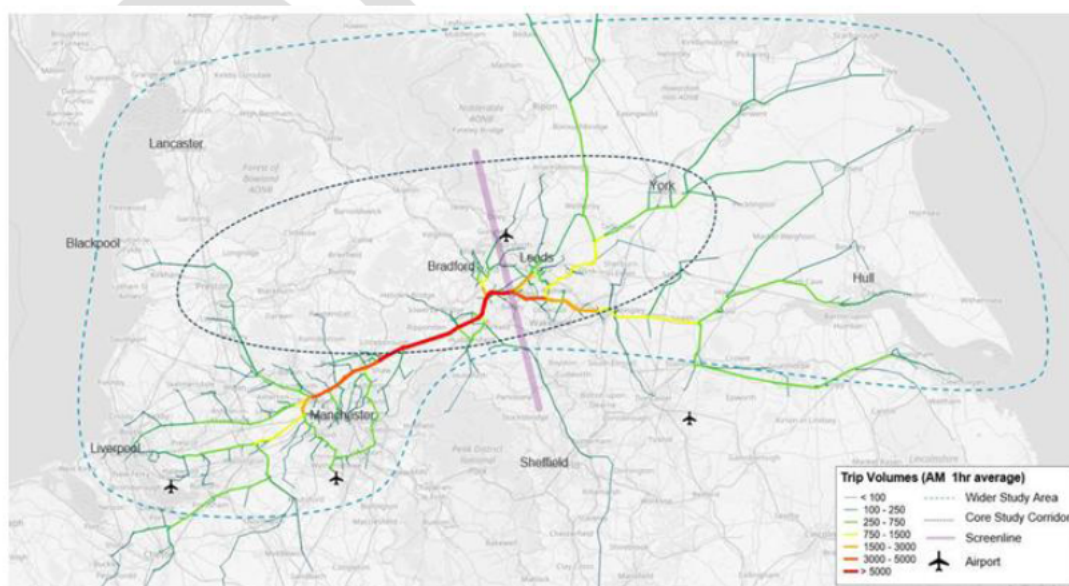
Figure 2.13: Trans Pennine Routes Select Link Analysis



Source: Data was extracted from the TPS RTM (a traffic model developed for Highways England in 2016) using Select Link Analysis.

As shown in **Figure 2.14**, traffic routing using the M62 has a widespread catchment with high volumes either side of the Pennines, and significant demand between major cities, most notably Manchester and Leeds. The data also suggests the route is favoured by traffic between key ports with flows extending to either coast, including Mersey ports in the west and Humber and Teesside ports in the east. The map highlights flows between the M62 and A1(M) north of Leeds, with smaller flows to the south of Leeds, whereas this trend was not evident in **Figure 2.13** indicating the Trans Pennine movements to/from the M1 south of Leeds likely utilise alternative routes.

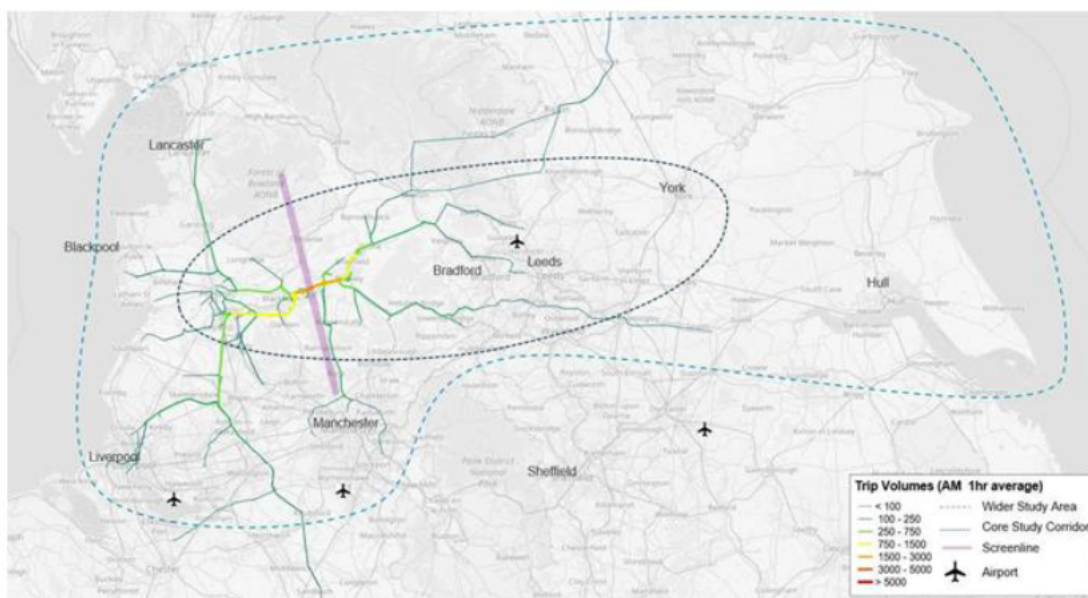
Figure 2.14: M62 Select Link Analysis



Source: Data was extracted from the TPS RTM (a traffic model developed for Highways England in 2016) using Select Link Analysis.

Meanwhile, analysis of the M65 (**Figure 2.15**) highlights there is a much lower overall volume of traffic compared with full Trans Pennine routes (**Figure 2.13**) and lower volumes of full east-west or city-to-city trips. Instead, the route comprises largely localised corridor flows to the west of the Pennines, serving the local towns within East Lancashire (i.e. Nelson, Burnley, Accrington and Blackburn) and further west to Preston and beyond via the M6. These findings indicate poor road connectivity between Lancashire and Yorkshire along the M65 Corridor compared with other routes, particularly the M62.

Figure 2.15: M65 Select Link Analysis

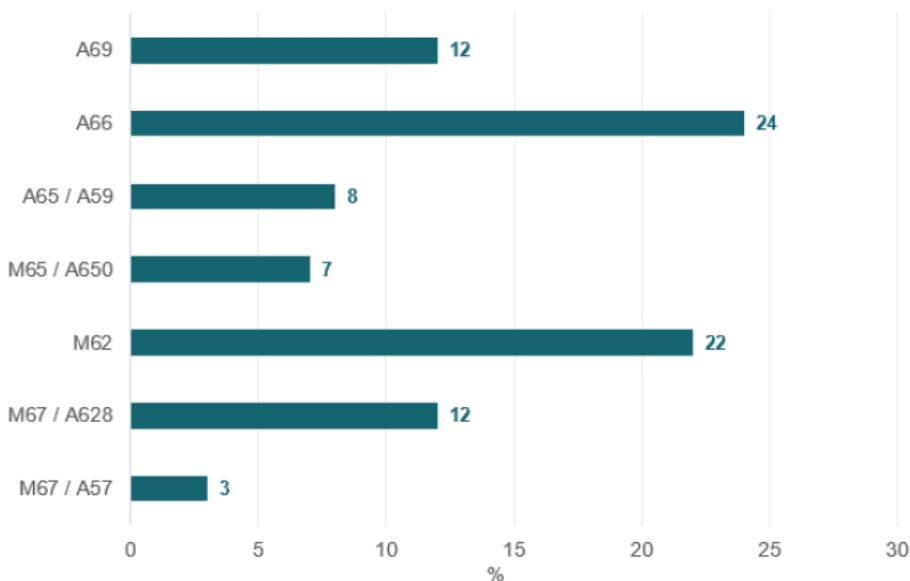


Source: Data was extracted from the TPS RTM (a traffic model developed for Highways England in 2016) using Select Link Analysis.

Traffic Composition

Figure 2.16 shows the proportion of freight traffic on each Trans Pennine route. This shows freight comprises more than a fifth (22%) of M62 traffic and highlights the importance of the M62 for east-west freight connectivity. The A66 has similar freight proportions (24%) between Penrith and Scotch Corner. Whilst the proportion of freight traffic is similar, it is important to consider the higher flows on the M62 and therefore higher quantity of freight traffic as well as the A66 being located a considerable distance north of the *Core Study Corridor*. Much lower freight proportions were recorded on the alternative routes and are likely to reflect the lack of suitable routes for freight traffic.

Figure 2.16: Proportion of Freight Traffic on Trans Pennine Routes (2017)

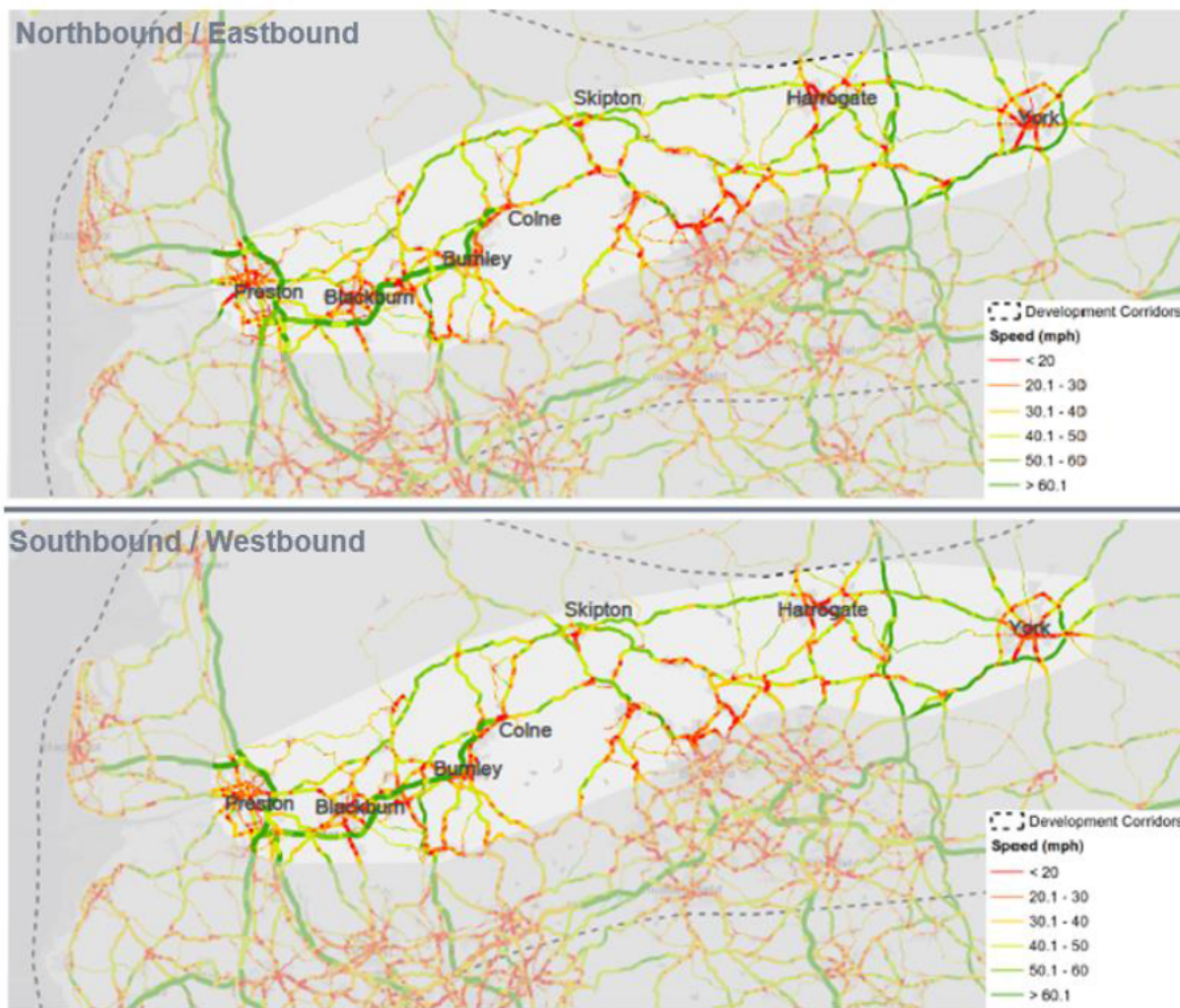


Source: WebTRIS Portal; DfT Local Roads Traffic Count Portal (2017).

Journey Speeds / Times

The Option Assessment Report for the CPC presents journey time analysis of pertinence to the M6 to A1(M). **Figure 2.17** shows the AM Peak average speeds northbound / eastbound and southbound / westbound. This highlights a number of locations along the *Core Study Corridor* with average AM Peak speeds of less than 20mph which will have implications for journey times. Key hotspots include York, Harrogate and Shipley to the east and Colne, Blackburn and Preston to the west. The CPC SPOC describes road connectivity as variable and specifically refers to the M65 terminating at Colne with onward connectivity to Yorkshire via lower standard roads which '*lack coherence, capacity and resilience*'. This is evident in **Figure 2.17** with sections of this network, particularly at highway intersections, with speeds of less than 20mph. Furthermore, the Option Assessment Report for the CPC highlights a distance of 32 miles from Colne to Leeds with an average AM Peak speed of 18mph compared with 28mph during the Inter-peak. The comparative journey time difference is consequently 01:50 and 01:11 and, therefore, a 39 minutes difference in journey time. Similarly, for the 57 miles between Colne and York, an average AM Peak speed of 21mph is stated compared with 29mph during the Inter-peak in the Option Assessment Report for the CPC.

Figure 2.17: Trans Pennine AM Peak Average Speeds (2015)



Source: Central Pennines Corridor Option Assessment Report, TfN.

The M62 regularly experiences congestion, with considerable sections identified as moderate or heavy, particularly around Greater Manchester and West Yorkshire. This reflects the high reliance on the M62 and demand exceeding the available capacity. Furthermore, the TfN Major Roads report noted certain stretches experience a 70-80% likelihood of serious congestion during peak periods. A major cause of the congestion is that the M62 directly serves three major conurbations: the Liverpool City Region, Greater Manchester and the Leeds City Region. This places significant pressure on the corridor to accommodate large numbers of inter-urban trips which compete for capacity against longer distance and local movements.

Alternative Trans Pennine routes generally have light congestion and therefore are likely to have more reliable journey times. Occurrences of congestion are typically isolated to particular towns, approaching urban areas and/or the intersection with other key routes; for example, the M65 near Colne, A650 near Bingley, A660 near Headingley and the M61/M65 near Preston. Within the *Core Study Corridor*, **Figure 2.17** identifies localised moderate congestion on the M65 / A6068 route in Colne, where there is a reduction in capacity at the end of the M65 and

this was also referenced in the M65 to Yorkshire Corridor Study¹³. Occasional congestion on the M65 was also identified between Junction 1 and Junction 5 (south and west of Blackburn), typically on the westbound carriageway during the Morning Peak. This is a result of traffic joining the M6 and M61, with moderate congestion evident on the M61 northbound merge with the M6 (near Preston). It is compounded by traffic leaving the M65 at its western terminus and joining the A582, part of the MRN, at Bamber Bridge.

Summary of Traffic Flows, Composition and Journey Times

The analysis of traffic flows highlights more than 103,000 vehicles per day on the M62, which is notably higher than the alternative Trans Pennine routes. The dominance of the M62 was also evident in the select link analysis of routes utilised by traffic. This demonstrates the M62 is utilised for longer-distance journeys with movements to the east and west coast of England, compared with the relatively localised demand on the M65. Both highlighted the importance of providing access to the SRN, with prominent flows between the M62 and A1(M) north of Leeds and the M65 and the M6.

Traffic on the M62 and A66 includes high proportions of freight but with the A66 being located considerably further north of the *Core Study Corridor*, this limits its suitability as an alternative route unless long-distance journeys are being made. Freight movements are important for the economy and therefore are dependent on the ability of the highway network to provide efficient and reliable conditions.

Several Trans Pennine routes experience localised congestion around key towns, close to urban areas or interchange locations. Congestion constrains the movement of people and goods and therefore limits the catchment area for commuters as well as the reliability for business and freight movements, particularly if the latter are dependent on just-in-time deliveries. The analysis has highlighted a number of congestion “hotspots” which are likely to impact local, as well as, strategic movements within the *Core Study Corridor* between the M6 and A1(M). These include:

- Colne (where the M65 ends and movements east rely on A roads);
- Harrogate Town Centre;
- North Bradford;
- LBA; and
- Central York.

The findings suggest a need for strategic highway improvements between the M6 and A1(M), across the *Core Study Corridor*, to create a viable alternative to the M62 for a variety of journey purposes, including local, commuter and freight traffic.

2.3.3 Travel Trends

This section explores Trans Pennine travel trends to understand daily travellers as well as isolating commuting movements.

¹³ M65 to Yorkshire Corridor Study, Jacobs (2013)

Daily Travellers

A high-level review has been undertaken between and within two defined sectors: (i) east of the Pennines and (ii) west of the Pennines. The results identify show a high reliance on cars for internal and cross-boundary travel between the east and west sectors (94.3% movements west to east, 93.9% movements east to west). Meanwhile, approximately 5% of cross-boundary trips are by rail, higher than the proportion for internal movements. Rail use within the east sector was higher than the west sector (4.5% and 2.6% respectively). Bus services tend to offer local services, which is reflected in the higher internal share within each sector, compared with cross-boundary movements.

In 2018, the Commission for Travel Demand¹⁴ highlighted travel trends and highlighted that per person the distance travelled by car has fallen in all parts of England. It also states that whilst city centre traffic has decreased, motorway traffic is increasing. Besides the increase in deliveries, reasons for increases in traffic reflect a growing population, 'baby boomers' entering retirement with higher car ownership than previous cohorts and the number of miles driven per capita by 65 year olds and older has increased by around 12% between 2004 and 2014.

Commuters

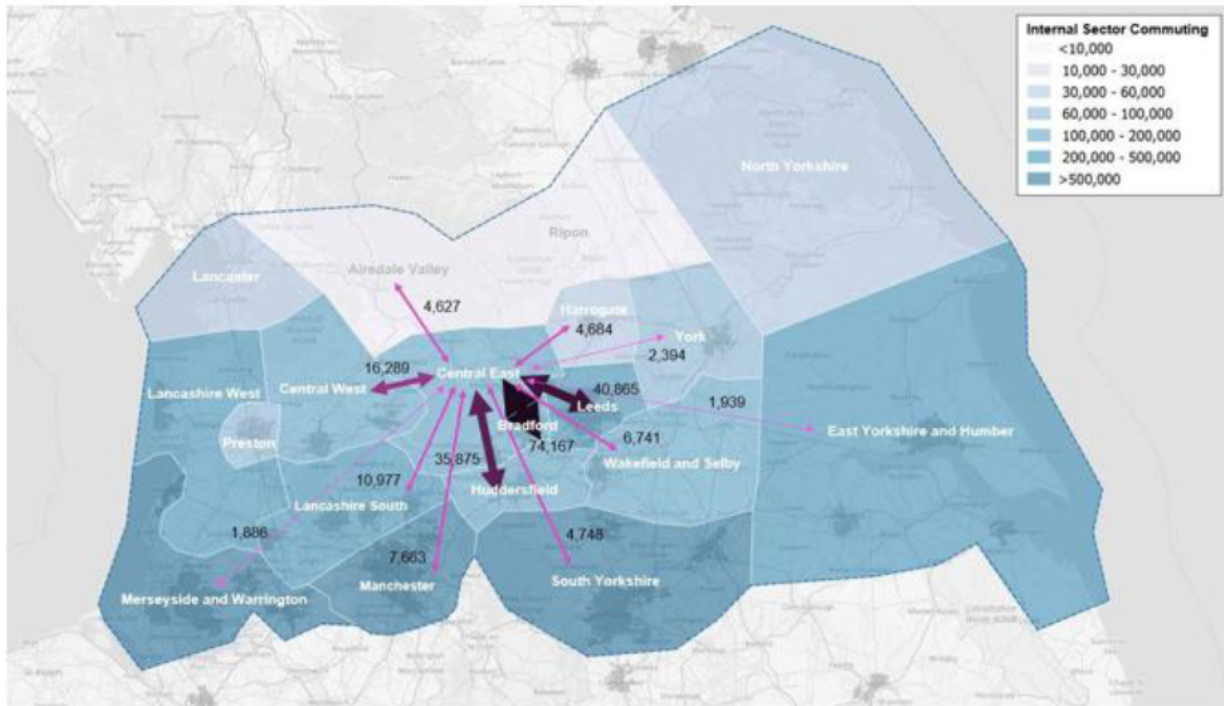
A review of TPS RTM data, by origin and destination for all modes, has been analysed to understand commuting behaviour within defined sectors. The focal point of this analysis is on internal commuting for each sector as well as cross-boundary commuting for a selection of sectors that form Central West (Clitheroe, Blackburn, Burnley and Colne) and Central East (Keighley, Skipton, and Leeds Bradford Airport) aggregated sectors (**Figures 2.18** and **2.19** respectively).

Figure 2.18 shows that the majority of movements to / from the Central East sector are dominated by demand to/from Leeds, Bradford and Kirklees (Huddersfield). Cross Pennine demand to Greater Manchester and Lancashire is much smaller despite the short distances between these sectors. A similar trend is also noted west of the Pennines (**Figure 2.19**), with greater demand between urban centres to the west, with considerably lower demand from Yorkshire.

The high reliance on the car was evident within the daily travellers analysis, and the analysis of commuting movements only by sector of the TPS RTM also identified a high reliance on the car for both internal and Trans Pennine trips. In the west, the car comprised over 95% of the movements to most locations, with Leeds and York the notable exceptions as rail comprised 15% of the commuting flows. In the east, there was higher rail usage to Leeds and York (15% and 25% respectively), and also for cross-boundary journeys to Preston and Greater Manchester south (both 12-15%).

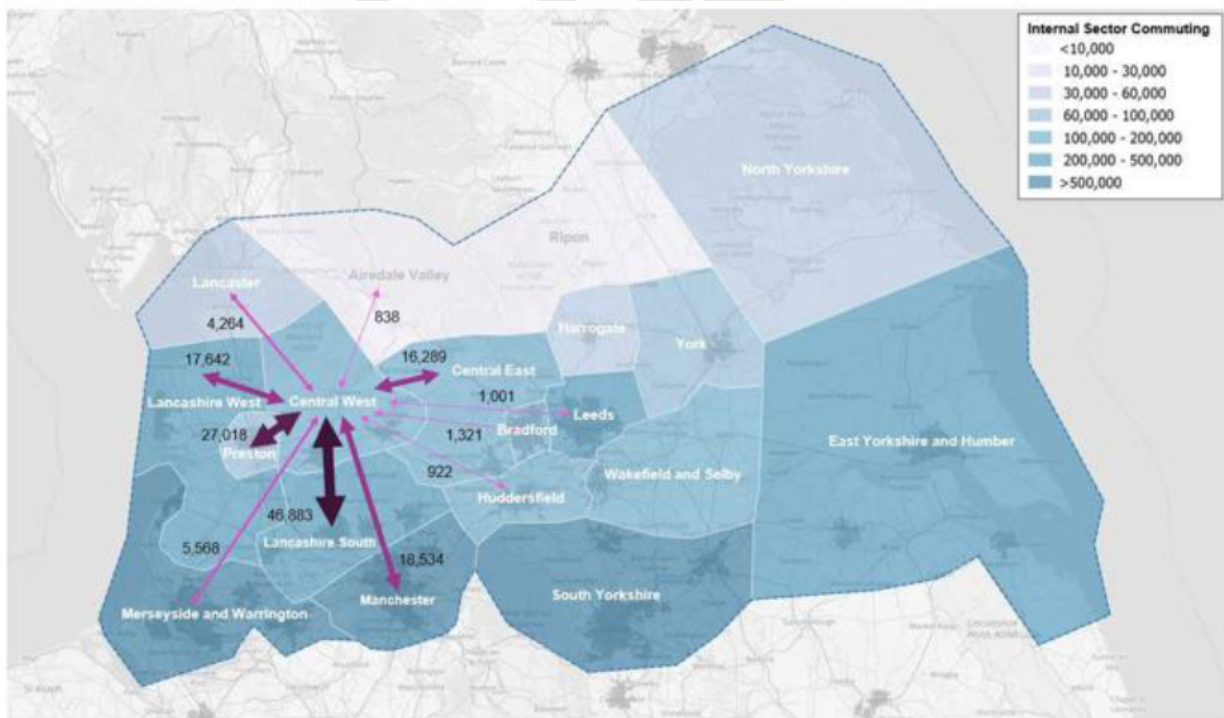
¹⁴ http://www.demand.ac.uk/wp-content/uploads/2018/05/FutureTravelDemand_infographic.pdf

Figure 2.18: TPS RTM Central East Commuter Trips



Source: Data was extracted from the TPS RTM (a SATURN model developed by AECOM, Atkins and SYSTRA for Highways England in 2016) using Select Link Analysis. N.B. Flows that were found to be below 1% of the total have not been mapped.

Figure 2.19: TPS RTM Central West Commuter Trips



Source: Data was extracted from the TPS RTM (a SATURN model developed by AECOM, Atkins and SYSTRA for Highways England in 2016) using Select Link Analysis. N.B. Flows that were found to be below 1% of the total have not been mapped.

Future Travel Demand

The Central Pennines SDC SPOC considers four future scenarios representing the potential variation in travel markets in the North by 2050 (**Table 2.2**). These scenarios highlight expected increases in rail and road demand; for example, a 54% increase for road travel would result in an increase from 126 billion vehicle km to 193 billion vehicle km by 2050.

Table 2.2: Initial Northern Transport Demand Model Forecasting Scenarios

Scenario	Description	Rail Growth	Road Growth
Compact and Digital	Brownfield development in the cores Local transport focuses on radial movements Preference for digital rather than physical connectivity Energy, therefore travel, costs are high	192%	26%
Compact and Travel Friendly	Brownfield development in the cores Local transport focuses on radial movements Advance in 'travel friendly' connectivity options Energy, therefore travel, costs are low	327%	52%
Dispersed and Digital	Mixed greenfield and brownfield development in suburbs and urban fringes Local transport provides all types of cross-district movements Preference for digital rather than physical connectivity Energy, therefore travel, costs are high	60%	27%
Dispersed and Travel Friendly	Mixed greenfield and brownfield development in suburbs and urban fringes Local transport provides all types of cross-district movements Advance in 'travel friendly' connectivity options Energy, therefore travel, costs are low	136%	54%

Source: Central Pennines Strategic Development Corridor Strategic Programme Outline Case, TfN (2019).

Summary of Travel Trends

The analysis has highlighted the dominance of the car for east-west movements in the *Core Study Corridor* and *Wider Study Area* despite the poor level of existing provision. This

emphasises the need for a high quality highway network which facilitates reliable and safe journeys to support all journey purposes, including commuting, leisure and freight. Enhancing accessibility between the M6 and A1(M) would provide viable route to the M62 and build greater resilience on the highway network. Consideration of the interchange between highway, public transport and active travel networks can also support modal shift to sustainable modes and help to mitigate the increased demand for car travel associated with population and economic growth in the area.

2.3.4 Accidents

A review of accident data has been undertaken to identify key accident hot spots on the Trans Pennine routes. The analysis undertaken was using 2018 DfT STATS19 accident data, focusing on the key SRN and A-road routes within the study area. It is important to note this data considers one year of data, albeit over a large geographical area, and this analysis could be expanded at Outline Business Case (OBC) to consider trends over time. **Figure 2.20** shows the number of accidents recorded in 2018 on each 10-kilometre segment of highway, and marks locations where fatal accidents have occurred.

The locations with the greatest number of accidents within the *Core Study Corridor* were along the M62 corridor across the Pennines up to Leeds. Other accident hotspots include the A660/A61 area to the north of Leeds, the eastern end of the M65 (where it is met by the A6068 and A56), and around Preston where the M6, M61 and M65 converge.

Figure 2.20: Accident Totals and Fatal Accidents (2018)



Source: STATS19.

Table 2.3 shows the proportion of Serious and Fatal accidents for motorway and A-road routes across the Central Pennines, as well as the 2018 figures for Great Britain. It is important to note that the figures presented for identified routes only reflect the portions of those roads that are shown in **Figure 2.20**. The results show that the proportion of Serious accidents on the M1

(19.8%) was notably higher than the average for Great Britain motorways (15.1%). The proportion of Serious accidents on the M62 (11.3%) was lower than the average, but the Fatal accident proportion was higher than average (3.4% compared with 2.0%).

The proportion of Fatal accidents on the A56 and A59 (2.7% and 3.1%) were higher than the average for Great Britain A roads (1.8%). The proportion of Serious accidents on the A59 was also higher than the average (22.0% compared with 19.0%).

Table 2.3: Key Route Accident Summary (2018)

Studied Route Section	Total Accidents (n)	Serious (%)	Fatal (%)
Motorways			
M1	111	19.8%	1.8%
M6	145	15.9%	2.1%
M62	203	11.3%	3.4%
M65	37	10.8%	0.0%
GB Motorway Average	-	15.1%	2.0%
A Roads			
A56	186	19.4%	2.7%
A58	208	17.8%	1.9%
A59	223	22.0%	3.1%
A6068	33	15.2%	0.0%
GB A Road Average	-	19.0%	1.8%

Source: STATS19.

It is noted within the Highways England 2018 Regional Safety Reports that for east-west routes, particularly single carriageway roads, accidents often have widespread consequences, with closures leading to heavy congestion, increased journey times and distances, and localised worsening of pollution levels due to the build-up of stationary traffic. Also, in the event of an accident closure on the M62, this can lead to critical delays and force high volumes of traffic onto the lower capacity alternatives or local roads. This can have a particular impact on freight movements which may have more limited alternative routes suitable for the height, width and length of vehicles, and are often opening on 'just-in-time' delivery schedules which are sensitive to delays.

Summary of Accidents

The analysis has demonstrated several roads have sections with higher occurrences of Serious and Fatal accidents. In addition to the safety concerns, accidents also have implications for journey times and journey time reliability. Safety on the network is critical and improvements need to consider the 'safe and serviceable' ambition identified by Highways England.

2.3.5 Resilience

This section assesses the resilience of the existing transport network to cope with unexpected events including the impacts of extreme weather, as well as planned events and known conditions that stretch capacity. At the time of preparing this SOBC, Highways England were unable to provide data regarding the number and duration of incidents on the network in the study area.

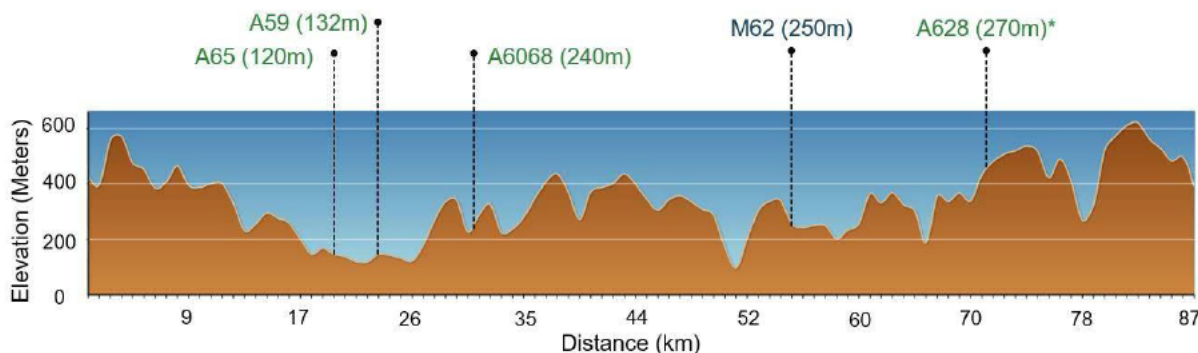
Topography and Gradient: The Pennine range rises 2,000 feet above sea level, although the highest points are not within the *Core Study Corridor*. However, as **Figure 2.21** shows, many routes across the Pennines follow indirect routes dictated by topography and valleys or cross at high altitudes. For example, at its highest point the M62 is approximately 1,220 feet, making this the highest section of motorway in the UK. Along sections of the highway network with a steep gradient, there is often a build-up of slow-moving traffic, particularly HGVs, which can increase the likelihood of delays and safety risks. Further detail on the constraint to the scheme posed by the topography of the *Core Study Corridor* is contained in **section 2.3.7**.

Figure 2.21: Study Area Topography



Source: topographic-map.com; wellyteamgeo.maps.arcgis.com.

Figure 2.22: Elevation Profile (A-AA in Figure 2.21)



Source: topographic-map.com; wellyteamgeo.maps.arcgis.com. N.B. A628 in slight valley not shown in Figure 2.22.

Severe Weather Conditions: Routes crossing at high altitudes are more vulnerable to strong winds, fog, heavy snowfall and sub-zero temperatures, particularly during winter months. This can lead to poor driving conditions and the frequent closure of routes, diverting traffic on to alternatives which can add significant time and mileage to journeys. Adverse weather can also increase safety concerns, with a higher rate of casualties in the darker, winter months of the year (October-March). The Transport Resilience Review in 2014¹⁵ referred to a total of 12 weather related critical incidents as a result of storms on 5th December 2013 including overturned vehicles on the M62 in Humberside, M6 in Cheshire, M60 in Greater Manchester and A1 in West Yorkshire.

Climate Change: To better understand the specific risks that climate change poses to the UK, the government carried out a Climate Change Risk Assessment (CCRA) in 2012. This refers to the “*strong scientific evidence that climate change will disrupt the global economy, environment and society due to projected warming, sea level rise and changes in global rainfall / snowfall patterns and extreme events*”. It is noted that scientists are confident that average UK temperatures will continue to rise, but there is less certainty about how other aspects of the climate will change. The CCRA notes the disruption of transport networks is one of the main climate challenges to businesses. This highlights climate change does not necessarily create ‘new’ constraints, but the events occurring as a result of climate change are likely to last longer or become more frequent. Similarly, the CCRA also refers to the implications for the built environment, including transport, and the effects of extreme weather events and long-term gradual change in the climate.

Summary of Resilience

A resilient highway network is important for ensuring journey times and journey time reliability are not adversely impacted and therefore provides confidence to those travelling on the network that they will be able to complete their journey in the expected time frame. As the *Core Study Corridor* crosses the Pennines, the topography challenges the resilience of several routes. Meanwhile, severe weather conditions can adversely affect traffic movements and this is exacerbated by the topography increasing the likelihood of severe weather along the routes. Furthermore, climate change is likely to increase the frequency and severity of severe weather and the adverse impacts for the highway network.

The accidents commentary (**section 2.3.4**) highlighted the impact of an M62 closure leading to critical delays and high volumes of traffic needing to use lower capacity alternative routes. This also demonstrates the limited resilience of the existing east-west movements to cope when unexpected events occur with diversions and delays for movements. Low levels of resilience can have a particular impact on freight, with more limited suitable alternative routes for some vehicles, and the importance of timely movements for the economy.

2.3.6 Socio-Economic Characteristics

This section summarises the socio-economic characteristics of the *Wider Study Area*, with a particular focus on the *Core Study Corridor*. It provides an overview of the population, employment, education and deprivation as these aspects are more likely to be affected by transport connectivity constraints.

¹⁵ Transport Resilience Review: A review of the resilience of the transport network to extreme weather events, DfT (2014)

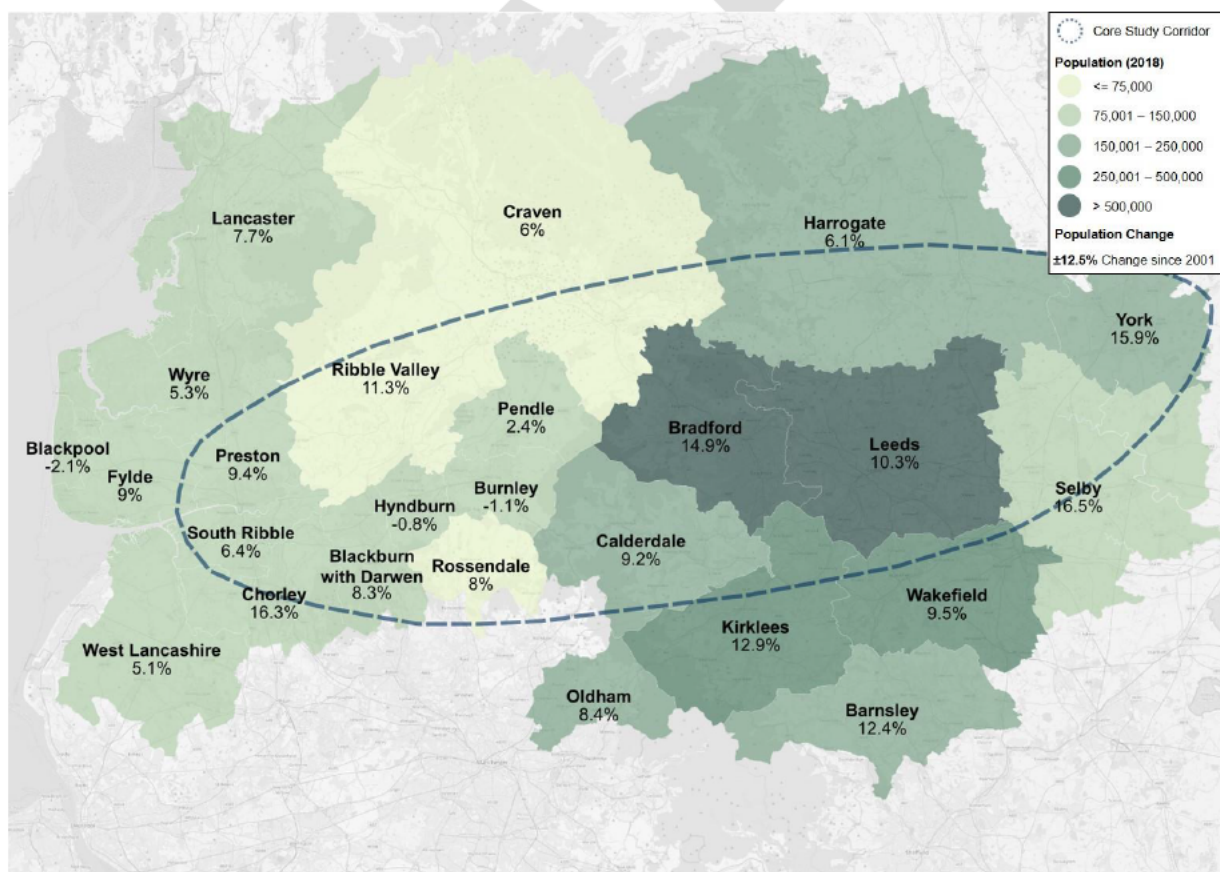
Population

For those districts within the *Core Study Corridor*, the 2018 population estimate is shown in **Figure 2.23**, as well as the percentage change in population between 2001 and 2018. The map shows distinct clustering of populations either side of the Pennines, with relatively low populations in Craven and the Ribble Valley and the highest concentrations in Leeds and Bradford (both 500,000+).

With regards to population change, **Figure 2.23** shows an increase in population across most of the areas with the exception of Blackpool (-2.1%), Hyndburn (-0.8%) and Burnley (-1.1%). The latter two of these areas fall within the *Core Study Corridor* and, whilst the declining population cannot be attributed to transport alone, improving connectivity could potentially help to increase the appeal of the area as a place to live and work.

Although relatively close in distance, connectivity between the two regions is limited. Previous studies have shown that improved connectivity between areas with larger populations is known to contribute towards agglomeration effects¹⁶ which in turn can support economic growth.

Figure 2.23: 2018 Population and Percentage Change since 2001



Source: ONS / NOMIS 2001 and 2018 Mid-Year Estimates.

¹⁶ Northern Powerhouse Independent Economic Review (2016); Cushman & Wakefield and SYSTRA, (2017).

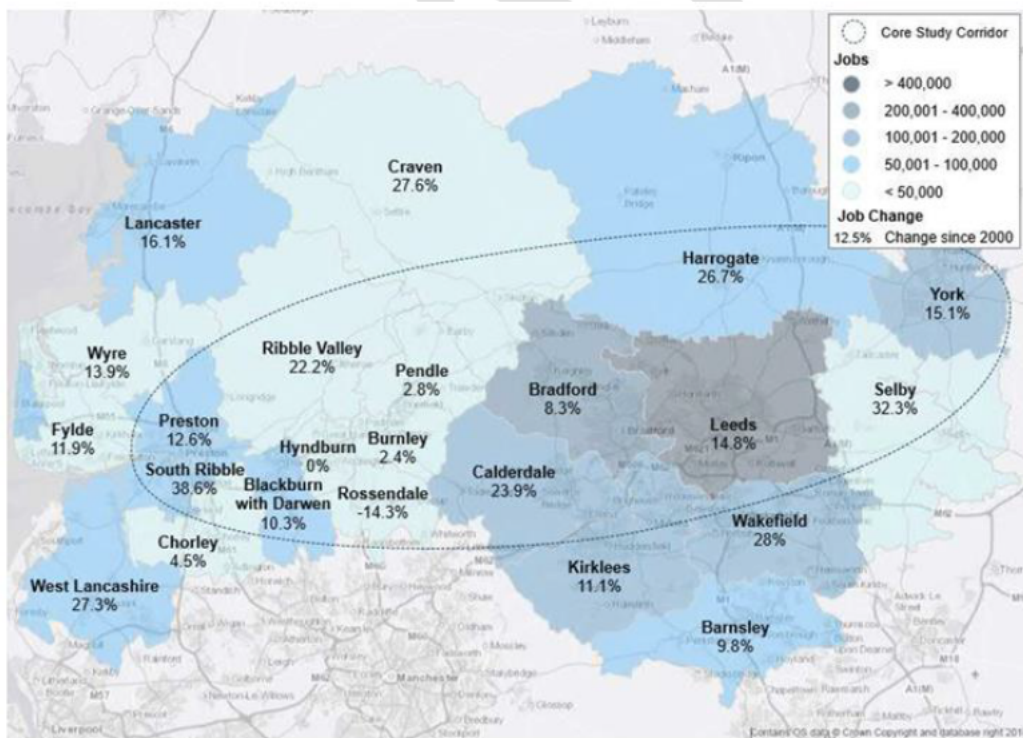
Employment

The total number of jobs, by district, in 2017 is shown in **Figure 2.24** alongside the percentage change in jobs between 2000 and 2017. The map also shows a concentration of jobs in Leeds and Bradford, with the trends in job numbers reflecting the population trends presented earlier.

With regards to percentage change in jobs, the results show most districts have experienced job growth since 2000 albeit to varying extents. Much lower growth in jobs has been observed in parts of East Lancashire, for example just 2.4% in Burnley, compared with 23.9% in neighbouring Calderdale within West Yorkshire. Whilst the number of jobs was notably lower to the east of the M65 Corridor, along the same corridor to the west, there are higher job numbers and job growth over the same time period. This area also benefits from higher levels of connectivity with junctions providing access to the M6, M61 and M65.

Figure 2.24 shows the M62 Trans Pennine Corridor, through Kirklees and Wakefield, has experienced much higher job growth compared with the M65 Corridor, as well as population as shown in **Figure 2.23**. The M65 and M62 Corridors have notable differences in both investment and connectivity, which suggests there is a relationship between these aspects. Therefore, by improving connectivity across the M65 Corridor with an M6 to A1(M) improvement, this could potential contribute to similar levels of economic growth and business activity along the M65 as are observed on the M62.

Figure 2.24: 2017 Jobs and Percentage Change (2000 to 2017)

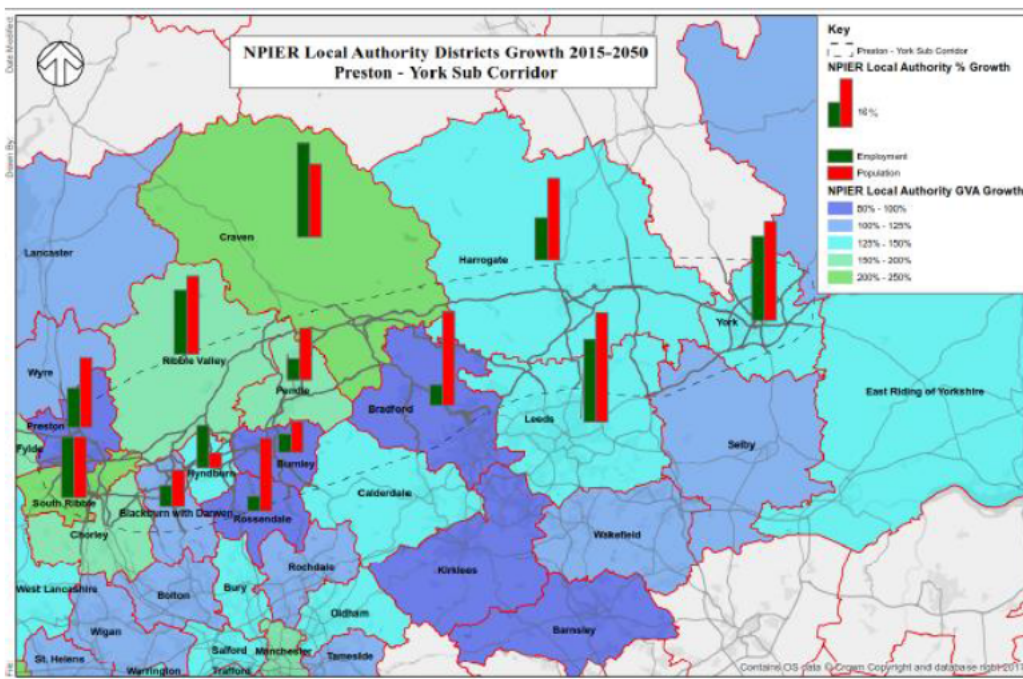


Source: ONS / NOMIS.

Figure 2.25 shows the NPIER growth projections from 2015 to 2050 with regards to employment, population and GVA. This highlights the greatest increase in GVA within Craven with GVA growth of 200-250% with high growth in employment and population. Neighbouring authorities of Ribble Valley and Pendle are also expected to have higher GVA growth,

although the increase in employment in Pendle is lower. Meanwhile, the growth in Harrogate, Leeds and York suggests GVA growth of 125-150% with greater employment increases in Leeds and York compared Harrogate.

Figure 2.25: NPIER Local Authority Growth Projections (2015 to 2050)



Source: Central Pennines Corridor Option Assessment Report, TfN.

As well as the number of jobs and job growth, it is also important to consider the sector of jobs to further understand the trends in job growth and identify opportunities for improvements to the transport network to support agglomeration of particular industries. Between 2005 and 2017, the UK economy experienced a decline in traditional heavy industries, such as mining, but a growth in advanced manufacturing (e.g. aviation) and service sectors (Table 2.4). These trends are reflective of the Wider Study Area, for example, the areas around Preston (located near the highly accessible M6 / M61 / M65 triangle) display some of the highest job density and growth within Lancashire. In September 2013, the Preston, South Ribble and Lancashire City Deal was signed with the Government as a means to harness economic growth potential of key cities with investment anticipated to create 20,000 new jobs. East of the Pennines, the Leeds City Region has some of the highest job density and growth figures for this period, with particularly strong figures in growth sectors such as digital and health.

Table 2.4: Occupation Change by Sector (2005 to 2017)

Region	Types of Occupation and Trade						
	Knowledge Intensive Occupations *	Administrative Occupations	Skilled Metal, Electrical and Electronic Trades	Caring Personal Service Occupations	Leisure, Travel and Related Personal Service Occupations	Customer Service Occupations	Process, Plant and Machine Operatives
Greater Manchester	22.3%	-0.4%	-13.0%	24.2%	55.5%	15.9%	-27.1%
Lancashire	11.9%	7.9%	-4.5%	39.3%	28.9%	19.5%	-23.4%
Leeds City Region	21.4%	-8.1%	9.4%	30.1%	16.2%	-4.7%	-29.5%
Liverpool City Region	28.3%	-15.2%	-9.1%	1.9%	16.4%	-8.1%	-24.2%
England	27.4%	-3.2%	-9.5%	29.7%	20.6%	15.5%	-17.5%

N.B. Knowledge Intensive Occupations are an amalgamation of eleven occupation categories in accordance with a methodology set out by The Work Foundation. Source: ONS / NOMIS, Annual Population Survey.

The analysis has highlighted job growth across the *Wider Study Area*, with clustering in particular geographies and sectors. Previous studies have identified high-levels of 'self-containment' of jobs and commuting within Lancashire and the Leeds City Region. This suggests that opportunities in growth sectors are not being fully harnessed, which could be attributed to limited east-west connectivity between the two regions and/or a mismatch between the supply and demand of skills and jobs. Improved connectivity could potentially address these trends to strengthen agglomeration effects, therefore, enhancing the catchment area for jobs and benefiting potential employees as well as the pool of potential candidates for businesses.

The Annual Population Survey undertaken by the Office of National Statistics can provide insight into unemployment levels across the *Core Study Corridor*. **Table 2.5** shows the unemployment rate for each district across the corridor between 2017 and 2018, with the exception of the following districts (for which data was not available): Chorley, Fylde, Hyndburn, Ribble Valley, Rossendale, Craven and Selby.

In 2018, West Lancashire had the highest unemployment rate of the districts within the corridor at 8.8%, which was a notable increase from 4.0% in 2017. Blackpool and Burnley also had unemployment rates in 2018 (7.5% and 6.4% respectively), with an increase in unemployment in Blackpool from 6.7% in 2017. Unemployment was lowest in Harrogate and York in 2018 (2.2% and 2.4% respectively).

Table 2.5: Unemployment Rates by District (2017 to 2018)

District	Unemployment (%)		
	2017	2018	Change
Blackburn with Darwen	6.2	5.4	-0.8
Blackpool	6.7	7.5	0.8
Bradford	5.9	4.2	-1.7
Burnley	6.4	6.4	0
Calderdale	3.4	3.4	0
Harrogate	4.3	2.2	-2.1
Kirklees	4.0	5.2	1.2
Lancaster	3.5	4.1	0.6
Leeds	4.4	3.3	-1.1
Pendle	6.4	4.7	-1.7
Preston	3.1	4.5	1.4
South Ribble	3.7	5.4	1.7
Wakefield	6.2	6.1	-0.1
West Lancashire	4.0	8.8	4.8
Wyre	2.8	3.3	0.5
York	2.8	2.4	-0.4

Source: ONS Annual Population Survey.

Education

Throughout the *Wider Study Area* there are several Higher Education Institutions (HEIs), for example, the University of Leeds, Lancaster University, and University of Central Lancashire. Some institutions have campus sites within the *Core Study Corridor*, for example, the

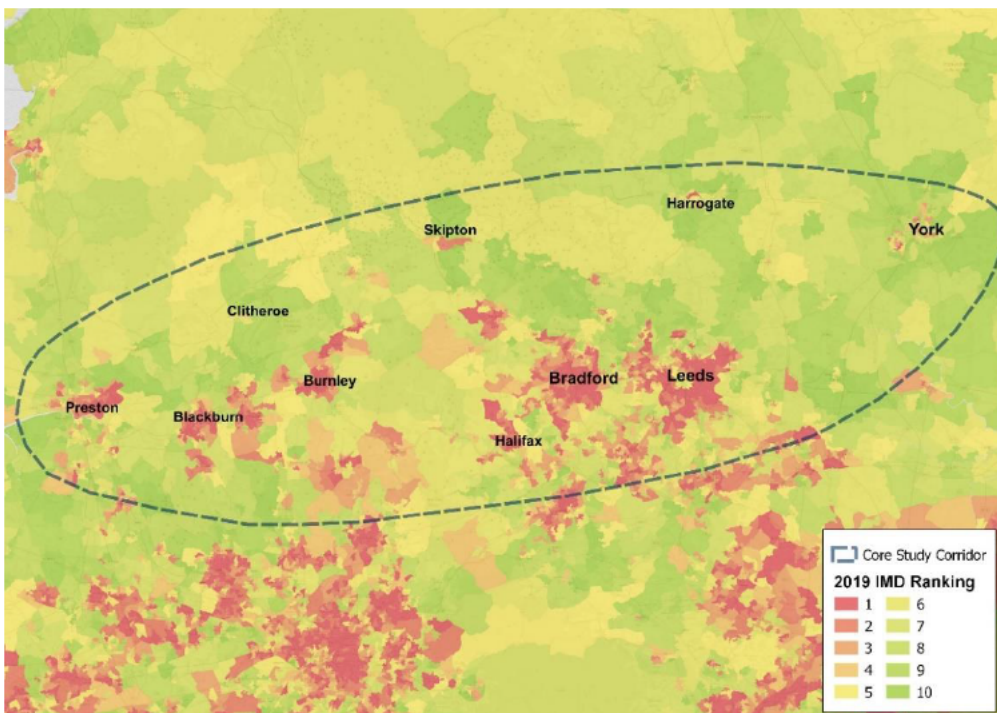
University of Central Lancashire has a campus in Burnley. There is an opportunity to build on the existing strength of these assets, by improving connectivity and accessibility between and to HEIs. This has potential benefits associated with greater opportunities for collaboration between universities and university-business relationships. This could also increase the number of people who can access higher education opportunities as well as supporting higher rates of graduate retention through improving access to employment opportunities.

In addition to HEIs, apprenticeships provide industry-driven career pathways which benefit apprentices as well as businesses by preparing their future workforce. Within the *Core Study Corridor*, the South Ribble, Ribble Valley and Hyndburn areas have over 5% of the working age population with an apprenticeship qualification or still within apprenticeship training and this is above the national average of 3.6%. This could reflect the strength of employment clusters that support this type of training in the area, including the presence of Rolls Royce, BAE Systems, Airbus and Safran. Enhancing accessibility to these locations and sites that offer apprenticeship opportunities from within the *Core Study Corridor* and beyond (i.e. access from larger populations in Leeds and Bradford) can potentially contribute to further strengthening the apprenticeship opportunities available by broadening the travel horizons for potential apprentices.

Deprivation

The English Indices of Multiple Deprivation (IMD) is used to score small area geographies (Lower layer Super Output Areas (LSOAs)) across England based on seven different domains of deprivation: (i) income, (ii) employment, (iii) education, skills and training, (iv) health and disability, (v) crime, (vi) barriers to housing and services, and (vii) living environment deprivation. The IMD has been used to understand deprivation levels in the *Core Study Corridor* and **Figure 2.26** presents the results using deciles, with 1 representing the 10% most deprived and 10 representing the 10% least deprived in England. The results show some of the highest concentrations of deprivation, most notably within the major urban areas (Leeds, Bradford, Blackburn and Burnley), as well as along the M65 Corridor between Blackburn and Pendle. These trends may relate to the industrial decline since the late 1980s and limited inter-regional accessibility which is impeding access to education, jobs and key services.

Figure 2.26: Overall Deprivation Ranking (2019)



Source: Ministry of Housing, Communities and Local Government.

Summary of Socio-Economic Characteristics

The findings have demonstrated clustering of population and jobs growth within the *Core Study Corridor*, whilst other locations have seen marginal or negligible changes. Transport improvements can ensure there is suitable accessibility in areas of growth, whilst also providing the necessary connectivity to facilitate growth elsewhere.

With areas amongst some of the most deprived nationally, this suggests there is a need to drive economic growth and productivity to reduce unemployment, improve skills and ‘gaps’ in employability. Although enhanced connectivity between the M6 and A1(M) is unlikely to solely address the challenges as it primarily benefits those with car access, strategic highway improvements can contribute to reducing deprivation levels and boosting employment levels.

2.3.7 Key Sites

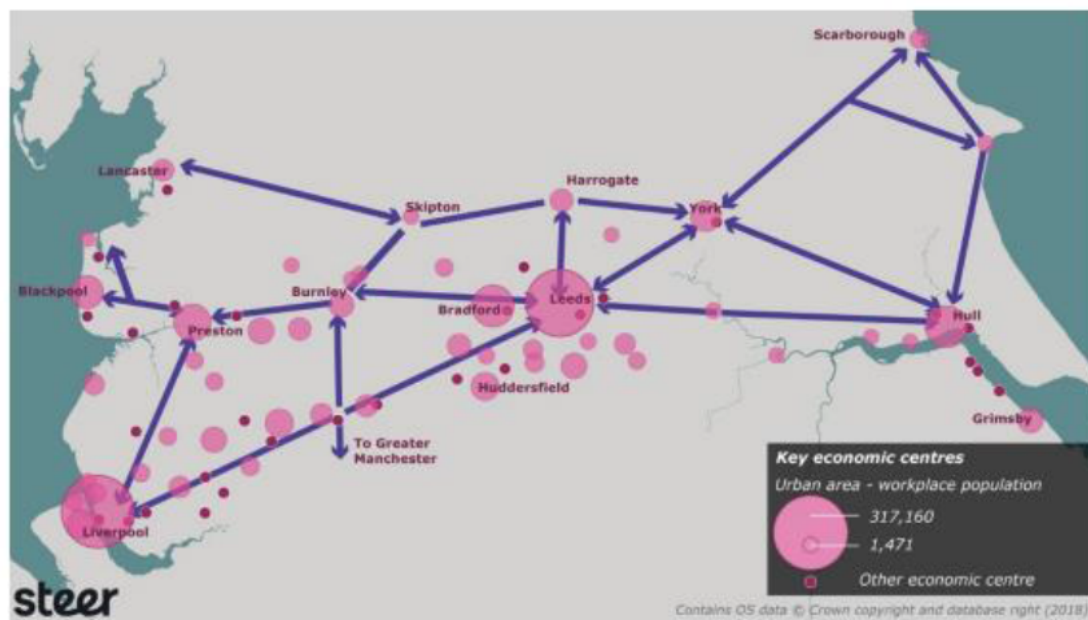
Economic Centres

The *Wider Study Area* broadly reflects TfN’s Central Pennines SDC which is an east-west corridor encompassing some of the North’s IECs and assets in North Yorkshire, West Yorkshire, East Riding and Hull and Humber through to Greater Manchester, Lancashire and Liverpool City Region. The SPOC for the Central Pennines SDC describes how this corridor has some of the North’s key economic and population centres, with a diverse mix of strategic movements. It is home to approximately 8.7 million people, accommodating over 4 million jobs which generate between 40-45% of the North’s annual GVA.

The Central Pennines SDC contains some of the most populated centres of the North of England, including Leeds City Region and Liverpool City Region. The Central Pennines SDC has an important relationship with Greater Manchester, as it is through Greater Manchester that the movement of goods and people between the east and west largely occurs (due to the existing east-west transport infrastructure). The economies within the *Core Study Corridor* therefore have a key role in the economic growth of the North of England.

Improved connectivity to IECs (**Figure 2.27**) will support increased engagement in the labour market, access to skills and improved interaction between centres. A relatively small proportion of the North's population commutes by rail due to a number of factors, such as, the cost, convenience and perception of the rail network, as well as capacity constraints on both intra and inter-urban rail services. Many of the current journeys between Northern economic assets and clusters are slow and infrequent, both in absolute terms and compared with journeys to and from London. For example, it currently takes longer to travel by rail between Liverpool and Hull than it does to travel twice the distance between London and Paris.

Figure 2.27: Important Economic Centres in Central Pennines SDC



Source: Central Pennines Strategic Development Corridor Strategic Programme Outline Case, TfN (2019).

Leisure and Tourism

The *Wider Study Area* has a number of cultural, leisure and visitor assets that attract millions of visitors annually, with several of these sites within the *Core Study Corridor*. These attractions include coastlines, national parks and areas of outstanding natural beauty (AONB), historic and cultural locations, and internationally recognised museums. Large shopping and sporting events also attract considerable visitor numbers. Collectively, the leisure and tourism markets generate high-levels of movement across the network, with higher demand often experienced during weekends and public holidays. **Table 2.6** summarises Tourism Day Visits (TDVs) in the North East, North West and Yorkshire and the Humber regions. This highlights 12% of English TDVs are to the North West, whilst 9% are to Yorkshire and the Humber and 5% to the North East. Outside of London and the South East, the North West generates greater TDVs than any other region, whilst the North East generated the fewest.

Table 2.6: Tourism Day Visits (2018)

Region	Trip Volume (millions)	Expenditure (£m)
North East	77 (5%)	£2,547 (5%)
North West	170 (12%)	£6,345 (12%)
Yorkshire and the Humber	130 (9%)	£5,066 (10%)
East Midlands	102 (7%)	£2,867 (5%)
West Midlands	121 (8%)	£3,829 (7%)
East	137 (10%)	£5,042 (10%)
London	319 (22%)	£13,964 (26%)
South East	225 (16%)	£7,515 (14%)
South West	148 (10%)	£5,862 (11%)
England	1,431	£53,037

Source: VisitBritain (https://www.visitbritain.org/sites/default/files/vb-corporate/gbdvs_2018_annual_report.pdf).

N.B. A TDV is defined as a leisure visit lasting more than three hours, which is not undertaken very regularly, and is to a destination different to where the respondent lives.

Increasing the visitor economy requires easy and accessible transport connectivity so that visitors can easily access attractions across the North and therefore increase the likelihood of them visiting to spend more time and money. However, a key challenge for numerous leisure and tourism sites in the area is they are situated in relatively isolated areas and with visitors reliant on the car to access them, particularly those away from major conurbations (e.g. attractions within the Yorkshire Dales). As a result, this brings a high-level of additional traffic to a small proportion of the road network where capacity is limited and already low in resilience, particularly on A class Trans Pennine routes. For example, during busy periods at Bolton Abbey in the Yorkshire Dales, traffic queueing to enter the on-site car park often creates tailbacks on to the A59, which can lead to conflict between visitor, local, and Trans Pennine traffic¹⁷. Furthermore, these isolated attractions sometimes overlap with environmentally sensitive areas, with the natural environment often the reason the site is attracting visitors and increasing connectivity should not restrict tourism potential. The constraints are considered further in **section 2.7**.

Strategic highway improvements within the *Core Study Corridor* have the potential to address the current challenges of the leisure and tourism market, as well as unlocking future growth in this industry both within the *Core Study Corridor* and *Wider Study Area* (for example, Blackpool which is one of the largest seaside resorts in the UK). Creating a new high capacity link could accommodate the high car dependency for many sites and reduce the conflict between visitor, local, and Trans Pennine traffic, particularly if implemented alongside measures to influence travel behaviour. This would reduce the risk of localised congestion, improve journey times and reduce pollution hotspots. In addition, promoting accessibility to

¹⁷ Bolton Abbey Village Masterplan: High Level Transport Statement, Arup (2016)

high-quality cultural and leisure assets, particularly from international airports and major cities, could increase the number of visitors and associated net additional expenditure¹⁸.

2.3.8 Case for Change

This section has identified that the *Wider Study Area* displays a number of strengths with population growth across much of the area, high-quality education and training offerings and growth in key economic sectors, such as, advanced manufacturing. However, it is considered that these strengths are not being fully harnessed across the whole area, particularly in many parts of East Lancashire. Limited transport connectivity (particularly Trans Pennine cross-boundary between East Lancashire and West Yorkshire) can contribute to this inability to maximise the strengths identified, although it cannot be attributed to transport alone.

Delivering strategic highway improvements across the *Core Study Corridor* has the potential to enhance connectivity to improve the directness, journey time and resilience of journeys. This could broaden the travel horizons for people to access greater economic and education opportunities. Improvements could also promote greater cross-boundary movements, which could strengthen agglomeration effects and therefore unlock the area's economic, business and innovation potential as well as the appeal as a place to live. This is also recognised in the CPC SDC reporting which identifies improvements in connectivity between the M6 and A1(M).

As identified in this section, there are notable pressures in terms of capacity, journey times, reliability and resilience across the *Core Study Corridor* highway network, particularly on Trans Pennine routes.

Capacity: The M62 is the only Trans Pennine route that is dual carriageway across its entirety. Consequently, it attracts greater traffic volumes and there is a reliance on this route which can lead to delays during peak periods. Meanwhile, alternative routes often have a single carriageway and this limited capacity exacerbates congestion, increases in journey times and reduces journey time reliability. With regards to the *Core Study Corridor*, with the exception of sections of A650 and A629, the network is typically comprised of lower standard roads which lack coherence and capacity, resulting in the journey times to key centres being much greater despite the short distances. Whilst these routes provide local accessibility with fronting properties and multiple junctions, this results in lower speed limits which impacts the journey time and can create congestion pinch-points as vehicles make turning movements at key junctions.

Journey Times: It is evident that there are poor journey times / slow speeds on sections of the highway network between the M6 and A1(M). This affects all movements, including commuters, freight and those visiting in the *Core Study Corridor*, and consequently has adverse economic and social impacts as a result of the impact on connectivity. The analysis in the CPC Option Assessment Report highlights journey times during the interpeak are also affected indicating the pressure extends beyond the typical peak periods. Slow journey times is a barrier to connectivity as the decision to travel in the *Core Study Corridor* may be constrained by the available catchment within the travel time an individual is willing to accept; this can impact access to employment for residents as well as the pool of potential employees for businesses.

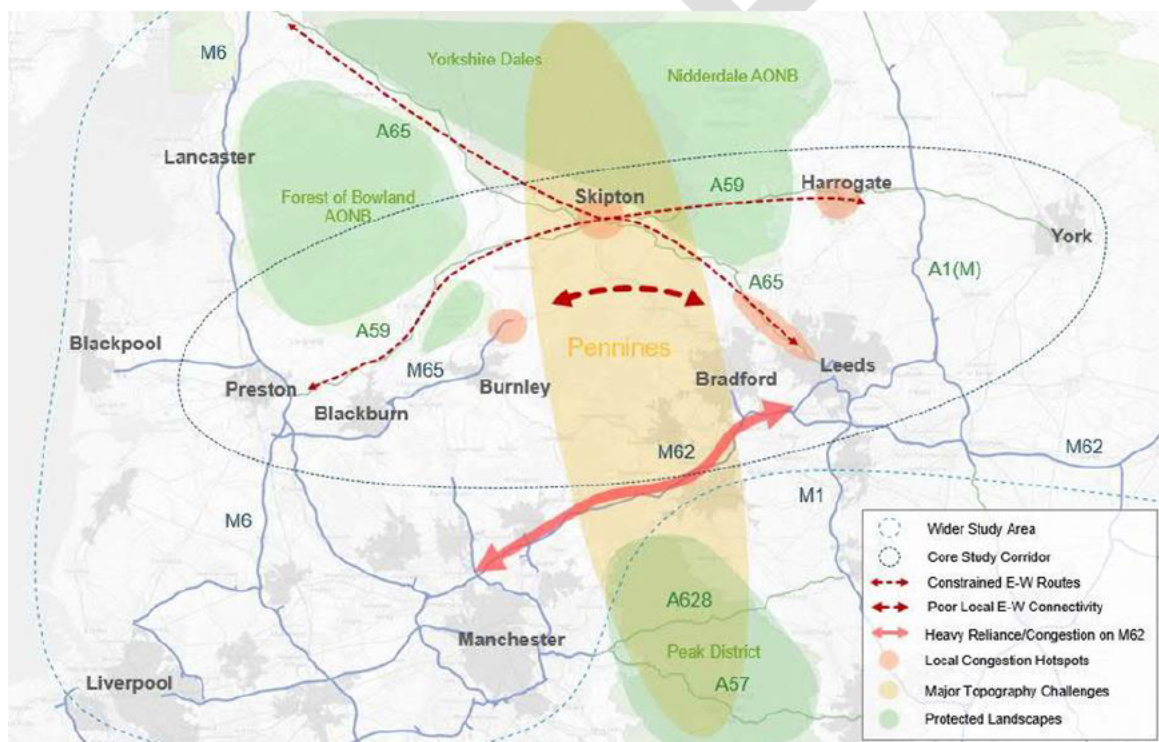
¹⁸ Central Trans Pennine Corridor East – West Connectivity, Cushman & Wakefield and SYSTRA (2017)

Reliability: The evidence has shown congestion on the network, particularly the M62 between Manchester and Leeds and localised congestion on alternative Trans Pennine routes around key towns and interchange between junctions. Congestion causes delays resulting in slower journey times and greater variation in journey times reducing the reliability, which can be compounded by the topography and vulnerability to severe weather. This disruption and unreliability is likely to have an adverse impact on the Northern economy as the commuters, business travellers and freight (particularly for just-in-time deliveries) movements are affected.

Resilience: There is a need to improve resilience of the highway network across the *Core Study Corridor* to enable the network to better cope with increases in demand and the response to accidents / incidents on the network which cause delays and diversions. **Figure 2.9** highlighted there are limited east-west routes north of the M62 between the M6 and A1(M), with 22 miles to the next alternative route (A59 / A65) compared with just 12 miles to the south of the M62 (A682). This limits the alternative options available, particularly for relatively localised movements.

Figure 2.28 summarises the key challenges resulting in the need for highways improvements between the M6 and A1(M).

Figure 2.28: Summary of Strategic Highway Challenges



N.B. The map shows indicative examples of local congestion hotspots and excludes urban areas.

The analysis has also highlighted a number of opportunities which an intervention between the M6 and A1(M) could harness, including:

Transport Hubs: Accessibility to key transport hubs, for example LBA and onward connectivity to ports, could be improved which would enable greater demand to be accommodated with improvements in journey quality. This would broaden the catchment of transport hubs within a defined journey time and make it quicker / more convenient for all

journey purposes. For example, surface access to LBA is considered to be limited and risks impeding growth aspirations so improving accessibility could unlock a wider passenger market. This highlights how enhancing highway connectivity between the M6 and A1(M) can have synergy with wider transport network improvements and deliver integration benefits across the region as well as supporting modal shift to public transport.

Regional Growth: Enhanced connectivity between IECs provides the infrastructure to support economic growth and contributes to local and regional growth as part of the Northern Powerhouse. Transport can unlock increased productivity and improve inter-regional flows as businesses are able to benefit from quicker and more reliable journeys. This can help to stimulate agglomeration of particular sectors and unlock development site potential to further harness the economic benefits of an improved Trans Pennine highway network. Furthermore, the NPIER projections identify growth in population and employment across the Preston to York Sub Corridor between 2015 and 2050, with considerable population growth across the local authorities and notably employment growth in Leeds, York, Bradford, Craven, Ribble Valley and Harrogate. Addressing the transport constraint will support the 'levelling-up' between the north and south by contributing to the unlocking of economic potential in the *Core Study Corridor*.

Leisure and Tourism: Investment in the M6 to A1(M) Corridor has the potential to support future growth in the leisure and tourism sector and mitigate existing challenges. A new route could accommodate the high car dependency evident to access these sites and seek to reduce the conflict between visitor, local and Trans Pennine traffic. This increase in leisure and tourism would support the local economy and regional growth described above; however, there is a need to be mindful of the potential adverse impacts associated with new infrastructure in proximity to environmentally sensitive areas (which may be a leisure and tourism attraction).

2.4 Impact of Not Changing

This states the impact of not changing. At SOBC stage, this should be completed.

The decision to progress with a project should also consider any impacts if the project did not take place. This involves assessing the current situation and anticipating the likely future situation and four key areas which would be impacted have been identified.

Transport

- Existing congestion issues, with slower journey times and poor journey time reliability, are likely to worsen without an intervention and with expected increases in travel demand, this will make it difficult to accommodate this increase without exacerbating congestion.
- Limited east-west connectivity across the Pennines will persist without an intervention and this constrains the capacity of the highway network with many routes of a lower standard which support local movements but impede efficient strategic movements.
- Resilience of the network is limited by the lack of alternative routes to lower standard routes which results in delays or a need to use often lengthy diversion routes.

- The transport network within the *Core Study Corridor* provides accessibility to the wider strategic network, for example, the SRN, airports and ports. Growth in travel demand, for a variety of journey purposes (e.g. commuting, freight and leisure), will need to ensure sufficient accessibility to facilitate these movements reliably and effectively.

Economy

- The *Core Study Corridor* contains a number of economic centres and assets which rely on the transport network to facilitate commuting, business and freight movements, as well as the access for customers and visitors.
- The NPIER highlights the existing performance gap with regards to productivity in the North, and investment in the transport network can support an increase in productivity and mitigate the widening of this gap.
- The full potential of planned, proposed and potential developments may not be realised without sufficient transport accessibility to facilitate the connectivity as well as the likely growth of existing sites (such as LBA).
- Increased economic growth and prosperity in the CPC is critical to unlocking the potential of North, and in supporting the levelling up of the UK economy.

Social and Wellbeing

- Without intervention, existing areas suffering from deprivation and the disparity in deprivation levels are likely to persist. Improving access to employment and education opportunities can help to reduce the number of areas experiencing deprivation.
- The transport network provides access to employment and education so improving connectivity can broaden the potential catchment area and therefore the opportunities to improve economic activity, which would not necessarily be facilitated without an intervention in the network.
- Ensuring the transport network can support the movement and address severance barriers of active travel is also important for contributing to the levels of physical activity and without intervention this would be constrained.

Environment

- High car dependency and congestion on the network contributes to air quality and localised noise issues along the corridor so will be exacerbated without an intervention to better manage traffic flows.
- The impact of climate change and severe weather will exacerbate existing issues on the highway network without an intervention to better manage traffic flows.

2.5 Objectives

This establishes specific, measurable, achievable, realistic and time-bound objectives that will solve with problem identified and they should be aligned with the organisation's strategic aims. At SOBC stage, this should be completed.

The previous M6 to A1(M) study developed scheme objectives and these were refined during a Delivery Partner Workshop in August 2019. The scheme objectives have been identified across four themes: Connectivity, Economic Growth, Network Performance and the Environment, as shown in **Figure 2.29**. These themes are aligned with the Trans Pennine Tunnels work which also considers Trans Pennine movements.

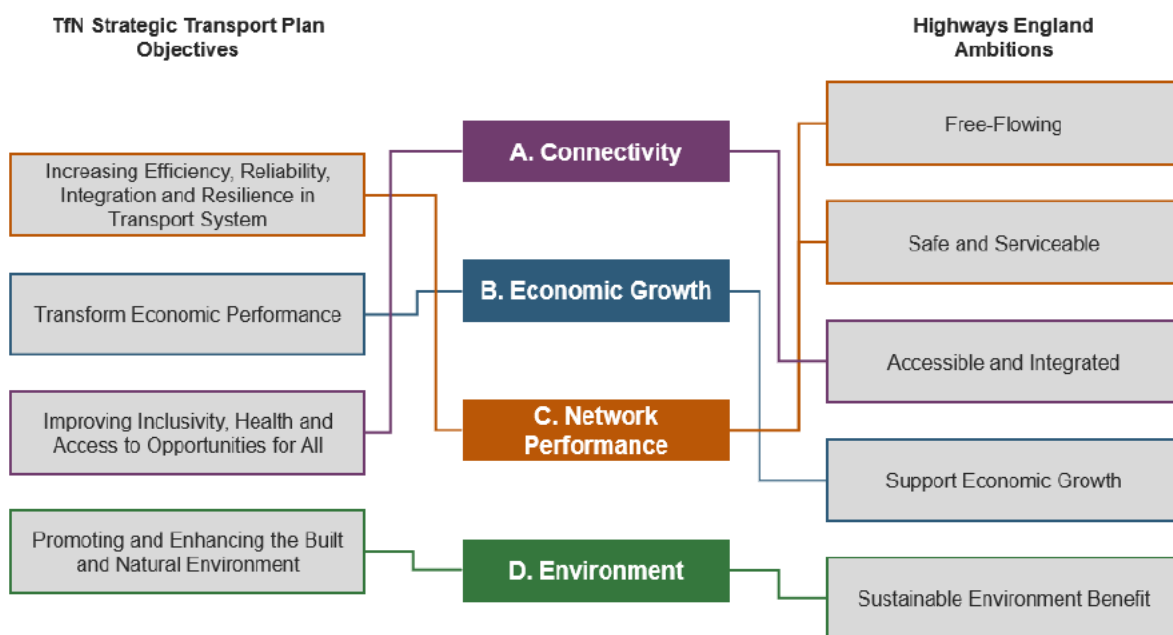
Figure 2.29: M6 to A1(M) Objectives

A. Connectivity	B. Economic Growth	C. Network Performance	D. Environment
A1. Improve connectivity between important economic centres east and west of the Pennines to increase growth and productivity	B1. Support the economic growth of the Northern Powerhouse economy, in particular, the prime and enabling sectors as set out in the North's Independent Economic Review	C1. Improve journey time reliability for all road users	D1. Minimise adverse impacts on the built and natural environment
A2. Reduce Trans Pennine journey times, including for freight	B2. Support the regional growth aspirations of East Lancashire and North and West Yorkshire by facilitating new economic development opportunities along existing developed corridors where poor connectivity currently impacts on growth and productivity	C2. Improve road safety, including for non-motorised users	D2. Optimise opportunities to enhance the built and natural environment
A3. Maintain and improve access for tourism and local communities in the Yorkshire Dales National Park and the Bowland and Nidderdale Areas of Outstanding Natural Beauty	B3. Improve accessibility from economically deprived areas in the corridor (East Lancashire and West Yorkshire) to centres of employment, education and training	C3. Improve access for non-motorised users and reduce severance for local communities	D3. Reduce the impact of traffic on local communities
A4. Improve access to international transport hubs and gateways such as Leeds Bradford Airport		C4. Reduce congestion on Trans Pennine routes	
		C5. Improve the resilience of strategic Trans Pennine routes to severe weather events and other incidents	

Scheme objectives are used to aid the assessment of scheme options and help to inform the selection of the preferred option. They are also used to assess the extent to which a built scheme has been successful in delivering the intended benefits. To ensure that a robust approach can be taken the objectives are aligned with SMART (Specific, Measurable, Achievable, Realistic, and Time-Specific) principles. They are **specific** as they identify the M6 to A1(M) Corridor and particular locations along or within the vicinity of the corridor. The objectives are **measurable** with specific metrics identified in **section 2.6**. All of the objectives are considered to be **achievable** and **realistic** as they are informed by a robust evidence review of existing and anticipated conditions on the transport network. Finally, the objectives are **time-bound** to the appraisal period, with benefits expected to start occurring in the opening year.

The alignment between the M6 to A1(M) scheme objective themes and the ambitions of Highways England and the TfN STP objectives are shown in **Figure 2.30**. This demonstrates the synergy in the aspirations and shows the scheme is likely to support transport strategy across the North.

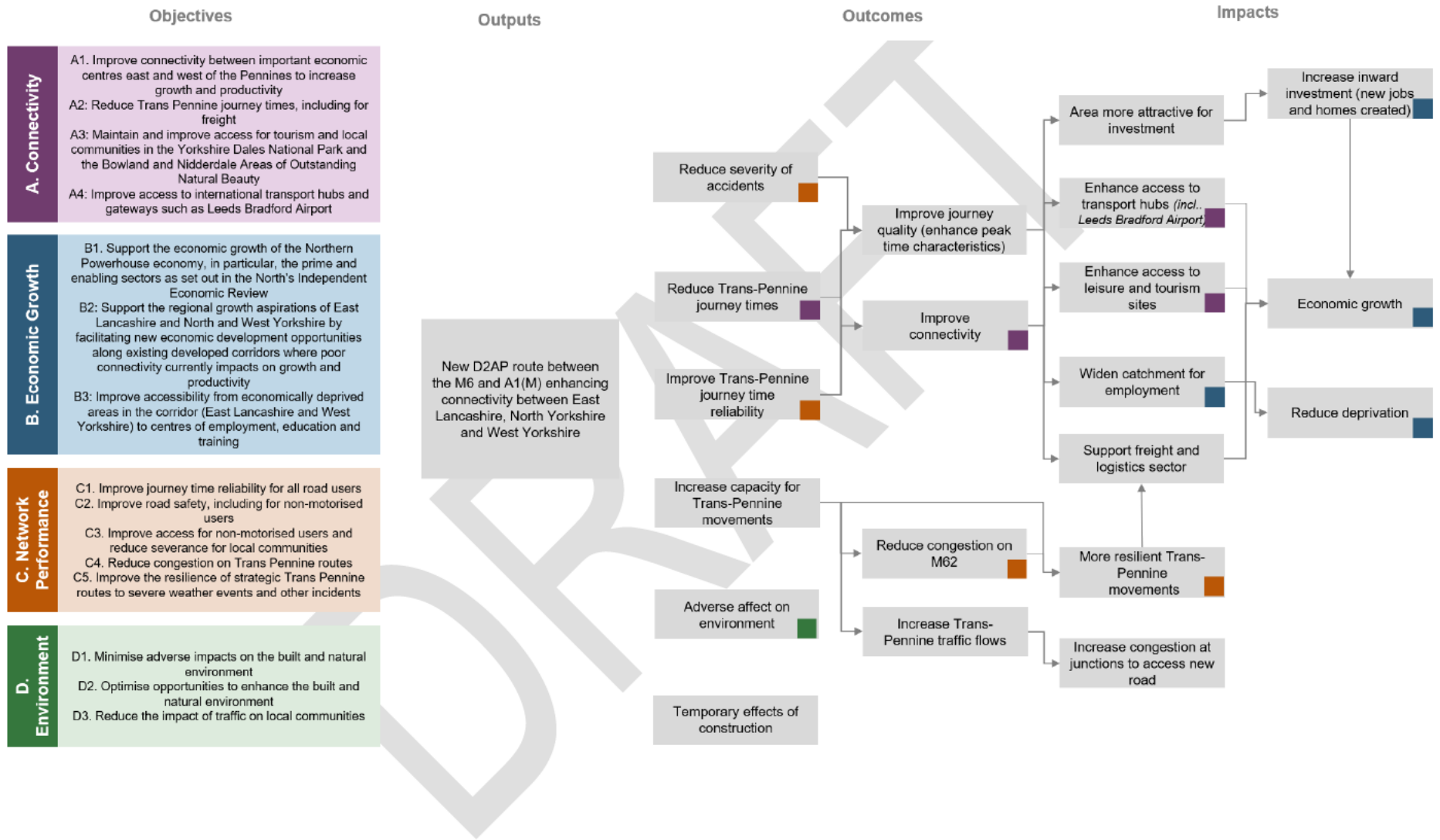
Figure 2.30: M6 to A1(M) Objective Alignment with Policy and Strategy



To improve transparency of decision-making, the project objectives are accompanied by an indicative Investment Logic Map (ILM) in **Figure 2.31**. This summarises the rationale for the scheme as well as the anticipated short and medium-term outcomes and longer-term impacts. The ILM will be developed further in future stages in line with the design and development of the project.

DRAFT

Figure 2.31: Indicative Investment Logic Map



2.6 Measures for Success

This sets out what constitutes successful delivery of the objectives. At SOBC stage, this should be completed.

A summary of the key metrics for success of the objectives is provided in **Table 2.7**. As the scheme progresses through the business case stages, a Monitoring and Evaluation Plan is expected to be developed which will refine these metrics and data sources.

Table 2.7: Key Metrics to Measure for Success

Objective		Key Metrics
A. Connectivity	A1: Improve connectivity between important economic centres east and west of the Pennines to increase growth and productivity	<ul style="list-style-type: none"> • Journey times between IECs. • Journey time reliability between IECs. • Resilience metric. • Inward investment to the study area. • GVA per workforce job.
	A2: Reduce Trans Pennine journey times, including for freight	<ul style="list-style-type: none"> • Trans Pennine journey times between key economic centres. • Trans Pennine journey times on the M62. • Average speed along Trans Pennine routes.
	A3: Maintain and improve access for tourism and local communities in the Yorkshire Dales National Park and the Bowland and Nidderdale Areas of Outstanding Natural Beauty (AONB)	<ul style="list-style-type: none"> • Catchment area (within defined journey time) of Yorkshire Dales National Park and Bowland and Nidderdale AONBs. • Visitor numbers at Yorkshire Dales National Park.
	A4: Improve access to international transport hubs and gateways such as Leeds Bradford Airport	<ul style="list-style-type: none"> • Annual airport passengers at international transport hubs in <i>Core Study Corridor</i> (split by journey purpose). • Catchment area (within defined journey time) of international transport hubs in <i>Core Study Corridor</i>. • Air freight in tonnes at international transport hubs in <i>Core Study Corridor</i>.

Objective	Key Metrics
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">B. Economic Growth</p> <p>B1: Support the economic growth of the Northern Powerhouse economy, in particular, the prime and enabling sectors as set out in the North's Independent Economic Review</p>	<ul style="list-style-type: none"> • Resident population. • Business demographics (growth in enterprise numbers and number of full-time equivalent jobs). • Inward investment to the study area. • GVA per workforce job. • Productivity level.
	<ul style="list-style-type: none"> • Gross Value Added (GVA) for East Lancashire, North Yorkshire and West Yorkshire. • Number of new jobs created along the corridor. • Number of new homes created along the corridor.
	<ul style="list-style-type: none"> • Deprivation levels along the corridor. • Proportion of working age residents in employment or education. • Proportion of population within defined catchment of IEC.
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">C. Network Performance</p> <p>C1: Improve journey time reliability for all road users</p>	<ul style="list-style-type: none"> • Journey time reliability along Trans Pennine routes.
	<ul style="list-style-type: none"> • Number of accidents within the <i>Core Study Corridor</i>. • Severity of accidents within the <i>Core Study Corridor</i>.
	<ul style="list-style-type: none"> • Number of pedestrians on identified routes. • Number of cyclists on identified routes. • Perceived severance amongst cyclists and pedestrians.
	<ul style="list-style-type: none"> • Trans Pennine journey times between key economic centres. • Trans Pennine journey times on the M62.

Objective		Key Metrics
		<ul style="list-style-type: none"> Number of congestion hotspots on Trans Pennine routes. Average delay (time lost per vehicle per mile).
	C5: Improve the resilience of strategic Trans Pennine routes to severe weather events and other incidents	<ul style="list-style-type: none"> Number of incidents (of defined minimum duration). Delay duration. Proportion of freight traffic using diversion routes through local towns.
D. Environment	D1: Minimise adverse impacts on the built and natural environment	<ul style="list-style-type: none"> Impact of construction. Air quality and noise levels. Carbon dioxide emissions. Nitrogen dioxide emissions. Cultural and heritage impacts. Landscape and townscape impacts.
	D2: Optimise opportunities to enhance the built and natural environment	<ul style="list-style-type: none"> Record of opportunities identified as a result of the scheme to enhance the built and natural environment.
	D3: Reduce the impact of traffic on local communities	<ul style="list-style-type: none"> Traffic flows on local highway network.

2.7 Constraints

This details the high level internal / external constraints. At SOBC stage, this should be outlined with initial findings.

A high-level desktop review of existing challenges to the highway network across the *Wider Study Area* has been undertaken. These constraints will be an important consideration during the option identification and assessment process. As the scheme progresses, a more detailed assessment of the constraints will be completed to deepen the understanding.

2.7.1 Environmental

A summary of the key constraints is provided in this section. A series of Environmental Constraints Plans have been produced for the corridor and were subsequently updated to highlight the options taken forward for economic appraisal (**Appendix A**).

Topography: The topography was shown in **section 2.3.5** and this elevation profile is a significant challenge the potential options for a new route between the M6 and A1(M). The numerous hills, valleys and waterways considerably increase the need for cut, fill and new complex structures which impact on the buildability and scheme cost. Both the physical and financial implications (as a result of the cut/fill or structures requirements) of the topography

are expected to be a key constraint for particular locations within the *Core Study Corridor* so will be an important consideration during the option identification and assessment process.

Protected Landscapes and Environmental Designations: Designations such as National Parks, Areas of Outstanding Natural Beauty (AONBs), and Sites of Special Scientific Interest (SSSIs) pose a constraint to improvements due to the tighter planning regulations. Excluding the M62, many existing routes travel within close proximity to the designations (e.g. the A59 and A65 and the Yorkshire Dales). A large green belt area that lies between the M65 and Bradford and includes multiple Special Areas of Conservation and Special Protection Areas is likely to be affected by a scheme through the *Core Study Corridor*. In addition, there are a number of SSSIs to the north of Leeds, including Eccup Reservoir.

Built Environment: Many existing routes have experienced organic urban development within the immediate vicinity, and this is likely to constrain expanding a number of the single carriageway routes owing to the density of surrounding development, as well as increasing the need to ensure that the multitude of towns and villages within the study area are not adversely affected. In particular, the *Core Study Corridor* includes urban features such as roads, rail lines, canals and reservoirs, which all present additional technical and financial challenges in bypassing often in close proximity to one another. There are also additional constraints imposed by major infrastructure, including height restrictions on any sections of the scheme within the vicinity of LBA, and junction spacing requirements for any connections to major existing routes such as the A1.

Heritage and Conservation: Heritage and conservation designations, including listed buildings, conservation areas and World Heritage Sites (WHS), as well as the potential presence of unrecorded buried archaeology may restrict improvements due to tighter planning regulations or the need to avoid areas completely. All corridors within the study area are occupied by a substantial number of listed buildings (both Grade I and Grade II) across their full lengths. Other notable sites include Saltaire WHS in Shipley, which is adjacent to all-but-one of the scenario concepts, and a registered battlefield at Marston Moor, close to the A64 and the accompanying option.

Climate Emergency: With growing recognition of the Climate Emergency and a need to reduce transport emissions, the creation of a new strategic highway link is potentially a contentious scheme which will need to have strategic justification. In June 2019, the government set an ambitious target of reaching net zero carbon emissions by 2050 and in February 2020 the government announced a ban on the sale of new petrol, diesel or hybrid cars from 2035. Whilst in March 2020, DfT published the Decarbonising Transport: Setting the Challenge document which stated a TDP would be produced in 2020.

Flooding: There are a number of flood zones within the *Core Study Corridor*, particularly along the A629, adjacent to a number of proposed option alignments, as well as at the eastern end on the corridor close to both the A59 and A64.

2.7.2 Engineering

Land-take: Land take will be required, and the loss of agricultural land could impact on the productivity, and possible the viability, of farm holdings as a result of a reduced farming area or severance of parcels of land.

Crossings: The *Core Study Corridor* includes watercourses, railways and existing roads which require complex structures for the scheme to navigate. In some locations along the corridor, there are potentially a large number of structures required to cross existing roads in a relatively short length of the route. Dependant on the proximity of these structures to each other, it may be considered that one larger structure is preferred.

Cut / Fill Requirement: With numerous hills and valleys within the *Core Study Corridor* the terrain has the potential to require large amounts of cut / fill (or new structures). Where possible throughout the *Core Study Corridor*, options will be aligned as close as practicably possible to the existing ground profile in order to reduce the amount of cut / fill which needs to be carried out. However, there are some locations within the *Core Study Corridor* where a structure is not viable and significant cut / fill will be required.

Narrow Corridor: Sections of the route have a narrow potential corridor to minimise the adverse impact of the new link. For example, between Eccup Reservoir and the Leeds district of Alwoodly, and between the villages of East Keswick, Bardsey and East Rigton. The corridor has been aligned as to reduce the impact of the new link however, in some locations there are constraints either side of the *Core Study Corridor* and therefore the alignment is within close proximity to these constraints.

Tie in with A1(M): A new junction with the A1(M) needs to have sufficient junction spacing to meet design standards as set out in the Design Manual for Roads and Bridges (DMRB). The proposed junction would be a grade separated junction with slip roads to the A1(M). This junction needs to be considered with regard to existing junctions to ensure that junctions are not too close and to achieve the maximum weaving length possible, beyond the minimum requirement set out in the DMRB.

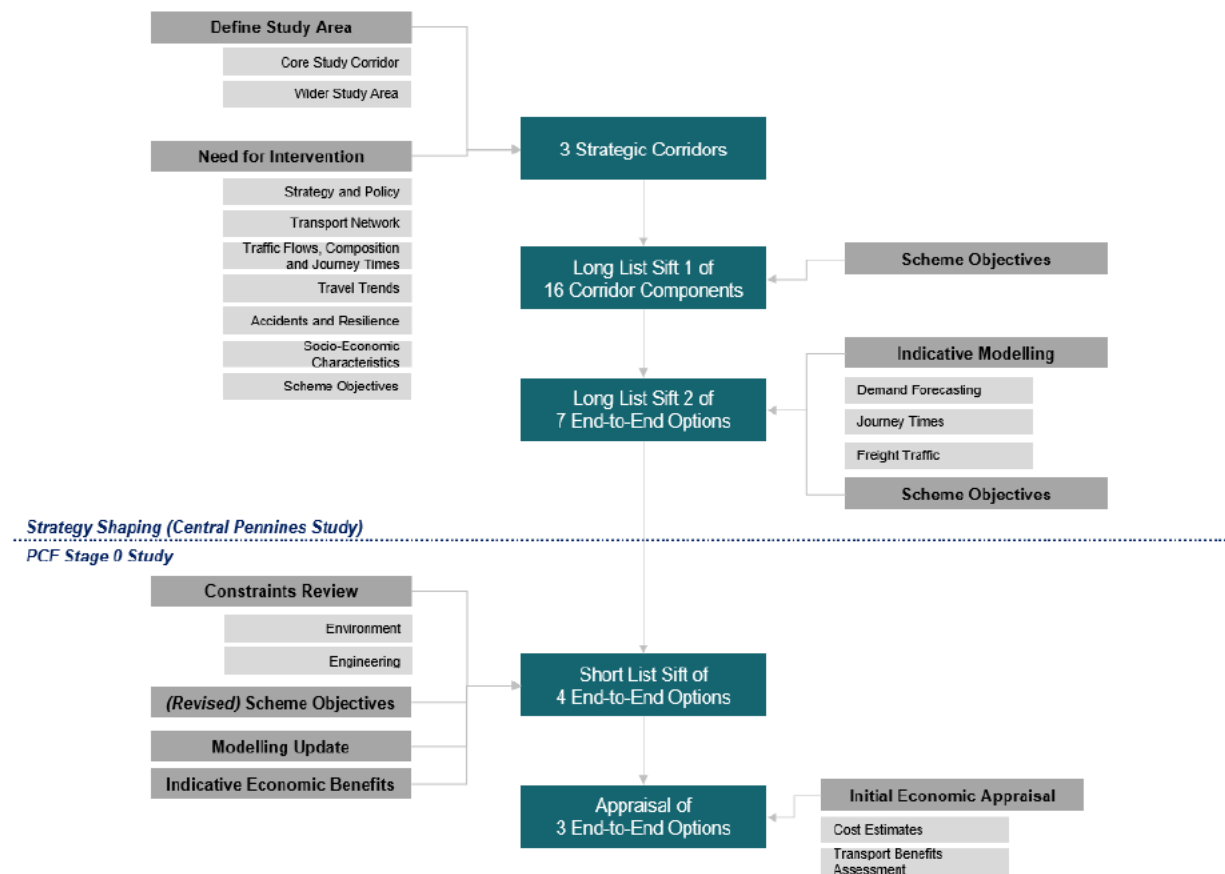
Tie in with M65: The existing junction arrangement is complex so a tie-in for the new route is challenging. Due to the nature of the alignment, there is likely to be a section of the existing M65 which will no longer carry motorway traffic. This existing road will serve the town of Colne from the M65 and a grade separated junction will be provided where the two diverge. A constraint with this is the close proximity between Junction 13 of the M65 and a proposed junction as there needs to be enough distance between junctions to achieve the maximum weaving length possible, beyond the minimum requirement set out in the DMRB.

2.8 Options

This sets out all of the options identified (including do nothing) and evaluates their impact on the objectives and wider public policy objectives. Risks associated with each option should be identified as should any risks common to all options. At SOBC stage, this should be outlined with initial findings.

A summary of the strategic option identification and assessment process is presented in **Figure 2.32**. Detailed reports with the options considered and the sifting process have been prepared so reference to these has been made in this overview of the process.

Figure 2.32: Strategic Corridor Option Assessment Process

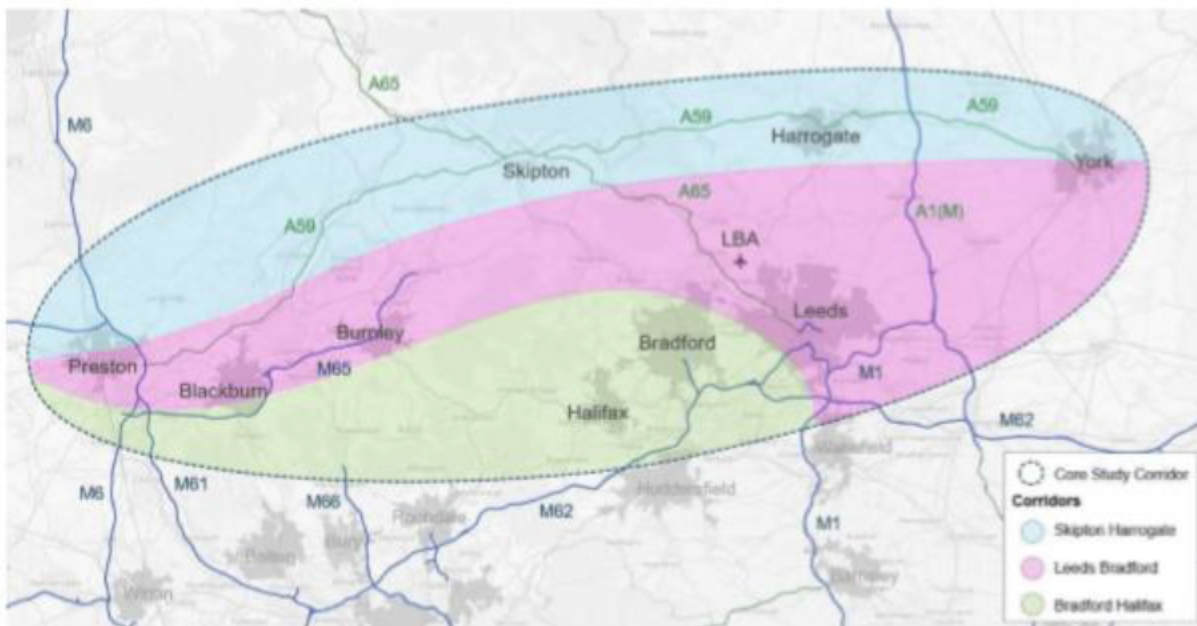


2.8.1 Option Identification (Strategy Shaping)

The process began with the identification of three strategic corridors and options for each of these. The three corridors are shown in **Figure 2.33** and were:

- **Skipton Harrogate:** Northernmost corridor which broadly follows the A59 from Preston, capturing Clitheroe, Skipton, Harrogate and the A1(M);
- **Leeds Bradford:** Central corridor between Preston and York, serving the conurbations of Leeds, Burnley and Blackburn as well as LBA, the M1 and A1(M); and
- **Bradford Halifax:** Southernmost corridor which primarily serves Halifax, Bradford and the M62.

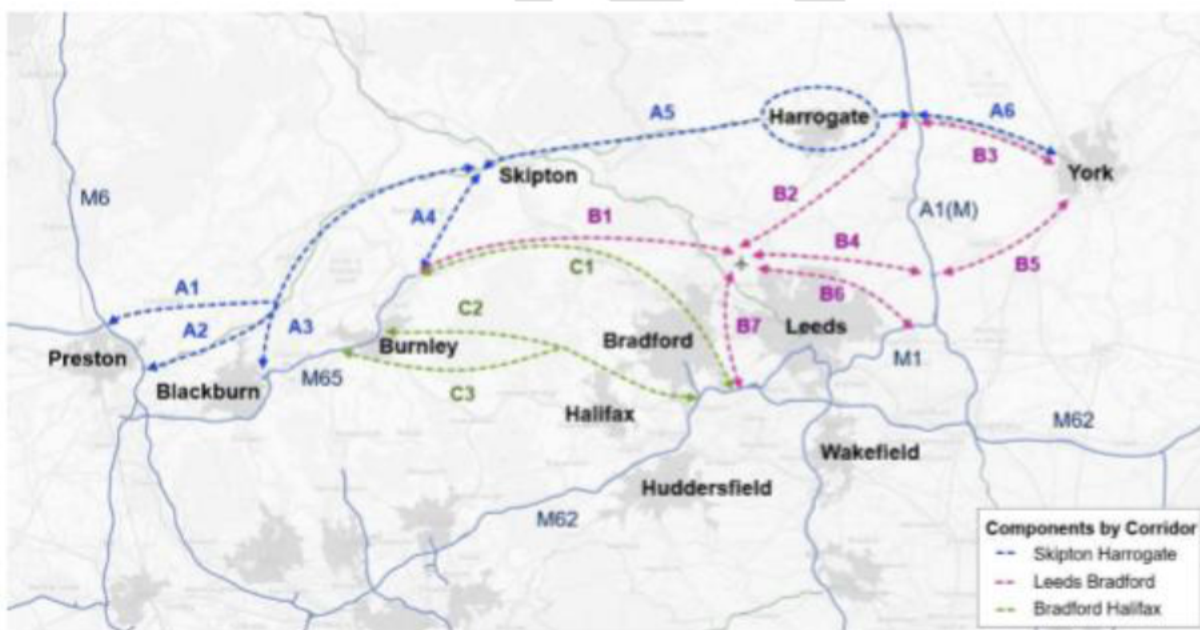
Figure 2.33: Strategic Corridors



Source: M6 to A1(M) Central Pennines Study, AECOM (2019).

For each corridor, a component long list was identified (Figure 2.34)

Figure 2.34: Corridor Component Long List Options



Source: M6 to A1(M) Central Pennines Study, AECOM (2019).

2.8.2 Long List Assessment - Sift One (Strategy Shaping)

Sift One included an assessment of each component against the following (to reflect the strategic need for an intervention):

- Improve east-west connectivity;
- Improve network resilience and reliability;

- Improve local connectivity;
- Integration with other modes;
- Support economic growth for the North; and
- Support Corridor economic growth.

This assessment was on a three-point scale from strong alignment, some alignment and limited alignment. A detailed breakdown of this assessment is contained in the M6 to A1(M) Central Pennines Study (AECOM, 2019).

This sifting resulted in seven long list routes being identified:

- **Option 1:** Colne (M65), Skipton, Harrogate, A1(M) and York (A59 Corridor) [Components A4, A5, A6];
- **Option 2:** Colne (M65), Keighley, LBA, Harrogate/A1(M) and York (A59 Corridor) [Components B1, B2, B3];
- **Option 3:** Colne (M65), LBA and A1(M) and York (A64 Corridor) [Components B1, B4, B5];
- **Option 4:** Colne (M65), LBA and M1 east of Leeds [Components B1, B6];
- **Option 5:** Colne (M65), LBA and M62 between Leeds and Bradford [Components B1, B7];
- **Option 6:** Colne (M65), LBA and outer ring road of Leeds connecting M1 and M62 [Components B1, B6 and B7]; and
- **Option 7:** Burnley (M65) to the M62 [Component C3].

This highlights several of the components did not demonstrate sufficient alignment with the criteria and were not included within a long list option.

2.8.3 Long List Assessment - Sift Two (Strategy Shaping)

A demand impact assessment of the seven long list options was undertaken, using the Highways England Trans Pennine South (TPS) Regional Transport Model (RTM), under a 2031 forecast scenario. Across the seven long list options, the following trends were consistent:

- A reduction in traffic of over 50% on the A6068 through Colne;
- M65 (Colne) experienced increased usage of approximately 65%; and
- Volume of traffic on the M62, west of Junction 26, reduced by at least 4%.

Journey times for a full Trans Pennine movement between Preston and York (via M65, A6068 and A658) and a shorter *Core Study Corridor* journey between Blackburn and Leeds (via the M65 and A646) were recorded to support the option assessment process. The results found almost all of the options provided significant quicker journey times, as well as supporting the mitigation of congestion on existing routes.

A second sifting exercise was then undertaken based on the modelling and journey times analysis. **Table 2.8** provides a summary of the findings and highlights four options performed stronger than the others so were short-listed for further development.

Option 1 provided significant benefit for local routes and towns to the north of the *Core Study Corridor*, such as Skipton and Harrogate, and improved connectivity to York. Slightly further south, Options 2 and 3 both provided alternative routes from East Lancashire to York via LBA. Of these two, Option 3 performed stronger with regards to improving east-west connectivity and improving network resilience and reliability.

Options 4 and 5 included eastern and western components of a Leeds ring road respectively, whilst Option 6 combined the two to create a full ring road. Options 4 and 6 both performed well across the transport metrics, but Scenario 5 was found to have limited alignment to metrics concerning east-west connectivity and network resilience.

Option 7, linking the M65 with the M62 to the south of Bradford, was found to provide some benefits but these did not necessarily align with the metrics. This is because there was limited benefit achieved for the *Core Study Corridor*, as well as contributing to increased traffic on the M62 between Leeds and Bradford.

In addition to the highway benefits, consideration was also given to multi-modal opportunities. Some of the scenarios have potential to align with proposed rail improvements, such as the NPR / HS2 growth stations and, should it be progressed, the Colne-Skipton Rail Link. Consequently, there is potential for multi-modal synergy to strengthen the rail and highway opportunities within the *Core Study Corridor*.

Following the assessment of the long list options, four were recommended to proceed with in further stages of the study.

Table 2.8: Long List Option Sift Summary

	Skipton - Harrogate	Leeds - Bradford					Bradford - Halifax
	Option 1 A4, A5, A6	Option 2 B1, B2, B3	Option 3 B1, B4, B5	Option 4 B1, B6	Option 5 B1, B7	Option 6 B1, B6, B7	Option 7 C3
Improve east-west connectivity	Some	Some	Strong	Strong	Slight	Strong	Some
Improve network resilience and reliability	Some	Some	Strong	Strong	Slight	Strong	Slight
Improve local connectivity	Strong	Some	Some	Strong	Strong	Strong	Slight
Integration with other modes	Some	Strong	Strong	Strong	Strong	Strong	Some
Total	Some	Some	Strong	Strong	Slight	Strong	Slight
Proceed?	Yes	No	Yes	Yes	No	Yes	No
Key:	Slight Alignment with aspect		Some Alignment with aspect		Strong Alignment with aspect		

2.8.4 Short List Assessment (Stage 0 Study)

The four indicative options recommended for short listing were refined and are shown in Figure 2.35 and in summary these were:

- **Orange:** Colne (M65) – Skipton – LBA – A1(M) – York (A64) (former Option 3);
- **Pink:** Colne (M65) – Skipton – Harrogate – A1(M) – York (A59) (former Option 1);
- **Purple:** Colne (M65) – Skipton - LBA – M1 east of Leeds (former Option 4); and
- **Red:** Colne (M65) – Skipton - LBA – Leeds outer ring road – M62 (former Option 6).

The four short listed options were modelled using the TPS RTM which covers the Core Study Corridor and Wider Study Area. This model contains an average hour for the: (i) AM Peak, defined as 07:00-10:00, (ii) Inter-peak, defined as 10:00-16:00, and (iii) PM Peak, defined as 16:00-19:00. The options were assessed for a notional opening year of 2041, with a fixed trip assessment (i.e. no change in the Do Minimum highway matrices as a consequence of the scheme). A preliminary economic appraisal was undertaken to identify which alternatives were to be progressed. Further details on the methodology and results are provided in the Preliminary Analysis Report (PAR), with a summary of the key findings in this section.

Table 2.9 summarises the journey time savings between economic centres. This highlights that the majority of routes provide an improvement to the Do Minimum situation during the AM Peak, Inter-peak and PM Peak. The level of improvement is most significant between Leeds and Lancaster with a journey time saving of 9-15%, except for the Pink option. Whilst the Orange, Purple and Red options generate small journey time savings between Warrington and York, the Pink option averages a 13% saving in the AM Peak, Inter-peak and PM Peak. The route between Preston and Sheffield experiences journey time savings of 1-3% across the time periods and options.

Table 2.9: Journey Time Savings between Economic Centres (2041)

Route	AM Peak (mins)				Inter-Peak (mins)				PM Peak (mins)			
	Orange	Pink	Purple	Red	Orange	Pink	Purple	Red	Orange	Pink	Purple	Red
Lancaster to Leeds	-12	-1	-14	-10	-13	-2	-14	-9	-13	-5	-14	-14
Leeds to Lancaster	-15	-1	-15	-14	-13	0	-13	-10	-15	-1	-15	-13
Warrington to York	-5	-16	-2	-1	-4	-13	-4	-2	-5	-11	-2	-1
York to Warrington	-3	-11	-1	0	-2	-2	-1	-1	-4	-4	-2	-1
Preston to Sheffield	-2	-1	-2	-2	-1	-1	-1	-1	-1	0	0	-1
Sheffield to Preston	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-2	-1

All four options potentially provide relief to existing Trans Pennine routes, particularly the M62 which is the only strategic dual carriageway providing east-west connectivity across the Pennines. **Table 2.10** shows the M62 journey time savings, between Leeds City Centre and Manchester City Centre, under the four options and indicate a traffic reduction to varying extents across the options. The eastbound time saving was greatest in the three time periods and across the four options.

Table 2.10: Journey Time Savings on M62 (2041)

Time Period	Orange (mins)	Pink (mins)	Purple (mins)	Red (mins)
AM Peak (westbound)	+1	0	-2	+2
AM Peak (eastbound)	-2	-2	-2	0
Inter-Peak (westbound)	-2	-2	-2	0
Inter-Peak (eastbound)	-2	-3	-3	-4
AM Peak (westbound)	-1	-1	0	0
AM Peak (eastbound)	-11	-9	-4	-7

Transport User Benefit Appraisal (TUBA) and Wider Impacts in Transport Appraisal (WITA) software has been used to assess the Level 1 and Level 2 economic benefits for the four short listed options. **Table 2.11** summarises the results and shows the Purple option ranked first.

Table 2.11: Indicative Economic Benefits (£m)

Time Period	Orange	Pink	Purple	Red
PVB – TUBA	2,536.4	1,977.8	2,561.2	2,031.6
PVB – WITA	2,537.5	2,249.5	2,982.9	2,373.6
PVB – Total	5,073.9	4,227.2	5,544.1	4,405.2
Rank	2	4	1	3

A high level Red-Amber-Green (RAG) rating for the four short listed options against the scheme objectives was also undertaken, as shown in **Table 2.12**. This highlights the options were assessed consistently for the Environmental objectives. With regards to Connectivity, the Pink option was the weakest, although it was the only option to receive a Green rating for Objective A3. The Pink option also scored weakest for the Economic Growth objectives; the remaining three options received a Green rating for the three objectives, but the Pink option received two Amber ratings. Finally, with regards to Highways Performance, the Red option received an Amber rating for two of the objectives, whereas the remaining options received Green for all of the objectives.

Table 2.12: Scheme Objective Assessment

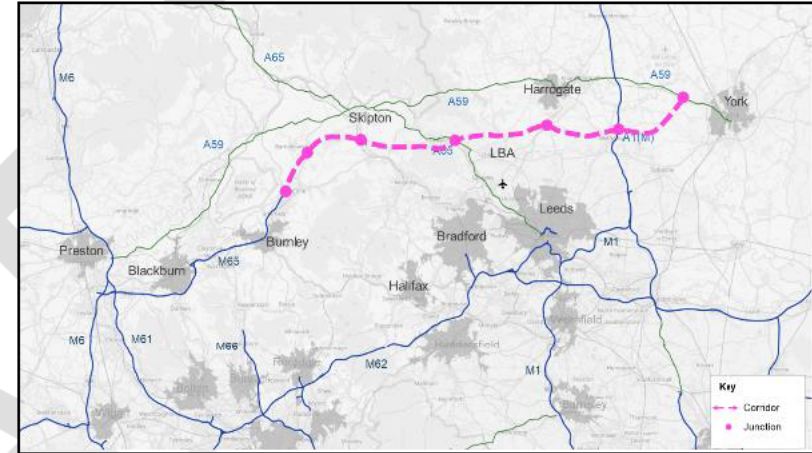
Objective		Orange	Pink	Purple	Red
Connectivity	A1: Improve connectivity between important economic centres east and west of the Pennines to increase growth and productivity				
	A2: Reduce Trans Pennine journey times, including for freight				
	A3: Maintain and improve access for tourism and local communities in the Yorkshire Dales National Park and the Bowland and Nidderdale Areas of Outstanding Natural Beauty (AONB)				
	A4: Improve access to international transport hubs and gateways such as Leeds Bradford Airport				
Economic Growth	B1: Support the economic growth of the Northern Powerhouse economy, in particular, the prime and enabling sectors as set out in the North's Independent Economic Review				
	B2: Support the regional growth aspirations of East Lancashire and North and West Yorkshire by facilitating new economic development opportunities along existing developed corridors where poor connectivity currently impacts on growth and productivity				
	B3: Improve accessibility from economically deprived areas in the corridor (East Lancashire and West Yorkshire) to centres of employment, education and training				
Network Performance	C1: Improve journey time reliability for all road users				
	C2: Improve road safety, including for non-motorised users				
	C3: Improve access for non-motorised users and reduce severance for local communities				
	C4: Reduce congestion on Trans Pennine routes				
	C5: Improve the resilience of strategic Trans Pennine routes to severe weather events and other incidents				
Environment	D1: Minimise adverse impacts on the built and natural environment				
	D2: Optimise opportunities to enhance the built and natural environment				
	D3: Reduce the impact of traffic on local communities				

Figure 2.35: Four Short Listed Options

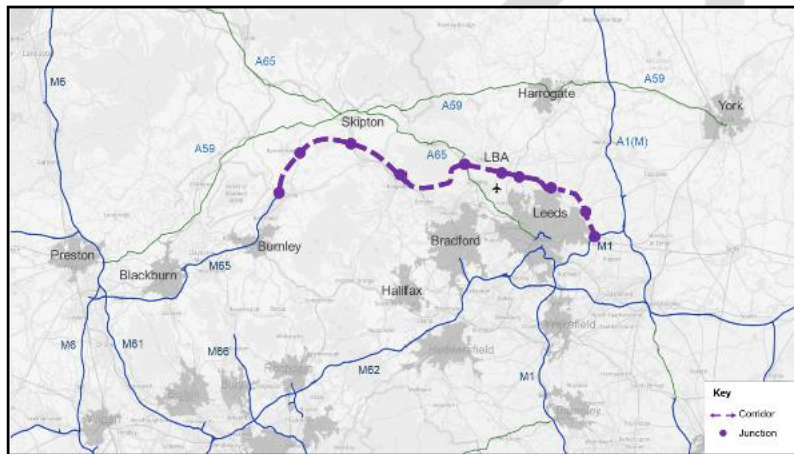
Orange



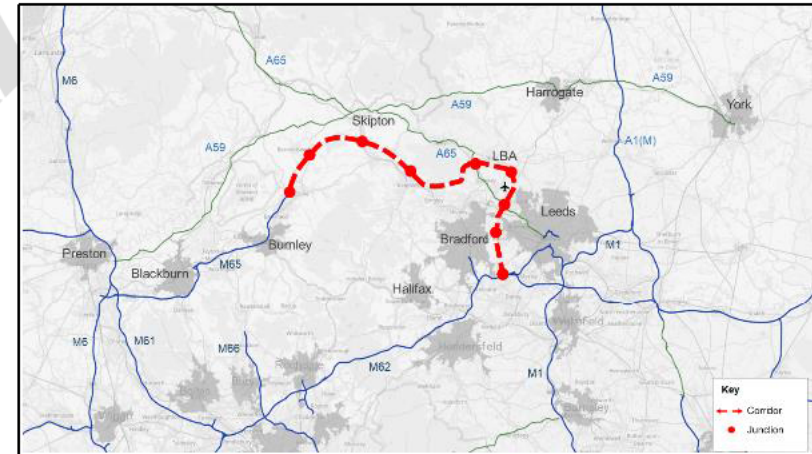
Pink



Purple



Red



The assessment of the four short listed options resulted in the Orange and Purple options being recommended for the further development and analysis. These options are expected to generate the highest benefits (Table 2.11) and performed strongest against the scheme objectives (Table 2.12).

2.9 Scope

This explains what the project will deliver and also what is out of scope. At SOBC stage, this should be completed.

At PCF Stage 0 the project has not identified a specific scheme but an indicative option alignment for further development during PCF Stage 1 and 2. Consequently, at this stage, the scope of the project considers the indicative corridor for the Orange and Purple options, which share the alignment between Colne and north Leeds. Prior to progressing the options, both were reviewed which resulted in amends to the alignments:

- It was decided to progress two variants for the eastern extent of the Orange option: (i) terminating at the A1(M) on the SRN (Orange Short) and (ii) extending beyond this to the A64, East of Tadcaster as shown in Figure 2.35 (Orange Long).
- The Purple option was amended to include a tie-in with the A1(M) rather than M1. This is because the East Leeds Orbital Route (ELOR) scheme will connect the outer ring road at Red Hall around the east side of Leeds to join the new Manston Lane Link Road and connection with Junction 46 of the M1. Therefore, the Purple option was amended to include a junction with the ELOR and onward connectivity to the A1(M).

This resulted in three options being progressed: (i) Orange Short, (ii) Orange Long and (iii) Purple. These are illustrated in Figure 2.36.

Figure 2.36: Option Corridors

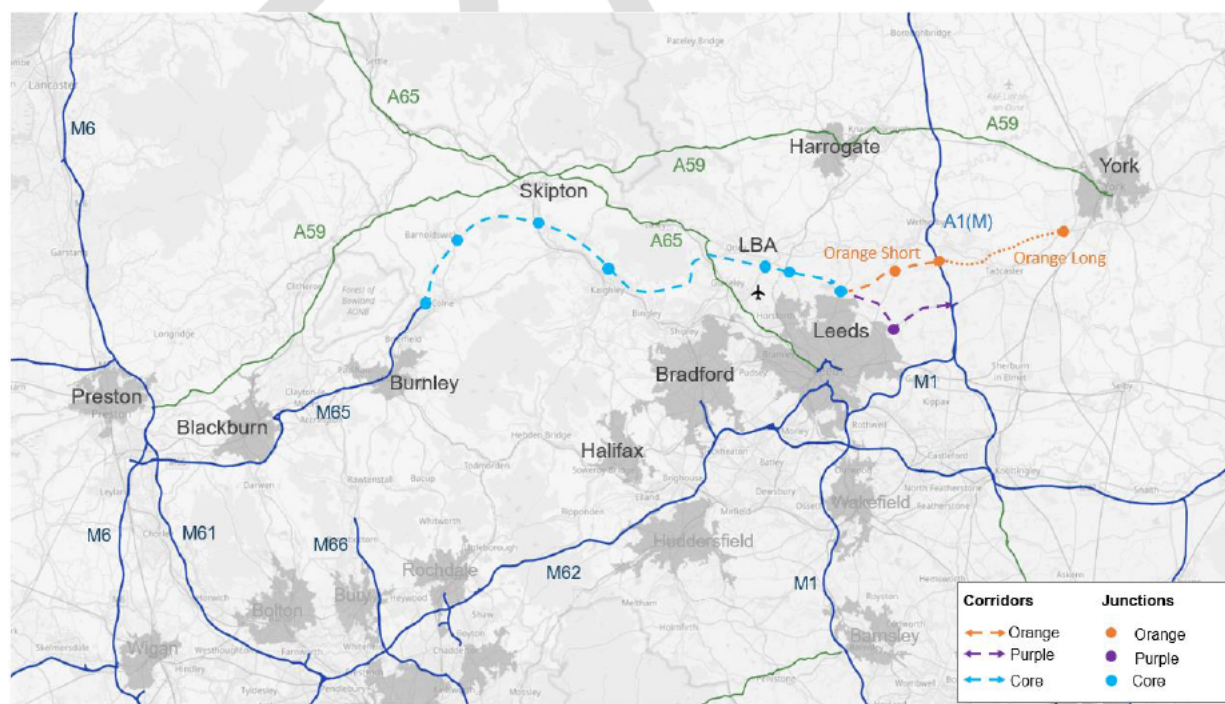


Figure 2.36 shows the three options share a Core section with each option having a different tie-in to the east of Leeds:

- **Blue Core:** This core section provides the connection with the M6 via the existing M65. From the eastern end of the M65, near Colne, the route passes through Skipton, Keighley to LBA and north Leeds;
- **Orange Short Variant:** This variant includes a junction with the A1(M);
- **Orange Long Variant:** This variant includes a junction with the A1(M) and A64 (near York); and
- **Purple Variant:** This variant includes a junction with the ELOR and dualling of the existing A64 to the A1(M).

For ease of reporting, each option refers to the Blue Core and one of the three variants i.e. the Orange Short option refers to the Blue Core and Orange Short Variant, the Orange Long option refers to the Blue Core and Orange Long Variant, whilst the Purple option refers to the Blue Core and Purple Variant.

An overview of the assumed scope of the options, highlighting the indicative length of dual to all purpose (D2AP) road, likely number of structures required, and expected length of tunnel required for different sections of the route is provided in **Table 2.13**. It is important to note this is based on indicative high level option alignment at this stage (PCF Stage 0).

Table 2.13: Indicative Characteristics, by Section (based on High Level Design Only)

Orange (Short & Long) / Purple Option			Section Description	D2AP Length	Structures	Length of Tunnel	Culverts	New Junctions	Cut Volume	Fill Volume
				(km)	(n)	(km)	(n)	(n)	(m ³)	(m ³)
			Colne to A629 Skipton	19.6	21	n/a	20	2	1,256,360	844,933
			A629 Skipton to A658 LBA	28.4	29	3.6	16	3	1,185,516	2,595,328
			A658 LBA to A1(M)	20.2	25	n/a	7	3	877,159	1,478,049
			A1(M) to A64 (Tadcaster)	10.4	12	n/a	4	1	210,396	211,818
			A658 LBA to A64	17.4	17	n/a	8	3	829,272	1,476,334
			A64 Dualling	7.0	1	n/a	2	3	77,822	445,310

2.10 Interdependencies

This specifies the internal and external factors upon which the successful delivery of the project are dependent. At SOBC stage, this should be outlined with initial findings.

Successful delivery of the project is dependent on a number of internal and external factors. **Table 2.14** summarises the known project dependencies and schemes which have synergy with the project, albeit delivery of the M6 to A1(M) project is not necessarily dependent.

Table 2.14: Scheme Interdependencies

Aspect	Dependency / Synergy with M6-A1(M) Project
Dependencies	
Funding	The costs associated with the development and construction of this project are significant. Securing funding will be important to the progression of the project.
Business Case Approval	To secure any government funding, the DfT Transport Business Case process will need to be adhered to. Following this SOBC, there is the need to produce an OBC and Full Business Case (FBC).
Political Support	Political support from local, regional and national leaders will need to be obtained to ensure that the scheme fits within the investment priorities. For example, a change in the level of political support is likely to impact on the progression of the project. In addition, with the Climate Emergency declaration and the preparation of the TDP later in 2020 there is likely to be greater challenge regarding the environmental implications of the project which could influence political support.
Stakeholder and Public Support	Strong stakeholder and public support are imperative for the project to progress. Subsequent PCF stages include stakeholder and public consultation.
Regulatory Approvals	Due to the development value and project significance, it is expected that project would classify as a 'Nationally Significant Infrastructure Project (NSIP)' as set out in the Planning Act 2008 and would require a Development Consent Order (DCO) from the Planning Inspectorate to proceed. The planning requirements will be determined at PCF Stage 1 and 2 as planning approval will need to be secured for the project.
East Leeds Orbital Route (ELOR)	The ELOR will connect the Outer Ring Road at Red Hall around the east side of Leeds joining the new Manston Lane Link Road and connecting with Junction 46 of the M1. The Purple option includes a junction with the ELOR.
Synergies	
Skipton – Colne Rail Link	There has been substantial interest in re-opening the Skipton-Colne rail link, a 12-mile section of track that would reduce the need for passengers to undertake much longer, indirect routes between the two stations. In

Aspect	Dependency / Synergy with M6-A1(M) Project
	October 2019, a Westminster Hall debate on the proposed reinstatement was held, which made reference to support from TfN and ongoing feasibility work by Network Rail ¹⁹ . There is, therefore, potential for the scheme to support access to the rail link but it is also important to understand how the rail link could affect changes in travel patterns.
Northern Powerhouse Rail (NPR)	NPR is a major rail programme across the Northern to significantly enhance rail services. This will impact movements within and across the <i>Core Study Corridor</i> so will need to be considered during scheme development.
Road Investment Strategy (RIS) Schemes	RIS2 references the M6 to A1 study as one of the strategic studies to address some of the biggest challenges facing the highway network. It will also be important for the project to consider other road improvements that could impact on traffic flows, capacity and level of service within the <i>Core Study Corridor</i> during scheme development.
Leeds Bradford Airport (LBA) Surface Access	The project would significantly improve surface access to/from LBA. Enhanced east-west connectivity will widen the catchment area and support wider economic growth. The airport is considering opportunities to improve surface access so this will need to be considered during scheme development.
Transport Decarbonisation Plan (TDP)	The TDP is due to be published later in 2020 and will set out how the UK intends to become 'carbon neutral' by 2050. The project will need to consider the findings of the plan and any implications for scheme development.

2.11 Stakeholders and Delivery Partners

This outlines the main stakeholder groups and their contribution to the project. Any potential conflicts between different stakeholder groups and their demands are also noted. At SOBC stage, this should be outlined with initial findings.

Table 2.15 identifies the key stakeholders expected to have interest in the M6 to A1(M) scheme and this distinguishes between those who are Delivery Partners and those who are wider stakeholders. A Stakeholder Plan was prepared in October 2019 which details how each stakeholder will be engaged and how often this will take place.

¹⁹ It is understood this feasibility work has subsequently been completed but a decision on whether the project should move to the next stage in the Rail Network Enhancements Pipeline process has not been announced.

Table 2.15: Key Stakeholders and Delivery Partners

Organisation	Interest
Delivery Partners	
Highways England	Highways England are responsible for operating, maintaining and improving England’s motorways and major A roads. Highways England have identified the need to explore the potential for alternatives to enhance connectivity between the M6 and A1(M) and will be seeking to progress the preferred option(s).
Department for Transport (DfT)	DfT are responsible for the strategic direction of the transport network and funding of improvement schemes in the country. They work alongside local authorities to maintain the road networks and help develop new transport schemes. Their interest will concern the boost the scheme will have to the local and national economy as well as the improvement to journeys for people, businesses and freight.
Transport for the North (TfN)	TfN are England’s first sub-national transport body, a partnership of the North’s 20 local transport authorities as well as business leaders. The body also works alongside Highways England, Network Rail, HS2 Ltd and Central Government. With regards to this scheme, engagement with TfN will ensure that the requirements of local authority Delivery Partners is taken into consideration, as well as statutory regional transport intelligence and advice, during the development process.
Local Transport and Highway Authorities in Study Area	Local transport and highway authorities are a potential Delivery Partner and as well as understanding the impact on strategic movements, these authorities will be interested in the local impact for their authority and integration between a new road and the existing network.
Wider Stakeholders	
Statutory Bodies	Several government-appointed bodies (e.g. Environment Agency and English Heritage) will need to be consulted for comments and advice surrounding any future development plans in the <i>Wider Study Area</i> and the potential impacts of the preferred option as it is refined and developed.
Local Authorities	Local authorities which have interest in the scheme include metropolitan districts, unitary authorities, county and district councils, as well as town and parish councils. Due to their delivery of vital services to people and businesses in the study area, local authorities’ interest in the scheme will place an emphasis on how it will impact communities.

Organisation	Interest
Freight Representative Groups	Groups representing the freight and logistics sector, for example, Freight Transport Association (FTA) and Road Haulage Association (RHA) will be an important stakeholder to ensure the needs of this industry are reflected, as well as keeping businesses up-to-date with the proposed improvements in the <i>Core Study Corridor</i> . This will need to reflect the multi-modal nature of the freight industry and consider rail, maritime and air freight operators, as well as road freight operators.
Airports	Engagement with the major airports (LBA, LPL, MAN) within the <i>Core Study Corridor</i> will support the integration of the proposed highway networks with international movements by air.
Community / Local Residents	Communities and local residents, especially those who live in the <i>Core Study Corridor</i> and whom would be directly impacted, will need regular engagement and consultation as the scheme progresses and during construction.

DRAFT

3 ECONOMIC CASE

3.1 Introduction

The Economic Case relates to the establishment of Value for Money (VfM) following the development of a scheme Benefit Cost Ratio (BCR). At the SOBC stage, DfT guidance states that the Economic Case should:

- set out the approach to assessing VfM (including assumptions to be used);
- list the options to be appraised (as identified in the Strategic Case); and
- provide an initial outline of the Appraisal Summary Table (AST) and VfM Statement.

3.2 Options Appraised

This presents a list of the options (as set out in the Strategic Case) that have been appraised. At SOBC stage, this should be completed.

The Strategic Case identified three options (Orange Short, Orange Long and Purple) as being taken forward for economic appraisal. These options were shown in **Figure 2.36** and highlight the following discrete sections:

- **Blue Core:** This core section provides the connection with the M6 via the existing M65. From the eastern end of the M65, near Colne, the route passes through Skipton and Keighley to LBA and north Leeds. This section features in all three options;
- **Orange Short Variant:** This includes a junction with the A1(M);
- **Orange Long Variant:** This includes a junction with the A1(M) and A64 (near York); and
- **Purple Variant:** This includes a junction with the ELOR and dualling of the existing A64 to the A1(M).

The transport modelling, which is strategic in nature, does not materially distinguish between D2AP and D2M. A common coding set (D2M) was used for all the assessments but with the VfM assessment considering the cost differential. The options have been coded into the Do Minimum network against which they were assessed. The Do Minimum network is the Base 2041 network developed for the Trans Pennine South (TPS) Regional Transport Model (RTM) and includes all RIS schemes and local authority schemes expected to be constructed by 2041. A full list of schemes included in the Do Minimum is included in the Traffic Forecasting Package in the Combined Modelling and Appraisal (ComMA) report.

3.3 Assumptions

This section details the TAG assumptions and any further assumptions used to support the analysis. At SOBC stage, this should be completed.

The approach to the assessment of costs and benefits of the scheme has been undertaken in line with DfT Transport Appraisal Guidance (TAG). This section describes the assumptions behind the modelling and appraisal, whilst the Appraisal Specification Report (ASR) and ComMA report provide a more detailed narrative.

3.3.1 Modelling

All modelling has been undertaken using the TPS RTM, which covers an average hour for the AM peak period (0700 – 1000), Inter-peak period (1000 – 1600) and PM peak period (1600 – 1900).

The structure of the model in terms of zonal definition and fixed speeds in urban areas remains unchanged from the version originally developed. Necessary corrections to network coding identified during other recent studies have been retained.

The model base year is 2015. The model has been produced for one forecast year (2041) and growth is derived from National Trip End Model (NTEM) central forecasts.

The ASR identifies the limitations of the modelling approach. An Analytical Assurance Statement has also been produced by Highways England and a summary of the Analytical Assurance Statement is provided in **section 3.8.2**.

3.3.2 Appraisal

Scheme costs and benefits were profiled over a 60-year appraisal period to establish the monetised VfM of the two M6 to A1(M) options taken forward. This approach follows a standard appraisal framework and aligns with DfT's economic appraisal guidance. A summary of the key appraisal assumptions are provided below:

- All options were assumed to have an opening year of 2041 and this is the only modelled year;
- Benefits have been calculated through Transport User Benefits Appraisal (TUBA) and Wider Impacts in Transport Appraisal (WITA) for the 60-year period starting in 2041, assuming that there will be no further traffic growth beyond the opening year;
- Costs were prepared by Highways England Commercial based on drawings and design assumptions provided; and
- It was assumed the route would be split into four or five sections which would be constructed sequentially between 2029 and 2043 with route sections open to traffic as they were completed. Therefore, benefits on completed sections would be realised prior to the assumed 2041 opening year but the benefits from this construction profile could not be captured.

The ASR identifies the limitations of the economic appraisal approach. An Analytical Assurance Statement has also been produced by Highways England, following the review of the appraisal deliverables prepared alongside the SOBC. A summary of the Analytical Assurance Statement is provided in **section 3.8.2**.

3.3.3 Present Value of Benefits

The Present Value of Benefits (PVB) is derived from the modelling and TUBA outputs for user time savings and WITA software outputs for the wider economic benefits of the scheme.

Single values for user time savings representing the 60-year appraisal period have been extracted from the TUBA output files so no further manipulation is required as they have already been through a TAG compliant process.

WITA software was used to identify the wider economic benefits of the scheme and included (i) agglomeration, (ii) market competition and (iii) labour supply. As these values were generated through a TAG compliant process no further manipulation is required.

Table 3.1 provides a summary of the approach used to appraise the benefits of each option at this stage. Should the scheme progress through the PCF process, there will be an opportunity to explore the monetisation of other benefits.

Table 3.1: Benefits Assessment Approach

		Type	Method
Economy	Business Users and Transport Providers	Monetised	TUBA
	Reliability Impact on Business Users	Qualitative	-
	Regeneration	Qualitative	-
	Wider impacts	Monetised	WITA
Environment		Qualitative	-
Society		Qualitative	-

3.3.4 Present Value of Costs

The Present Value of Costs (PVC) has been derived from the capital costs as well as indirect tax revenues. No ongoing and renewal costs have been produced so these are not included within the PVC.

The capital costs were prepared by Highways England Commercial, with a 2016 price base, based on the network specification provided by AECOM. These capital costs included a risk value and the risk value for the options is 20.7% of the cost (exc. inflation). No optimism bias has been included because the costing has taken a bottom-up approach with allowances for project and portfolio risk – this is in line with current Highways England practice for schemes using costs prepared by Highways England Commercial.

The development of scheme costs are strategic estimates at the early stages based on the level of scheme design and high level understanding of constraints. No detailed Quantitative Risk Assessment (QRA) has been undertaken.

The costs were assumed to be incurred over a 17-year construction period between 2028 and 2046. This length of construction period was assumed based on the length of the route and extent of transformation. To prepare the costs for the economic appraisal, the costs were adjusted to 2010 prices and discounted to 2010 values. **Section 4** presents the assumed cost profile.

3.4 Analysis of Monetised Costs and Benefits

3.4.1 Monetised Transport Benefits

Figures 3.1 to 3.3 show the 2041 AADT flows along the options and this highlights the highest flows occur between the A65 and north Leeds with eastbound flows of 43,000-44,000 and westbound flows of 38,000-39,000 in 2041. Meanwhile, AADT flows on the Orange Long

option between the A1(M) and York fall to 12,000 (eastbound) and 11,000 (westbound) respectively which is considerably lower than the rest of the route.

Figure 3.1: 2041 AADT – Orange Short Option

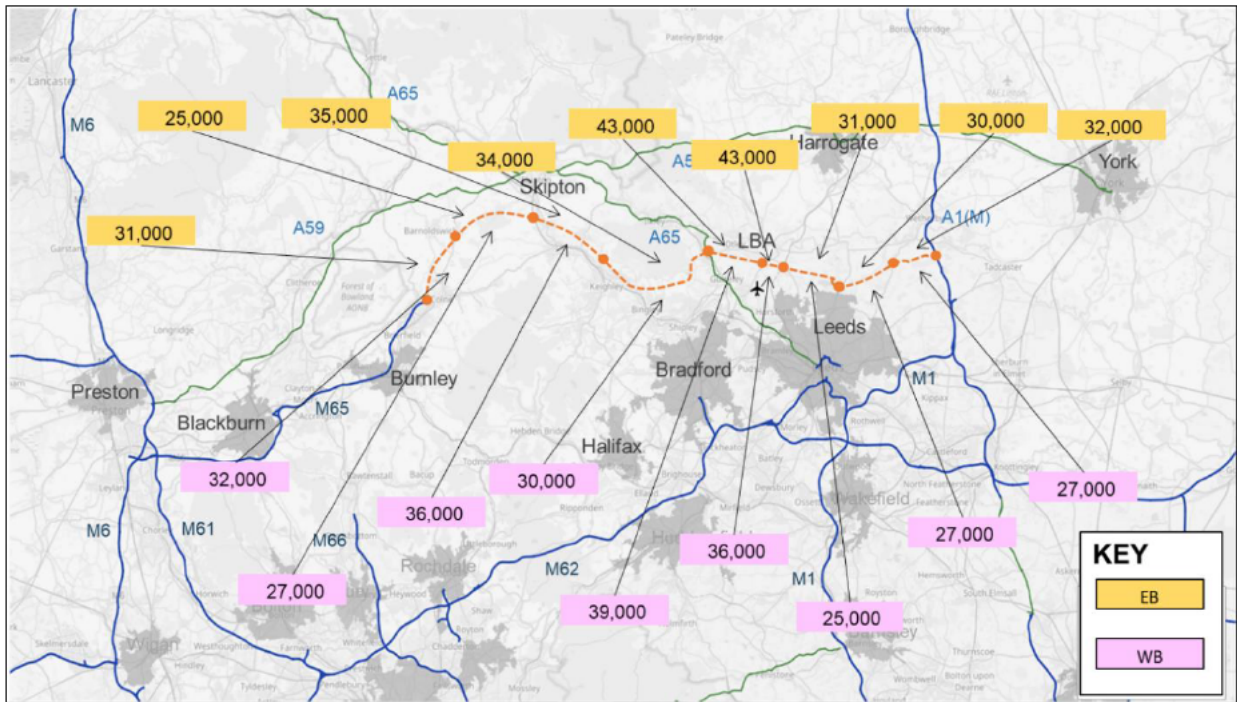


Figure 3.2: 2041 AADT – Orange Long Option

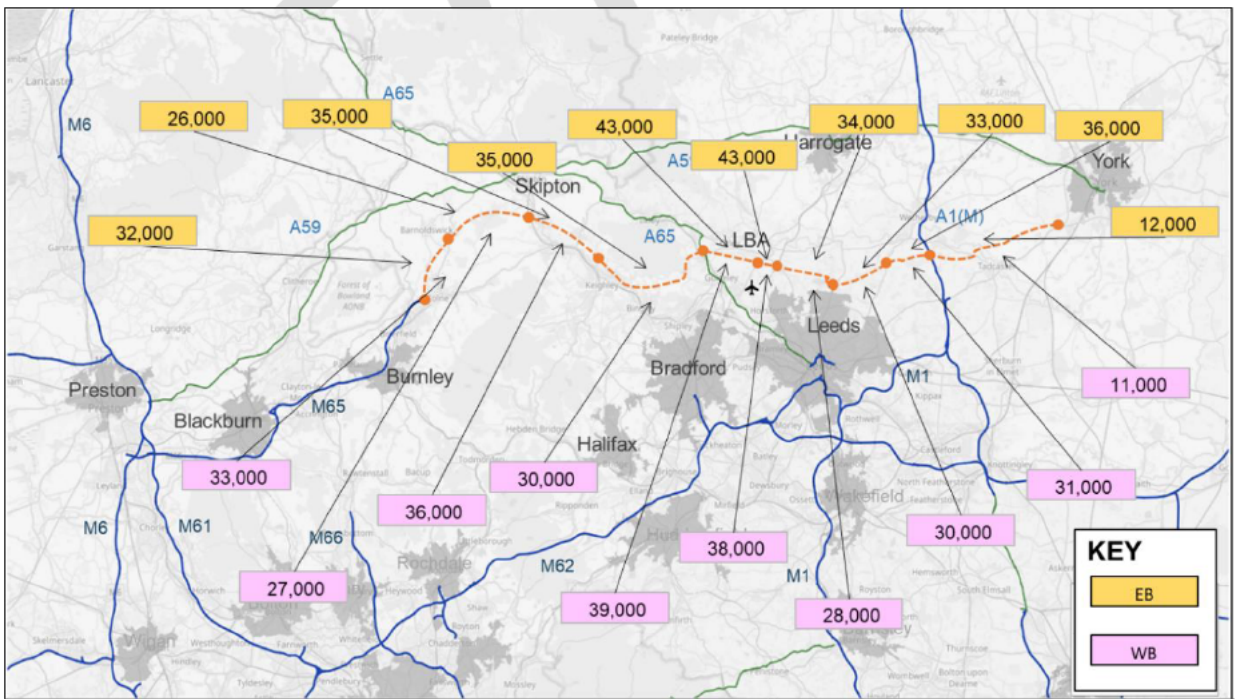
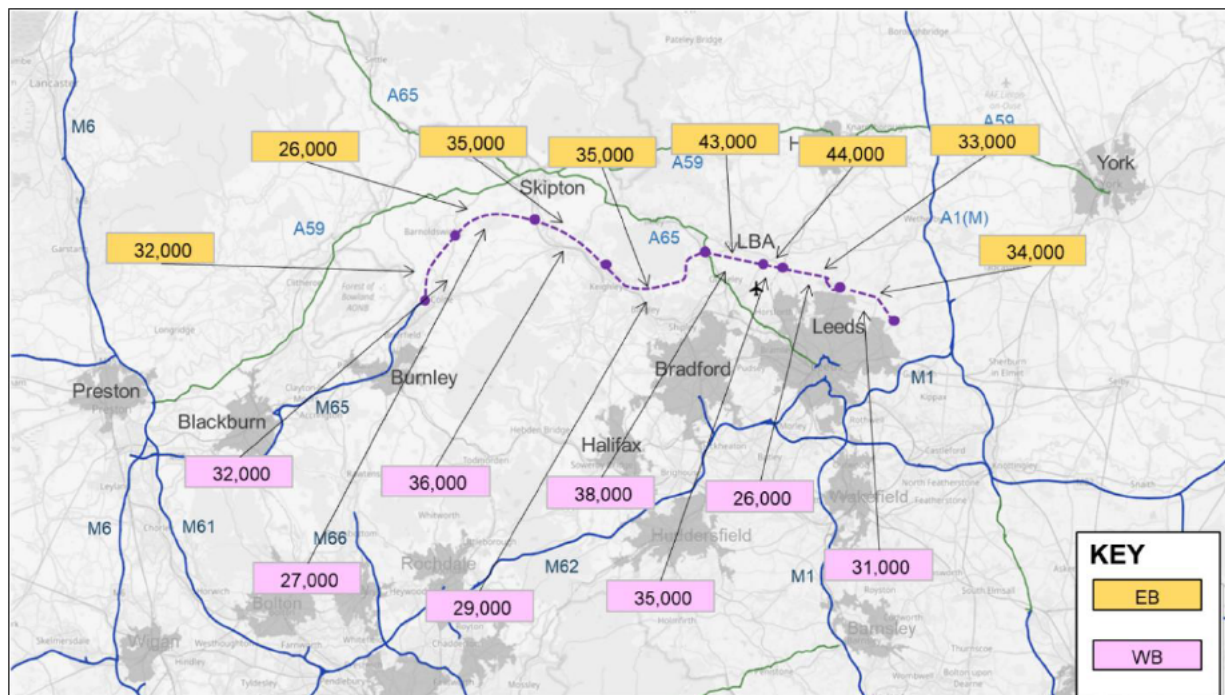


Figure 3.3: 2041 AADT – Purple Option



The change in journey times between key centres during the AM and PM peak are shown in Table 3.2. All options perform similarly with the Orange Long option delivering marginally better journey times compared with the Do Minimum. Journey time improvements of approximately 30 minutes compared with the Do Minimum were identified for all options along the Preston to York route during the AM and PM peak, this was slightly better for the Orange Long option reflecting the alignment. There were more marginal journey time improvements for the Leeds to Preston and Harrogate to Liverpool routes during the AM and PM peak, with the Purple journey time for the latter slightly longer during the AM peak.

Table 3.2: Journey Times

	Do Min (mins)	Orange Short (mins)	Orange Long (mins)	Purple (mins)
AM Peak				
Preston to York	140.0	110.4 (-29.6)	105.6 (-34.5)	109.0 (-31.0)
York to Preston	140.1	114.1 (-26.1)	110.4 (-29.8)	115.2 (-25.0)
Preston to Leeds	110.5	89.3 (-21.3)	89.8 (-20.8)	89.3 (-21.2)
Leeds to Preston	90.8	89.0 (-1.8)	89.2 (-1.7)	88.8 (-2.0)
Liverpool to Harrogate	158.8	149.6 (-9.3)	149.9 (-9.0)	155.6 (-3.2)
Harrogate to Liverpool	159.5	159.4 (-0.1)	159.3 (-0.2)	159.9 (0.1)
PM Peak				
Preston to York	135.4	106.9 (-28.5)	102.8 (-32.5)	106.3 (-29.1)
York to Preston	143.0	119.9 (-23.1)	116.3 (-26.7)	120.6 (-22.4)

	Do Min (mins)	Orange Short (mins)	Orange Long (mins)	Purple (mins)
Preston to Leeds	100.7	87.3 (-11.4)	87.5 (-13.2)	87.4 (-13.3)
Leeds to Preston	100.4	95.6 (-4.8)	96.0 (-4.4)	95.4 (-5.0)
Liverpool to Harrogate	158.5	147.9 (-10.6)	148.1 (-10.4)	155.0 (-3.5)
Harrogate to Liverpool	157.2	156.6 (-0.6)	156.5 (-0.7)	156.4 (-0.8)

N.B. The difference in journey time to the Do Minimum is shown in grey italics for each option.

The Transport Economic Efficiency (TEE) table incorporates the monetised benefits from the TUBA to consider the benefits to the users of the transport system. The TEE table (**Table 3.3**) is split into Commuting, Other and Business sections to reflect and distinguish the benefits and costs for different user groups.

Table 3.3: TEE Table (2010 prices and values, £ million)

		Orange Short	Orange Long	Purple
Consumer - Commuting	Travel time	£225.5	£276.2	£220.7
	Operating costs	-£30.2	-£30.4	-£25.7
	Total	£195.3	£245.8	£195.0
Consumer - Other	Travel time	£250.2	£239.2	£254.4
	Operating costs	-£88.1	-£95.5	-£83.3
	Total	£162.1	£143.7	£171.1
Business - Personal	Travel time	£1,159.8	£1,227.8	£1,163.8
	Operating costs	-£6.0	-£2.5	£11.4
	Total	£1,153.8	£1,225.3	£1,175.2
Business - Freight	Travel time	£223.2	£242.7	£242.9
	Operating costs	£1.1	£3.2	£11.0
	Total	£224.3	£246.0	£253.9
Total	PV of TEE	£1,735.5	£1,860.8	£1,795.3

3.4.2 Monetised Wider Economic Benefits

WITA software has been used to assess the wider economic benefits of each option. The ComMA presents the breakdown of WITA benefits between (i) agglomeration, (ii) labour supply, and (iii) imperfect markets for the three options. This highlighted the majority of wider economic benefits were associated with agglomeration **Figures 3.4 to 3.6** show the benefits, by local authority, and highlights Bradford and Leeds experience the majority of the benefits, followed by Pendle and Calderdale, in each option.

Figure 3.4: Wider Economic Benefits – Orange Short Option

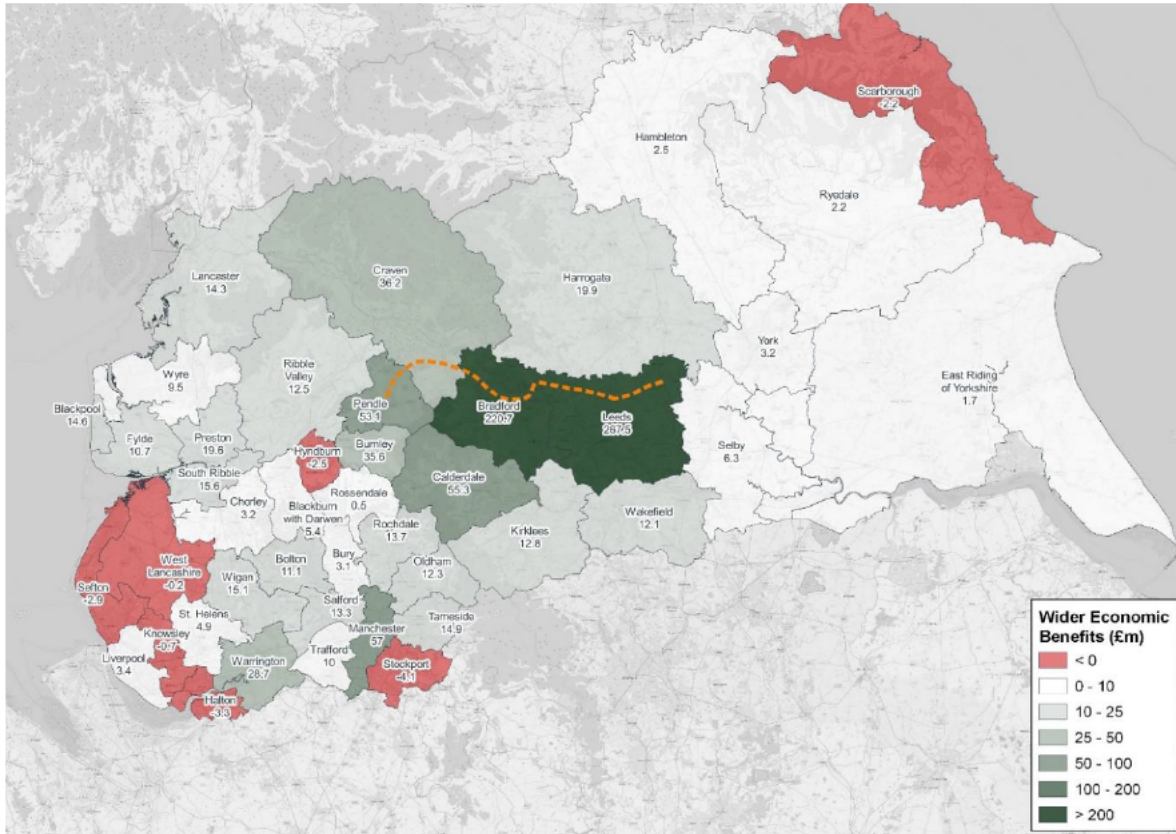


Figure 3.5: Wider Economic Benefits – Orange Long Option

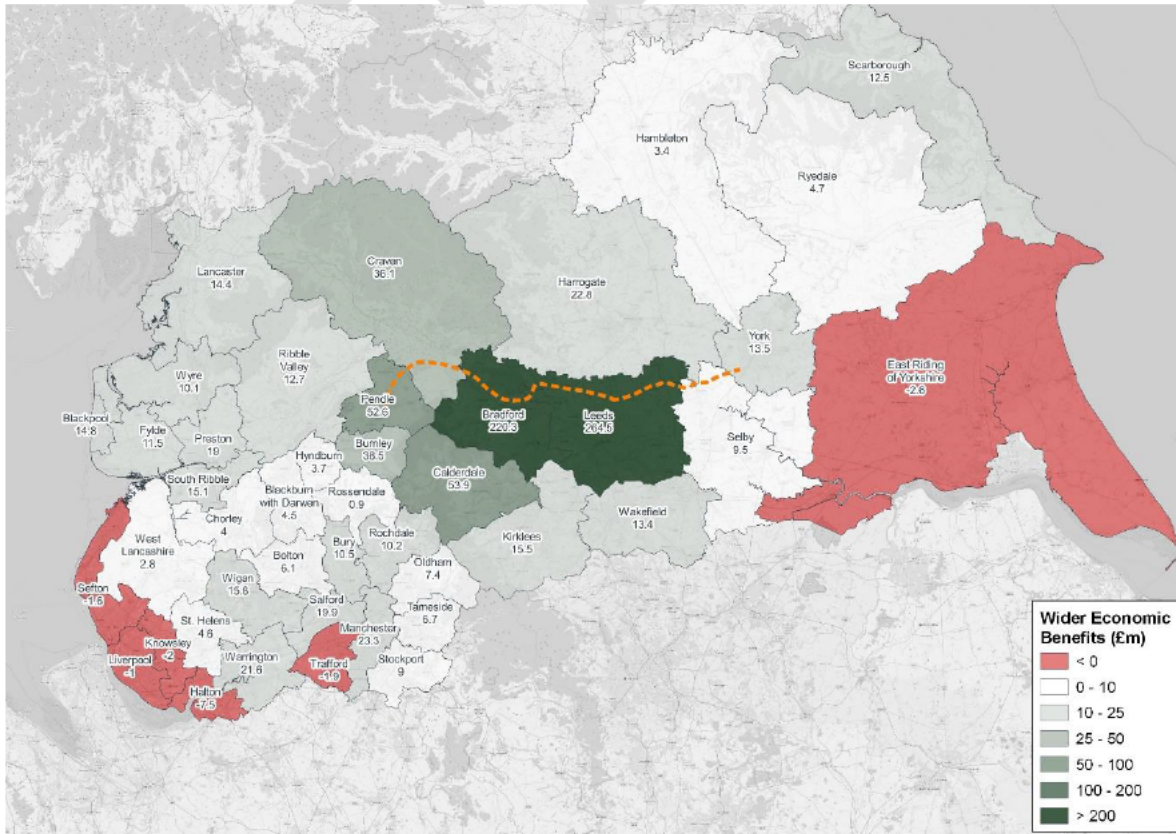
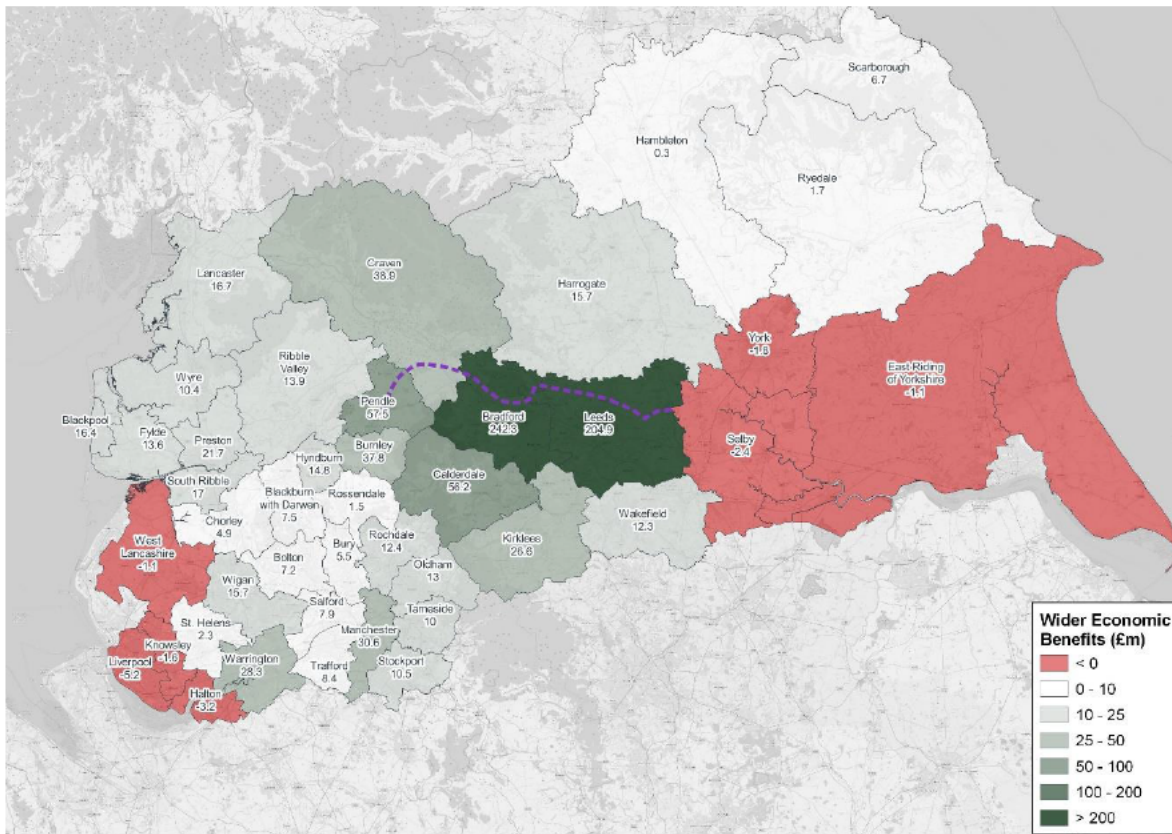


Figure 3.6: Wider Economic Benefits – Purple Option



3.4.3 Scheme Costs

The capital costs for each option are shown in **Table 3.4**, in 2016 prices, including the assumed inflation and risk. This highlights the Orange Long option has a higher cost of £13.7bn, whilst the Purple option is £12.7bn and the Orange Short option is £12.5bn.

The Financial Case (**section 4**) provides a breakdown of the capital costs and highlights minimum, maximum and most likely costs were produced for both options, with the latter used in the economic appraisal.

Table 3.4: Capital Costs (Q1 2016 prices, £ million)

	Orange Short	Orange Long	Purple
Cost	£5,408	£5,952	£5,502
Inflation	£6,006	£6,550	£6,088
Risk	£1,119	£1,227	£1,137
Total	£12,533	£13,728	£12,727

3.4.4 Public Accounts

The economic appraisal considers the effects on Public Accounts (PA) for the appraisal period and this is shown in **Table 3.5** for both options. The costs provided by Highways England Commercial (in 2016 price year) were treated in line with TAG. This included the costs being

profiled over the construction period (with significant expected activity beyond 2030), adjusted to 2010 prices and discounted to 2010 values.

Table 3.5: PA Table (2010 prices and values, £ million)

	Orange Short	Orange Long	Purple
Central Government Investment Cost	£2,931.3	£3,230.0	£2,986.4
Indirect Tax Revenue	-£115.1	-£123.8	-£107.9
Broad Transport Budget	£2,931.3	£3,230.0	£2,986.4
Wider Public Finances	-£115.1	-£123.8	-£107.9

3.4.5 Analysis of Monetised Costs and Benefits

A summary of the Analysis of Monetised Costs and Benefits (AMCB) Table is provided in **Table 3.6**. This compiles the monetised costs and benefits to determine the following:

- Present Value of Costs (PVC);
- Present Value of Benefits (PVB);
- Net Present Value (NPV) which is calculated by subtracting the PVC from PVB; and
- Benefit Cost Ratio (BCR) which is determined by dividing the PVB by the PVC.

The BCR indicates how much benefit is obtained from one unit of cost, with a BCR greater than one demonstrating that the benefits outweigh the costs. The VfM category is determined by the BCR, but it is important to note this excludes non-monetised benefits:

BCR < 0	0 < BCR < 1	1 < BCR < 1.5	1.5 < BCR < 2	2 < BCR < 4	BCR > 4
Very Poor	Poor	Low	Medium	High	Very High

Table 3.6 shows the options have an adjusted BCR (i.e. with wider economic benefits) around 1 which reflects Poor VfM. The adjusted BCR for the Purple option is 1.00, whilst the Orange Long option has a BCR of 0.95 and the Orange Short option is slightly higher at 1.01. The monetised benefits for all options are very similar, so it is the difference in scheme costs driving the variation in BCR.

Table 3.6: Analysis of Monetised Costs and Benefits (AMCB) Table (£ million)

	Orange Short	Orange Long	Purple
PVB: TUBA	£1,850.6	£1,984.6	£1,903.2
PVC	£2,931.3	£3,230.0	£2,986.4
Initial BCR	0.63	0.61	0.64
PVB: WITA	£1,099.0	£1,100.0	£1,073.0
PVB: Total	£2,949.6	£3,084.6	£2,976.2
Adjusted BCR	1.01	0.95	1.00
VfM	Poor	Poor	Poor

3.5 Sensitivity and Risk Profile

This sets out how changes in different variables affect the Net Present Value / Net Present Cost. The risk profile should show how likely it is that these changes will happen. No requirements are identified at SOBC.

There are no requirements for sensitivity testing at SOBC stage. Whilst no sensitivity testing of cost and demand have been undertaken, an alternative option has been considered. The appraisal assumed D2AP road type, but costs were also prepared for D2M. As shown in Table 3.7, this increases the scheme cost and therefore lowers the BCR for all options.

Table 3.7: Alternative D2M Option Summary (£millions)

	PVB (TUBA)	PVB (WITA)	PVB (Total)	PVC	Adjusted BCR	VfM
Core Option (D2AP)						
Orange Short	£1,850.6	£1,099.0	£2,949.6	£2,931.3	1.01	Poor
Orange Long	£1,984.6	£1,100.0	£3,084.6	£3,230.0	0.95	Poor
Purple	£1,903.2	£1,073.0	£2,976.2	£2,986.4	1.00	Poor
Alternative Option (D2M)						
Orange Short	£1,850.6	£1,099.0	£2,949.6	£3,205.7	0.92	Poor
Orange Long	£1,984.6	£1,100.0	£3,084.6	£3,532.5	0.87	Poor
Purple	£1,903.2	£1,073.0	£2,976.2	£3,270.9	0.91	Poor

3.6 Non-Monetised Benefits

In addition to the benefits identified in the AMCB table, the following non-monetised benefits are also expected:

- Improved journey time reliability;
- Reduction in accidents;
- Greater resilience for east-west movements within the *Core Study Corridor*;

- Improved journey quality;
- Regeneration at locations along the *Core Study Corridor*;
- Enhanced accessibility to key transport hubs;
- Improved access to leisure and tourism facilities (e.g. Yorkshire Dales National Park, Bowland and Nidderdale AONB); and
- Mitigation of deprivation along the *Core Study Corridor*.

3.7 Appraisal Summary Table

Production of an Appraisal Summary Table, as per TAG. At SOBC stage, this should be outlined with initial findings.

A standard approach to the assessment of costs and benefits relating to the scheme has been adopted, in line with DfT guidance. The preparation of an AST provides a summary of the impacts of the scheme against three assessment areas defined in TAG: Environment, Society and Economy. Each of these elements have been ranked on a seven-point scale depending on their level of impact. The ranking system is shown below:

Large Beneficial	Moderate Beneficial	Slight Beneficial	Neutral / No Impact	Slight Adverse	Moderate Adverse	Large Adverse	Very Large Adverse
------------------	---------------------	-------------------	---------------------	----------------	------------------	---------------	--------------------

Table 3.8 summarises the rating against each of the TAG assessment areas for the Orange Short, Orange Long, and Purple options (inclusive of the Core Blue section for all three options). This assessment will be reviewed at later PCF stages. Full TAG compliant tables have been produced in the Benefits Register deliverable.

Table 3.8: AST Summary

TAG Assessment Area		Orange Short	Orange Long	Purple
Economy	Business Users and Transport Providers	Large Beneficial	Large Beneficial	Large Beneficial
	Reliability Impact on Business Users	Moderate Beneficial	Moderate Beneficial	Moderate Beneficial
	Regeneration	Moderate Beneficial	Moderate Beneficial	Moderate Beneficial
	Wider impacts	Moderate Beneficial	Moderate Beneficial	Moderate Beneficial
Environment	Noise	Slight Adverse	Slight Adverse	Slight Adverse
	Local Air Quality	Large Adverse	Large Adverse	Large Adverse
	Greenhouse Gases	Slight Adverse	Slight Adverse	Slight Adverse
	Landscape	Large Adverse	Large Adverse	Large Adverse
	Cultural Heritage	Large Adverse	Large Adverse	Large Adverse
	Biodiversity	Large Adverse	Large Adverse	Large Adverse
	Water Environment	Moderate Adverse	Moderate Adverse	Moderate Adverse
Society	Commuting and Other Users	Moderate Beneficial	Moderate Beneficial	Moderate Beneficial
	Physical Activity	Neutral / No Impact	Neutral / No Impact	Neutral / No Impact
	Journey Quality	Slight Beneficial	Slight Beneficial	Slight Beneficial
	Accidents	Slight Beneficial	Slight Beneficial	Slight Beneficial
	Personal Safety	Neutral / No Impact	Neutral / No Impact	Neutral / No Impact
	Affordability	Slight Adverse	Slight Adverse	Slight Adverse
	Severance	Neutral / No Impact	Neutral / No Impact	Neutral / No Impact
	Access to Public Transport	Neutral / No Impact	Neutral / No Impact	Neutral / No Impact
	Option Values	Neutral / No Impact	Neutral / No Impact	Neutral / No Impact

3.7.1 Economy

Business Users and Transport Providers

The impact on business users and transport providers considers the change in travel times (and resulting impact on travel cost). The impact of the options has been assessed using TUBA and all are expected to deliver benefits for businesses (incl. freight), as detailed in **section 3.4.1**. All options are expected to considerably improve journey times, with time savings of 20-30 minutes between Preston and York during the AM and PM peak when compared with the do-minimum (**Table 3.2**). Whilst the Orange Long option performs slightly better overall, the impact has been assessed as 'Large Beneficial' for all options.

Reliability Impact on Business Users and Transport Providers

The reliability impact of each option on Business Users and Transport Providers the change in variation of journey times that is unable to be predicted. Journey time reliability is particularly important for business and freight deliveries operating with just-in-time productions. At this stage, it is considered proportionate to qualitatively assess this aspect. With the increased capacity on the network, all options are expected to improve journey time reliability along the *Core Study Corridor* so an assessment of 'Moderate Beneficial' has been made for all options. The additional capacity will support the mitigation of congestion and delays associated with traffic growth due to economic activity along the corridor. It will also provide greater resilience for east-west movements along the *Core Study Corridor* because accidents, incidents and severe weather (particularly in areas of high topography) can have considerable impact on journey time reliability.

Regeneration

A qualitative assessment on the regeneration impact has been made which is proportional with PCF Stage 0 / SOBC. Each option has been assessed as having a 'Moderate Beneficial' impact as the reduction in generalised journey time and improved connectivity would stimulate potential development activity along the *Core Study Corridor*, and extend the accessible workforce and accessible jobs. This would be particularly beneficial at LBA and IECs of Skipton, Leeds and York (the latter for the Orange Long option only). Whilst the Orange Long option supports regeneration east of the A1(M), the Purple option would encourage regeneration in east Leeds.

Wider Impacts

WITA software has been used to determine the wider economic impact of the options, as described in **section 3.4.2**, and has informed the overall assessment of 'Moderate Beneficial'. The majority of the wider economic impacts for the three options were associated with agglomeration. The reduction in generalised journey time and travel costs provided by the options may encourage businesses to alter their investment decisions because the reduced financial and time resources associated with transport improves productivity.

The options improve accessibility to the IECs along the *Core Study Corridor* and the WITA highlighted the greatest benefits in the local authorities of Leeds, Bradford, Pendle and Calderdale.

3.7.2 Environment

Noise

The existing noise climate along the options is likely to be dominated by road traffic noise from the highway network (e.g. A1(M), A56, A58, A59, A61, A64, A629, A658, A660, A682, A6068). Other localised noise sources may include agricultural and commercial activities, Airedale rail line, aircraft noise around LBA. The options pass through a predominately rural area, with some residential areas and there may be sensitive receptors, such as, educational, medical and community facilities. In addition, the proximity to a number of designated sites which are likely to be noise sensitive that are valued for tranquilly or acoustic environment is also affecting all options. There is the potential for significant changes in night time noise particularly in rural areas. Based on the desktop review of conditions, an overall assessment of 'Slight Adverse' has been made for the options.

Local Air Quality

As all options share a core section for the majority of the new link road, the impact on local air quality is expected to be similar. The options run through predominantly rural small-to-medium sized villages and market towns and two local authorities have declared Air Quality Management Areas (AQMAs) within the corridor (Pendle Borough Council at Colne, Leeds City Council at Pool in Wharfedale). The expected re-routing of traffic is likely to dissipate pollutant concentrations from existing locations to other areas resulting in localised benefits and disbenefits. A high-level desktop assessment at this stage identifies a 'Large Adverse' impact on local air quality.

Greenhouse Gases

All options may lead to an increase in traffic across rural areas which could lead to an increase in emissions and adverse contribution to greenhouse gas levels and Climate Change. The June 2019 legislation to reach net zero emissions by 2050 as well as the announcement that a TDP will be produced in 2020 also emphasise the commitment to reducing greenhouse gas emissions. Whilst congestion will be alleviated on surrounding local routes, a qualitative assessment of 'Slight Adverse' has been determined for the three options.

Landscape

Environmental specialists have assessed the options, via a desktop exercise, and consider all options to have a 'Large Adverse' impact on landscape. It is too early to fully understand the impact on landscape but there will be a potential adverse impact that will likely outweigh mitigation measures. Large adverse effects are likely at a local scale for each option, and in the absence of detailed design, this has been applied for the full corridor for all options as a precautionary basis. The Orange Long variation is located in an area which is already influenced by the existing A64 and A1(M) so a local impact on landscape is anticipated. Footpaths, open green spaces, the River Wharfe and ancient woodland may be impacted with regards to views and tranquillity. Meanwhile, the Purple variation is an area already influenced by the proximity to the urban fringe of Leeds, traffic on the A58 and A64 so the landscape impact will also be local. As well as the visual impact on footpaths and green open spaces, there is Green Belt land within the Purple variant.

With regards to Townscape, the majority of the three options pass through relatively rural areas and would avoid the centre of towns and villages, including any sensitive townscapes. At this stage, however, there remains an uncertainty around the impact on townscape, particularly on urban fringe areas with the introduction of new road infrastructure. It is assumed with good design, the impact on Townscape would be 'Slight Adverse'.

Cultural Heritage

A 'Large Adverse' impact on cultural heritage is anticipated for all options. The Saltaire World Heritage site (in Shipley) is within the vicinity of the Core section; therefore, both options are likely to have an impact. Meanwhile, there are numerous scheduled monuments, parks and gardens and listed buildings:

- Grade I Listed Buildings: 168 along the Orange option and 94 along the Purple option;
- Grade II* Listed Buildings: 323 along the Orange option and 120 along the Purple option; and
- Grade II Listed Buildings: 3,758 along the Orange option and 1,950 along the Purple option.

Biodiversity

A desktop assessment of the impact the options could have on biodiversity concluded all options would have a 'Large Adverse' impact. Key features within a 4km vicinity of the options are:

- South Pennines Moors Special Protection Area (SPA), Special Area of Conservation (SAC) and SSSI;
- Bingley South Bog SSSI;
- Trench Meadows SSSI;
- Eccup Reservoir SSSI;
- Breary Marsh SSSI;
- Hetchell Wood SSSI; and
- Norwood Bottoms SSSI.

Meanwhile, the Orange Long option also includes Tadcaster Mere SSSI and the Orange Long and Orange Short options include Linton Common SSSI and East Keswick Fitts SSSI.

Water Environment

There are several large watercourses within the options, most notably the Earby Beck, Aire, Wharfe and the Foss. These watercourses (as well as groundwater) are Water Framework Directive (WFD) waterbodies and new developments must not cause deterioration or prevent improvement. The options also lie within a Surface Water Drinking Water Protected Area and Source Protection Zones 1, 2 and 3. There are multiple Flood Zones 2 and 3 associated with the watercourses in the corridors and the increased impermeable area will need to be attenuated to ensure no detrimental increase in flooding potential. It is expected that some permanent modification to watercourses will be required, albeit the less important channels, and the development will introduce new sources of urban pollutants despite best available treatment, so an overall 'Moderate Adverse' impact is expected.

3.7.3 Society

Commuting and Other Users

Similarly to the impact on business users and transport providers, this has considered the change in travel time for those commuting or travelling for other (non-work) journey purposes. This has been assessed using TUBA and the options are expected to deliver generalised travel time savings, as described in **section 3.4.1**. TAG Unit A1.3 (User and Provider Impacts,

May 2019) states “people implicitly put a value on their own time in that they will trade a cheaper, slower journey against a faster, more expensive one”. Therefore, the reduction in generalised journey time for the options, compared with the do-minimum, is expected to attract commuters and other users and deliver benefit for their journeys. Whilst the Orange Long option performs slightly better, the impact has been assessed as ‘Moderate Beneficial’ for all options.

Physical Activity

Transport can affect levels of physical activity; the options are not expected to generate an increase in walking and cycling based on the indicative design therefore a ‘Neutral / No Impact’ has been made. However, it is understood Highways England now have a requirement to build in walking and cycling improvements to all schemes so in future design iterations, this assessment may be updated to demonstrate a benefit which could also be monetised.

Journey Quality

TAG Unit A4.1 (Social Impact Appraisal, May 2019) defines journey quality as a “*measure of the real and perceived physical and social environment experienced while travelling*”. Whilst high journey quality can be taken for granted, the experience of poor journey quality can be easily recognised and influence travel choices made by individuals.

A qualitative assessment of the impact the options would have on journey quality has been made using the three groups of journey quality defined in TAG: (i) traveller care, (ii) travellers’ views and (iii) traveller stress.

- **Traveller Care:** The new D2AP link for the options would be built to Highways England standard with appropriate information and support for those on the network. With the existing highway network in the *Core Study Corridor* being of a lower standard, it is reasonable to anticipate there will be an improvement in traveller care.
- **Travellers’ Views:** The core section of the options is through scenic green areas. Whilst the Orange Long variation east of the A1(M) is also through open space, the Purple variation east of Leeds is not. Travellers’ views are therefore expected to be pleasant; however, the D2AP standard road will be more visually intrusive than the existing provision so there is likely to be an adverse impact compared with the do-minimum.
- **Traveller Stress:** This considers driver frustration, fear of accidents and route uncertainty. All of these aspects are expected to be improved with the options and upgrade from the do-minimum to a D2AP road.

An overall assessment of ‘Slight Beneficial’ has been made on the qualitative assessment of each option.

Accidents

Accidents occur across all modes of transport and affect users and non-users with impacts on people and organisations. The monetised impact on accidents has not been assessed at this stage so a qualitative assessment on the seven-point scale has been made.

The introduction of a D2AP link between the M6 and A1(M) is anticipated to have a benefit on accidents as the higher standard of carriageway is likely to lead to a reduction in the number and severity of accidents. All options are, therefore, deemed to have a 'Slight Beneficial' impact at this stage.

Personal Safety

A negligible impact on personal safety is anticipated as a result of the options, although facilitating travel at higher speeds typically reduces vulnerability to crime and the scheme will be built to Highways England specification with suitable lighting, emergency call points and safety measures. A qualitative assessment considered a 'Neutral / No Impact' on personal safety as the scheme is not expected to adversely affect personal safety.

Affordability

The cost of travel can be a barrier; whilst the options do not change the cost of travel compared with the do-minimum (albeit some small user charge benefits associated with faster journeys), the affordability of using the scheme is limited to those with access to car. As highway schemes benefit those with access to car, low income groups may not be able to benefit from the enhanced connectivity (unless via bus / coach services). Consequently, the qualitative assessment has concluded a 'Slight Adverse' impact of the options on affordability.

Severance

This considers the separation between residents and facilities / services used within the community due to changes in transport infrastructure or traffic flows. All options provide a new D2AP link, rather than upgrading existing provision, so it is likely a new road will attract highway demand from the existing network which may reduce traffic flows (and severance barrier) in some locations. However, there is potential for the options to impede pedestrians and cyclists but the extent of this is not yet known and will depend on mitigation measures incorporated within the scheme. Therefore, an overall assessment of 'Neutral / No Impact' for all options with regards to severance.

Access to Public Transport

The impact of the options on public transport accessibility access to employment, services and social networks has been qualitatively assessed as being 'Neutral / No Impact'. Whilst the improved highway connectivity could support improvements to bus / coach services, there is limited understanding of this so a negligible impact has been assumed at this stage.

Option Values

Option values refer to the "*willingness-to-pay to preserve the option of using a transport service for trips not yet anticipated or currently undertaken by other modes, over and above the expected value of any such future use*" (TAG Unit A4.1 Social Impact Appraisal, May 2019). TAG states that monetisation of option values should be limited to the opening / closure of rail stations or the introduction / loss of good quality local bus services. Therefore, a qualitative assessment is suitable for this study. An assessment of 'Neutral / No Impact' has been made as there are existing highway roads providing connectivity, albeit to a lower standard, and the benefits associated with a D2AP road are captured elsewhere in the AST.

3.8 Value for Money Statement

Production of a Value for Money (VfM) statement as per VfM guidance. At SOBC stage, this should be outlined with initial findings.

Highways England produced a VfM statement (**Appendix B**) and this section provides a summary of the statement²⁰.

The three options explored for the M6 to A1(M) were considered to be within the Poor VfM category. The VfM judgement considers the likelihood of benefits being overestimated, the significant adverse impacts on the environment as well as other uncertainties surrounding the appraisal.

The main benefit of the options is the travel time saving created by the additional east-west route across the Pennines between Preston and York. However, there is significant concern to suggest the travel time benefits may be overestimated due to the appraisal methodology used and the assumption that the D2AP options will generate the same benefits as the D2M options.

The assessment has also shown that the scheme is likely to generate productivity gains from agglomeration; however, there is also significant uncertainty surrounding the true scale of these impacts and how likely these benefits will be realised due to the scheme being in the early stages of development.

Despite the considerable benefits, there are also large disbenefits associated with the scheme, mainly from the environmental impacts which have only been qualitatively assessed. Significant adverse environmental impacts are likely, particularly for air quality, landscape, biodiversity and the historic environment with the route being within a SAC and SPA. The scheme is also likely to route through several Natural Character Areas (NCAs) resulting in a negative impact on landscape. Where possible in future stages, the quantification of environmental impacts is likely to have a downward impact on the BCR and consequently a worsening of the VfM of the scheme.

The VfM statement notes that the benefits from travel time savings are likely to be overestimated, a number of impacts have yet to be assessed (e.g. carbon, delays during construction and accidents) and cost estimations are high level and likely to change should the scheme progress. It is stated that the non-monetised disbenefits arising from the scheme are likely to offset the likely benefits that have yet to be assessed. It is also important to note the TUBA assessment of carbon has been excluded from the impacts under the advice of TPG and the Environment team. Future assessment of carbon, using the Emissions Factor Toolkit, including using high carbon prices will likely have a negative impact on the scheme, reducing the BCR and in turn worsening the VfM of the scheme.

Table 3.9 provides a summary of the Economic Case.

²⁰ N.B. Unquantified positive contributions were not included in the Value for Money statement.

Table 3.9: Value for Money Summary (£millions)

		Orange Short	Orange Long	Purple
PVB: TUBA		£1,850.6	£1,984.6	£1,903.2
PVC		£2,931.3	£3,230.0	£2,986.4
Initial BCR		0.63	0.61	0.64
PVB: WITA		£1,099.0	£1,100.0	£1,073.0
PVB: Total		£2,949.6	£3,084.6	£2,976.2
Adjusted BCR		1.01	0.95	1.00
VfM		Poor	Poor	Poor
Non-Monetised Impacts				
Economy	Journey Time Reliability	Moderate Beneficial	Moderate Beneficial	Moderate Beneficial
	Regeneration	Moderate Beneficial	Moderate Beneficial	Moderate Beneficial
Environment	Noise	Slight Adverse	Slight Adverse	Slight Adverse
	Local Air Quality	Large Adverse	Large Adverse	Large Adverse
	Greenhouse Gases	Slight Adverse	Slight Adverse	Slight Adverse
	Landscape	Large Adverse	Large Adverse	Large Adverse
	Cultural Heritage	Large Adverse	Large Adverse	Large Adverse
	Biodiversity	Large Adverse	Large Adverse	Large Adverse
	Water Environment	Moderate Adverse	Moderate Adverse	Moderate Adverse
Society	Journey Quality	Slight Beneficial	Slight Beneficial	Slight Beneficial
	Accidents	Slight Beneficial	Slight Beneficial	Slight Beneficial
	Affordability	Slight Adverse	Slight Adverse	Slight Adverse
VfM		Poor	Poor	Poor

3.8.1 Analytical Assurance Statement

Highways England produced an Analysis Assurance Statement (3rd Line of Assurance) which is detailed in this section.

Overall, the assurance around the production of the analysis underpinning Stage 0 is considered Amber / Red.

The traffic and economic analysis has been undertaken using the TPS RTM as is, without any enhancements in the scheme vicinity. Whilst this is considered acceptable for Stage 0, the analysis is considered Amber.

The scheme has assessed wider impacts of agglomeration, output change in imperfectly competitive markets and labour supply. Whilst these impacts are likely to occur as a result of this scheme, there is significant uncertainty inherent with this analysis at such an early stage of development. The assurance associated with the wider economic impacts is therefore Amber / Red.

The M6 to A1(M) strategic estimates have been prepared in accordance with standard Highways England Commercial processes. The assurance however is considered Amber as the strategic estimates are at a high level due to the immaturity of design/information available in the production of the scheme estimates.

At this stage no analysis / models have been submitted to support environmental assessments. However, the environmental work has followed the Stage 0 process and is compliant with PCF and TAG. The assurance is considered Amber.

There is scope for challenge in the following areas:

- The economic appraisal is based on only one forecast year of 2041, with these results copied across as 2051 to run TUBA. This is not common practice and is likely to overestimate the benefits;
- The benefits for D2AP have been assumed to be the same as D2M, which means the D2AP benefits are overestimated;
- Use of the existing RTM Variable Demand Model may need to be re-assessed, given the very large time savings predicted for some journeys. It is not clear if the existing RTM Variable Demand Model is calibrated to assess the effects of such large time savings; and
- The economic analysis undertaken quantifies only the travel time benefits and wider economic impacts and, as such, it is possible that the VfM category could change significantly should the study progress to further PCF stages.

4 FINANCIAL CASE

4.1 Introduction

The Financial Case considers the affordability of the project, funding arrangements and technical accounting issues. This case outlines an estimate of the life cycle costs with a breakdown and the levels of contingency.

4.2 Costs

Details of expected whole life costs, when they will occur, a breakdown and profile of costs by those parties on whom they fall and any risk allowance that may be needed. There is no requirement stated at SOBC.

To assess the affordability of the scheme, capital cost estimates for each option assessed within the Economic Case have been produced by Highways England Commercial based on design assumptions and drawings provided. **Table 4.1** shows the minimum, most likely and maximum cost estimates for the options, in 2016 prices, for D2AP standard. The results show the most likely cost of the Orange Long option is 8% more than the most likely cost of the Purple option and 10% more than the most likely cost of the Orange Short option. The section between the A629 (Skipton) to A658 (LBA) is the most expensive section, comprising 57%, 62%, 63% respectively of the Orange Long, Purple and Orange Short most likely base cost.

Whilst a detailed costing exercise was undertaken, it is important to be cognisant that the alignments for the options are high-level concepts currently and therefore are subject to change should the scheme be progressed as activity is currently at PCF Stage 0 only. For each section the following aspects were considered:

- Length of D2AP link road;
- New structures required;
- Culverts;
- Cut and fill (including retaining walls);
- Length of tunnels (where required); and
- New junctions.

The consideration of these aspects aimed to help identify where significant cost elements could be encountered along the corridor. The 'most likely' costs have been utilised within the economic appraisal. A detailed breakdown of the assumptions for each is provided in the outputs produced by Highways England Commercial and summarised in **section 2.9**.

Table 4.2 provides a comparison with the costs for both options built to D2M standard, as utilised within **section 3.5** in the Economic Case.

Table 4.1: Capital Costs – D2AP Standard (Q1 2016 prices, £ million)

	Orange Short			Orange Long			Purple		
	Min	Most Likely	Max	Min	Most Likely	Max	Min	Most Likely	Max
Base Estimate (including risk)									
Colne to A629 (Skipton)	£513.4	£1,185.1	£2,561.9	£513.4	£1,185.1	£2,561.9	£513.4	£1,185.1	£2,561.9
A629 (Skipton) to A658 (LBA)	£1,380.7	£3,417.9	£6,782.9	£1,380.7	£3,417.9	£6,782.9	£1,380.7	£3,417.9	£6,782.9
A658 (LBA) to A1(M)	£333.4	£805.3	£2,079.6	£388.4	£931.1	£2,305.9			
A1(M) to A64 (Tadcaster)				£171.6	£417.3	£978.3			
A658 (LBA) to A64							£303.7	£758.8	£2,018.4
A64 Dualling							£60.3	£139.8	£366.2
Sub-Total	£2,227.5	£5,408.4	£11,424.5	£2,454.1	£5,951.5	£12,629.1	£2,258.1	£5,501.7	£11,729.4
Adjustments									
Inflation Adjustment	£1,039.8	£6,005.9	£25,715.6	£1,141.4	£6,549.9	£27,864.3	£1,051.4	£6,088.5	£26,140.5
Portfolio Risk Adjustment	£418.6	£1,119.2	£1,989.7	£460.6	£1,227.1	£2,164.4	£426.1	£1,136.8	£2,013.3
Sub-Total	£1,458.4	£7,125.1	£27,705.3	£1,602.1	£7,776.9	£30,028.7	£1,477.4	£7,225.3	£28,153.8
Outturn Costs									
Outturn Cost Total	£3,685.9	£12,533.5	£39,129.7	£4,056.1	£13,728.4	£42,657.8	£3,735.5	£12,726.9	£39,883.2

Source: Highways England Commercial

Table 4.2: Capital Costs – D2M Standard (Q1 2016 prices, £ million)

	Orange Short			Orange Long			Purple		
	Min	Most Likely	Max	Min	Most Likely	Max	Min	Most Likely	Max
Base Estimate (including risk)									
Colne to A629 (Skipton)	£574.1	£1,320.9	£2,793.9	£574.1	£1,320.9	£2,793.9	£574.1	£1,320.9	£2,793.9
A629 (Skipton) to A658 (LBA)	£1,516.5	£3,736.5	£7,320.6	£1,516.5	£3,736.5	£7,320.6	£1,516.5	£3,736.5	£7,320.6
A658 (LBA) to A1(M)	£356.2	£850.9	£2,166.1	£412.5	£981.1	£2,402.1			
A1(M) to A64 (Tadcaster)				£194.5	£463.9	£1,061.8			
A658 (LBA) to A64							£326.4	£821.7	£2,132.1
A64 Dualling							£60.3	£139.8	£366.2
Sub-Total	£2,446.8	£5,908.3	£12,280.6	£2,697.6	£6,502.4	£13,578.4	£2,477.2	£6,018.9	£12,612.8
Adjustments									
Inflation Adjustment	£1,141.9	£6,558.2	£27,608.4	£1,254.5	£7,153.4	£29,922.6	£1,153.2	£6,656.5	£28,077.9
Portfolio Risk Adjustment	£460.4	£1,229.1	£2,181.8	£507.0	£1,348.3	£2,375.1	£469.1	£1,249.7	£2,209.9
Sub-Total	£1,602.3	£7,787.3	£29,790.2	£1,761.5	£8,501.6	£32,397.7	£1,622.3	£7,906.2	£30,287.8
Outturn Costs									
Outturn Cost Total	£4,049.1	£13,695.6	£42,070.8	£4,459.1	£15,004.1	£45,876.1	£4,099.5	£13,925.1	£42,900.5

Source: Highways England Commercial

Figure 4.1 presents the assumed profile of PVC, whilst a summary of the proportion of PVC (for the D2AP standard) at five-year intervals is provided in Table 4.3.

Figure 4.1: PVC Profile

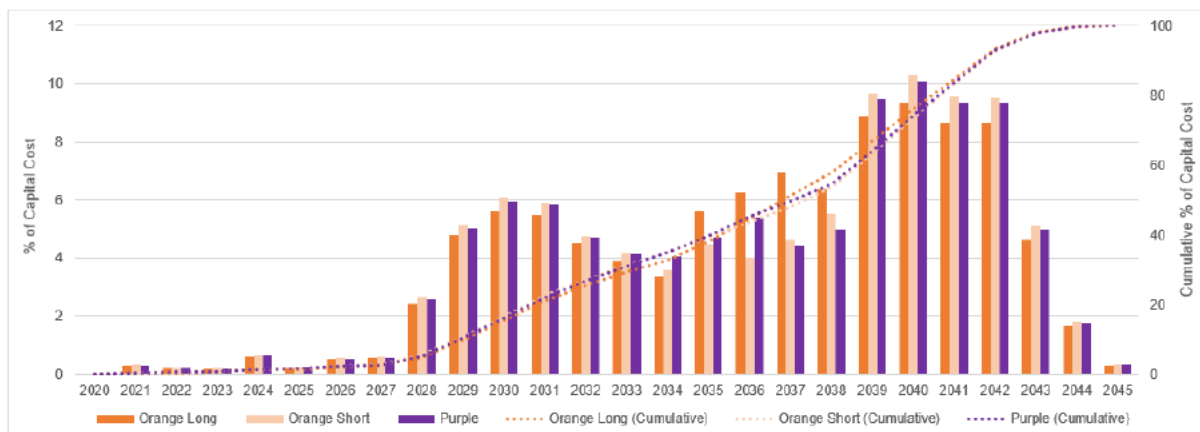


Table 4.3: PVC Profile Summary (£ million)

	Orange Short			Orange Long			Purple		
	PVC	%	Cumulative %	PVC	%	Cumulative %	PVC	%	Cumulative %
2021-2025	£47.6	1.6	1.6	£47.6	1.5	1.5	£47.6	1.6	1.6
2026-2030	£439.6	15.0	16.6	£448.8	13.9	15.4	£438.8	14.7	16.3
2031-2035	£671.6	22.9	39.5	£739.4	22.9	38.3	£699.7	23.4	39.7
2036-2040	£1,000.7	34.1	73.7	£1,222.4	37.8	76.1	£1,028.5	34.4	74.2
2041-2045	£771.8	26.3	100.0	£771.8	23.9	100.0	£771.8	25.8	100.0

No ongoing or renewal costs have been considered at this time.

4.3 Budgets / Funding Cover

Provision of analysis of the budget / funding cover for the project with details of other funding sources specified. At SOBC stage, this should be outlined.

No specific funding source has been identified for the project at this time. The most likely cost range of £12-14bn for the D2AP standard options could put significant long term pressure on future transport budgets on the assumed build-out profile.

Potential funding sources would be reviewed if it was considered that the SOBC provides sufficient basis to develop the proposals further.

5 COMMERCIAL CASE

5.1 Introduction

The Commercial Case provides evidence on the commercial viability of the proposed option and the procurement strategy that will be used. Understanding the commercial viability of a scheme is the first step in ensuring due diligence for any project.

5.2 Output Based Specification

A summary of the requirements in terms of outcomes and outputs, supplemented by full specification as annex. At SOBC stage, this should be outlined with initial findings.

At this stage, a preferred option has not been identified so the scope of works presented in **section 2.9** reflects the outputs delivered by the three options. Meanwhile, the ILM (**Figure 2.35**) presents the anticipated outcomes and impacts of a new link between the M6 and A1(M).

5.3 Procurement Strategy

This details the procurement / purchasing options including how they will secure the economic, social and environment factors outlined in the economic case. At SOBC stage, this should be outlined with initial findings.

It is too early to consider the procurement strategy for this project. However, if the project were to proceed it is anticipated the procurement strategy would be closely aligned with Highways England's PCF, which sets out how Highways England, together with DfT, manage and deliver major improvement projects. As shown in **Figure 1.1**, the PCF is split into distinct phases, accompanied by a series of stages:

- **Pre-Project Phase:** During which the transport issues are identified and the viability of potential transport interventions to the issues are assessed. This reflects the current stage of the M6 to A1(M) study with the production of this SOBC (PCF Stage 0).
- **Options Phase:** A preferred solution to the transport issue / opportunity is identified.
- **Development Phase:** The design of the preferred solution is progressed and taken through the necessary statutory processes up to the point when a decision to commit to invest in building can be made.
- **Construction Phase:** This is when the scheme is built, handed over for operation and the project closed down.

At the end of each PCF stage, a decision is made about whether the study should proceed to the next stage. At each investment decision point, there should be a clear commercial strategy in place for commissioning preferred supplier(s) to deliver the subsequent PCF stage / phase.

Following the completion of Stage 0 (the current activity), the project would move to Stage 1 and 2. The key tasks associated with Stage 1 are to identify options to be taken to public consultation, assess the options with regards to environmental, traffic and economic impacts and to refine the cost estimates. At Stage 2 the PCF process includes public consultation, selection of a preferred option, refining of the environmental, traffic and economic assessments and production of an OBC. The procurement of this activity is likely to be via established frameworks.

6 MANAGEMENT CASE

6.1 Introduction

The Management Case assesses whether a proposed scheme is deliverable, with regards to both implementation and ongoing management during operation. It tests the project planning, governance structure, risk management, communications and stakeholder management, benefit realisation and assurance. Therefore, the Management Case sets out a plan to ensure the benefits specified in the Economic Case are realised and includes measures to assess and evaluate this.

6.2 Evidence of Similar Projects

If possible, provide evidence of similar projects that have been successful to support the recommended project approach. If no similar projects are available for comparison, outline the basis of assumptions for delivery of this project. At SOBC stage, this should be completed.

Highways England have experience delivering numerous highways schemes and the case studies below demonstrate this.

Case Study #1: A1 Dishforth to Leeming Improvement

The A1 Dishforth to Leeming improvement was a major scheme comprising the upgrade of a 13.7mile (22km) section of the A1 to motorway standard in North Yorkshire and the construction of a Local Access Road to provide access for local traffic. The scheme opened in 2012 with objectives to enhance journey time reliability, reduce congestion and reduce high levels of accidents. The One Year After study²¹ found there were more reliable journeys on the A1(M) with a journey time saving of 2-3 minutes and a reduction in the number of collisions.

Case Study #2: A1 Leeming to Barton²²

This improvement scheme replaced the existing dual carriageway with a new 3-lane motorway on a 12mile section of the A1 between Leeming and Barton, including new improved junctions and local access roads. Between 59,000 and 69,000 vehicles use this section of the road every day and the scheme sought to improve safety, relieve congestion, connect communities and support economic growth. It is estimated that over £1bn will be added to the economy as a result of a 20% reduction in journey times and safety improvements.

Construction took place between 2014 and 2018 and to help make a positive difference on the local community during this time there were 27 visits to educational facilities, archaeology open days, 300 tree saplings planted to form a local pollinator corridor and free health checks for HGV drivers.

Case Study #3 – A14 Cambridge to Huntingdon²³

The Cambridge to Huntingdon improvement scheme opened to traffic in May 2020 and includes a major new bypass south of Huntingdon and upgrades to 21 miles of the A14. The

²¹ A1 Dishforth to Leeming: One Year After Study, Highways England (2015)

²² <http://assets.highwaysengland.co.uk/roads/road-projects/a1-leeming-to-barton/A1+Leeming+to+Barton+scheme+completion+brochure.pdf>

²³ <https://highwaysengland.co.uk/a14-cambridge-to-huntingdon-improvement-scheme-about/>

scheme is expected to reduce journey times by 20 minutes and boost the local economy, connect communities, improve the environment and create a positive legacy for the region.

The first section of the scheme, Huntingdon southern bypass, opened to traffic one year ahead of schedule in December 2019, whilst the A14 opened to traffic eight months ahead of schedule in May 2020.

6.3 Programme / Project Dependencies

This sets out the deliverables and decisions that are provided / received from other projects. At SOBC stage, this should be outlined with initial findings.

Table 2.13 outlines the dependencies and synergies the project has and those of particular pertinence are:

- ELOR (*Purple option only*);
- TDP findings in Autumn 2020;
- Skipton-Colne rail link;
- RIS schemes;
- NPR schemes; and
- LBA surface access improvements.

The specific dependencies with the M6 to A1(M) project will be explored as the scheme progresses through the PCF process and the alignment of the options detailed. However, the ELOR is likely to be particularly pertinent for the tie-in with the Purple option and development of the M6 to A1(M) project will need to be cognisant of schemes identified by other studies and the TDP.

6.4 Governance, Organisational Structure and Roles

This describes key roles, lines of accountability and how they are resourced. At SOBC stage, this should be completed.

At this time, the M6 to A1(M) project is expected to be governed according to Highways England's PCF, which is applied to all major projects (those costing more than £10m). Should an alternative approach to delivery be identified, the arrangements will need to be updated.

The PCF sets out the lifecycle of a project in terms of key stages (corresponding to vital decision points), the necessary deliverables (products) at each stage, and the various roles and responsibilities that must be fulfilled. DfT recently announced a study into the role of the SRN in Combined Authority areas and this could influence future governance arrangements for the project (which falls partially within the West Yorkshire Combined Authority).

The PCF sets out seven key roles; **Figure 6.1** presents these within an indicative organogram and supplementary detail on the anticipated responsibility for each role is provided in **Table 6.1**.

Figure 6.1: M6 to A1(M) Corridor Study Indicative Organogram

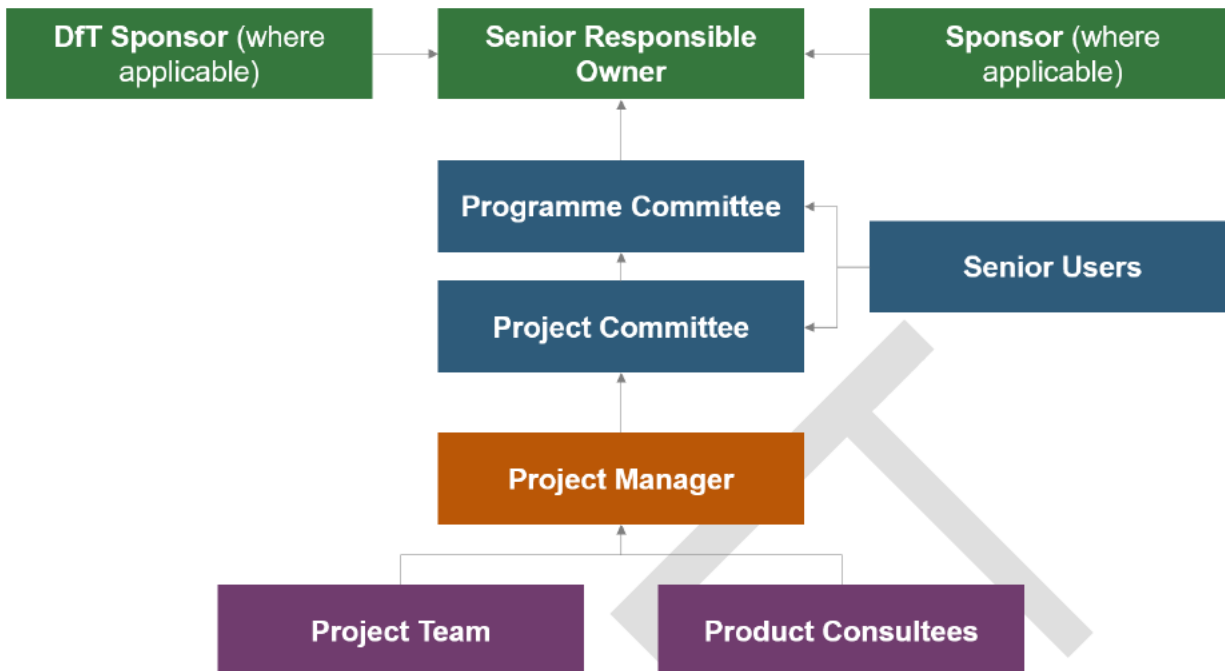


Table 6.1: Anticipated Governance Roles and Responsibilities

Role	Responsibilities
Project Manager	Responsible for day-to-day management of the project within Highways England’s standards and processes. These responsibilities include establishing the project organisation and defining roles and responsibilities within the project team, as well as providing agreed reporting and ensuring the sponsor has all relevant up-to-date information.
DfT Sponsor	It is anticipated that a DfT Sponsor would be required for the M6 to A1(M) project given the scheme scope. A DfT Sponsor is responsible for representing DfT interests and this includes co-ordinating submissions to ministers and managing the DfT’s relationship with relevant external stakeholders.
Senior Responsible Owner (SRO)	The SRO has an overall accountability for the delivery of the project in a manner that is compliant with Highways England standards and strategic business plans. As part of this, the SRO is responsible for reviewing and signing off key products and deciding the outcome of Stage Gate Assessment Reviews (SGARs) which determine whether the project has been completed within tolerance and is fit to proceed to the next stage.
Programme and Project Committees	These are two separate bodies, with the Programme Committee operating directly above the Project Committee. The former is responsible for driving a programme’s progress and resolving issues that may compromise delivery or realisation of outcomes / benefits. This sets out a framework within which the Project Committee has

Role	Responsibilities
	authority to direct the project. The Project Committee is then accountable to the Programme Committee for the success of the project.
Senior Users	Senior User roles are undertaken by regional divisional directors to represent the interests of Operations directorate (i.e. those who will operate and maintain the new infrastructure once the project is completed and handed over). This role is analogous to a client role, and will fulfil many of the same responsibilities, including holding a role in Project / Programme Committees and SGARs, acting as a single sign-off point from an Operations directorate perspective, and acceptance of the scheme being delivered and handed over.
Product Consultees	These are key advisors and specialists whose input is likely to be required in order to help achieve the outcome of the product. Primarily contributing to the work of the project team, these stakeholders should be identified and engaged early and often. The PCF specifies that face-to-face meetings are to be held when possible, and that email (or other indirect means) should not be the primary line of contact.

6.5 Programme / Project Plan

Plan with key milestones and progress, including critical path. At SOBC stage, this should be outlined with initial findings.

Table 6.2 presents the key stages set out in the PCF, which can be summarised as Pre-Project (Stage 0), Options Phase (Stage 1-2), Development Phase (Stage 3-5) and Construction Phase (Stage 6-7). The milestones described in **Table 6.2** are not a complete list of those detailed in the PCF but serve to summarise the vital aspects of each stage.

Should the scheme progress through the PCF stages, a programme will be developed to identify the key stages of project development and likely timescale for each activity.

Table 6.2: Indicative Milestones

Stage		Milestone	Estimated Date
0	Strategy, Shaping and Prioritisation	Identify transport issues and shaping of solutions, followed by the production of an SOBC.	Summer 2020
1	Option Identification	Identify options to be taken forward to public consultation, accompanied by an assessment of environmental, traffic and economic impact including refined cost estimates.	Unknown
2	Option Selection	Carry out public consultation and identify a preferred option. Further refine impact and cost assessments and produce an OBC.	Unknown

Stage		Milestone	Estimated Date
3	Preliminary Design	Complete preliminary scheme design, environmental assessment, and environmental statement. Undertake consultation and survey work and begin to engage contractors (if possible) to initially agree target costs.	Unknown
4	Statutory Procedures and Powers	Publish notice of acceptance of Planning Act 2008, notice of Highways Act 1980 orders, and environmental statement. Follow these procedures as required until a Secretary of State's decision letter can be published.	Unknown
5	Construction Preparation	Obtain approval to advance work (including responding to any high court challenges) and agree cost of construction with contractor. Produce FBC and obtain notice to proceed.	Unknown
6	Construction, Commissioning and Handover	Complete detailed scheme design, construct and commission scheme and open it to traffic. Hand over the asset for operation with all necessary documentation.	Unknown
7	Closeout	Agree final account with contractor and ensure all outstanding work / re-work is completed. Complete a review of project delivery and initiate post opening project evaluation process.	Unknown

6.6 Assurance and Approvals Plan

Plan with key assurance and approval milestones. At SOBC stage, this should be completed.

Project assurance provides the basic framework of controls that assure the project is being well managed and controlled and basic standards are being followed. The PCF utilises four assurance controls:

- Regular reporting;
- Sign-off of products as they are produced;
- SGARs; and
- Independent Assurance Reviews (IARs).

Regular Reporting

The Major Projects Programme Hub defines a schedule of regular reports, which the PCF adheres to. The Project Manager is responsible for the timely completion of these reports.

Product Sign-Off

After a product has been produced, including the appropriate consultations, it must go through one final sign-off in order to ensure that there is a single point of accountability for every product. The sign-off signifies that the product has been produced in line with the product definition and quality criteria, and that the identified consultees have been properly engaged.

Stage Gate Assessment Reviews

SGARs are evidence-based reviews completed at the end of every stage, prior to seeking investment authorisation for the next stage, as well as every 12 months if a project stage is planned to last longer than 18 months. These reviews must be chaired by the SRO (or Sponsor as appropriate) and attended by the Project Manager and PCF Manager. Additionally, appropriate Senior Users and Highways England project team representatives should attend if possible.

The purpose of each SGAR is to ensure that all products have been completed and signed-off, and appropriate procedures have been followed throughout the current stage, or that any deviations from the planned products has been agreed. In addition, the SGAR ensures that the following stage has been appropriately planned, and there are measures in place to secure the necessary resources to continue. The outcome of each SGAR will be recorded as 'green' (proceed to next stage), 'amber' (proceed to next stage, but complete certain actions), 'amber/red' (do not proceed until certain actions are complete), or 'red' (do not proceed).

Independent Assurance Reviews

IARs utilise the experience and expertise of independent project managers to examine the progress and likelihood of successful delivery of the project. Five IARs are held throughout the project lifecycle:

- Business Justification: Entry to the options phase;
- Delivery Strategy: Entry to development phase;
- Investment Decision A: Entry to statutory procedures and powers stage;
- Investment Decision B: End of construction preparation stage; and
- Operational Review and Benefits Realisation: Following the post opening project review.

6.7 Communications and Stakeholder Management

Development of Communications Strategy for the project. At SOBC stage, this should be outlined with initial findings.

Public and partner / stakeholder consultation is an important aspect of all projects and ensures the aims / aspirations of the public and stakeholders are considered, as well as managing the communication of information relating to the project.

A Stakeholder Plan was developed for the M6 to A1(M) project in October 2019. This Plan details an approach that ensures the benefits of the scheme are effectively communicated and understood by specifying the level and type of communications required at different stages of the project to ensure stakeholder involvement and input is included at appropriate times.

As the scheme progresses through the PCF process, the Plan will be updated to reflect the influence of key stakeholders on the option development, the level of engagement required and the mechanism for managing the Communication Strategy. The Plan will also need to be developed within the context of other investment in schemes and studies to strengthen the understanding of the M6 to A1(M) project within the wider transport strategy for the *Core Study Corridor*, Central Pennines Corridor and the North.

6.8 Programme and Project Reporting

Description of reporting arrangements. At SOBC stage, this should be outlined with initial findings.

Project reporting is vital for keeping all delivery partners and stakeholders up-to-date as the project progresses, as well as providing an opportunity to focus attention on key issues, tasks and decision points.

Regular reporting is part of the project assurance and governance of the project and would be undertaken in accordance with PCF, should the project progress further.

The frequency of reporting is likely to vary with weekly reports and meetings amongst the project team and monthly reporting to a Project Board. The Project Board is expected to include representatives from Highways England, DfT, TfN and the local authorities.

6.9 Risk Management Strategy

Arrangements for risk management and its effectiveness so far. At SOBC stage, this should be outlined with initial findings.

Approach to Risk

The management of risk is an important part of any project, as risks can have a considerable effect on the timescale, cost and overall impact of an initiative. Risk management is about managing threats and opportunities to a project. Effective risk management will maximise the opportunity for the project to deliver its strategic objectives, ensure better VfM and support efficient resource allocation.

A Risk Management Plan (RMP) has been prepared which explains how the project team intend to manage project risk during the M6 to A1(M) study. In summary, the RMP contains:

- Risk management principles and features;
- Scope of risk management activity during all remaining project lifecycle stages;
- Levels of risk exposure the scheme is prepared to tolerate;
- Risk management methodology, techniques and tools to be applied;
- Risk management organisation, together with key risk management roles and responsibilities;
- Communication protocols, including reporting and collaboration with Highways England, local authorities, designers, delivery partners and key stakeholders; and
- Scheduling of risk management activities in relation to the overall scheme.

Cost-effective risk management is critically important to realising the objectives and principles. Specifically, risk management will:

- Align the risk approach with risk appetite and/or tolerance: Understand the study appetite for risk and ensure each risk is managed within these expectations;
- Secure predictability of study objectives: In particular, it will help to inform cost certainty and forecasts, as well as help increase the probability of meeting key / milestone dates;
- Ensure governance compliance: Robust project governance through a transparent, continually improving process, and integration with the overarching programme and project governance processes; and
- Help to identify and realise cost savings as infrastructure designs develop.

Effective risk management is a structured, communicable and traceable process for identifying, assessing and management of risks to the objectives of the project throughout project delivery and begins with a Risk Register during the development of the project.

Risk Identification

A Risk Register for the M6 to A1(M) Corridor Study has been produced and is updated monthly, with the last Risk Review on 6th May 2020. A Risk Workshop was held in September 2019 to identify the key risks and opportunities based on the initial scheme design. A monthly review of the risks enables the risks and opportunities to be reviewed and updated as required throughout the lifecycle of the project.

Risk Assessment

The Risk Register also contains a qualitative risk assessment with regards to the probability of it occurring and the impact. This includes a pre-mitigation and post-mitigation assessment which enables the risks to be prioritised for more detailed quantitative analysis and risk response planning.

Risk Mitigation

The risk assessment determines the need and urgency for risk response planning with the aim to ensure levels of risk exposure remain within tolerable limits. There are several approaches to the management of risk:

- Eliminating the risk;
- Reducing the risk;
- Transferring the risk; and
- Accepting / tolerating the risk.

Once the appropriate approach has been selected, a risk response plan will be prepared which identifies the action required, action owner and target completion date. Risk owners will be responsible for identifying an action owner that is suitably qualified and experienced.

Risk Monitoring and Review

Risk exposure can change over time owing to the implementation of risk mitigations, emergence of new risks, occurred or non-occurrence of risk events, changing risk proximity and agreed changes / trends. Therefore, risk monitoring is an iterative process that will occur throughout the delivery. The Risk Register will be the primary means of recording risk information and monitoring risk exposure; this will be reviewed monthly to ensure it reflects the latest position.

Risk Reporting

The RMP presents the approach to risk communication and highlights there will be monthly risk reports as well as month-end project risk registers.

Key Risks

A summary of the key risks identified, at this stage, are presented in **Table 6.3**.

Table 6.3: M6 to A1(M) Key Risks

Risk / Opportunity	Description	Mitigating Action(s)
Construction Complexity	The <i>Core Study Corridor</i> includes numerous features including challenging geography, existing junctions, waterways and rail lines. These may require a scheme to include complex structures and this is likely to have cost implications.	Gain accurate information early to enable corridor refinement.
Environmental	The <i>Core Study Corridor</i> has multiple environmental constraints, including SSSI, National Parks, and protected species. These features may reduce the political attractiveness of a scheme or result in environmental PCF products being unable to be signed off.	Mitigations to be identified within the study area and preferred route selection to account for these constraints.
Carbon Impact	With legislation to achieve net zero emissions by 2050 and the publishing of a TDP later in 2020, the carbon impact of an intervention is a risk to the scheme delivery.	Application of TDP once published. Mitigations to be identified within the study area.
Suitable Transport Model Availability	The model used for this study may not represent the likely impacts of proposals with sufficient accuracy.	Early engagement with other project teams using similar models.
Political	Changes in government policy due to political uncertainty in Parliament. This may result in the scheme study being put on-hold or changes to the scope / programme.	Work with Highways England and key stakeholders to provide robust case for continued scheme delivery.

Risk / Opportunity	Description	Mitigating Action(s)
Collaboration	Opportunity to collaborate with teams that have been involved in similar studies to improve knowledge, enhance technical understanding and deliver efficiency benefits.	Share information across projects.
Impact of Other Schemes	Other schemes may have an impact on movements along the <i>Core Study Corridor</i> , for example, the impact of dualling the A64 is not yet understood.	Discuss with local stakeholders and undertake further investigation.

6.10 Options

Summarise the overall approach for project management at this stage of project. At SOBC stage, this should be outlined with initial findings.

In summary, at this stage it is anticipated the M6 to A1(M) project would be managed in accordance with the Highways England PCF process with the specific requirements defined for each stage in the process. Should the scheme be progressed further, project-specific aspects of project management will be identified for each aspect of the Management Case.

7 NEXT STEPS

The M6 to A1(M) project is currently at Stage 0 of the PCF process which is the strategy, shaping and prioritisation stage. This SOBC presents the process to identify two possible options which have subsequently been appraised based on indicative scheme designs, and would be developed further during Stage 1 and Stage 2 of the PCF process should the decision be to proceed with the project.

The strategic need for an intervention within the *Core Study Corridor* is driven by the need to improve connectivity between IECs to support economic growth of the Northern Powerhouse economy. The Central Pennines SDC SPOC clearly identified an aspiration of TfN to improve east-west connectivity, particularly between East Lancashire and North and West Yorkshire.

Significant political and public interest in environmental considerations have been seen over the past 24 months with local authorities declaring climate emergencies and the Government announcing the preparation of a TDP. This is likely to have a considerable impact on all future road schemes and a detailed assessment to understand the environmental impacts will be necessary. In addition, the Covid-19 pandemic is also likely to have an impact on travel behaviour so further option development will need to cognisant of this.

All options appraised generated similar adjusted BCRs, inclusive of wider economic impacts, with a BCR of around 1. Whilst both options are expected to generate economic benefit from improved journey times and wider economic impacts across the *Core Study Corridor*, as detailed in the Economic Case, the significant cost associated with the options has an adverse impact on the BCR. A VfM statement produced by Highways England concluded both options represent Poor VfM and noted the likelihood for monetised benefits being overestimated and significant adverse non-monetised impacts on the environment, as well as other uncertainties surrounding the appraisal.

Given the BCR of around 1, reflecting Poor VfM, the next step for this project could be to consider the potential for a staggered investment of shorter sections along the route, potentially as MRN schemes, which would deliver localised improvements. Further analysis of the modelling and appraisal could seek to identify those sections which deliver higher VfM. This could enable lower cost options to be explored for particular sections of the corridor.

Should the improvements be delivered as a series of localised schemes, the scheme objectives are likely to be re-visited as there may be more opportunity to consider the integration with the public transport and active travel networks to support sustainable travel. In addition, there would need to be consideration with who is best placed to be the scheme promoter. For example, this may lead to Highways England becoming a stakeholder rather than delivery partner with TfN envisaged to have a key strategic role with localised schemes promoted by the relevant local authority.

APPENDIX A: ENVIRONMENTAL CONSTRAINTS

DRAFT

APPENDIX B: VALUE FOR MONEY STATEMENT

DRAFT