

## West Yorkshire Connectivity Plan

Airport, Airedale and Wharfedale: Case for Change

November 2020

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Change

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# 1 Introduction

## 1.1 The role of this Case for Change

This Case for Change report for Airport, Airedale and Wharfedale provides an important first step, and part of the evidence, for identifying a connectivity pipeline of future transport investments for this part of the region.

This report provides analysis of transport and socio-economic data, to identify an initial longlist of potential transport investments aimed at improving connectivity. The approach takes the view that transport should not be a barrier to people accessing jobs, to businesses choosing to invest here and to improving the health of our residents and visitors. Improvements in transport should be a catalyst for change across all these objectives.

This report's outputs will be integrated with other Case for Change reports, and other workstreams, including proposals to decarbonise transport, Urban Mass Transit market testing, Bus Network Reviews, Rail Capacity Study, Local Cycling and Walking Infrastructure Plans and a Future Mobility Strategy, to produce a connectivity plan and long term investment programme for the whole of West Yorkshire, to the 2040's.

## 1.2 Background to the report

The West Yorkshire Combined Authority has adopted a Transport Strategy to 2040. The strategy was a collaboration between the Combined Authority and the West Yorkshire partner councils of Bradford, Calderdale, Kirklees, Leeds and Wakefield and covers the geography of West Yorkshire but recognises the importance of the wider Leeds City Region, and that people and goods travel longer distances across administrative boundaries. The strategy provides a framework of high-level transport policies aimed at delivering a world-class, modern, integrated transport system, that will play a key role in transforming the region's economy and delivering inclusive, sustainable growth.

A daughter document, the Leeds City Region HS2 Growth Strategy, set out the strategic case for change for building on the once-in-a-generation opportunity provided by the arrival of High Speed 2 (HS2) and Northern Powerhouse Rail (NPR) in the region, to transform the City Region's economy. The benefits of HS2 and NPR cannot however drive inclusive growth alone; a range of factors are essential to create more and better jobs, with a highly skilled workforce to sustain them - and a lack of transport capacity and infrastructure at the City Region and local level will inhibit growth. The HS2 Growth Strategy identified corridors and communities which are in economic need of improved connectivity.

Significant investments in transport are planned through the West Yorkshire Transport Fund, Connecting Leeds and Transforming Cities Fund programmes, and by the rail industry, which will provide the early years of the connectivity pipeline. However, there remains insufficient capacity and resilience in our transport system, particularly to key employment centres, which will constrain business and labour market catchments, and the ability to train and develop the next generation, by restricting access to colleges and universities. The National Infrastructure Commission identified that this is affecting many places across the North of England and will increasingly inhibit economic development and living standards.

An important next step is to support the delivery of our strategies is to develop a plan and pipeline of longer term investments, which address a full range of strategic and local connectivity needs.

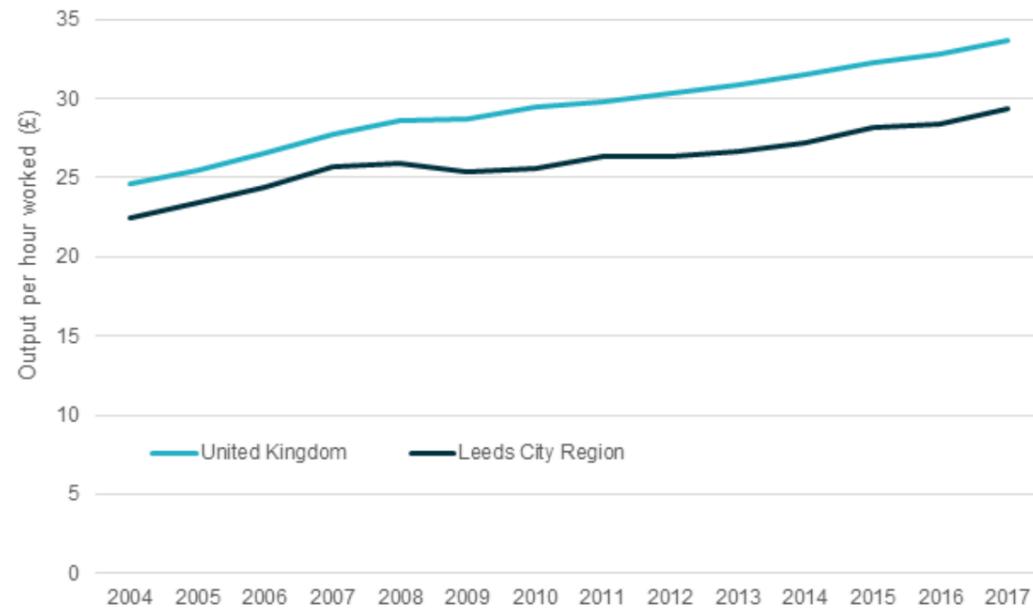
Ten Case for Change reports have been produced with the input of the partner councils, which study corridors covering the geography of West Yorkshire and including parts of the wider City Region, to provide detailed evidence of connectivity needs. These Case for Change reports should be read in conjunction with the Connectivity Plan Appraisal Handbook for further detail on background and methodology.



### 1.3 West Yorkshire's priorities for growth

The emerging Industrial Strategy for West Yorkshire highlights a significant and widening productivity and innovation deficit, as shown in Figure 1. Living standards across the City Region have stalled with several communities facing persistent poverty.

**Figure 1: Illustration of productivity gap in West Yorkshire**



Source: Office for National Statistics, 2019

The West Yorkshire Transport Strategy recognises that our transport network currently constrains opportunities for growth and is a key factor in shaping experiences of poverty. Our network does not sufficiently support sustainable travel as the obvious choice for many. In the wake of the declaration of a “climate emergency” by all West Yorkshire districts, there is a growing need to de-carbonise our transport network; as the transport sector contributes 41% of Leeds’s and 27% of Bradford’s total CO<sub>2</sub> emissions<sup>1</sup>. This needs immediate action as transport emissions are expected to grow, constraining West Yorkshire’s ability to meet overall emissions targets.

We have four priorities for the region aimed at addressing our key challenges. These are summarised in Table 1.

<sup>1</sup> UK local authority and regional carbon dioxide emissions national statistics: 2005-2016

**Table 1: Leeds City Region’s four priorities for growth**



**Enabling Inclusive Growth** – Ensuring that economic growth leads to opportunities for all who live and work in the region



**Boosting Productivity** – Helping businesses grow and bringing new investment into the region to drive economic growth and create jobs



**Tackling the Climate Emergency** - Growing our regional economy whilst cutting carbon dioxide emissions



**Delivering 21<sup>st</sup> Century Transport** - Creating efficient transport infrastructure that makes it easier to get to work, do business and connect with each other

Source: West Yorkshire Combined Authority

### 1.4 Defining the scope and study area

This section explains the process undertaken to define the corridor from the original scope to an economic area in which to focus the evidence base, develop key connectivity concepts and interventions.

The Leeds City Region HS2 Growth Strategy identified a network of communities and corridors that would benefit from inclusive growth. Table 2 shows a list of the corridors and the corresponding reports with their approximate extents illustrated in Figure 2. All the Case for Change corridors are shown in Figure 3 with the Airport, Airedale and Wharfedale corridor highlighted in red.

**Table 2: Reporting index**

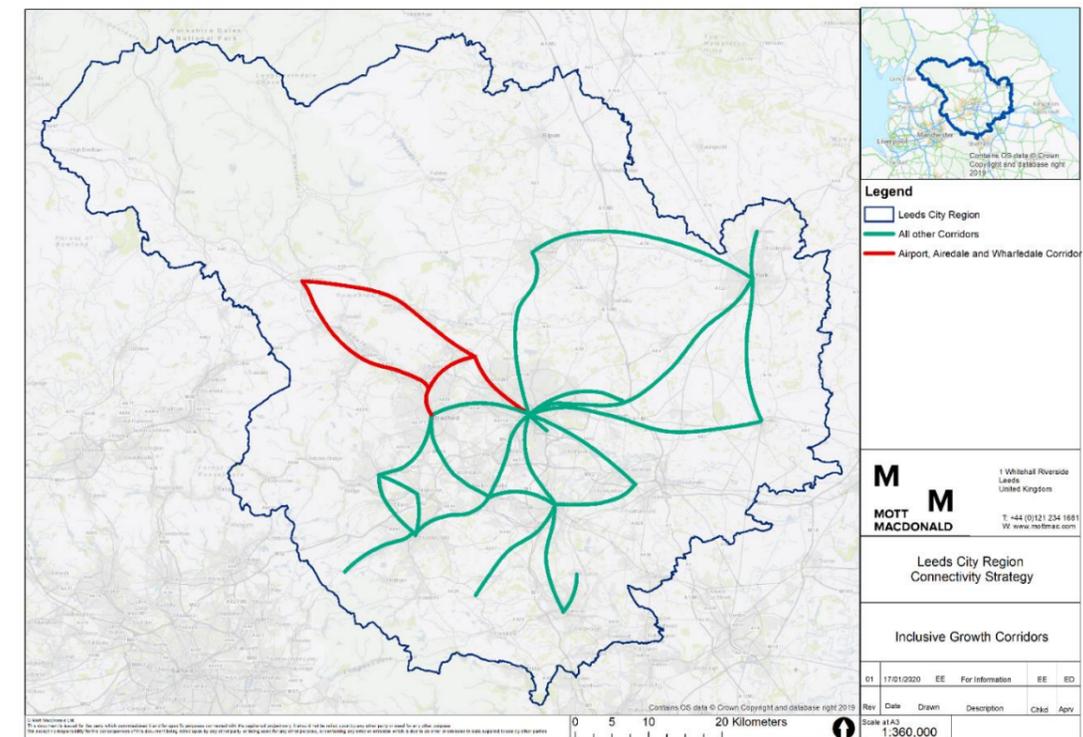
Ref.	Report Name	Original corridor name
1		Strengthening high value assets in the North West of Leeds, the University of Leeds, Kirkstall Forge and the airport
1	Airport, Airedale and Wharfedale: Case for Change	Skipton to Leeds
1		Stimulating development from the city centre into North Bradford towards Shipley, Saltaire and the airport
2	Calder Valley and Bradford: Case for Change	The Calder Valley and Bradford
3	West Kirklees to Calderdale: Case for Change	Huddersfield to Brighouse
3		South West Kirklees (including Slaithwaite) to Brighouse
3		Huddersfield – Halifax
3		Halifax to Brighouse
4	Leeds – Bradford: Case for Change	Leeds Bradford cross connectivity
4		South Bradford and North Kirklees – Bradford
5	Leeds – Huddersfield: Case for Change	Dewsbury / Huddersfield to the HS2 Hub
6	East Kirklees to Wakefield: Case for Change	Dewsbury to Wakefield
6		East Kirklees (including Denby Dale) to Wakefield
6		Five Towns to Wakefield
7	South and East Leeds: Case for Change	Extending the South Bank opportunity to the south of Leeds
7		Accelerating inclusive growth in the East of Leeds towards St James' Hospital and the East Leeds extension
8	North Yorkshire to Leeds: Case for Change	Harrogate to the HS2 Hub
8		York to Leeds
8		Se by to the HS2 Hub
9	Five Towns to Leeds: Case for Change	Five Towns to Leeds
10	Barnsley and Wakefield to Leeds: Case for Change	Barnsley and Wakefield to Leeds
10		North Barnsley to Barnsley

Source: Mott MacDonald

**Figure 3: West Yorkshire Connectivity Plan: Reporting Map**



**Figure 2: West Yorkshire Connectivity Plan: Corridor Map**



The corridor incorporates Bradford, Skipton, the North West of Leeds and Leeds Bradford Airport, as well as large rural areas including Ilkley Moor and key tourist attractions such as Saltaire. The defined economic area roughly encompasses those parts of Airedale and Wharfedale to the north of Bradford and Leeds, and is shown in the next chapter.

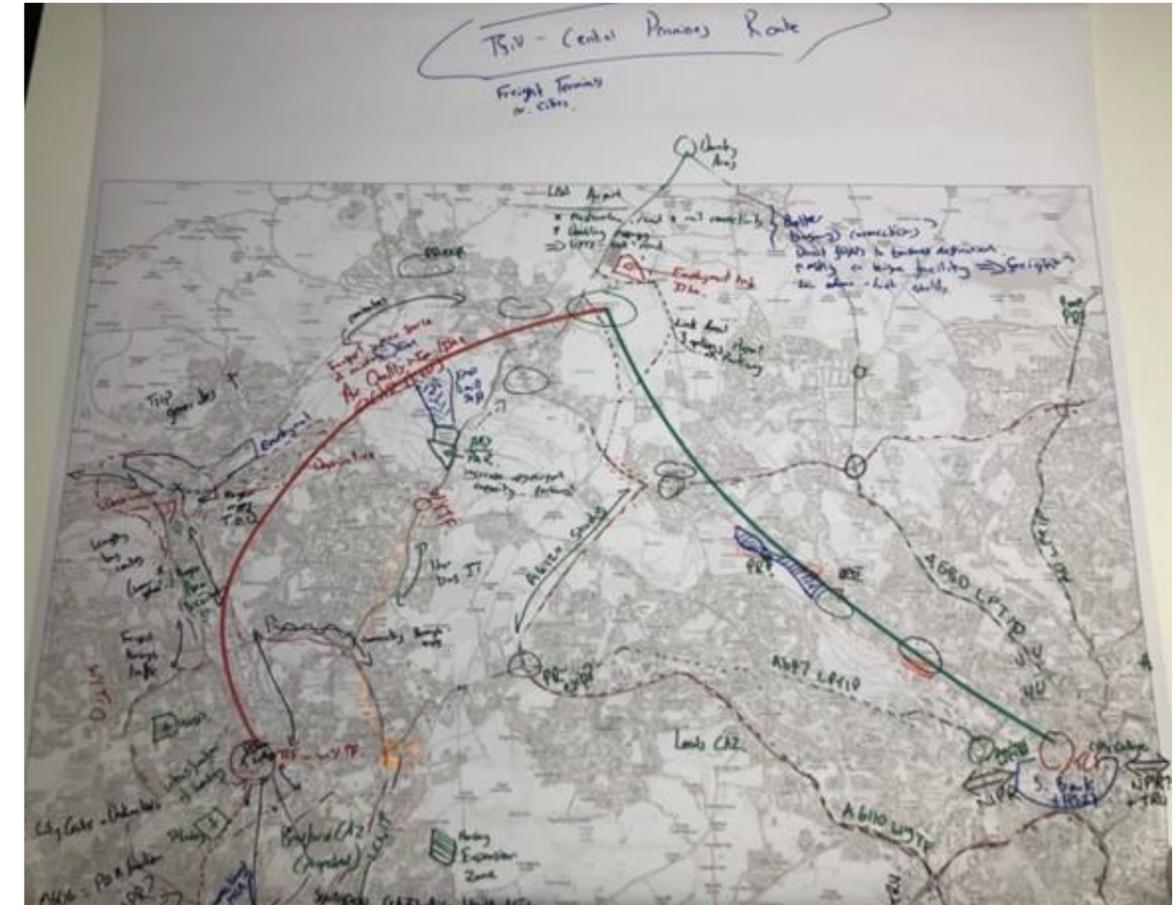
The study area has been defined in consultation with officer representatives from Leeds and Bradford districts (these will now be referred to as the partners). An initial workshop helped to identify and confirm the key “problems and opportunities” for the study area. An example of the outputs from this is shown in Figure 4.

The findings were then used to define both the extent of the corridor or economic area, the main elements of the accompanying “story map” (which summarises the key issues and opportunities in the spatial context, and sits behind the Case for Change as the data repository and analysis tool) and to develop a set of corridor-specific aspirations.

### 1.5 Airport, Airedale and Wharfedale: at a glance

The following two pages provide some highlights for this study area – these cover the key socio-economic features of the geography as well as the connectivity challenges it faces and conclude with prioritised investment proposals to meet these challenges. The 2-page summary is designed as a double sided “lift out” of the key issues and conclusions. Further detail to underpin these summary points is provided in subsequent Chapters.

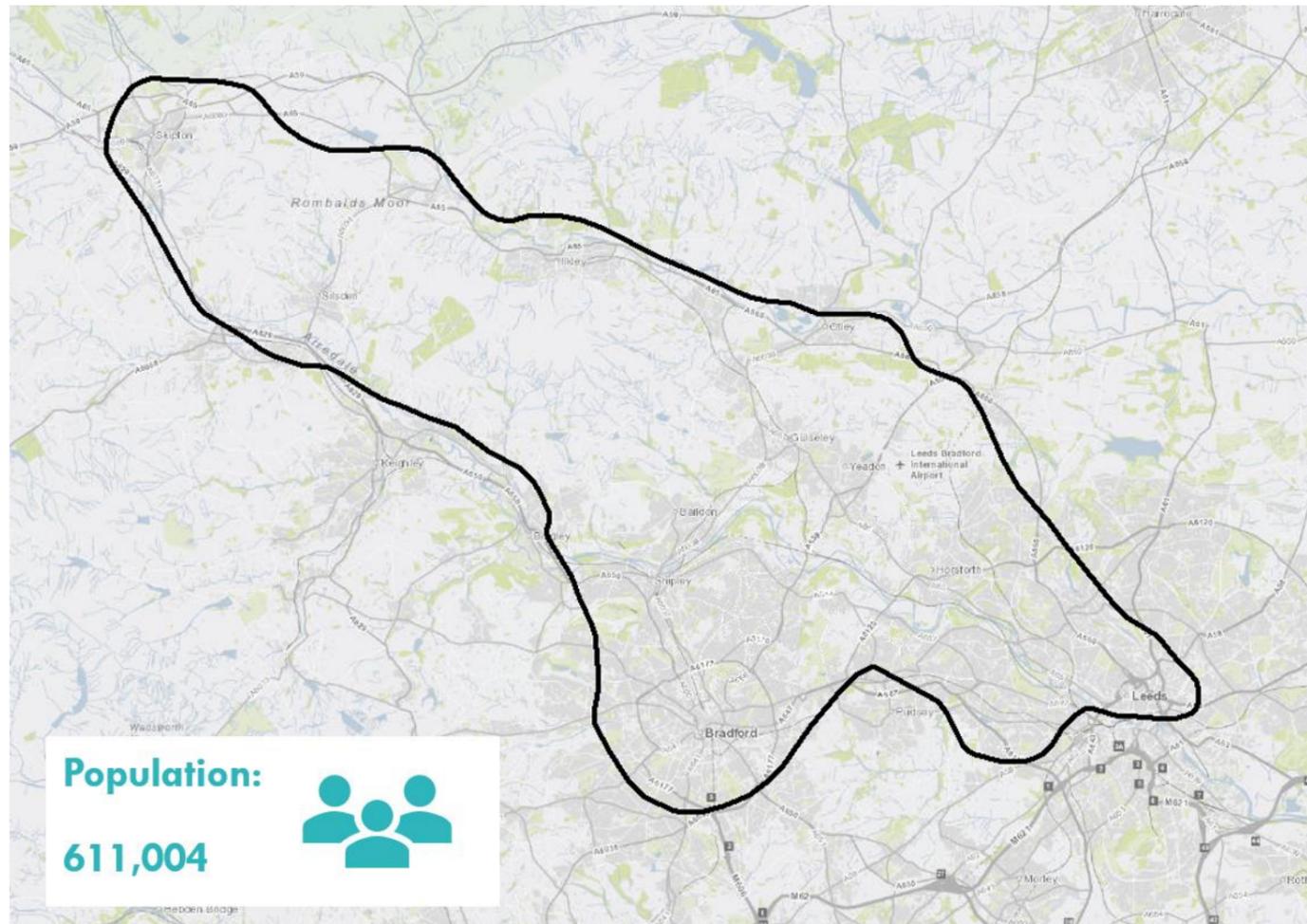
Figure 4: Example of issues identification and corridor definition from stakeholder workshop



Source: Mott MacDonald

## Airport, Airedale and Wharfedale: socio-economic profile

This corridor incorporates Bradford, Skipton, the North West of Leeds and Leeds Bradford Airport, as well as large rural areas including Ilkley Moor. Average household income in the corridor is lower than both the national and regional averages and the number of people in employment is below the national average. There are a high number of new housing and employment growth sites throughout the corridor and connectivity to and between these future sites is fundamental to enable inclusive growth throughout the Leeds City Region.



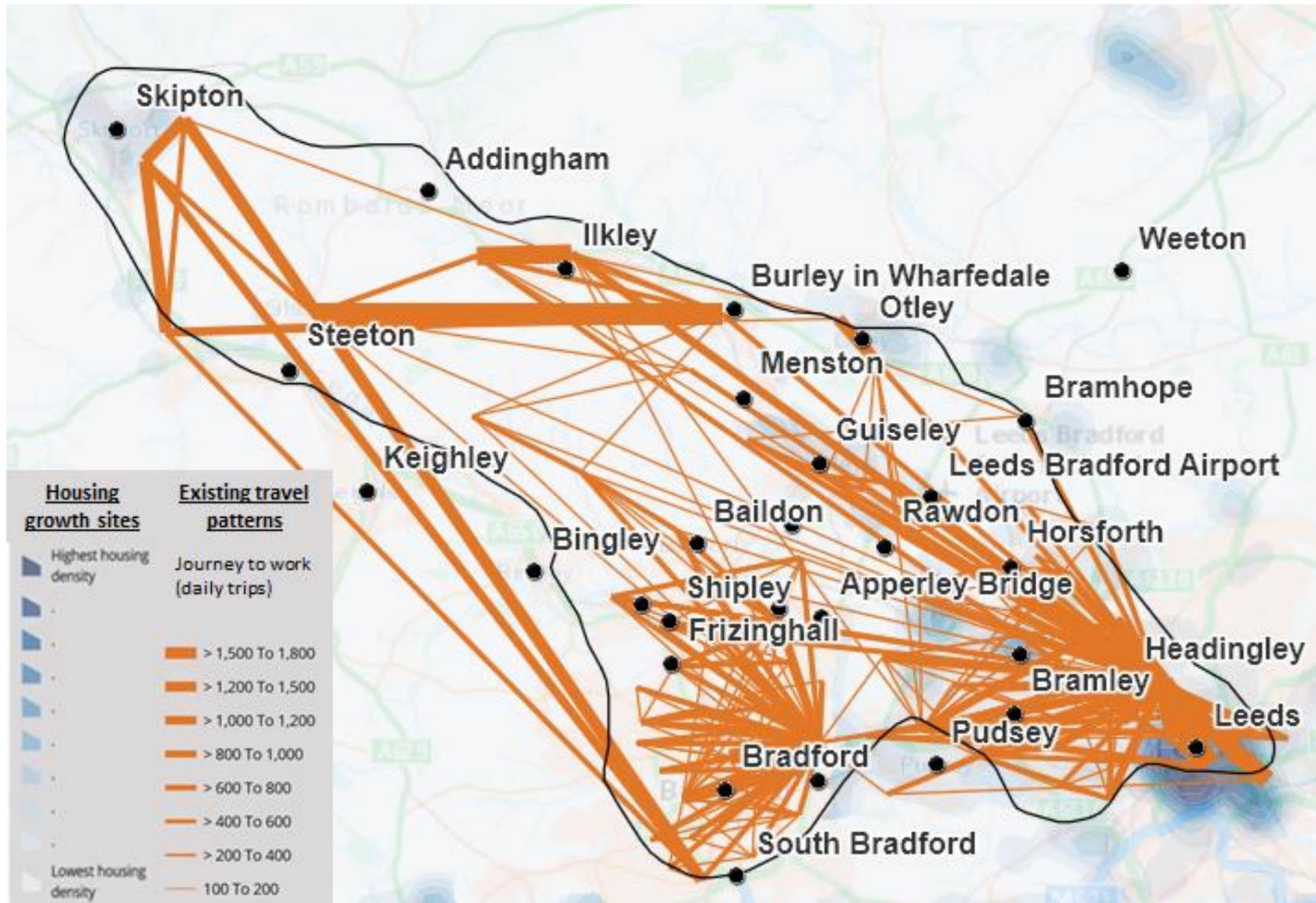
**Places with challenges for:**



**Places with opportunities for:**



## Airport, Airedale and Wharfedale – connectivity highlights



People in communities within the corridor, including in Bradford, South Bradford and Shipley experience low employment and skills prospects, low household income, and low car ownership, with several areas being within the 10% of most deprived communities in the UK.

Many job opportunities, often in the wholesale and retail trade and the health and social services sector rely on car access and are poorly served by other modes. To improve the prospects of these communities, and to boost productivity, they must be better connected to suitable employment opportunities by a range of transport

### Key connectivity challenges:

- 188,700 people in the corridor live within an isolated community, approximately 31% of the population. Improving access to employment destinations will help to **boost productivity**
- There is a skills gap. Bradford city centre, South Bradford and Shipley are in the top 10% most deprived areas for education in England. Improving connectivity to education opportunities, will ultimately help people to find better employment, helping to ensure **inclusive growth**
- Poor bus service provision, even in peak hours for some existing and future employment and housing locations such as Leeds Bradford Airport, Menston and Burley in Wharfedale, restricts the delivery of a **21<sup>st</sup> century transport system**
- High levels of peak-time traffic, and associated congestion on the radial routes into both Leeds and Bradford must be addressed to **tackle the climate emergency**

Investment is required in improved connectivity, both for strategic trips towards Leeds and Bradford, and local trips to key housing and employment sites. Schemes that will best address these connectivity challenges will be taken forward into a West Yorkshire pipeline of interventions to deliver inclusive and clean growth.

## 2 Spatial context

This chapter sets out the key spatial challenges for each of our four regional priorities in the corridor. It presents the key outputs from the “story map” for this corridor; this is a web-based Geographical Information System (GIS) data repository and analysis tool, which summarises the key issues and opportunities in the spatial context and sits behind the Case for Change. The story map was developed from a wide range of spatial datasets and the resulting narrative was shared with and shaped by feedback from key stakeholders on key issues, opportunities and local priorities. These are presented alongside the major priorities for the City Region.

Please refer to Chapter 6 of the Appraisal Handbook for a summary of the datasets which form part of the evidence base for the “story map” that supports the development of the Case for Change.

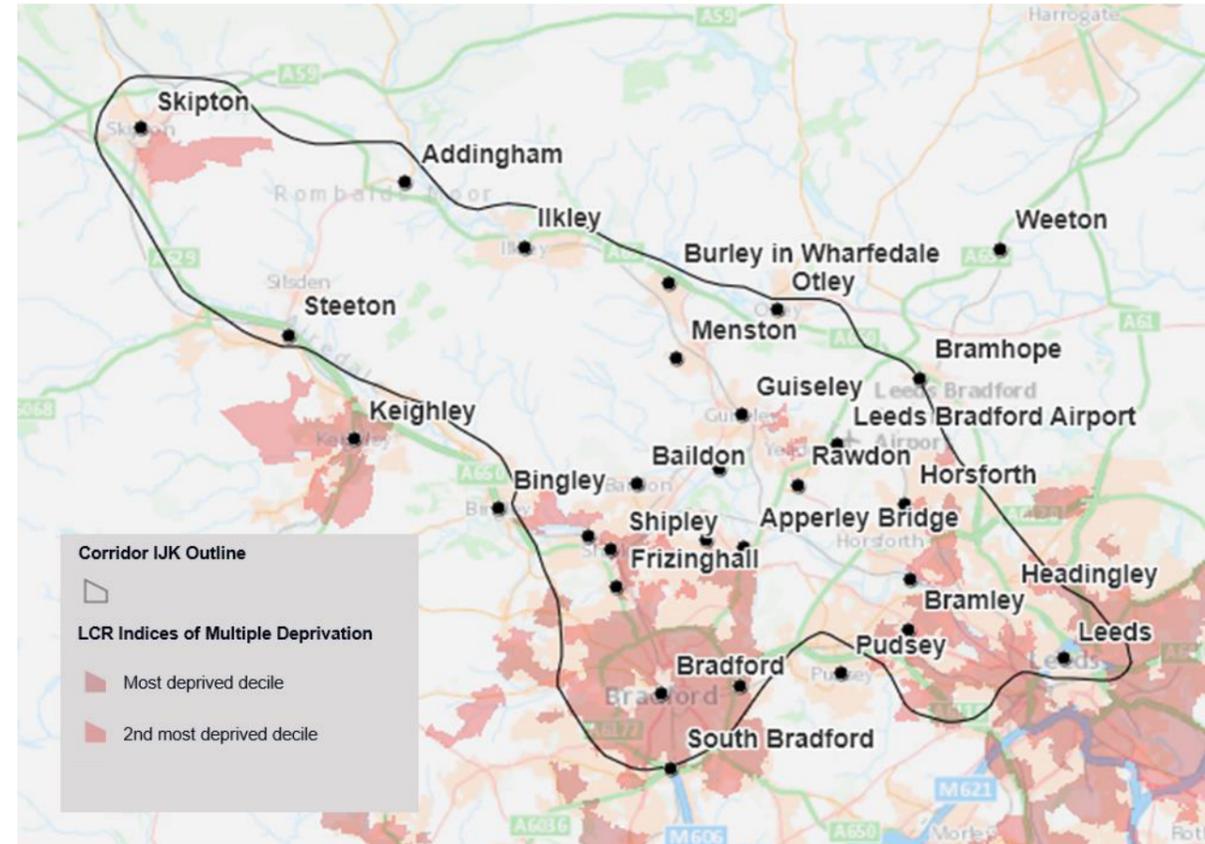
### 2.1 Enabling Inclusive Growth

#### 2.1.1 Deprivation

Figure 5 shows areas that are within the top two deciles of the indices of multiple deprivation. Deciles are calculated by ranking the 32,844 Lower Super Output Areas (LSOA) in England from most deprived to least deprived and dividing them into 10 equal groups. LSOAs in decile 1 fall within the 10% most deprived LSOAs nationally, whilst LSOAs in decile 10 fall within the 10% least deprived of LSOAs nationally<sup>2</sup>. The index of multiple deprivation is an overall relative measure of deprivation constructed by combining seven domains of deprivation according to their respective weights.<sup>3</sup> These include:

- Income Deprivation
- Employment Deprivation
- Education, Skills and Training Deprivation
- Health Deprivation and Disability
- Crime
- Barriers to Housing and Services
- Living Environment Deprivation

Figure 5: Areas of high deprivation



Source: Mott MacDonald

Deprivation is concentrated within the urban areas of the Airport, Airedale and Wharfedale corridor, particularly in and around Bradford, Leeds and south east of Skipton. Bramley, Armley, Bradford city centre and Shipley are in the top 10% deprived areas for health in England. Bradford city centre, South Bradford, and Shipley are in the top 10% deprived areas for education in England. **People in these areas are more likely to suffer from poor connectivity and fewer opportunities to access jobs and education and many will rely on convenient and reliable transport; connecting these areas is vital to enabling inclusive growth<sup>4</sup>.**

<sup>2</sup> English Indices of Deprivation 2015 – Department for Communities and Local Government

<sup>3</sup> ibid

<sup>4</sup> Tackling transport-related barriers to employment in low-income neighbourhoods (2018) accessed via: <https://www.jrf.org.uk/report/tackling-transport-related-barriers-employment-low-income-neighbourhoods>

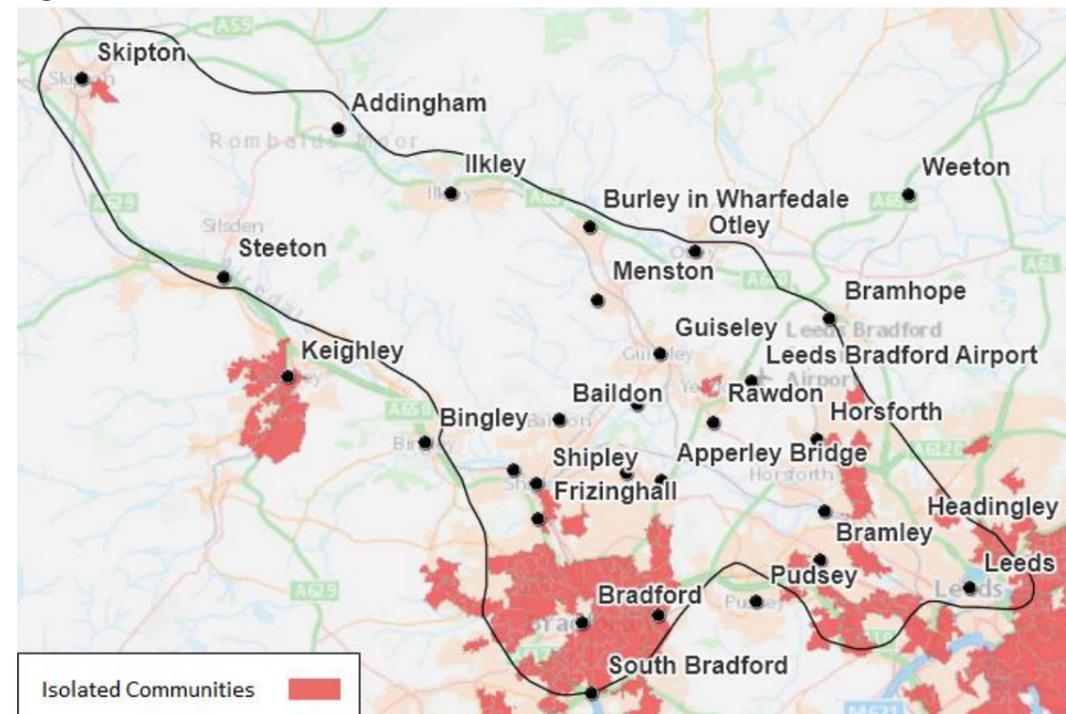
### 2.1.2 Isolated communities

**Isolated communities have high levels of deprivation (are within the top 20% most deprived in England) and can access a lower than average number of employment destinations.** Residents find that job opportunities are difficult to access because of public transport journey times, reliability (perceived as well as actual) and affordability<sup>5</sup>.

This uses the approach adopted for the Joseph Rowntree Foundation for “*Tackling transport related barriers to employment in low-income neighbourhoods*” – Census data (distance travelled to work, and the average number of destinations people can reach for journeys to work across the LCR).

There are several areas in the corridor, particularly Bradford, South Bradford, west Leeds and south east of Skipton that are defined as “isolated communities” (see Figure 6).

**Figure 6: Isolated communities**



Source: Mott MacDonald

**Around 188,700 people in the corridor live within an isolated community, approximately 31% of the corridor.**

Improving connectivity in these areas is fundamental to enabling inclusive growth. People within these communities are unable to access many destinations for work, therefore, limiting access to job opportunities. Many people in isolated communities also rely on affordable, convenient and reliable transport to access education and job opportunities. Ensuring that these areas are well connected by public transport to access employment and education is fundamental to achieving inclusive growth<sup>6</sup>.

<sup>5</sup> Tackling transport-related barriers to employment in low-income neighbourhoods (2018) accessed via: <https://www.jrf.org.uk/report/tackling-transport-related-barriers-employment-low-income-neighbourhoods>

### 2.1.3 Car ownership

The strategic road network ensures that some of these areas are reasonably well connected. **However, there are several urban areas within the Airport, Airedale and Wharfedale corridor which are characterised by low car ownership** (see Figure 7), meaning that some households without a car may not benefit from the connectivity opportunities this brings.

**Figure 7: Car ownership**



Source: Mott MacDonald

The level of car ownership is generally lower for communities living in and around Leeds, Bradford, Shipley and Skipton, where some major residential and employment sites are located. An integrated public transport network is required to improve end-to-end connections between these urban centres. Combined with the installation of good active travel infrastructure, this can encourage local short distance trips within communities whilst improving household accessibility from the outskirts into the city centres of Leeds and Bradford.

**Ensuring that key employment areas are connected by good public transport links in both peak and off-peak time periods will enable people to access employment without owning a car. A high-quality integrated transport system will also encourage people to choose to travel by public transport rather than car which is key to meeting carbon reduction targets.**

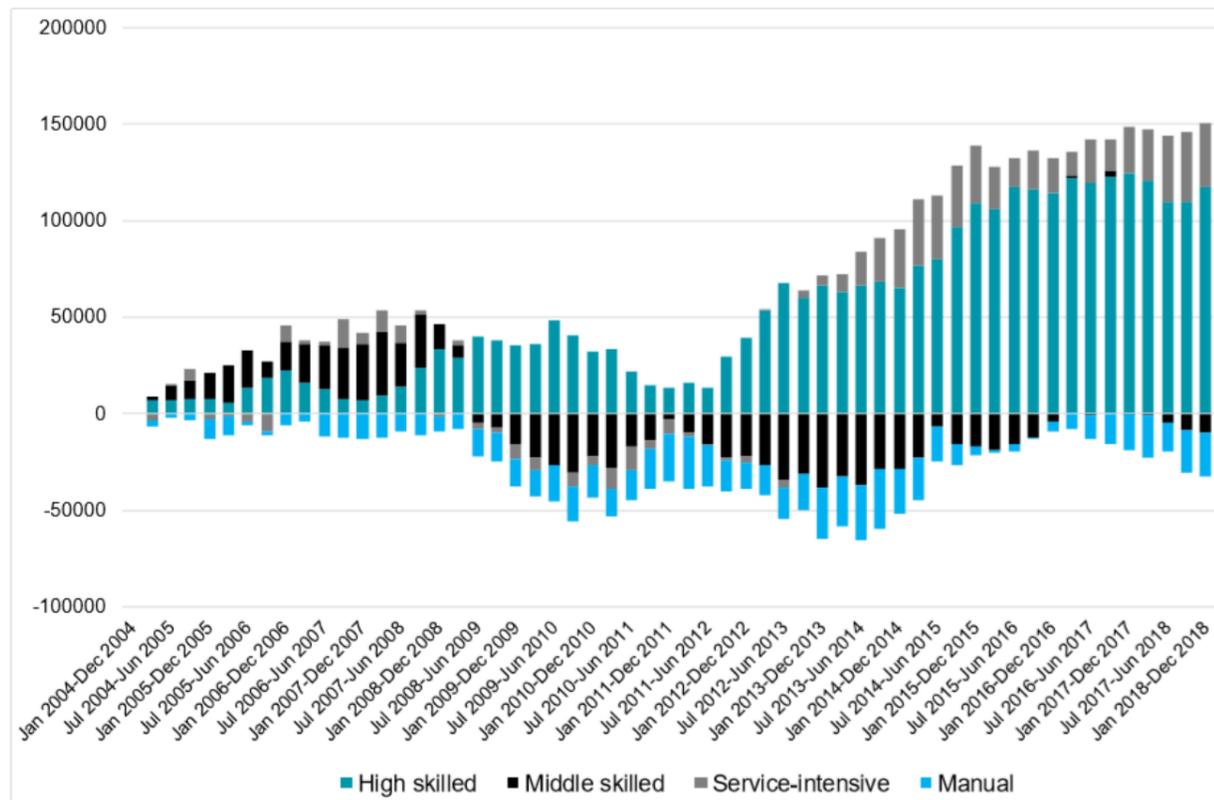
<sup>6</sup> Tackling transport-related barriers to employment in low-income neighbourhoods (2018) accessed via: <https://www.jrf.org.uk/report/tackling-transport-related-barriers-employment-low-income-neighbourhoods>

## 2.2 Boosting Productivity

### 2.2.1 Employment characteristics

The emerging Industrial Strategy for West Yorkshire highlights an increase in highly skilled employment in the City Region (see Figure 8). In this corridor, these employment opportunities include those in the finance and insurance sectors. This has an impact on commuting flows as these workers often commute further and travel more. Having an effective and reliable transport system is therefore paramount to maximise productivity in the region.

**Figure 8: Occupational contribution to cumulative employment growth**



Source: LCR Industrial Strategy

<sup>7</sup> Business Register and Employment Survey: open access (2017)

The Airport, Airedale and Wharfedale corridor has some distinct employment characteristics and strengths.



Total jobs in the corridor:  
 Over  
**380,600**



% in employment:  
**56%**  
 Yorkshire and Humber **60%**    England and Wales **62%**

In terms of the number of employees, the financial and insurance sector employs 26,931 people in the corridor, which is *twice the national average*<sup>7</sup>. 54,609 people work in the health and social services sector. People employed in this sector may rely on transport options outside of peak times. The highest number of employees, 62,307, are in the wholesale and retail trade. This sector operates shift patterns outside of the traditional timetables and schedules of current public transport routes.

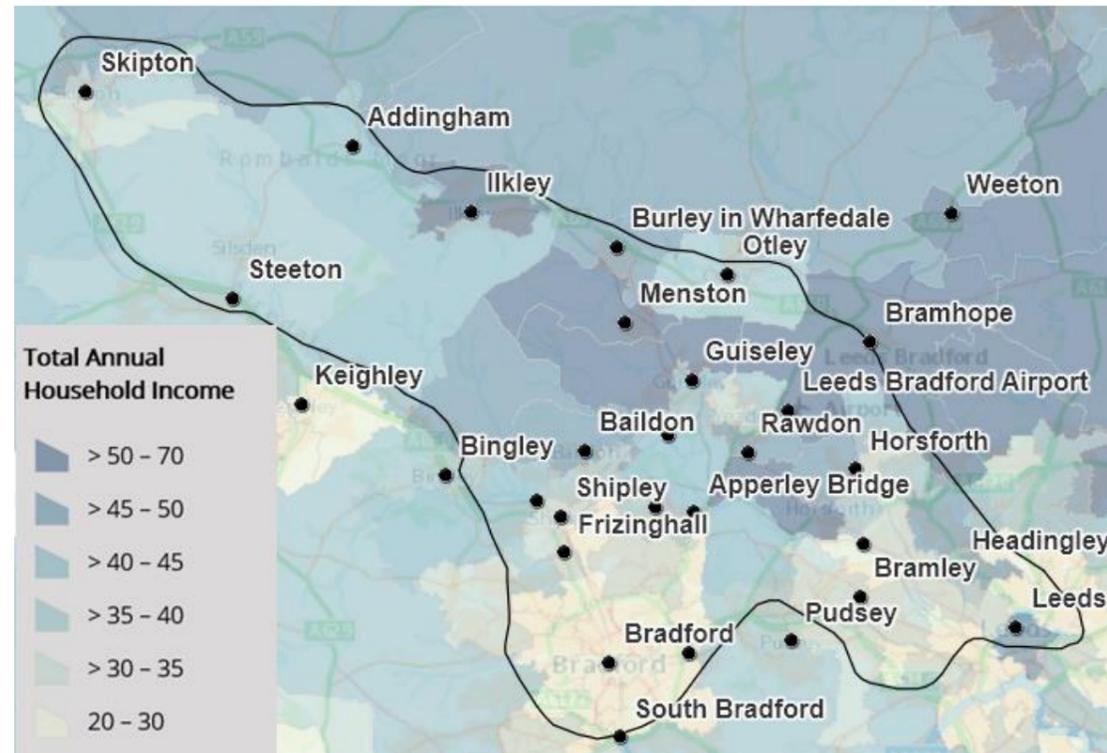
Much of Bradford's economy is still focused around manufacturing, with Shipley being a key centre. 27,115 people are employed in the manufacturing sector in this corridor.

**Connectivity to these specialisms is fundamental to boosting productivity.**

### 2.2.2 Household income

Average total annual household income in the corridor (£35,854) is lower than the average for England and Wales (£41,642) and close to the average for Yorkshire and Humber (£36,526) and is particularly low in areas within and around Bradford, Skipton and west of Leeds (shown in Figure 9). The gross value added per head (GVA) according to the West Yorkshire Combined Authority for Leeds is 8% higher than the UK average, whereas for Bradford it is only 68% of the UK average. This general measure of prosperity shows the need for better connections in the area to create opportunities to help enhance the economy and to help reduce the gap between some communities in the area and national income levels.

Figure 9: Total annual household income



Source: Mott MacDonald

Better connecting areas of deprivation and low annual household income is important to provide opportunities for people to access education and employment and in enabling inclusive growth throughout the corridor.

### 2.2.3 Growth areas

The Airport, Airedale and Wharfedale corridor is subject to considerable growth plans. To maximise the economic benefit and potential that these bring, their connectivity requirements must be considered carefully, and in the context of the existing socio-economic issues. Leeds Bradford Airport is an important centre of employment growth, with the economic hub creating up to 5,500 new jobs. Targeted growth and development within Leeds are partly driven by the South Bank regeneration project, with significant

investment in new employment sites and housing development also proposed around the 'East Side' of Leeds city centre. More central to this corridor, a key employment development is proposed at Apperley Bridge, which would provide up to 500,000 sq. ft of commercial and residential land. This emphasises the need for good transport options connecting businesses to potential employees and customers.

Figure 10 shows a heatmap of housing growth sites in the Airport, Airedale and Wharfedale corridor. At this stage, the specific locations for housing sites in Bradford are not available so cannot be mapped, however, significant housing developments are planned throughout the district, including key sites in Holme Wood to the south east of the city, close to the A650. Significant housing developments are also proposed in the heart of this corridor at Menston, Burley in Wharfedale, Ilkley, Horsforth, Addingham and Skipton. **Further employment growth emphasises the need to improve public transport connectivity to these areas, both from existing communities and new housing growth sites, to enable access to employment opportunities for everyone.**

Figure 10: Housing growth sites heatmap



Source: Mott MacDonald

## 2.3 Tackling the Climate Emergency

### 2.3.1 Carbon emissions

The West Yorkshire Transport Strategy recognises that our transport network currently constrains opportunities for growth and is a key factor in shaping experiences of poverty, but also that our networks do not sufficiently support sustainable travel as the obvious choice for many.

This is reflected in the evidence that the transport sector is the largest emitter of damaging carbon dioxide in the region, with transport contributing 4.9 MtCO<sub>2</sub>e/year (millions of tonnes of carbon emissions per year). Transport sector emissions are dominated by emissions from road transport with 4.4 MtCO<sub>2</sub>e/year being from road transport<sup>8</sup>, representing roughly 40% of total CO<sub>2</sub> emissions in West Yorkshire (11.1 MtCO<sub>2</sub>e/year)<sup>9</sup>. Road transport emissions are dominated by emissions from private cars, vans and lorries - with conventional petrol and diesel internal combustion engines the dominant technology across all vehicle types.

In June 2019 the Combined Authority, in line with all the West Yorkshire partner councils and most Leeds City Region local authorities, formally declared a Climate Emergency. This declaration signals the Combined Authority and partner councils' ambition for the region to become net zero-carbon by 2038, with significant progress being made by 2030. The 2038 target was determined following work by the Tyndall Centre for Climate Change Research, which was commissioned to create a science-based carbon budget for the Leeds City Region that is consistent with the objectives of the UN Paris Agreement on Climate Change (Paris Agreement) and the Intergovernmental Panel on Climate Change (IPCC)<sup>10</sup>.

The Combined Authority published, in July 2020, the findings of a Carbon Emissions Reduction Pathways (CERP) study<sup>11</sup>. This report, produced for the Leeds City Region and York and North Yorkshire local enterprise partnerships, is the first step in identifying the actions needed to create a net zero carbon economy.

While three pathways have been identified through the CERP work, there are several common actions identified in all the pathways, including a series of measures on transport. These modelled pathways all recognise the need for further modal shift to achieve the scale of reduction in carbon emissions from transport required to meet the ambitious net zero target and timeline.

Transport is therefore a critical sector for carbon emissions reduction across West Yorkshire requiring ambitious action that goes beyond current national policy and targets. The CERP asserts that this will require a significant shift in behaviour change and the fast adoption of low carbon technology.

At the time of publication, no further specific evidence on carbon emissions was available (pending release of West Yorkshire Combined Authority Emissions Reduction Pathway study and other work on carbon emissions), however **these influences, once understood, will be critical in understanding and prioritising connectivity requirements in future.**

### 2.3.2 Air quality

Partners across West Yorkshire, including the Combined Authority, the five district councils, and Public Health England, have developed the West Yorkshire Low Emissions Strategy (2016). The focus of the strategy is “tackling transport emissions as pollution from transport causes most local air quality problems”.

The strategy highlights that health effects associated with exposure to air pollution are significant; more deaths are caused by air pollution than preventable liver or respiratory disease. In West Yorkshire in 2013, 5.1% of all deaths (1 in 20 deaths) were caused by exposure to particulate air pollution with up to 6% in some local authority areas. Traffic in our urban centres and on busy roads results in levels of air pollution which have a significant impact on the health of the population, with those having underlying health conditions being most at risk. There are two pollutants of greatest concern: nitrogen dioxide (NO<sub>2</sub>) and

<sup>8</sup> West Yorkshire Combined Authority, 2020. West Yorkshire Carbon Emission Reduction Pathways Key Findings Report. Available at: <https://westyorkshire.moderngov.co.uk/documents/s16572/Item%2011%20-%20Appendix%201.pdf>

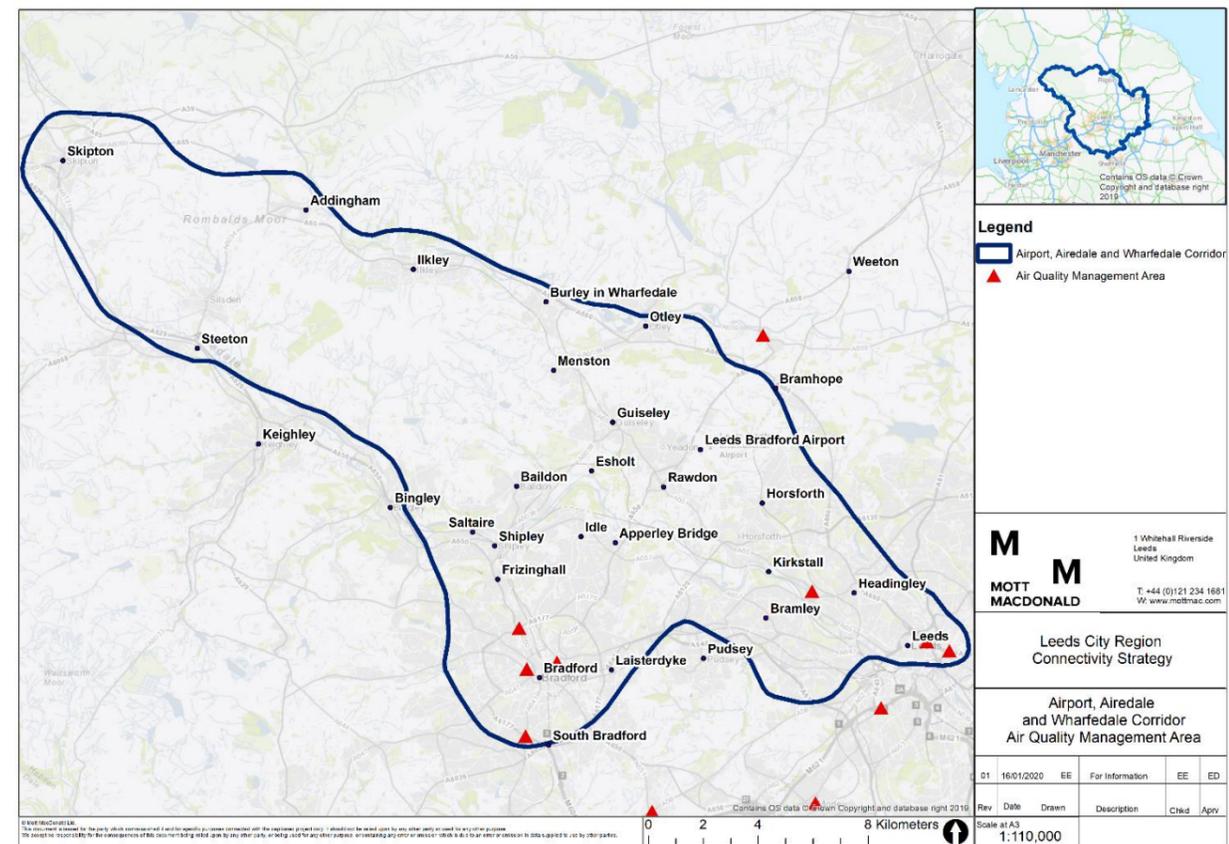
<sup>9</sup> ibid

particulate matter (PM<sub>n</sub>) which have an adverse impact on health and mainly result from emissions from traffic, particularly exhaust emissions from older diesel vehicles.

Nitrogen dioxide and particulate matter, together with other air pollutants, have been set an upper air quality limit value that the general population should not be exposed to that is legally binding in UK law. Since 1997 each local authority has been carrying out review and assessment of air quality in its area, and where it is found likely that national air quality objectives will not be achieved, an air quality management area must be declared<sup>12</sup>.

There are several localised air quality management areas within the corridor, as shown in Figure 11. In addition, the Leeds Clean Air Zone (CAZ) will be introduced in 2020 to help reduce air pollution and protect the health of everyone in Leeds. This includes Leeds City Centre and in an arc to the north from west to east; Farsley, Headingley, Roundhay, Harehills, Cross Gates and Temple Newsam. Bradford is also developing proposals for a CAZ which would extend to the outer ring road, and includes links to Shipley and Saltaire, to help reduce transport emissions. **Facilitating sustainable modes of transport will reduce car use, enabling a consequent reduction in traffic congestion and the associated emissions that cause air pollution and poor air quality.**

Figure 11: Air Quality Management Areas (AQMA)



Source: Mott MacDonald

<sup>10</sup> ibid

<sup>11</sup> ibid

<sup>12</sup> Department for Environment Food & Rural Affairs at <https://uk-air.defra.gov.uk/aqma/> accessed in October 2020

## 2.4 Delivering 21st century transport

### 2.4.1 Active modes

The ability for people to frequently and safely cycle and walk has been identified in policy as having a significant role to play in the strategic transport network in West Yorkshire. This corridor is relatively well connected and has seen recent significant investment in the cycling and walking infrastructure along the main routes between Leeds and Bradford, through the Combined Authority's CityConnect programme, with the 23km Leeds Bradford Cycle Superhighway. The off-highway network has also seen significant improvement, with the Leeds Liverpool canal towpath between Leeds and Shipley having been upgraded providing a 16km off-highway route.

Figure 12 identifies there are large areas of the corridor which lack infrastructure, particularly around the airport, and there is no on-highway infrastructure along the A65 beyond Kirkstall towards Ilkley and Skipton. Throughout Wharfedale, places such as Menston, Guiseley, Otley, Ilkley and Skipton are disconnected from each other and the rest of the corridor, which presents a barrier to active travel in these communities.

Although the topography in this area is challenging for active travel, the provision of high quality, segregated routes could provide people with the space and confidence to make these journeys. The A65 provides a route through this corridor, which with quality provision would increase opportunity for more journeys by bike along the corridor. **The area has good potential for an increase in the use of active modes; investment in better infrastructure will improve connectivity to current and future employment and education opportunities, particularly in areas that are presently only accessible by private car.**

Figure 12: Active travel network



Source: Mott MacDonald

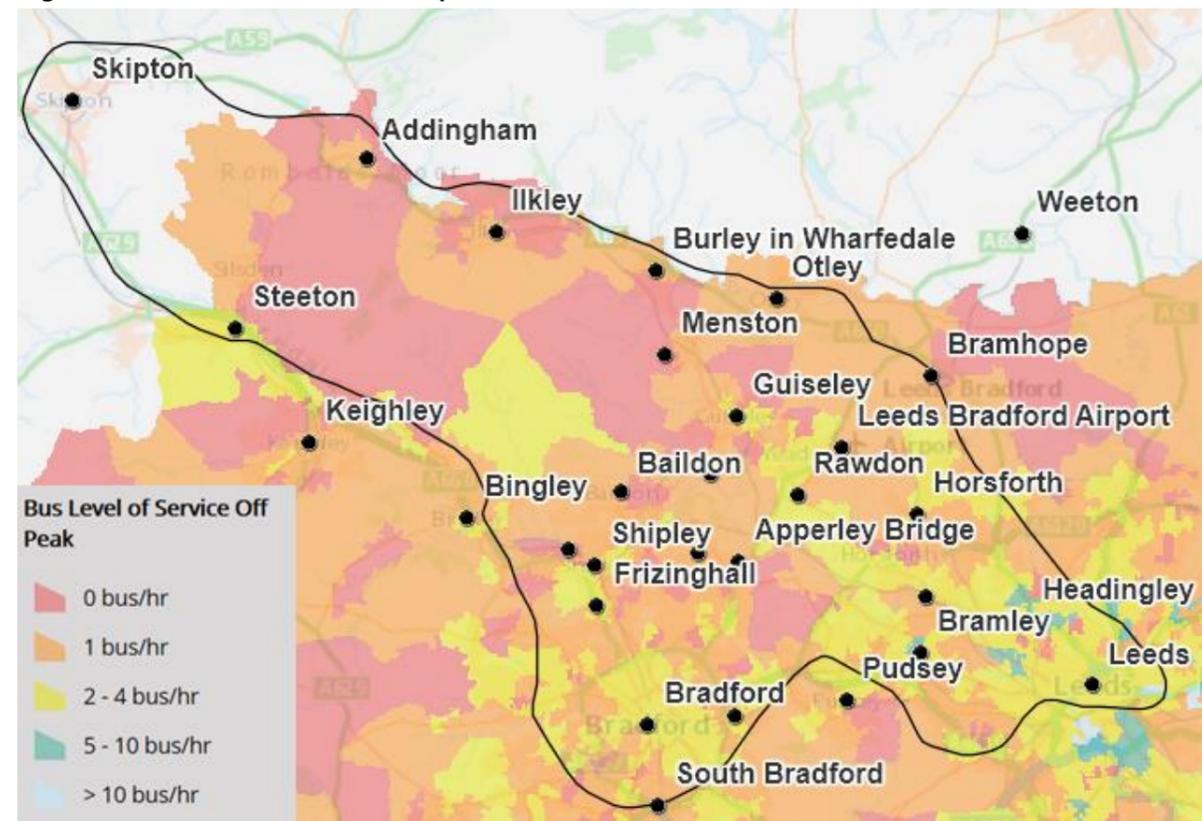
### 2.4.2 Bus

Figure 13 shows levels of bus service during the off-peak period in the corridor. This uses information about service frequencies across all routes at individual bus stops and calculates an average level of service across census output areas. This helps to characterise areas by their level of accessibility alongside comparable socio-economic characteristics outlined in earlier sections.

No data was available beyond West Yorkshire, hence services in Skipton and its surrounding area have not been mapped. Figure 13 illustrates that the two city centres and their suburbs are served by the highest frequency of buses, 2-4 buses per hour as shown in yellow. Communities in Airedale from Shipley and Bingley to Steeton/Silsden are served predominantly by 1 bus per hour. Key locations on radial routes such as Apperley Bridge, Rawdon and Guiseley are served by 2-4 buses per hour. There are important existing and future employment and housing locations, such as Leeds Bradford Airport, Menston, Burley in Wharfedale and Otley, that are served by one bus per hour and some have no bus services in the off peak, leaving people without access to a car very limited opportunities to travel, often to a limited number of locations.

**Around 71,400 people in the corridor (12%) excluding those outside West Yorkshire have no access to a bus service outside of peak periods and 260,800 people (43%) excluding those outside West Yorkshire have access to just one bus per hour.**

Figure 13: Bus level of service - off-peak



Source: Mott MacDonald

### 2.4.3 Rail

The current passenger rail network (see Figure 14) consists of:

- The Aire Valley line: Leeds via Shipley to Bradford Forster Square and to Skipton via Keighley, with onward links to Carlisle and Lancaster; it also connects Bradford Forster Square to Skipton
- The Wharfedale line: Leeds and Bradford Forster Square to Ilkley, connecting to the above routes at Shipley
- The Harrogate line: Leeds to Harrogate via Headingley and Horsforth
- The Calder Valley line from Leeds to Bradford via New Pudsey also skirts the study area.

In addition, there are heritage railways between Keighley and the Worth Valley; and between Embsay and Bolton Abbey. Freight traffic also utilises the network, particularly between Skipton and the Wharfe Valley to service quarries.

Local services on the Leeds/Bradford Forster Square/Ilkley/Skipton network utilise modern electric units, with standard services all running twice-hourly (though less on Sundays). As a result, rail modal shares for commuting into main centres are high<sup>13</sup> and rail is popular for leisure journeys too. However, this has resulted in serious crowding at peak times according to passenger surveys. Service levels beyond Skipton are lower, reflecting to an extent the more rural catchments, and the rolling-stock used is less modern.

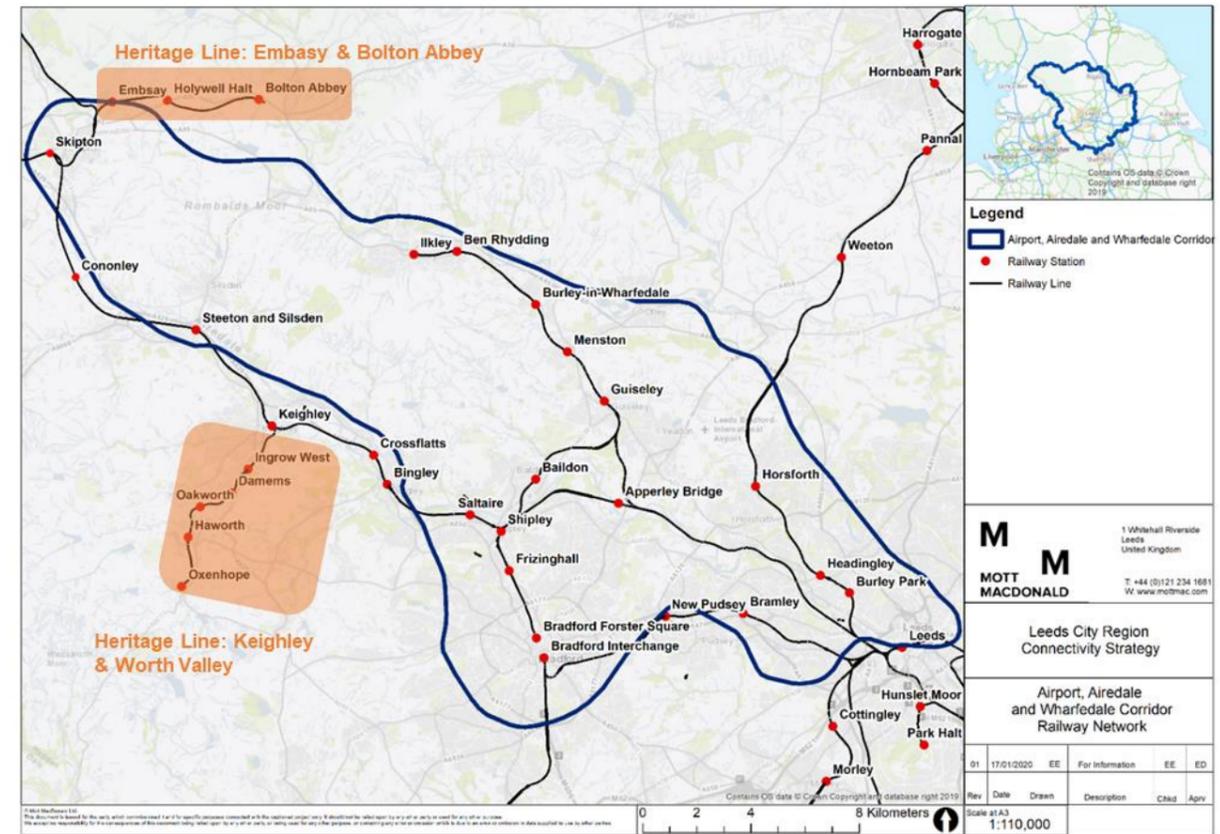
Some gaps in the network have been highlighted by partners, including the absence of a rail link to Leeds – Bradford Airport (though a parkway station on the Harrogate line is planned); the town of Otley; and the isolation of the two Bradford termini from one another. The requirement for Calder Valley trains to reverse direction in Bradford is also a constraint. In addition, partners have identified the aspiration for a regular local rail service between Keighley and the Worth Valley. Other challenges for rail services in the study area at present include variable station facilities and accessibility; some poor access between stations and the communities they serve; and limited integration both between rail services and with buses<sup>14</sup>.

While this report makes recommendations that are directly or indirectly relevant to rail, most rail content will be picked up separately in WYCA’s Rail Strategy work. That Rail Strategy sits alongside these Case for Change reports, informed by them and informing them, and this report should be read in conjunction with the WYCA Rail Strategy.

<sup>13</sup> Census 2011 Journey to Work Data

<sup>14</sup> National Rail Passenger Service ratings, partner (plus stakeholder, user and political) feedback.

Figure 14: Current Rail Network

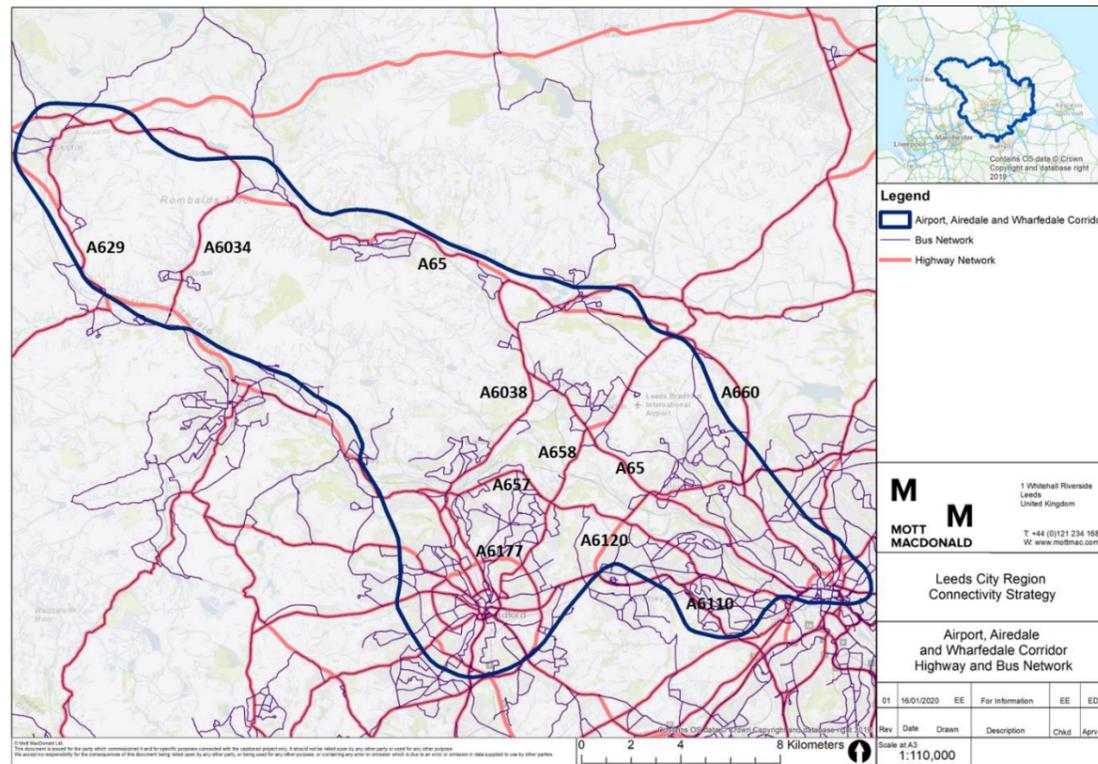


Source: Mott MacDonald

### 2.4.4 Road

Figure 15 presents the road and bus networks throughout the corridor. The strategic road network includes the A6177, A658, A657, A65 and A660. The A6110 runs east-west connecting Leeds and Bradford and key roads provide north-south connectivity including the A6038 and A658.

Figure 15: Current bus and highway network (A roads and motorway network)



#### 2.4.4.1 Highway network performance

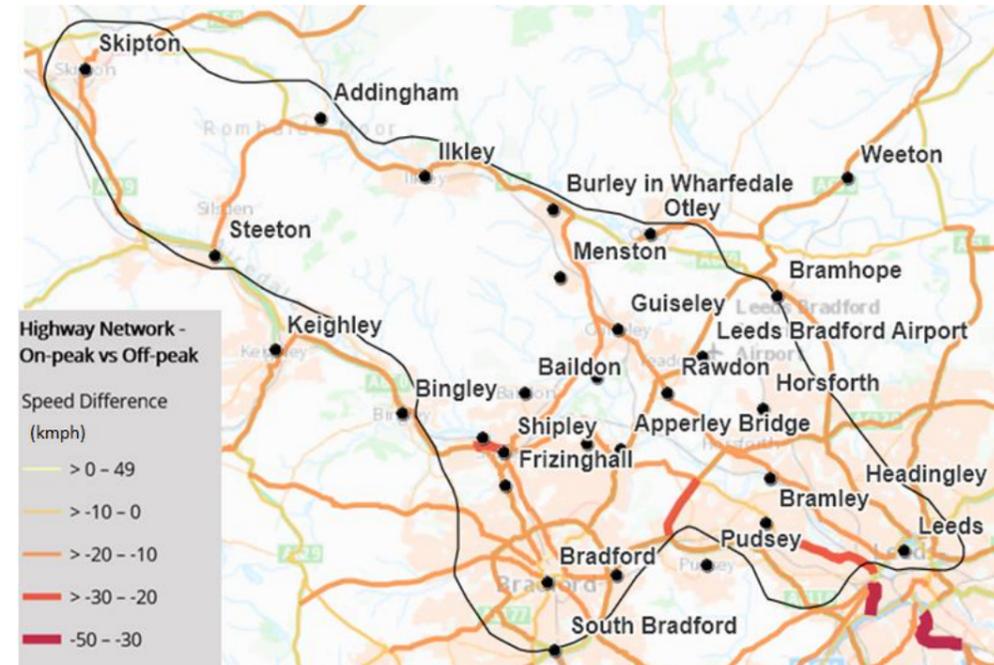
Figure 16 shows the speed difference (kmph) on the highway network between the peak and off-peak. There are large reductions in speed along all the radial routes into both Leeds and Bradford, including the A6110, A658, A650, A6038, A65 and A660. The A6177 ring road around Bradford similarly experiences delay. Sections of highway with significant delay can be found on the A6120, A650 and A647. The A629 and A6131 in and around Skipton also experience reductions in speed in the peak.

The A6177 causes severance issues across some communities to the east of Bradford. Similar issues are experienced throughout Leeds, with arterial roads dividing communities.

Partners highlighted the relatively poor road connectivity to the airport, which is located away from the major motorway network and accessed via a congested local road network.

Introducing more opportunities to travel to these areas via public transport will help to reduce capacity constraints on the network and enable further inclusive growth.

Figure 16: Highway network on-peak vs off-peak speed difference



Source: Trafficmaster

#### 2.4.5 Patterns in transport demand

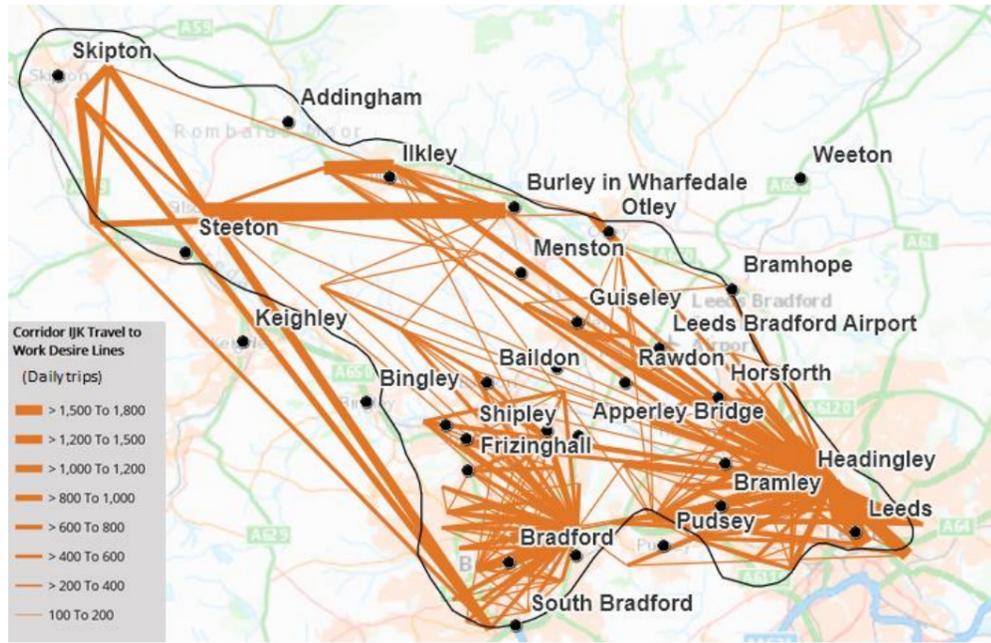
Figure 17 shows that key movements in the area (in the form of journey to work desire lines – person daily trips to work, Census 2011) are towards Leeds and Bradford City Centres, with notable movements between Silsden and Steeton and Wharfedale, which could be attributed to staff travelling to Airedale General Hospital.

Figure 18 and Figure 19 show where new housing and employment sites are located and the current travel to work patterns.

**These graphics indicate that there is value in improving connectivity in this area, in order to broaden these limited travel horizons and ensure its current and future residents and employees benefit from the growth opportunities that will become available. They also illustrate the potential for travel patterns to change, where demand is likely to increase, and where investment needs to be made in order to connect people to these new growth sites.** This is explained in further detail in Chapter 4.

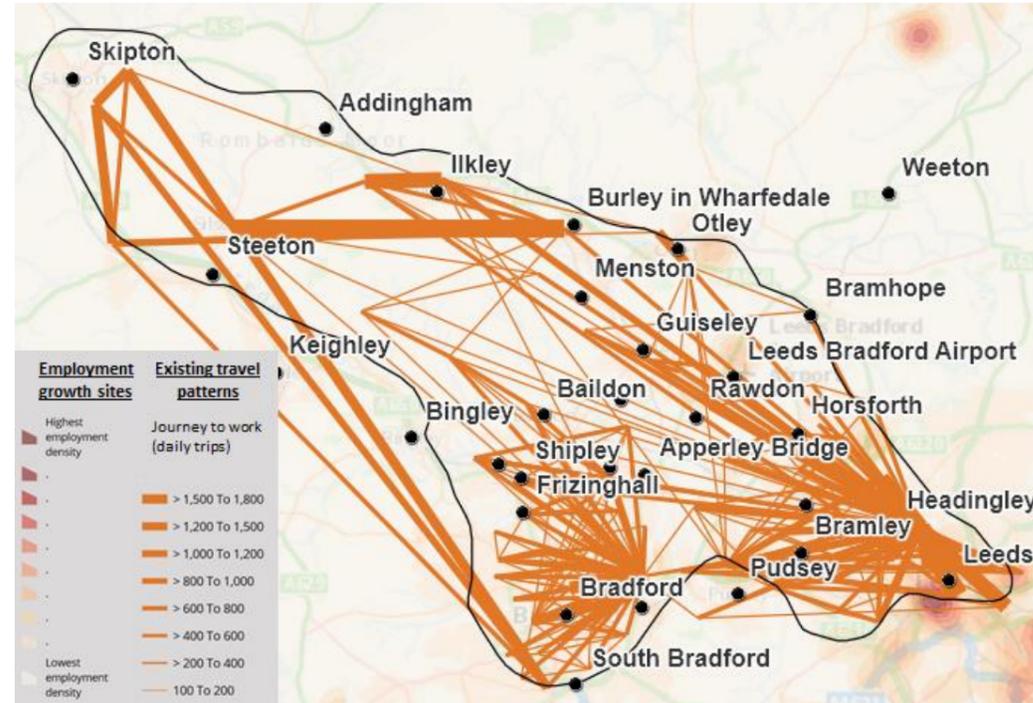
Changes in employment locations is likely to have the most significant effect on travel patterns; it is crucial to connect these places with a range of travel choices to ensure inclusive growth.

Figure 17: Journey to work desire lines



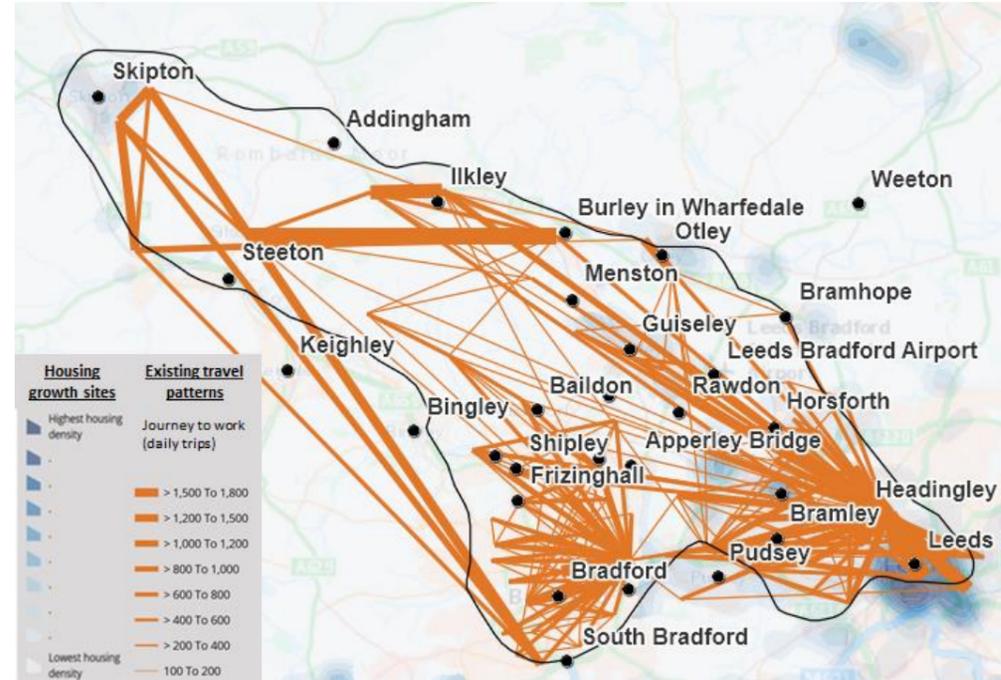
Source: Mott Macdonald

Figure 18: Future employment growth and current travel to work desire lines



Source: Mott Macdonald

Figure 19: Future housing growth and current travel to work desire lines



Source: Mott Macdonald

## 2.5 Summary

To **enable inclusive growth**, improved connectivity is needed to provide better access to work for people in communities within the Airport, Airedale and Wharfedale corridor. Whilst some communities in Ilkley, Menston and Burley in Wharfedale are relatively affluent, some communities are characterised by low employment and skills prospects, low household income (14% below national average) and low car ownership, with several areas being within the 10% of most deprived communities in the UK.

Employment prospects in the corridor are focused at key sites including Leeds Bradford Airport, Apperley Bridge and Skipton. Job opportunities in the wholesale and retail trade rely heavily on car access, and yet, the communities in Leeds, Bradford, Shipley and Skipton are characterised by low car ownership (with over 26% of households without access to a car).

Approximately 260,800 people in the corridor (43% of the population), excluding those outside of West Yorkshire, have access to just one bus per hour outside of peak periods. There is a disconnect between jobs located in places that have poor access for people without a car and communities with low car ownership. Elsewhere in the corridor, access to highly skilled service and finance jobs in Leeds and Bradford can be limited in areas where limited public transport options are available, such as Otley and Bramhope. To improve the prospects of these communities, and to **boost productivity**, employment opportunities must be better connected to communities of the greatest economic need.

There is also a skills gap. Bradford city centre, South Bradford and Shipley are in the top 10% most deprived areas for education in England. Improving connectivity to education opportunities will help close this skills gap and help people to find better employment, contributing to opportunities for everyone in the area. Improving productivity through better connectivity to employment and skills will also help improve broader economic indicators.

Several areas suffer from poor air quality; particularly within Bradford's outer ring road, Leeds city centre and areas to the north. This not only affects populations living within Bradford and Leeds, but also affects the high number of commuters travelling through the AQMAs and CAZs. To help **tackle the climate emergency** and achieve carbon emission targets, congestion and traffic levels on these strategic links must be addressed. Options for travel that has lower carbon emissions must be improved, both through cleaner public transport options and an expanded active travel network.

The Connectivity Plan for this area will focus upon **delivering 21<sup>st</sup> century transport** that connects the places of greatest economic need to employment and skills opportunities through greener modes of transport. Ensuring cleaner, greener modes are used will contribute to achieving a zero-carbon economy in the City Region.

The focus should be on:

- Strategic trips from key transport and housing hubs towards opportunities in Leeds and Bradford
- Localised trips within and between Airedale and Wharfedale
- Local trips to key housing and employment hubs, such as Apperley Bridge and Leeds Bradford Airport

Four summary maps have been created to summarise the spatial context highlights for each of the regional priorities. These are shown in **Appendix A**.

### 3 Corridor aspirations

This section outlines the processes through which the corridor aspirations have been defined, and how they link to the evidence base and local policy.

Please refer to Chapters 4 and 8 of the Appraisal Handbook for details of how the West Yorkshire Connectivity Plan core objectives have been derived from key policy drivers and how they and corridor-specific aspirations are used in the development of the Case for Change.

#### 3.1 Defining objectives

The core objectives have been derived from strategic visions and ambitions from policy and have been agreed with the West Yorkshire Combined Authority. They ensure that the West Yorkshire Connectivity Plan supports the delivery of the long-term vision for the Leeds City Region – as identified in the LCR HS2 Growth Strategy – as well as the priorities and ambitions outlined in the Strategic Economic Plan (SEP), the LCR HS2 Connectivity Strategy, and the West Yorkshire Transport Strategy 2040. These objectives are applicable to all inclusive growth corridors.

Corridor-specific aspirations have been developed from the key issues, opportunities and priorities identified in the workshop with local officer representatives. These objectives ensure that the interventions developed align with the priorities of West Yorkshire and its districts. Each intervention is assessed against both the core objectives and corridor-specific aspirations to ensure the best possible fit.

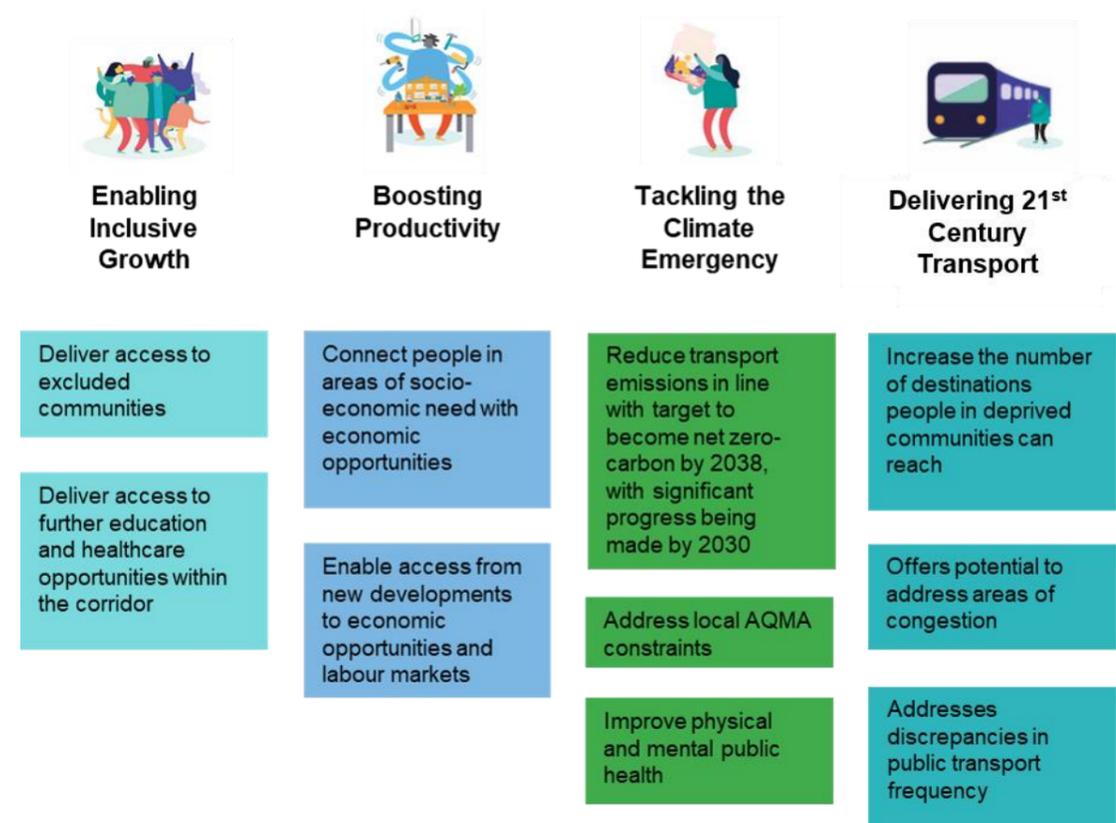
#### 3.2 Core objectives

The West Yorkshire Connectivity Plan core objectives are aligned to the City Region's core priorities, as illustrated below:

**The West Yorkshire Connectivity Plan Core Objectives are to:**

- Connect people in areas of socio-economic need with economic opportunities
- Enable access from new developments to economic opportunities and labour markets
- Deliver access to further education and healthcare opportunities within the corridor
- Deliver access to excluded communities
- Increase the number of destinations people in deprived communities can reach
- Offer potential to address areas of congestion
- Address discrepancies in public transport frequency
- Reduce transport emissions in line with target to become net zero-carbon by 2038, with significant progress being made by 2030
- Address local AQMA constraints
- Improve physical and mental public health

Figure 17: Alignment of the West Yorkshire Connectivity Plan core objectives to the City Region's core priorities



#### 3.3 Corridor-specific aspirations

Drawing on the key issues and opportunities identified from the evidence base, corridor-specific aspirations have been agreed for Airedale and Wharfedale, in consultation with stakeholders from Leeds and Bradford districts.

**The Airport, Airedale and Wharfedale Aspirations are to:**

- Improve sustainable, reliable and fast connectivity to Leeds Bradford Airport from Leeds, Bradford and Skipton
- Connect proposed key employment sites in North East Bradford to neighbouring areas
- Improve accessibility to Shipley and Saltaire
- Improve end to end connectivity between Leeds, Bradford and Skipton
- Encourage sustainable transport usage for shorter-distance trips
- Improve air quality at the urban centres, reduce through traffic in Bradford district
- Apply concepts of Blue Green Infrastructure, e.g. nature can address resilience against flooding

These all align to current local policy documentation such as the Bradford Core Strategy and the Interim Leeds Transport Strategy (2016).

### 3.4 Measuring objectives

#### 3.4.1 The appraisal process

The core objectives and corridor-specific aspirations provide the foundation of the West Yorkshire Connectivity Plan options appraisal process, alongside spatial analysis. Interventions are assessed against a set of criteria aligned with the objectives, and the spatial evidence base in a Geographical Information System (GIS) – such as whether the intervention connects to areas of deprivation and employment, housing and education sites. A description of the data that underpins this is detailed in Chapter 7 of the Appraisal Handbook.

The outputs are then fed into the Mott MacDonald’s Investment Sifting & Evaluation Tool or “INSET” – this is a WebTAG-compliant decision support process, based on multi-criteria analysis. It enables interventions to be assessed and “sifted” against specially defined and flexible parameters which determine how well the interventions meet the objectives and corridor-specific aspirations.

INSET is like the Department for Transport (DfT) Early Assessment and Sifting Tool (EAST) but has been built to surpass its capabilities – such as the ability to assess interventions across a full range of themes, including economic, social and environmental indicators, depending on local circumstances, and to reflect on multiple future scenarios.

The appraisal is classified into four assessment themes, all linked to the core policy priorities. These are used to classify the core objectives and have specific scoring criteria – as shown in Table 3. The assessment themes also enable policy makers and scheme promoters to sift interventions that will meet specific policy drivers (e.g. economic growth, social, transport, environmental) enabling them to quickly respond to different funding opportunities as they come forward. Interventions can be assessed individually relative to other Business Case factors such as deliverability.

**Table 3: Key themes for multi-criteria assessment**

Core objective	Assessment theme	Scoring notes
<ul style="list-style-type: none"> <li>Deliver access to further education and healthcare opportunities within the corridor</li> <li>Deliver access to excluded communities</li> </ul>	<b>Enabling Inclusive Growth</b> 	Based on the number of Equality, Diversity and Inclusion hotspots the intervention connects to as well as health and education sites. This theme helps to address the need to connect people including those in excluded communities to education and health facilities which links to the key objectives in the HS2 Connectivity Strategy.
<ul style="list-style-type: none"> <li>Connect people in areas of socio-economic need with economic opportunities</li> <li>Enable access from new developments to economic opportunities and labour markets</li> </ul>	<b>Boosting Productivity</b> 	Based on the number of housing and employment growth sites the intervention connects to, as well as the affected population for deprivation, low car ownership and the total number of jobs. This helps to identify interventions that best help to improve inclusive growth by connecting people to jobs who are living in areas of deprivation and low car ownership.
<ul style="list-style-type: none"> <li>Reduce transport emissions in line with targets to become net zero-carbon by 2038, with significant progress being made by 2030</li> <li>Address local AQMA constraints</li> <li>Improve physical and mental public health</li> </ul>	<b>Tackling the Climate Emergency</b> 	<p>At the time of assessment, no quantifiable evidence on carbon emissions was available (pending release of West Yorkshire Combined Authority Emissions Reduction Pathway study and other work on carbon emissions) – therefore, based on the broad understanding that significant modal shift alongside fast adoption of low carbon technology will be required, it is assumed that all schemes would inherently contribute to the decarbonisation agenda, unless they are road schemes.</p> <p>As a proxy, scoring was influenced by how many Air Quality Management Areas (where it can be reasonably assumed there will be action to tackle emissions from transport) and touchpoints with the National Cycle Network (which may positively influence mode shift to cleaner modes) the intervention connects to, as well as their performance against the Healthy Streets™<sup>15</sup> principles (again, an influence on positive mode shift to cleaner modes).</p>
<ul style="list-style-type: none"> <li>Increase the number of destinations people in deprived communities can reach</li> <li>Offers potential to address areas of congestion</li> <li>Addresses discrepancies in public transport frequency</li> </ul>	<b>Delivering 21st century transport</b> 	Based on how well the intervention connects areas with low levels of existing travel identified as isolated communities as well as areas with a large speed difference between on-peak and off-peak periods on the highway network and those with poor levels of bus service. As these are transportation schemes, a high number of interventions scored well for this theme.

Source: Mott MacDonald

The multi-criteria analysis is done in three “sifts”. These are summarised below and the sub-criteria and scoring approach for each is available in Chapter 8 of the Appraisal Handbook.

**Sift 1: Early sift.** This is based on the potential for the intervention to address the Core Objectives – it is simply scored using a Yes / No outcome against a series of sub-criteria, linked to the spatial data in GIS. On its own, the early sift can be used to rule out interventions at a very high-level; i.e. if it does not

<sup>15</sup> Pedestrians from all walks of life; Easy to cross; Shade and shelter; Places to stop and rest; Not too noisy; People choose to walk, Cycle and use public transport; People feel safe; Things to see and do; People feel relaxed; Clean air.

address one or more of the four themes or policy priorities or does not meet a criterion or combination of criteria.

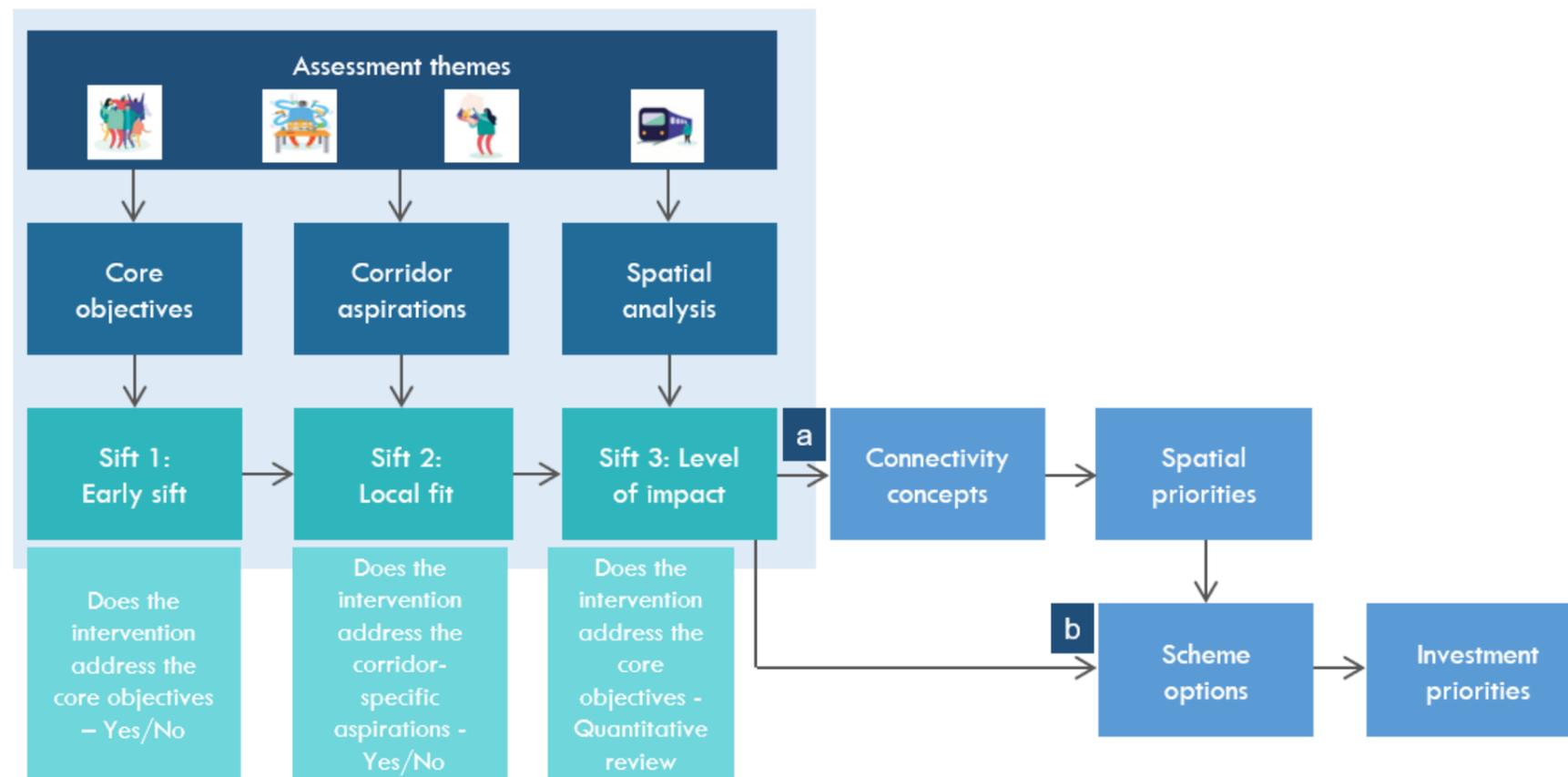
**Sift 2: Local fit.** This is based on the potential for the intervention to address the corridor-specific aspirations – again, it is simply scored using a Yes / No assessment by determining whether an intervention meets a certain criterion (or combination of criteria) and/or whether it is above or below a certain threshold for a given objective.

**Sift 3: Level of impact.** Like the first sift, this is based on the potential for the intervention to address the Core Objectives identified; however, the third sift has a *quantitative* element, drawing on the spatial evidence from the datasets in GIS. It also introduces a degree of standardisation to mitigate against the scale of intervention, and ensure schemes are tested fairly in terms of their level of impact relative to their size and spatial scale.

The key outcomes from the appraisal are two-fold – (a) a set of spatial priorities determined from several “connectivity concepts” (mode agnostic connections between key places – described further in Chapter 4), and (b) investment priorities determined from several interventions.

The diagram below summarises the appraisal process:

**Figure 18: Appraisal process**



Source: Mott MacDonald

**The core appraisal adopted for Airport, Airedale and Wharfedale assumes that all assessment themes have equal weighting or importance.** However, the application of the appraisal process is very flexible and can be used to adapt to different requirements (e.g. a change in funding or policy environment). Different weightings can be applied to the four assessment themes. For example, the user can “switch-off”, “switch-on” or change the weighting that is applied for the assessment themes and criteria to perform sensitivity tests or to simply enable interventions to be filtered for their suitability for future funding streams – such as how they score against specific policy levers, and their readiness or timescales for delivery (e.g. Transforming Cities). Corridor specific aspirations can also be “switched-off” to enable a more Leeds City Region focused list of priorities. The appraisal process can also be used to better understand the relative strength or weakness of different interventions and can highlight opportunities to “repackage” schemes for future funding streams.

Please refer to Chapters 8, 9 and 10 of the Appraisal Handbook for the detailed workings of option appraisal process and its outcomes.

## 4 Determining spatial priorities

In determining spatial priorities, the evidence base and stakeholder workshops enable identification of key places to connect and resulting connectivity requirements for the corridor’s economic area. From this, “connectivity concepts” are defined. At this stage, connectivity concepts do not relate to a specific transport mode or a specific route alignment. However, they do enable a strategic appraisal of whether there is merit in connecting people and places, as well as helping to define spatial priorities within the area. Connectivity concepts will allow further exploration of alignments, transport modes and specific interventions should they meet a series of key objectives.

### 4.1 Places to connect

Table 4 shows the key places to connect that have been identified, reflecting the inputs of partners and supported by the evidence base.

Key sections of the evidence base that have informed the identification of these places are listed below:

- Section 2.1.1: Deprivation
- Section 2.1.2: Isolated Communities
- Section 2.2.1: Employment Characteristics
- Section 2.2.3: Growth Areas
- Section 2.4.2: Bus
- Section 2.4.3: Rail

The principal characteristic influencing the selection of each place to connect is also shown. Places include key settlements, transport hubs, housing and employment growth zones. These were identified on the “story map” for the Airport, Airedale and Wharfedale corridor and are shown in Figure 22.

**Table 4: Key places to connect**

Key place	Characteristic	Scale / justification
Leeds Bradford Airport	Employment growth and travel hub	Key airport within the region therefore major trip attractor and approximately 58.6ha of new employment land allocated
Allerton	Bus network	Suburb located on strategic bus network
Apperley Bridge	Train station	Station stop on Leeds – Bradford Forster Square line
Baildon	Housing growth	Approximately 350 new dwellings
Ben Rhydding	Train station	Station stop on Leeds – Ilkley line
Bingley	Housing growth	Approximately 1400 new dwellings
Bowling	Inclusive growth	Within the top 20% most deprived neighbourhoods in England
Bradford	Sub-regional city. Employment and housing growth and focus for inclusive growth	Key city within the region. Slower than average growth emphasises the need for good transport options connecting businesses to potential employees and custom. Approximately 3500 new dwellings. In the top 10% deprived areas for England.
Bradford Royal Infirmary	Hospital	Key local employer and important provider of health services
Bramhope	Housing growth	A settlement with commuter flows into Leeds with approximately 370 new dwellings proposed
Bramley	Inclusive growth	Within the top 20% most deprived neighbourhoods in England
Broomfields	Inclusive growth	Within the top 20% most deprived neighbourhoods in England

Key place	Characteristic	Scale / justification
Burley in Wharfedale	Housing growth	Village with a rail station. Approximately 700 new dwellings
Burley Park	Train station	Station stop on Leeds – Harrogate line
Clayton	Bus network	Suburb located on strategic bus network
Crossflatts	Housing growth	Over 100 dwellings allocated for development
Cullingworth	Bus network	Village located on strategic bus network
Dudley Hill	Bus network	Suburb located on strategic bus network
East Bowling	Inclusive growth	Within the top 20% most deprived neighbourhoods in England
Eastburn	Bus network	Village located on strategic bus network
Eccleshill	Inclusive growth	Within the top 20% most deprived neighbourhoods in England
Eldwick	Bus network	Suburb located on strategic bus network
Esholt	Housing growth	New housing and employment site
Frizinghall	Inclusive growth	Within the top 20% most deprived neighbourhoods in England
Guiseley	Housing growth	Key settlement with a rail station and 503 dwellings allocated
Headingley	Housing growth	Approximately 150 new dwellings proposed
Holme Wood	Inclusive growth and housing growth	Within the top 20% most deprived in England and large housing growth zone
Horsforth	Housing growth and rail station	Station stop on Leeds – Harrogate line and approximately 209 new dwellings
Idle	Inclusive growth	Within the top 20% most deprived neighbourhoods in England
Ilkley	Housing growth	Key settlement with a rail station. Approximately 1,000 new dwellings
Keighley	Principal town and housing and employment growth	Approximately 17.5ha of new employment land and approximately 4500 new dwellings
Laisterdyke	Inclusive growth	Within the top 20% most deprived neighbourhoods in England
Leeds	Sub-regional city. Housing and employment growth and deprivation	A key hub for HS2 and a core city in the region. Substantial housing and employment development sites, including South Bank and areas of deprivation.
Menston	Housing growth	Approximately 600 new dwellings
Oakworth	Bus network	Village located on strategic bus network
Otley	Large employment and housing growth	Approximately 50 ha of new employment land allocated and 500 dwellings
Pannal	Housing growth	Has a rail station on commuter line into Leeds, with mixed-use development on the site of Pannal Business Park and the allocation of approximately 350 dwellings in the Harrogate Draft Local Plan
Pudsey	Inclusive growth	Within the top 20% most deprived neighbourhoods in England.
Rawdon	Key settlement	Key settlement
Saltaire	Visitor attraction	UNESCO world heritage site
Shipley	Inclusive growth and housing growth	Approximately 750 new dwellings
Skipton	Principal town and employment growth	Approximately 18.5 ha of new employment land allocated
South Bradford	Inclusive growth and housing growth	Only 38% of the population economically active in an area of South Bradford and within the top 20% most deprived neighbourhoods in England
Steeton & Silsden	Housing growth	Key settlements with a rail station. Approximately 1900 new dwellings
Tong Street	Bus network	Village located on strategic bus network
Thackley	Key settlement	Key settlement
Thornbury	Bus network	Suburb located on strategic bus network
Thornton	Bus network	Village located on strategic bus network
Yeadon	Inclusive growth	Within the top 20% most deprived neighbourhoods in England



## 4.2 Existing connectivity improvements

There are several schemes scheduled for implementation within the corridor. Figure 20 presents a conceptual map showing the planned highway and active travel corridors and interventions as part of the West Yorkshire Plus Transport Fund (WYPTF) and Connecting Leeds. These include several transport projects to improve connectivity on key routes as well as several proposals to enhance the active travel network, such as the A660 Adel to Leeds.

Figure 20 also shows the initial areas being included in the work to develop the Local Cycling and Walking Infrastructure Plan (LCWIP). LCWIP is a planning process and delivery is currently unfunded. A selection of West Yorkshire's Transforming Cities Fund (TCF) schemes are also planned in the area.

Table 5 provides a description of each programme currently providing connectivity improvements throughout the corridor.

**Table 5: Programmed Investment**

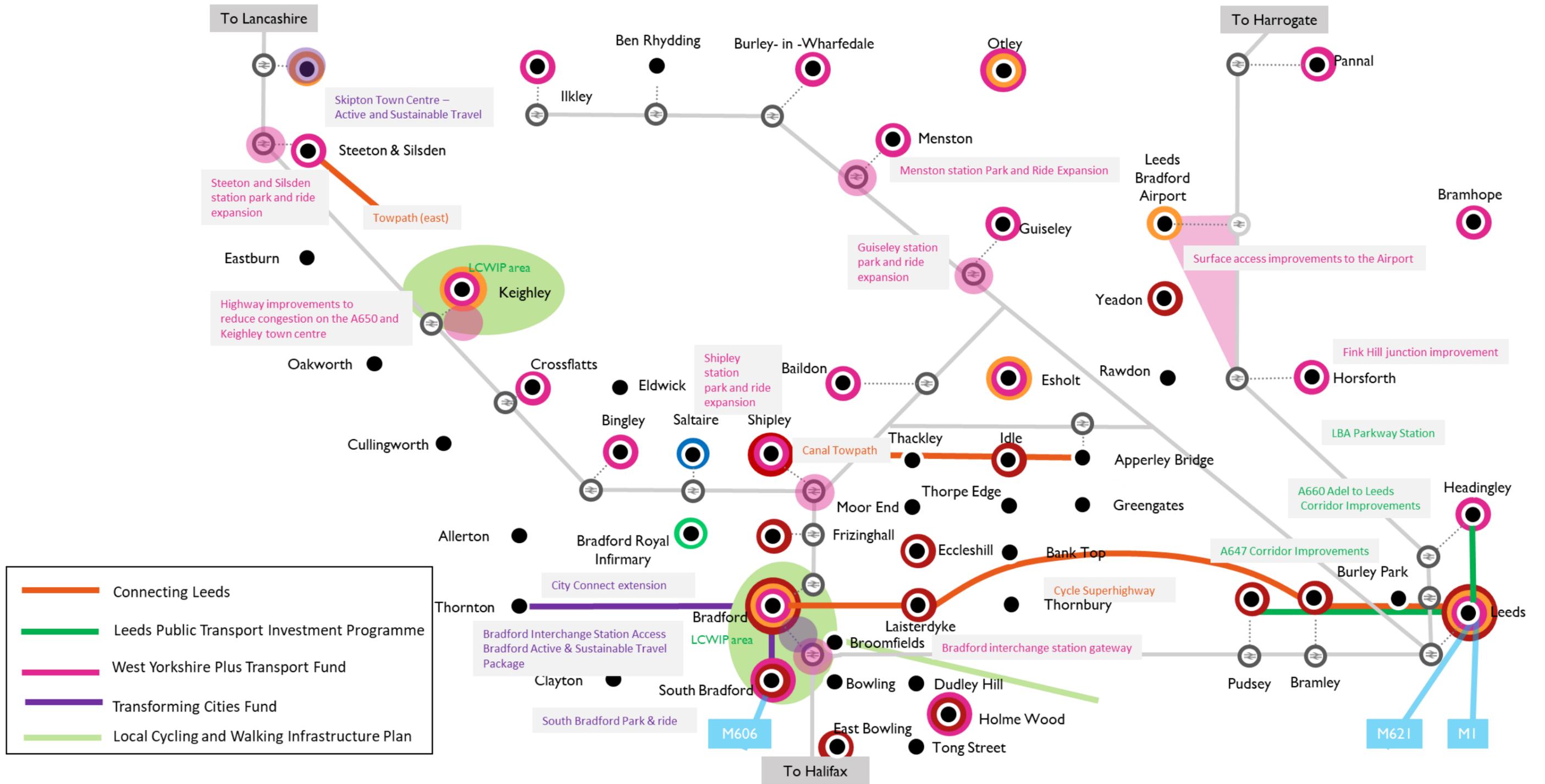
Programme	Scheme	Description
West Yorkshire Plus Transport Fund	Bradford Interchange Station Gateway	Proposals to re-develop Bradford Interchange to improve; customer experience, the visibility of the station from the city centre and safety for pedestrians.
West Yorkshire Plus Transport Fund	Bradford to Shipley Multi-modal corridor	Multi-modal enhancements along Canal Road/Valley Road (A6037) and Manningham Lane/Bradford Road to improve the links between Bradford city centre and Shipley. Construction is expected to start in 2022 and end in 2025.
West Yorkshire Plus Transport Fund	Shipley Station Park and Ride	Increased parking provision for station users. Work has been ongoing since 2014 and is due for completion in 2021.
West Yorkshire Plus Transport Fund	Steeton and Silsden Park and Ride	Provision of approximately 250 spaces in a new 3-level car park. Completion aimed for 2021.
West Yorkshire Plus Transport Fund	Guiseley Station Park and Ride	Investigating how to increase parking capacity for rail users. The station provides connections to Bradford and Leeds city centres.
West Yorkshire Plus Transport Fund	Menston Station Park and Ride	Provision of up to 30 additional car parking spaces at Menston rail station to help improve connectivity across West Yorkshire
West Yorkshire Plus Transport Fund	A650 Hard Ings Road	Road widening, junction improvements, new traffic signals, segregated pedestrian and cycle routes and verge improvements. Work is due for completion in April 2020.
West Yorkshire Plus Transport Fund	Harrogate Road New Line	Improved bus, cycle and pedestrian infrastructure provision. Junction improvement, tree and grass verge provision.
West Yorkshire Plus Transport Fund	South East Bradford Access Road	Providing an alternative route to M62/M606 into Bradford. Helping to improve; reliability of public transport, air quality, and safety for pedestrians and cyclists. It will also unlock land for housing development.
West Yorkshire Plus Transport Fund	A650 Tong St	Proposals to improve highway capacity, efficiency, safety and air quality and enhancements to pedestrian and cycle provision.
West Yorkshire Plus Transport Fund	Fink Hill	Junction improvement part of a corridor improvement programme to reduce congestion, improve journey times and unlock economic growth.
West Yorkshire Plus Transport Fund	Leeds Bradford Airport access improvements	Surface access improvements including proposals of a new parkway station to the existing Leeds – Harrogate line, along with a connecting road from the A658 to access the proposed North West Leeds Employment Hub on land adjacent to the airport.
Leeds Public Transport Investment Programme	A660 Adel to Leeds	Corridor improvements proposed along the A660 from Adel to Leeds to deliver improvements to the bus network and make journeys on foot and by bike more convenient and attractive.

Programme	Scheme	Description
Leeds Public Transport Investment Programme	A647 corridor improvements	Bus network improvements including bus priority measures and junction improvements.
Connecting Leeds	Cycle superhighway	14km segregated cycle superhighway from Leeds city centre along the A647 to Bradford city centre. This is now open.
Connecting Leeds	Canal towpath	Upgraded shared use canal towpath from Shipley to Apperley Bridge. This is now open.
Transforming Cities Fund	Skipton Town Centre	Active and Sustainable Travel across Skipton Town Centre and station access.
Transforming Cities Fund	Bradford City Centre	Active and Sustainable Travel across Bradford City Centre
Transforming Cities Fund	Bradford Interchange Station Access	Transforming access to Bradford Interchange from employment areas
Transforming Cities Fund	Bradford City Connect	City Connect Extension to West Bradford
Transforming Cities Fund	South Bradford P&R	Creating a new P&R facility serving key employment sites in Bradford

Despite these already planned investments, there are further opportunities to better connect areas in Wharfedale (such as Burley in Wharfedale and Otley) and Airedale, to employment opportunities in Bradford and Leeds, ensuring that a wide range of prospects are available to these neighbourhoods; and in the surrounding areas.

Similarly, there are opportunities to better connect isolated and deprived communities in Bradford, Leeds and Skipton to local employment opportunities.

Figure 20: Programmed investment





### 4.3 Connectivity concepts

Based on the feedback from partners and the spatial analysis (which together provide an assessment of the current transport network and issues, future development plans and investment programmes), several “connectivity concepts” have been defined across the economic area, to demonstrate the need for improved connectivity between key places. At this stage, connectivity concepts do not relate to a specific transport mode or a specific route alignment. However, they do enable a strategic appraisal of whether there is merit in connecting people and places, as well as helping to define spatial priorities within the area. Some places not connected through the connectivity concept framework have been addressed in other strands of work such as the West Yorkshire Bus Network Review. Nine connectivity concepts have been defined for the Airport, Airedale and Wharfedale corridor which are shown in Figure 24. A brief narrative for each concept is given below:

#### 1 – The Orange Concept (Leeds to Bradford via Pudsey)

<b>Concept function</b>	Provides <i>strategic</i> connectivity
-------------------------	----------------------------------------

**Summary** This concept provides a strategic connection between Bradford South and Leeds. It connects deprived communities such as Bramley and Laisterdyke with employment growth sites. It intersects with a large proportion of the Clean Air Zone and will help to alleviate air quality issues around the two congested city centres.

Enabling Inclusive Growth	Boosting Productivity	Tackling the Climate Emergency	Delivering 21st century transport
<ul style="list-style-type: none"> <li>Connects deprived communities in Bramley, Pudsey and Laisterdyke to economic opportunities</li> </ul>	<ul style="list-style-type: none"> <li>Improves connectivity to the major areas of employment and housing development in Leeds and Bradford city centres</li> </ul>	<ul style="list-style-type: none"> <li>Intersects with 67% of the corridors AQMA areas and a large proportion of the CAZ</li> <li>Intersects with the Bradford Leeds Cycle Superhighway</li> </ul>	<ul style="list-style-type: none"> <li>Provides a strategic connection between Leeds and Bradford and improves connectivity to the rail stations</li> </ul>

**Indicative mode** Heavy rail/MRT

#### 2 – The Navy Concept (Leeds to Skipton via Bramhope, Leeds Bradford Airport, Guiseley and Ilkley)

<b>Concept function</b>	Provides <i>strategic</i> connectivity
-------------------------	----------------------------------------

**Summary** This concept provides a strategic connection between Leeds and Skipton while improving connectivity to Bramhope, Guiseley and Ilkley along the route. It improves connection to Leeds Bradford Airport from Leeds and Skipton, whilst providing end to end connection between housing growth sites and employment development areas in the two centres.

Enabling Inclusive Growth	Boosting Productivity	Tackling the Climate Emergency	Delivering 21st century transport
<ul style="list-style-type: none"> <li>Connects deprived communities in the north of Leeds around Headingley and Meanwood</li> <li>Connects deprived communities in Skipton and Ilkley</li> </ul>	<ul style="list-style-type: none"> <li>Improves connectivity to the employment growth area around Leeds Bradford Airport</li> <li>Improves connectivity to employment and housing growth sites within Leeds, Ilkley and Skipton</li> <li>Connects residential growth zones around Bramhope and Menston</li> </ul>	<ul style="list-style-type: none"> <li>Provides connections that offer local alternatives to the congested strategic road network</li> </ul>	<ul style="list-style-type: none"> <li>Provides strategic connectivity to Leeds Bradford Airport</li> <li>Improves connectivity to seven rail stations along the route</li> </ul>

**Indicative mode** Heavy Rail / MRT

#### 3 – The Green Concept (Bradford to Pannal via Apperley Bridge and Leeds Bradford Airport)

<b>Concept function</b>	Provides <i>strategic</i> connectivity
-------------------------	----------------------------------------

**Summary** This concept provides a strategic connection between Bradford and Pannal through Apperley Bridge and the Airport. In doing so it connects the housing and employment development sites near Apperley Bridge and the employment growth zone at Leeds Bradford Airport as well as the deprived communities in north east Bradford.

Enabling Inclusive Growth	Boosting Productivity	Tackling the Climate Emergency	Delivering 21st century transport
<ul style="list-style-type: none"> <li>Connects deprived communities in north east Bradford, and Laisterdyke to economic opportunities</li> </ul>	<ul style="list-style-type: none"> <li>Provides a strategic connection to the proposed key employment and residential site in Apperley Bridge</li> <li>Improves connectivity to housing and employment growth areas including Bradford and Leeds Bradford Airport</li> </ul>	<ul style="list-style-type: none"> <li>Improves connectivity on routes where congestion is an issue</li> </ul>	<ul style="list-style-type: none"> <li>Improves connectivity to the Airport from Bradford and Pannal which provides an onward link to Harrogate</li> </ul>

**Indicative mode** Bus / BRT

#### 4 – The Purple Concept (Leeds to Keighley via Apperley Bridge and Shipley)

<b>Concept function</b>	Provides <i>strategic</i> connectivity
-------------------------	----------------------------------------

**Summary** This concept provides a strategic connection between Leeds and Keighley, whilst connecting the housing and employment growth sites in north east Bradford and Bingley. The concept connects deprived communities in Shipley and Keighley with the surrounding employment and residential development zones.

Enabling Inclusive Growth	Boosting Productivity	Tackling the Climate Emergency	Delivering 21st century transport
<ul style="list-style-type: none"> <li>Provides connections to deprived communities in Pudsey and Idle</li> <li>Connects deprived and isolated communities in Keighley and Shipley</li> </ul>	<ul style="list-style-type: none"> <li>Improves connectivity to the proposed key employment and residential sites in Apperley Bridge and Keighley</li> </ul>	<ul style="list-style-type: none"> <li>Provides connections that offer local alternatives to the congested strategic road network</li> <li>Has 7 touchpoints with the National Cycle Network</li> </ul>	<ul style="list-style-type: none"> <li>Provides a strategic connection between Leeds and Keighley improving connectivity to nine rail stations along the route</li> <li>Improves connectivity between rail stations and bus interchanges in Leeds and Shipley</li> </ul>

**Indicative mode** Bus / Active modes

## 5 – The Lilac Concept (Bradford to Skipton via Shipley and Keighley)

<b>Concept function</b>	Provides <i>strategic</i> connectivity		
<b>Summary</b>	This concept provides a strategic connection between Bradford South and Skipton. It connects deprived communities near Bradford, Shipley, Keighley and Skipton with housing and employment growth sites. It also frequently intersects with the National Cycle Network to encourage active travel.		
Enabling Inclusive Growth	Boosting Productivity	Tackling the Climate Emergency	Delivering 21st century transport
<ul style="list-style-type: none"> <li>Connects deprived communities around Bradford, Frizinghall, and Shipley</li> <li>Improves connections to deprived communities in Keighley and Skipton</li> </ul>	<ul style="list-style-type: none"> <li>Connects areas of employment development and housing growth zones in Bradford, Shipley, Bingley, Keighley, Steeton, Silsden and Skipton</li> </ul>	<ul style="list-style-type: none"> <li>Intersects with 67% of the corridors AQMA areas</li> <li>Has 9 touchpoints with the National Cycle Network</li> </ul>	<ul style="list-style-type: none"> <li>Improves connectivity between the rail station and bus interchange in Shipley and between the two rail stations in Bradford</li> <li>Provides a strategic connection between Bradford and Skipton and improves connectivity to the rail stations on the concept</li> </ul>
<b>Indicative mode</b>	Rail/ Bus		

## 6 – The Gold Concept (Bradford to Burley in Wharfedale via Apperley Bridge and Leeds Bradford Airport)

<b>Concept function</b>	Provides <i>strategic</i> connectivity		
<b>Summary</b>	This concept provides a strategic end to end connection between Bradford and Burley in Wharfedale. It connects deprived areas in north east Bradford to other employment growth zones. It also improves connection to Leeds Bradford Airport from Bradford and Burley in Wharfedale.		
Enabling Inclusive Growth	Boosting Productivity	Tackling the Climate Emergency	Delivering 21st century transport
<ul style="list-style-type: none"> <li>Connects deprived communities in Yeadon, Laisterdyke, and Idle</li> </ul>	<ul style="list-style-type: none"> <li>Connects key employment and residential sites in Apperley Bridge, Leeds Bradford Airport and north east Bradford</li> <li>Improves connectivity to housing growth zones including Bradford and Burley in Wharfedale</li> </ul>	<ul style="list-style-type: none"> <li>Improves connectivity on routes where congestion is an issue</li> <li>Passes through Bradford city centre which, offers the potential to encourage sustainable modes of transport</li> <li>Intersects with 4 AQMAs</li> </ul>	<ul style="list-style-type: none"> <li>Provides a strategic connection to Leeds Bradford Airport</li> <li>Provides a strategic connection between Bradford and Burley in Wharfedale</li> </ul>
<b>Indicative mode</b>	MRT / BRT		

## 7 – The Pink Concept (Bradford to Skipton via Keighley)

<b>Concept function</b>	Provides <i>strategic</i> connectivity		
<b>Summary</b>	This concept provides a strategic connection between Bradford South and Skipton, connecting with Bradford Royal Infirmary to help improve healthcare access from the surrounding areas. It connects deprived communities such as South Bradford and Keighley with housing and employment growth sites.		
Enabling Inclusive Growth	Boosting Productivity	Tackling the Climate Emergency	Delivering 21st century transport
<ul style="list-style-type: none"> <li>Connects deprived communities in Bradford South and Keighley</li> <li>Improves connectivity to healthcare facilities at Bradford Royal Infirmary</li> </ul>	<ul style="list-style-type: none"> <li>Improves connectivity between areas of employment and housing development in Bradford, Bingley, Keighley, Steeton and Silsden and Skipton</li> </ul>	<ul style="list-style-type: none"> <li>Provides connections that offer local alternatives to the congested strategic road network</li> <li>Passes through Bradford city centre offering the potential to encourage walking and cycling trips</li> </ul>	<ul style="list-style-type: none"> <li>Provides a strategic connection between Bradford and Skipton</li> <li>Improves connectivity to existing rail stations</li> </ul>
<b>Indicative mode</b>	Bus / BRT		

## 8 – The Light Blue Concept (Leeds to Otley via Leeds Bradford Airport)

<b>Concept function</b>	Provides <i>strategic</i> connectivity		
<b>Summary</b>	This concept provides a strategic connection between Leeds and Otley. It improves accessibility to Leeds Bradford Airport and the north of Horsforth where the proposed airport parkway station is located. It also improves connections to the employment growth sites around Leeds and Leeds Bradford Airport.		
Enabling Inclusive Growth	Boosting Productivity	Tackling the Climate Emergency	Delivering 21st century transport
<ul style="list-style-type: none"> <li>Connects communities between Leeds and the Airport</li> </ul>	<ul style="list-style-type: none"> <li>Improves connectivity to key areas of employment and housing growth in Leeds</li> <li>Connects areas of employment and housing in Otley, Leeds Bradford Airport and Horsforth</li> </ul>	<ul style="list-style-type: none"> <li>Accords with 3 Healthy Street Principles</li> </ul>	<ul style="list-style-type: none"> <li>Provides connectivity to Leeds Bradford Airport from Otley and Leeds</li> <li>Provides a strategic connection between Leeds and Otley</li> </ul>
<b>Indicative mode</b>	Bus / BRT		

## 9 – The Red Concept (Bradford to Pannal via Shipley and Leeds Bradford Airport)

<b>Concept function</b>	Provides <i>strategic</i> connectivity
-------------------------	----------------------------------------

<b>Summary</b>	This concept provides a strategic connection between Bradford South and Pannal, connecting deprived communities between Bradford and Shipley with housing and employment zones. It also improves connections to Leeds Bradford Airport from Bradford and Pannal and on to Harrogate. Using sustainable modes will help to alleviate air quality issues along these congested routes.
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Enabling Inclusive Growth	Boosting Productivity	Tackling the Climate Emergency	Delivering 21st century transport
<ul style="list-style-type: none"> <li>Improves connectivity to deprived communities in Bradford, Frizinghall and Shipley</li> </ul>	<ul style="list-style-type: none"> <li>Improves connectivity to key areas of employment opportunities and residential growth zones around Bradford, Shipley, Baildon and Leeds Bradford Airport</li> </ul>	<ul style="list-style-type: none"> <li>Intersects with 83% of the corridors AQMA areas</li> <li>Has 7 touchpoints with the National Cycle Network</li> </ul>	<ul style="list-style-type: none"> <li>Provides a strategic connection to Leeds Bradford Airport</li> <li>Pannal provides an onward link towards Harrogate</li> <li>Improves connectivity between the rail station and bus interchange in Shipley and between the two rail stations in Bradford</li> </ul>

**Indicative mode** MRT / BRT

### 4.4 Appraisal outcomes

Our appraisal process (summarised in 3.4.1) has been applied to the 9 connectivity concepts to define spatial priorities in the Airport, Airedale and Wharfedale corridor.

Each of the four assessment theme scores are averaged to provide an overall INSET score of between 0 and 1, where 1 represents a perfect correlation and anything else represents a degree of deviation from that perfect score. Typically, the total scheme scores lie somewhere between the two numbers with the following categories assigned:

**Table 6: Scoring ranges**

Scores	Ranges
Excellent	0.99 – 1.00
Good	0.75 – 0.99
Average	0.50 – 0.75
Fair	0.25 – 0.50
Low	<0.25

Source: Mott MacDonald

The outcome of the prioritisation for the connectivity concepts is summarised in Figure 22.

Although many concepts were classified as “Average” overall, there is differentiation within the defined scoring range. Figure 22 highlights that the Red, Orange, Purple and Gold concepts demonstrated the best level of fit across all themes and sifts and therefore, have the potential to produce the greatest benefit for interventions. Given that the Orange concept features in the Leeds to Bradford Case for Change report, further analysis will focus on the Red, Purple and Gold routes where additional infrastructure could be considered (Figure 23).

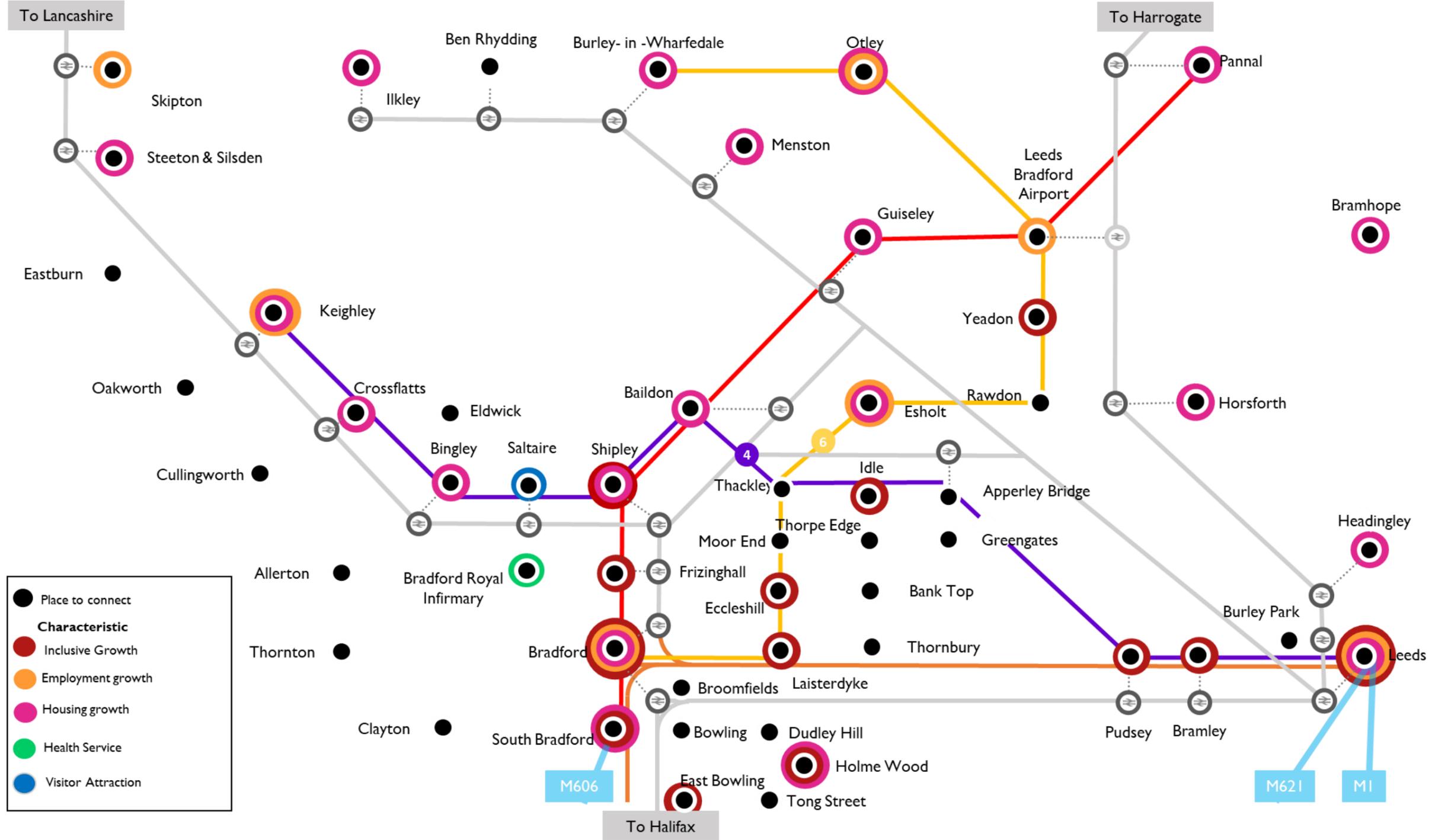
**Figure 22: Appraisal outcomes for connectivity concepts – ranked**

Rank	#	Connectivity concept	Sift 1: Early sift				Sift 1: Early sift Score	Sift 2: Local fit	Sift 3: Level of impact				Sift 3: Level of impact	Overall score
			Enabling Inclusive Growth	Boosting Productivity	Tackling the Climate Emergency	Delivering 21st Century Transport			Enabling Inclusive Growth	Boosting Productivity	Tackling the Climate Emergency	Delivering 21st Century Transport		
1	9	Red route (Bradford to Pannal via Shipley and LBA)	Excellent	Excellent	Excellent	Excellent	Excellent	Average	Fair	Fair	Average	Good	Average	Good
2	1	Orange route (Leeds to Bradford via Pudsey)	Excellent	Excellent	Excellent	Excellent	Excellent	Average	Good	Fair	Average	Good	Average	Good
3	4	Purple route (Leeds to Keighley via Apperley Bridge and Shipley)	Excellent	Excellent	Excellent	Excellent	Excellent	Average	Average	Fair	Fair	Good	Average	Average
4	6	Gold route (Bradford to Burley-in-Wharfedale via Apperley Bridge and LBA)	Excellent	Excellent	Excellent	Excellent	Excellent	Average	Average	Fair	Fair	Good	Average	Average
5	7	Pink route (Bradford to Skipton via Keighley)	Excellent	Excellent	Excellent	Excellent	Excellent	Average	Average	Fair	Average	Good	Average	Average
6	5	Lilac route (Bradford to Skipton via Shipley and Keighley)	Excellent	Excellent	Excellent	Excellent	Excellent	Average	Average	Fair	Low	Average	Fair	Average
7	3	Green route (Bradford to Pannal via Apperley Bridge and LBA)	Excellent	Excellent	Excellent	Excellent	Excellent	Average	Fair	Fair	Fair	Good	Fair	Average
8	8	Light blue route (Leeds to Otley via Horsforth and LBA)	Excellent	Excellent	Excellent	Excellent	Excellent	Average	Average	Fair	Average	Good	Average	Average
9	2	Navy route (Leeds to Skipton via Bramhope, LBA, Guiseley and Ilkley)	Excellent	Excellent	Excellent	Excellent	Excellent	Average	Fair	Fair	Low	Average	Fair	Average

Source: Mott MacDonald

Overall, the Red, Purple and Gold connectivity concepts have been identified as the spatial priorities as they are the highest scoring concepts that address *both connectivity requirements to Leeds Bradford Airport from Leeds, Bradford and Keighley as well as between the three centres*. These are shown in Figure 23. Delivering improved connectivity along these connectivity concepts will help to increase travel horizons within the Airport, Airedale and Wharfedale corridor and beyond.

Figure 23: Prioritised connectivity concepts



Source: Mott MacDonald

### 4.5 Demand

An assessment has been undertaken using the Combined Authority's Urban Dynamic Model (UDM) to estimate the total peak hour trip demand along each of the prioritised connectivity concepts. This presents 2033 forecasts of demand using established assumptions of the development landscape.

A mode technology framework developed by the Combined Authority has then been used to identify what mode of transport might be appropriate based on having a suitable capacity per hour (see Table 7).

Please refer to Section 9.2.2 of the Appraisal Handbook for the detailed workings of demand estimation.

**Table 7: Mode technology framework**

Mode	Capacity per service	Typical capacity per hour	Potential role
Walking and Cycling	1	Greatest potential for shorter distance journeys, particularly across congested city centre/urban environments.	
Demand Responsive Transport	5 - 12	800 – 1,500 passengers	Most suited to low demand areas or periods where a scheduled service would be inefficient with regard to cost and use.
Standard Double Decker Bus	70 – 80	Less than 1,000 passengers	Flexible services which meet local accessibility needs – with very high-density shopping patterns.
Bus Rapid Transit	70 – 80	500 – 2,000 passengers	Limited stops outside of urban centres. Moves large volumes of people relatively short distances within an urban / city centre environment.
Light Rail / Tram / Mass Transit	100 – 200	1,000 – 4,000 passengers	BRT is often typically implemented where there is less demand or as a precursor to Mass Transit.
Suburban Heavy Rail	500 – 700	2,000 – 6,000 passengers	Move large volumes of people over longer distances (eg:10-30 miles) with limited stops.
Inter Urban / National Heavy Rail	500 - 1000	Up to 27,000 passengers	Centre to centre fast and direct services.

Source: West Yorkshire Combined Authority

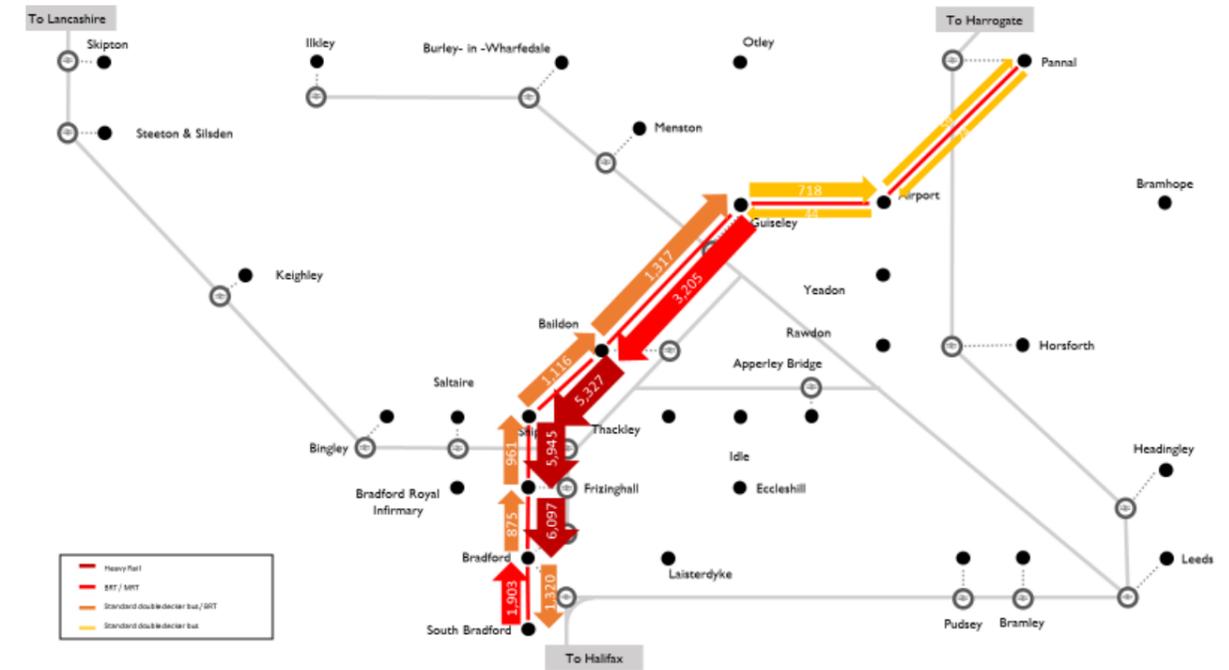
The demand analysis provides indicative evidence towards what the highest capacity mode could be along the connectivity concepts. Other lower capacity modes also could be considered elsewhere in the hierarchy to provide a range of integrated transport services that could address these forecast levels of demand. The second highest scoring concept, the Orange concept, is considered in more depth in the Leeds, Bradford and North Kirklees corridor. The figures presented here illustrate

- Unconstrained demand that focuses on the potential of movement between places
- Aggregate flows between each place to connect within the connectivity concept
- Two-way flows to illustrate key attractors on the network
- Variations in demand between places to connect to demonstrate the range of services that could potentially be provided within each connectivity concept.

Figure 24 shows demand in 2033 along the highest scoring connectivity concept; the Red concept. This provides a strategic connection between South Bradford and Pannal through Shipley and Leeds Bradford Airport. The modelling suggests that the demand may be high enough to require heavy rail on this corridor running south between Baildon and Bradford. A rail service currently

exists between Guiseley and Bradford and so an assessment of capacity and reliability of this service here may be appropriate.

**Figure 24: 3 – Red Concept – Demand 2033**



Source: Urban Dynamic Model (UDM)

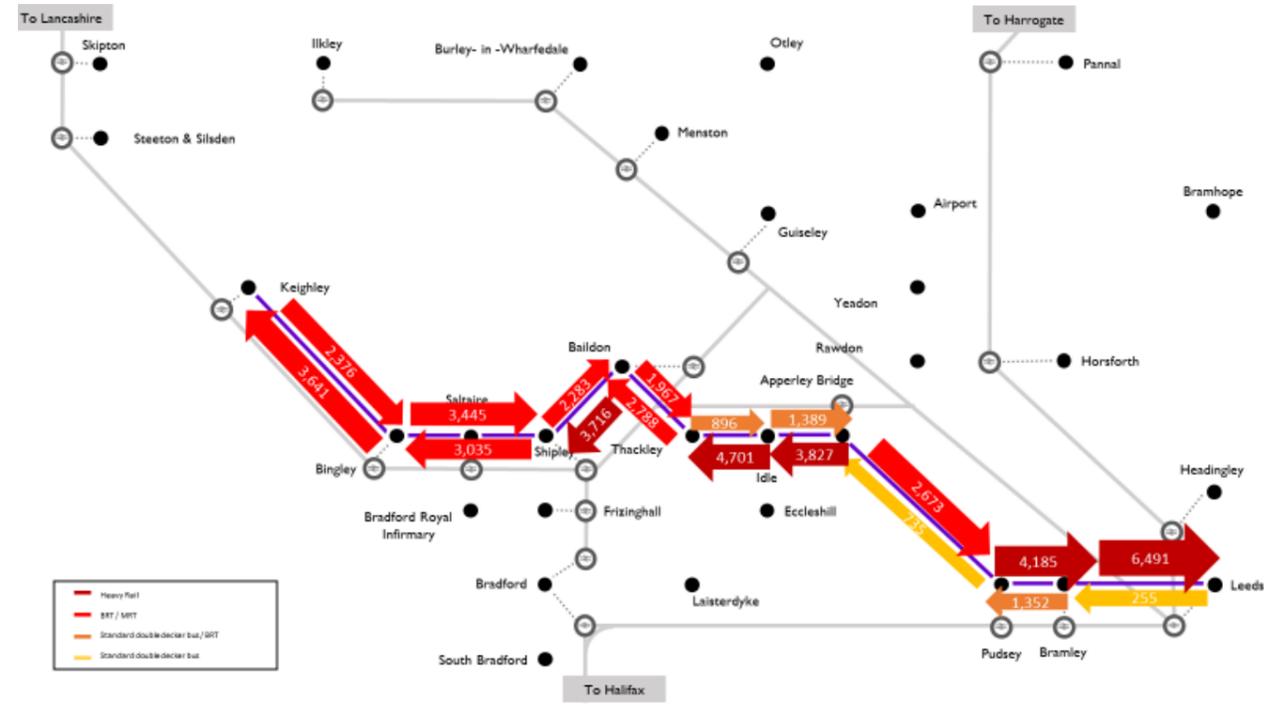
Travelling northwards from Bradford to Guiseley, demand is lower, though still indicative of the need for a mass transit mode. Demand is lowest between Guiseley and Pannal indicating standard double decker bus service between these areas may be appropriate.

Figure 25 shows demand between Leeds and Keighley (the Purple concept). Demand travelling towards Leeds from Pudsey is high enough to support a heavy rail option, necessitating examination of current capacity. Similarly, demand from Apperley Bridge towards Thackley is high suggest the need for a mode with the capacity of heavy rail, however, the short distance indicates that an alternative means of travel such as BRT or Mass Rapid Transit (MRT) would be more appropriate. Similarly, BRT or MRT would also accommodate demand between Thackley and Keighley.

Figure 26 shows demand between Bradford and Burley in Wharfedale (the Gold concept). Like the Red concept demand is highest travelling south towards Bradford city centre. The level of demand from Burley in Wharfedale to Apperley Bridge is high, implying the potential for Bus Rapid Transit (BRT) or Mass Rapid Transit (MRT) whereas demand between Apperley Bridge and Bradford is at a level to support the case for heavy rail. There may be a need to provide an alternative means to increase capacity along this route, such as BRT or MRT.

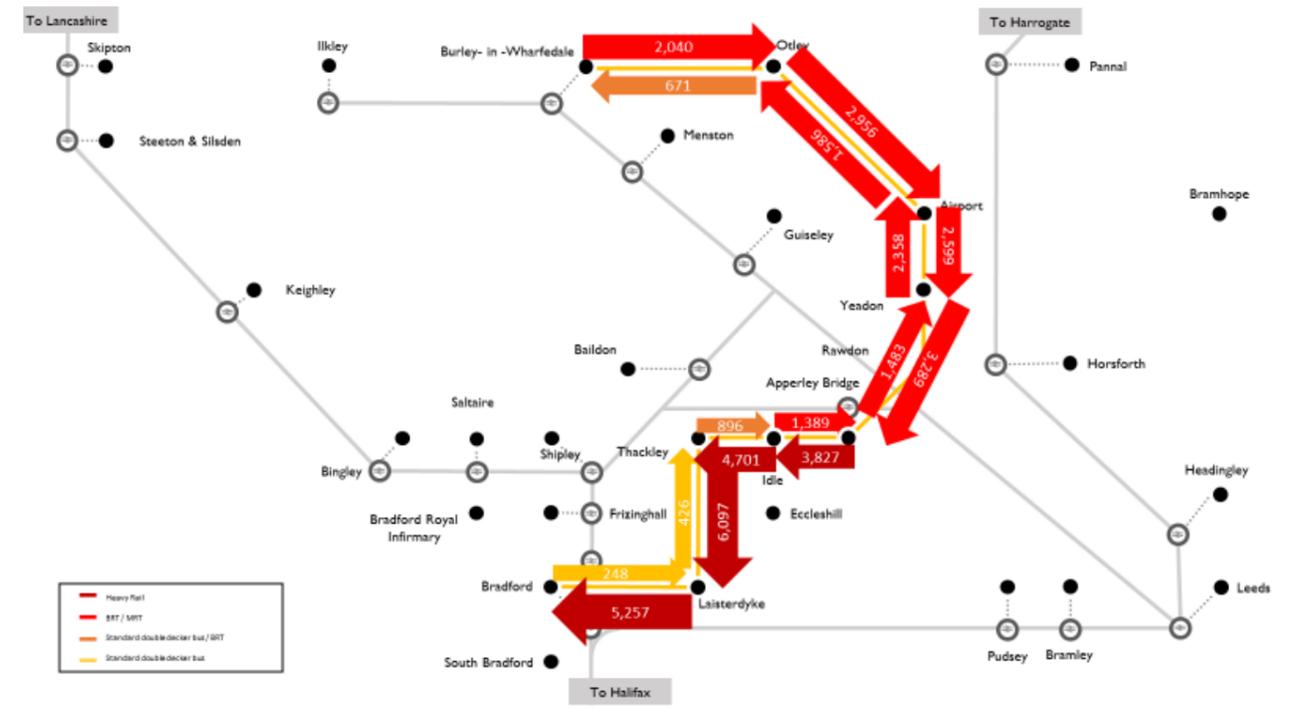
Travelling northwards from Bradford to Idle, demand indicates standard double decker bus service between these areas may be appropriate. From Idle to Otley demand increases sufficiently to suggest examination of BRT or MRT may be required.

Figure 25: Purple Concept – Demand 2033



Source: Urban Dynamic Model (UDM)

Figure 26: Gold Concept – Demand 2033



Source: Urban Dynamic Model (UDM)

## 5 Conclusion: The need for intervention for the Airport, Airedale and Wharfedale

### 5.1 Introduction

This Case for Change presents the evidence and strategic narrative for investing in improved connectivity in the Airport, Airedale and Wharfedale corridor.

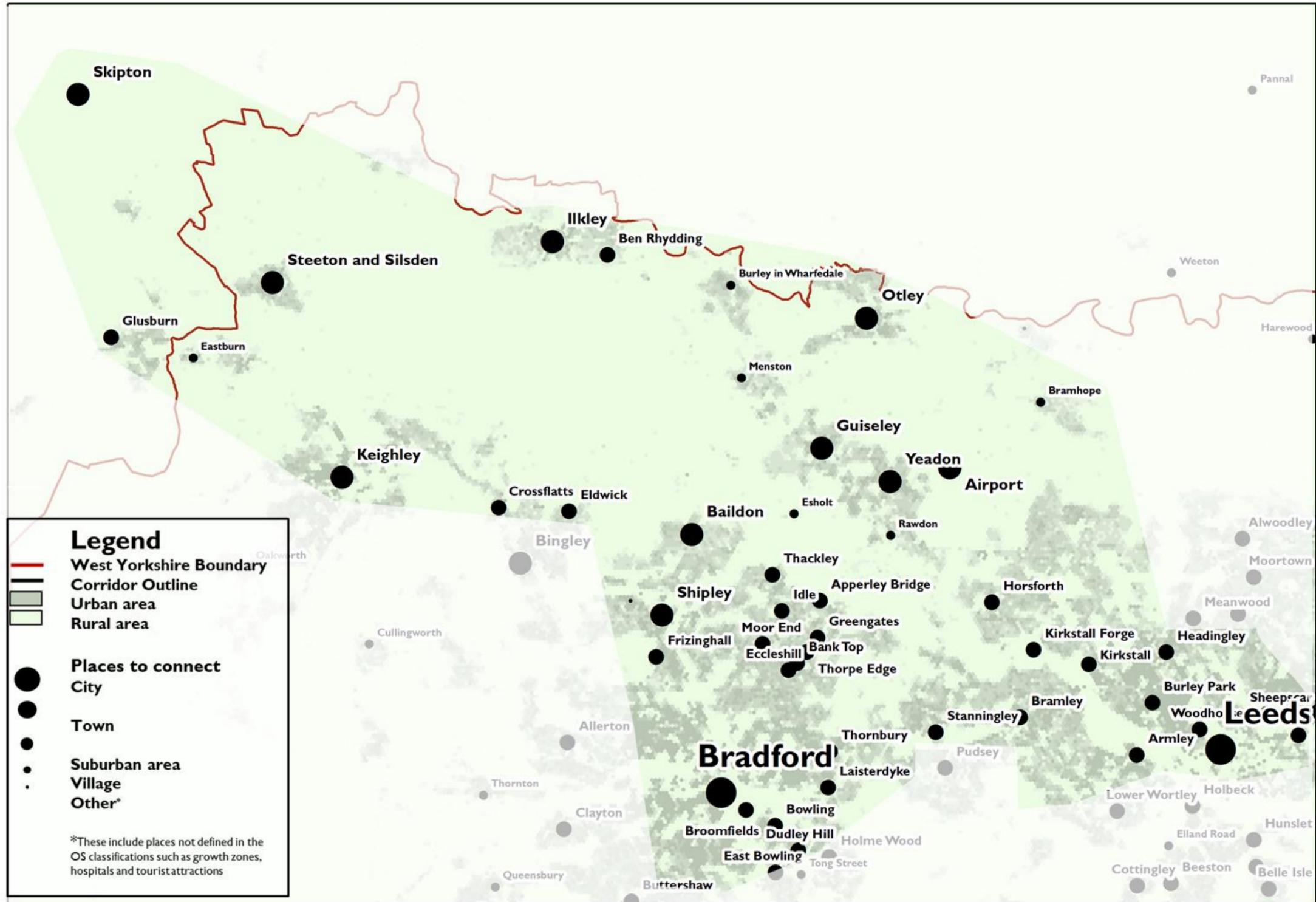
Through evidence review, and engagement from district partners, key places to connect have been identified, and a complementary series of connectivity concepts have been developed to show where there is greatest need to improve connections between people and places in the corridor. These places to connect have been used to support evidence gathering in other workstreams and are shown in Figure 27.

An appraisal of each of the concepts provides evidence to demonstrate which connectivity concepts have the greatest potential to enable inclusive growth, boost productivity, tackle the climate emergency, and deliver a 21st century transport system. The connectivity concepts prioritised through this process focus on making connections between isolated communities across the corridor; including those in Bradford, South Bradford, west Leeds and Keighley. These neighbourhoods and the wider community could benefit from connections to the full range of employment and service opportunities on offer. These include current local employment centres in Shipley, Leeds and Bradford; as well as nearby employment prospects in Apperley Bridge and Leeds Bradford Airport.

The Case for Change is one of several complementary sources that together, form a complex evidence base. Other evidence sources include:

- West Yorkshire Bus Network Review
- Leeds City Region Rail Vision and Capacity Study
- Leeds City Region Emissions Reduction Pathway
- West Yorkshire Walking and Cycling Strategy
- West Yorkshire Future Mobility Strategy
- West Yorkshire Urban Transit Study
- Ongoing engagement with district partners

Figure 27: Places to Connect



## 5.2 Connectivity Network

This Case for Change report therefore brings together several strands of evidence that have been evaluated and will ultimately inform the development of a package of interventions across several modes.

The emerging multi-modal network on which future interventions will focus provides a framework to address the key connectivity issues and opportunities that have been highlighted through this study and other strands of evidence. This network for the Airport, Airedale and Wharfedale Corridor is illustrated in Figure 28. This will link with networks developed in other Case for Change reports within the Connectivity Plan to provide a full multi-modal network for West Yorkshire.

Figure 28: Airport, Airedale and Wharfedale Connectivity Network

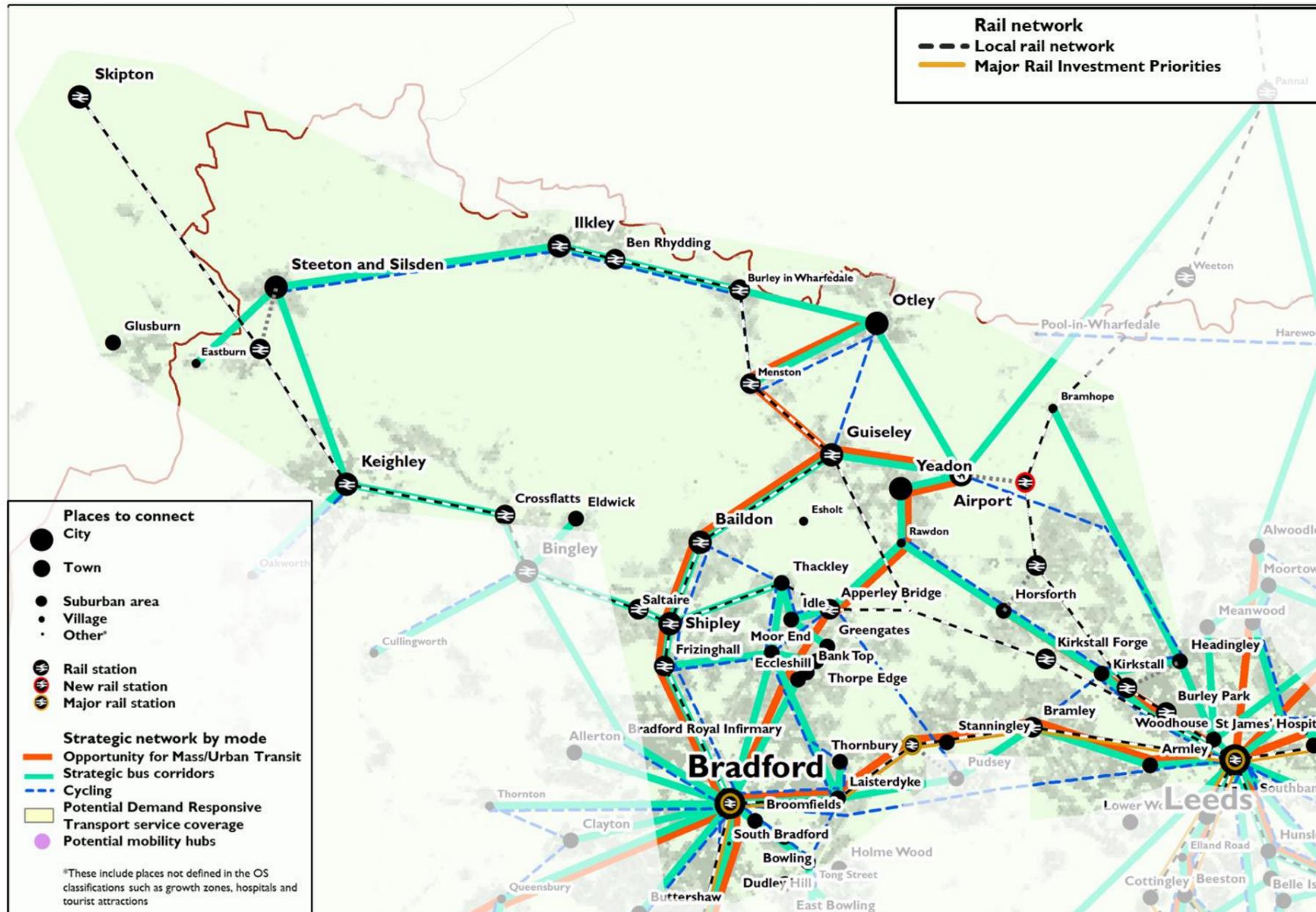
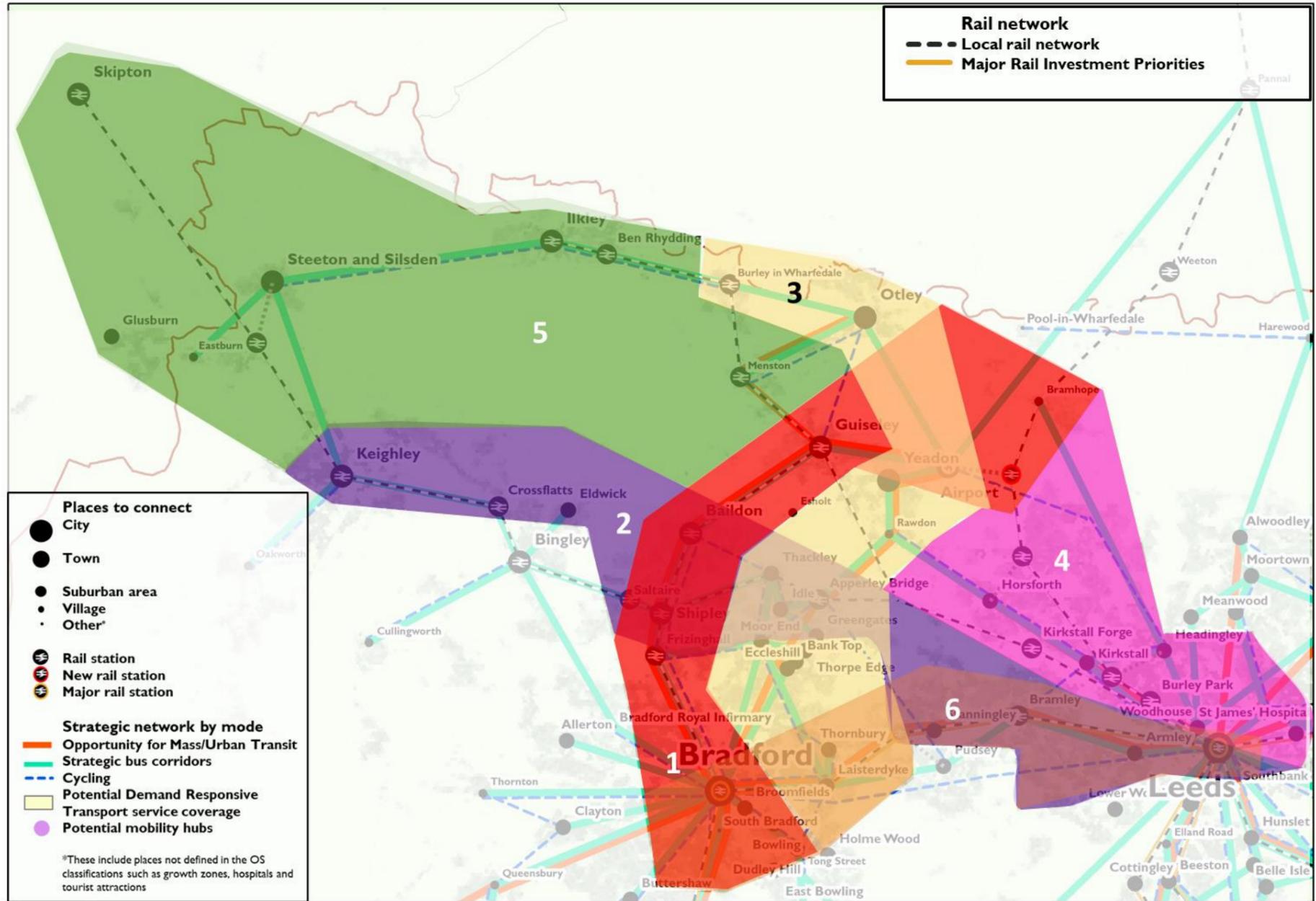


Figure 29 illustrates spatially how the various strands of evidence, including the prioritised connectivity concepts and subsequent demand analysis, provide a rationale for network interventions in the Airport, Airedale and Wharfedale Corridor. These strands of evidence are summarised in Table 8:

**Table 8: Network Areas**

Network Area	Description	Rationale				Evidence
		Enabling Inclusive Growth	Boosting Productivity	Tackling the Climate Emergency	Delivering 21 <sup>st</sup> Century Transport	
						
1	Red Connectivity Concept	Improves connectivity to deprived communities in Bradford, Frizinghall and Shipley	Improves connectivity to key areas of employment opportunities and residential growth zones around Bradford, Shipley, Baildon and Leeds Bradford Airport	Intersects with 83% of the corridors AQMA areas Has 7 touchpoints with the National Cycle Network	Demand suggests the potential for Bus Rapid Transit (BRT) along most of the concept, with lower demands such that a standard double decker bus service between Guiseley and Pannal is appropriate. A rail service currently exists between Guiseley and Bradford and so examining capacity here would be beneficial.	Airport, Airedale and Wharfedale Case for Change
2	Purple Connectivity Concept	Provides connections to deprived communities in Pudsey and Idle Connects deprived and isolated communities in Keighley and Shipley	Improves connectivity to the proposed key employment and residential sites in Apperley Bridge and Keighley	Provides connections that offer local alternatives to the congested strategic road network Has 7 touchpoints with the National Cycle Network	Demand towards Leeds from Pudsey is high enough to support heavy rail. Mass transit options including examination of the existing heavy rail offer could accommodate this. BRT or MRT would accommodate demand from Apperley Bridge to Thackley and between Thackley and Keighley.	Airport, Airedale and Wharfedale Case for Change
3	Gold Connectivity Concept	Connects deprived communities in Yeadon, Laisterdyke, and Idle	Connects key employment and residential sites in Apperley Bridge, Leeds Bradford Airport and north east Bradford Improves connectivity to housing growth zones including Bradford and Burley in Wharfedale	Improves connectivity on routes where congestion is an issue Passes through Bradford city centre which, offers the potential to encourage sustainable modes of transport Intersects with 4 AQMA	The level of demand from Burley in Wharfedale to Apperley Bridge and from Idle to Otley suggests the potential for BRT or MRT. From Apperley Bridge to Bradford demand suggests the potential for heavy rail. Travelling northwards from Bradford to Idle, demand suggests a standard double decker bus service is appropriate.	Airport, Airedale and Wharfedale Case for Change
4	North West Leeds	Some areas of deprivation and isolated communities to the east of Horsforth	Connects Leeds to Leeds Bradford Airport via several key communities and improves connections to employment growth sites. Provide capacity, reliability, and attractiveness of services for affluent communities to access high value jobs located in Leeds City Centre.	Improves connectivity on routes where congestion is an issue	West Yorkshire Bus Network Review highlighted the importance of connecting these communities to the North West of Leeds with improved bus connections. There may also be demand for improved active travel measures along these routes.	West Yorkshire Bus Network Review
5	Wharfedale	Area within the top 20% of deprivation to the south east of Skipton	Key connections between communities in Wharfedale many of which have housing growth plans. Provide capacity, reliability, and attractiveness of services for affluent communities to access high value jobs located in Leeds City Centre.	Improves connectivity on routes where congestion is an issue at points along the A65	West Yorkshire Bus Network Review has highlighted the need for localised bus corridor improvements along the A65 connecting local towns along this route.	West Yorkshire Bus Network Review
6	Leeds-Bradford corridor	Connects several places such as Laisterdyke, Bramley and South Bradford that would benefit from inclusive growth	Improves connectivity between the two major economic hubs in the region.	Congested corridor between Leeds and Bradford and two proposed Clean Air Zones	Demand on this corridor is high enough to warrant examination of an additional mass transit link to supplement the congested bus and rail offer	Leeds to Bradford, South Bradford and North Kirkstall Case for Change Report Urban Transit Study

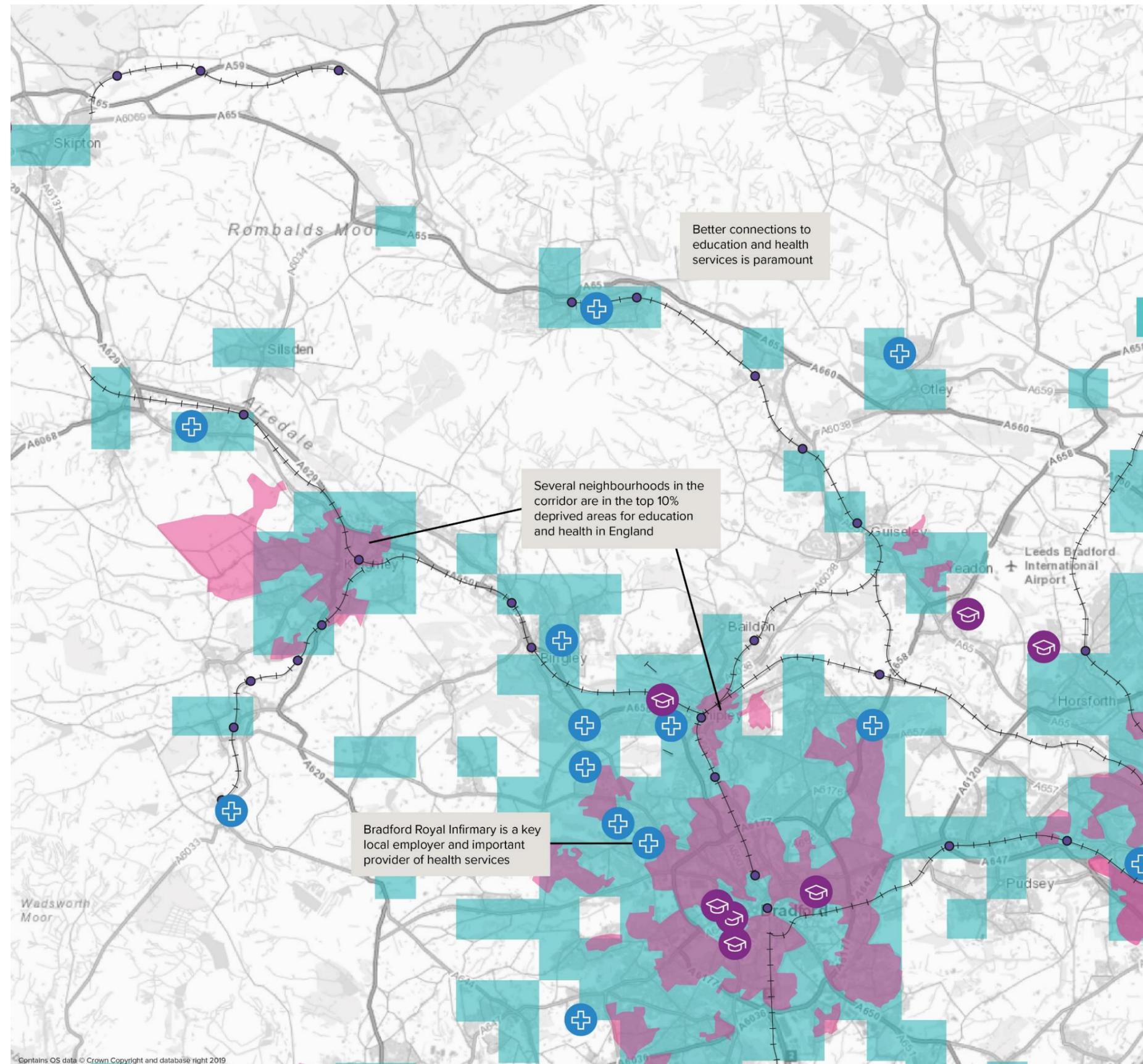
Figure 29: Evidence map for network interventions



## Appendices

A.	Spatial context highlights across the regional priorities	38
B.	Airport, Airedale and Wharfedale: Investment Case	43

## **A. Spatial context highlights across the regional priorities**



## Enabling inclusive growth

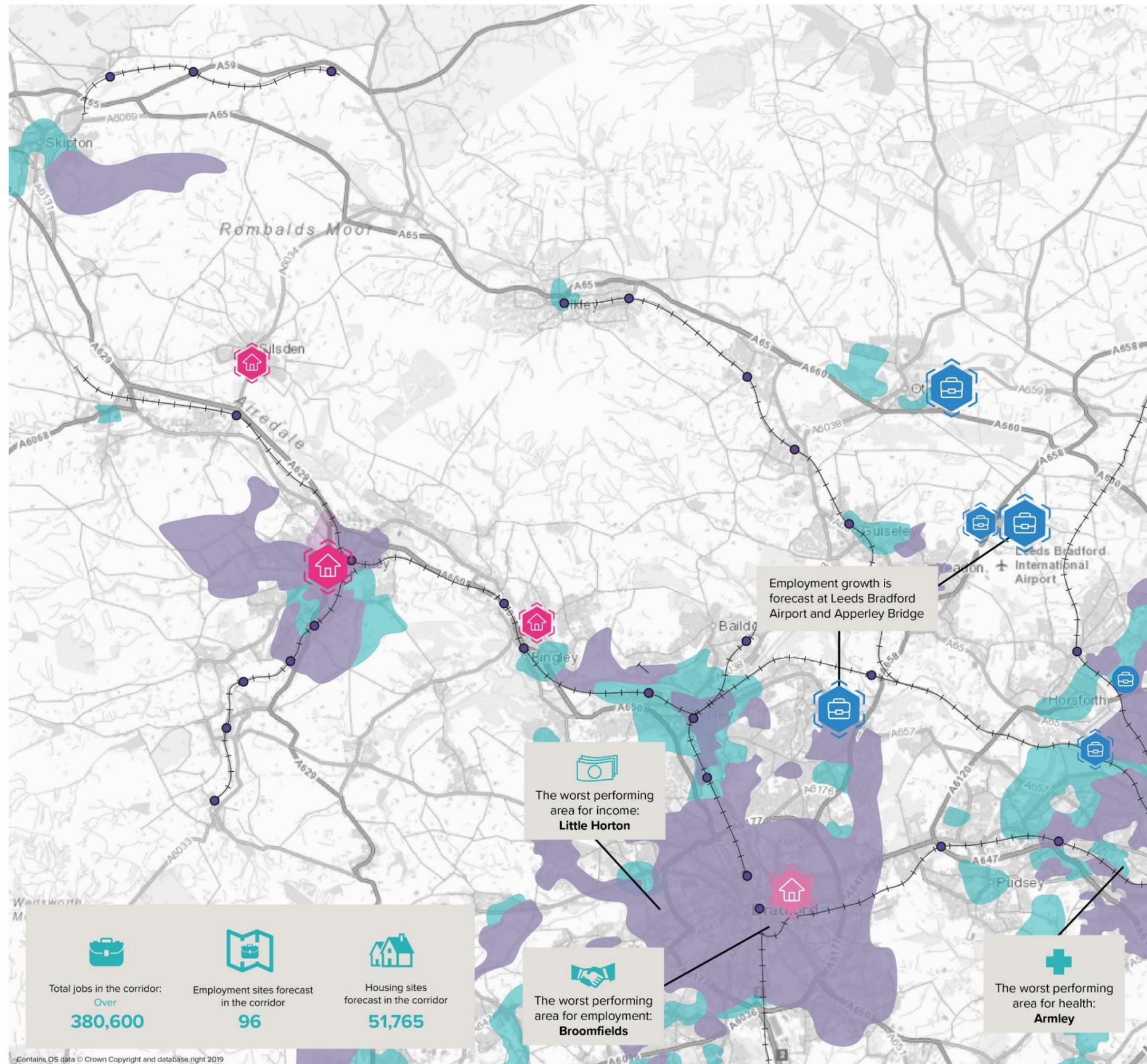
- +- Rail line
- Rail station
- ⊕ Hospitals
- 🎓 Higher education services
- 🔴 Top 10% deprived areas for education in England
- 🟢 Equality, Diversity and Inclusion (EDI) hotspots

These areas show high concentrations of population, people from "protected characteristic groups" (as defined by the Equality Act 2010, including age, disability, gender reassignment, marriage or civil partnership, pregnancy and maternity, race, religion or belief, sex, sexual orientation), and trip attractor destinations such as schools, hospitals, religious buildings and care homes.

This map shows the inclusivity indicators within the corridor, including education and health services and the spread of Equality, Diversity and Inclusion (EDI) hotspots.

Several areas across the corridor are affected by poor access to health services and upskilling opportunities as evidenced by the deprivation statistics. There is a concentration of these facilities in Leeds and Bradford, and therefore having reliable connections within the corridor to these services is essential.

EDI hotspots are concentrated in the urban areas of the corridor, in and around Bradford, Leeds and Keighley where there are many communities with protected characteristics and specific needs. Considerations of these must be made when improving transport services to ensure growth is felt by all and does not discriminate or divide access between groups of people.



## Boosting productivity

### Future Growth Sites

-  Employment
-  Housing
-  Precise location of Bradford housing sites not yet allocated

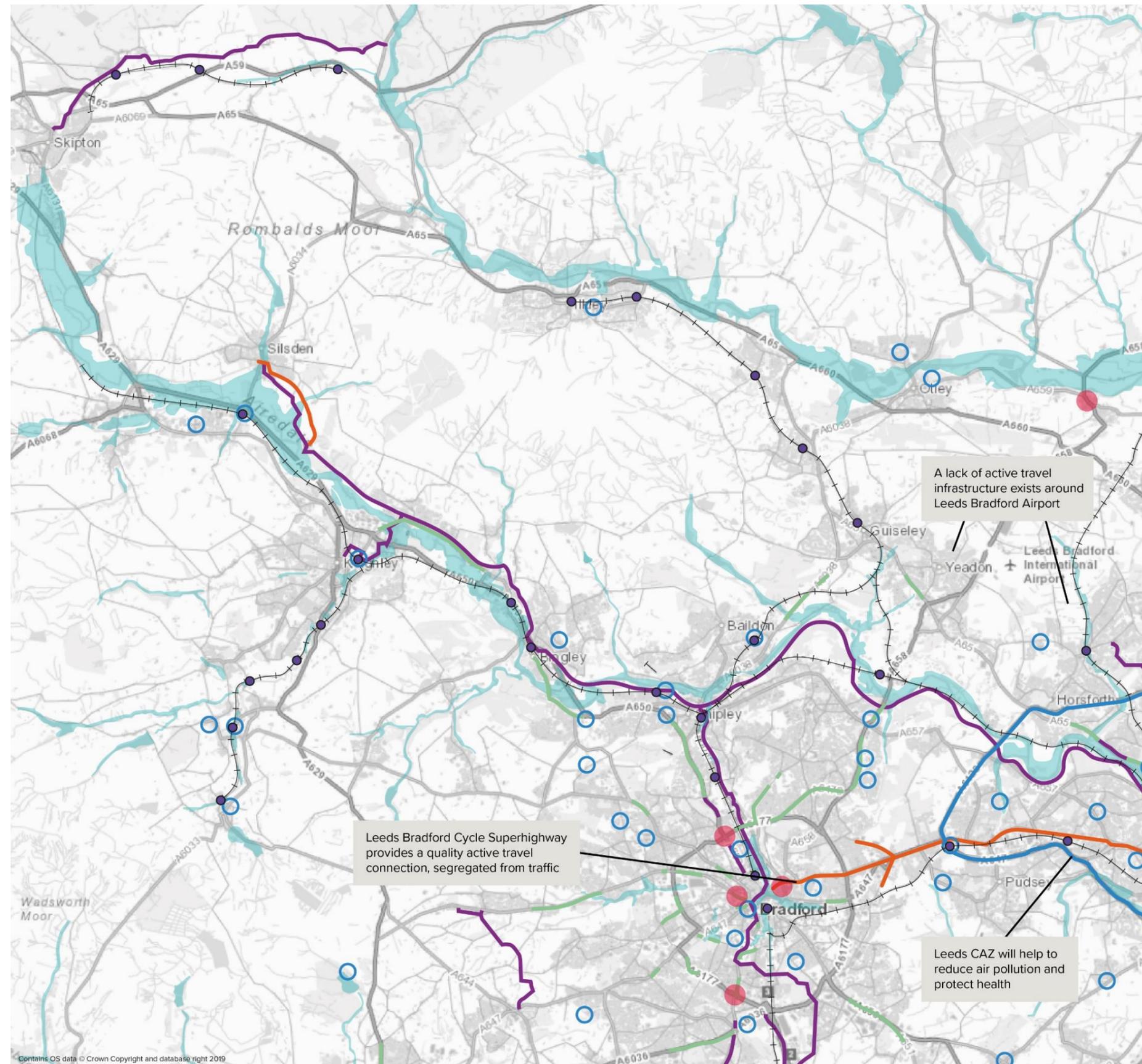
-  Rail line
-  Rail station
-  >26% no car ownership
-  Top 20% most deprived in England
-  Top 20% most deprived in England and >26% no car ownership

This map shows employment and housing growth opportunities and other economic characteristics to understand the corridor's productivity gap.

There are many areas of housing growth, particularly in communities around Bradford, including Keighley and Bingley. Significant employment growth is forecast at Leeds Bradford Airport and Apperley Bridge. Providing access to such sites by public transport and active modes of travel will help to improve employment opportunities for those in deprived areas.

Low levels of car ownership are concentrated in and around Bradford, Leeds and Skipton. It is therefore, of utmost importance that these areas are connected by good public transport links, to the current and future housing and employment centres. An important consideration of any connectivity plan will be to ensure these areas are appropriately connected to these opportunities to boost productivity.

		
Total jobs in the corridor: Over	Employment sites forecast in the corridor	Housing sites forecast in the corridor
<b>380,600</b>	<b>96</b>	<b>51,765</b>



### Tackling the climate emergency

- Rail line
- Rail station
- Clean Air Zone 2025
- National Cycle Network
- Cycle City Ambition Grant
- West Yorkshire National Cycle Lanes
- Points of interest
- Air Quality Management Area
- Flood Zone 3

These areas are assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), as set out in the National Planning Policy Guidance.

This map shows how the corridor currently stands in relation to delivering clean growth, particularly looking at the active travel network, the air quality management areas (AQMAs) and Clean Air Zone (CAZ). The geography of the corridor means that some areas are of high flood vulnerability, which any interventions will need to take into consideration.

There are several localised AQMAs within the corridor. The Leeds CAZ will be introduced in 2020, to help reduce air pollution and protect health. This will include Leeds City Centre and extend to; Roundhay, Headingley, Farsley, Harehills, Cross Gates and Temple Newsam. Bradford is also developing proposals for a CAZ which would extend to the outer ring road to include Bingley, Saltaire and Keighley, to help reduce transport emissions.

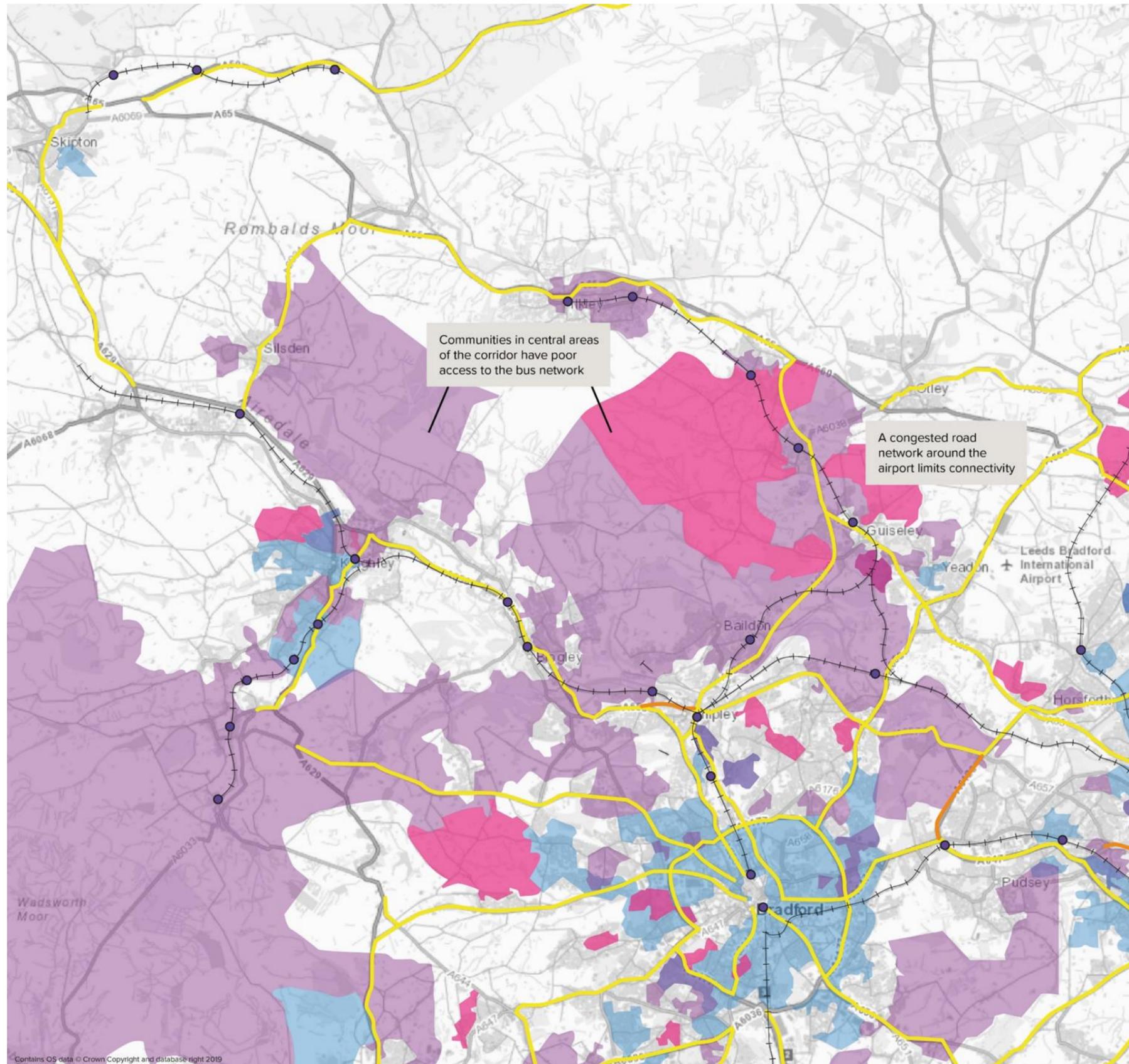
The active travel network varies hugely throughout the corridor. There are large areas of the corridor which lack infrastructure, particularly around Leeds Bradford Airport and along the A65. However, connectivity is good between Leeds and Bradford City Centres thanks to the Cycle Superhighway. Shipley and Leeds City Centre are also well connected via route 66 of the National Cycle Network. More investment is needed throughout the corridor to provide a connected and quality network that will provide access to key centres and trip attractors/destinations.

Leeds Bradford Cycle Superhighway provides a quality active travel connection, segregated from traffic

A lack of active travel infrastructure exists around Leeds Bradford Airport

Leeds CAZ will help to reduce air pollution and protect health





## Delivering 21<sup>st</sup> century transport

- ++ Rail line
- Rail station
- Isolated communities  
These are areas where the distance travelled to work and the average number of destinations people can reach for journeys to work across the Leeds City Region, are lower than the national average. This is based on the approach adopted for the Joseph Rowntree Foundation for "Tackling transport related barriers to employment in low-income neighbourhoods".
- Bus service provision (in the morning peak)**
- Poor (1 bus per hour)
- Non-existent (0 buses per hour)
- Congestion: Speed reduction due to peak-time congestion**
- Over 30 kmph
- Between 20 – 29 kmph
- Between 10 – 19 kmph

This map shows the existing transport networks, including rail lines and stations, highway congestion and bus service provision.

There are good rail links along the Airedale and Wharfedale Lines within the corridor and particularly between Leeds and Bradford. However, there is no direct rail link between Ilkley and Skipton.

The disparity in travel horizons within the corridor is also highlighted by bus service patterns; Bradford and Leeds have good levels of service, whereas rural communities around Skipton, Burley in Wharfedale and Keighley have limited or no bus connectivity. This demonstrates public transport connectivity issues and potential accessibility problems for people accessing jobs outside of peak times. Congestion compounds some of these issues on key routes where bus services may be more frequent, particularly near Shipley and Farley.

## B. Airport, Airedale and Wharfedale: Investment Case

The highest scoring “connectivity concepts” represent the corridor’s spatial priorities. For this corridor these are the Red, Purple and Gold concepts as these were the best performing for connectivity *to and within* the Airport, Airedale and Wharfedale corridor. These connectivity concepts are used as the framework for developing interventions that will address the Leeds City Region’s future connectivity requirements and improve travel horizons throughout the corridor.

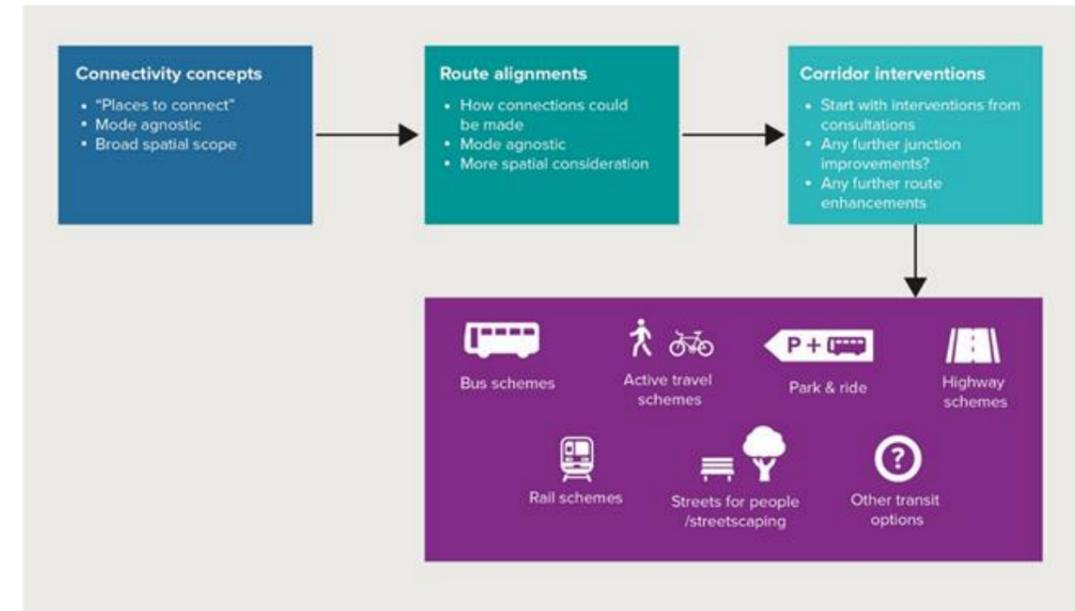
### B.1 Developing interventions

Potential route alignments are identified as ways to provide the connections identified within the “connectivity concepts”. For example, potential route alignments could be road corridors, disused railway lines, canal towpaths, watercourses or public rights of way. The route alignments remain conceptual and mode agnostic, but as they are considered in further detail, can become more mode specific as interventions.

Interventions are identified from stakeholder feedback, consideration of previous feasibility studies, and a detailed desktop gap analysis. The latter looks at existing (current and disused) transport provision and networks and the current pipeline of works in the corridor<sup>16</sup> to identify new interventions that will provide the required connectivity opportunities for the future by giving greater breadth and opportunity to travel and increasing travel horizons. Scheme types include: active travel – walking and cycling (both on and off road), bus corridor treatment (bus priority measures and/or road space reallocation), bus service, masterplanning and “Streets for People”, Park & Ride, rail, highways, transit concepts (e.g. BRT, tram-train etc.).

Additional emphasis was put on identifying short to medium term interventions to support the development of the emerging programme for the West Yorkshire Transforming Cities Fund (TCF) bid.

The following diagram summarises the process for developing interventions.



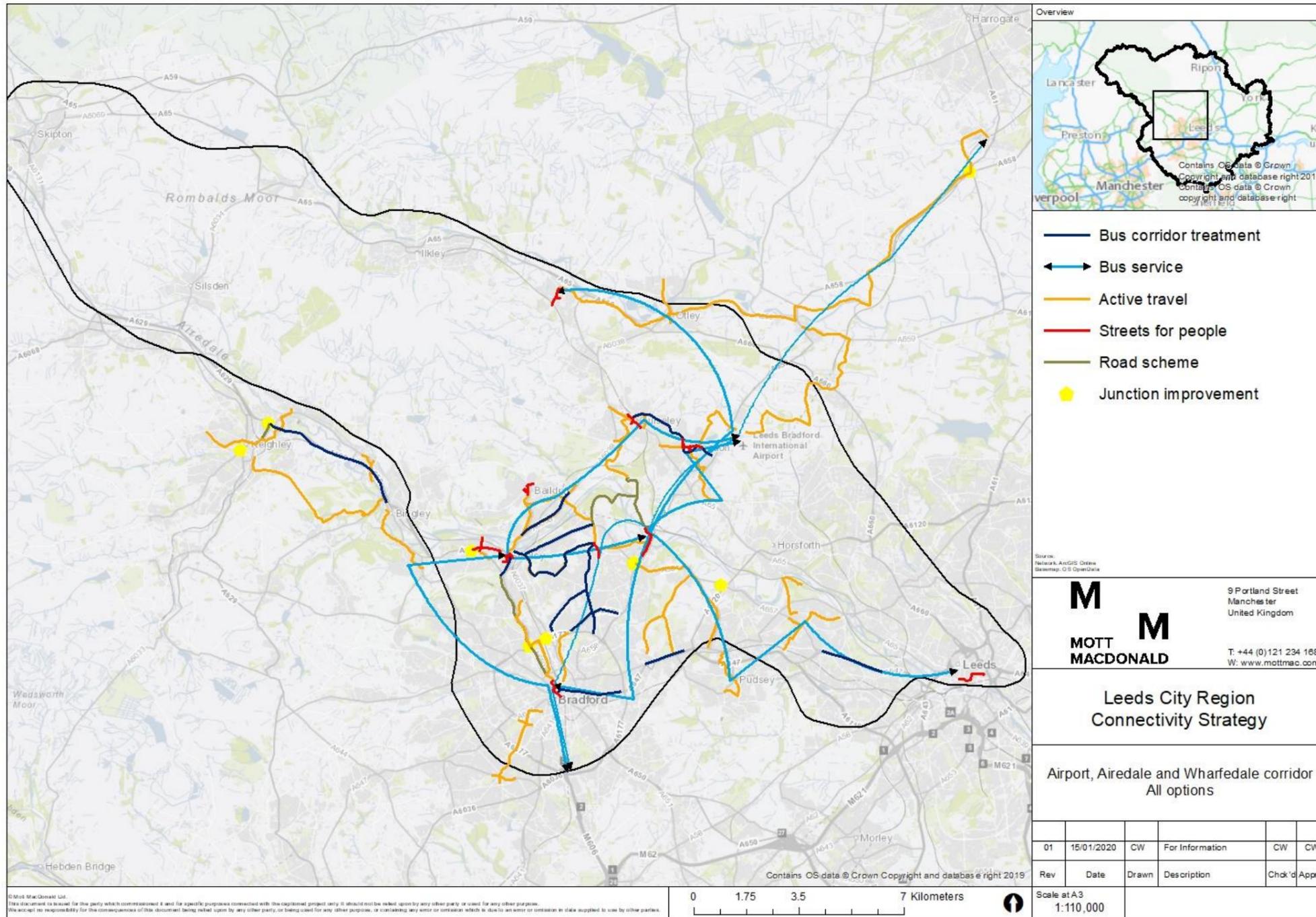
All interventions have been assigned a scheme type, a high-level deliverability and timescale attribute, as follows:

- Scheme types
  - Active travel (on and off-road walking and cycling)
  - Bus corridor treatment (bus priority measures and/or road space reallocation)
  - Bus service
  - Masterplanning / Streets for People - Improved urban realm and accessibility for pedestrians and cyclists
  - Road scheme
  - Junction improvement
- Delivery timescales: short, medium, long term.
- Technical complexity: low, medium, high.
- Connectivity concept: identifies the connectivity concept each scheme aligns to

The result of the process above is a longlist of 71 interventions for the Airport, Airedale and Wharfedale corridor. The alignments for these are mapped in Figure 30.

<sup>16</sup> e.g. West Yorkshire Transport Fund, Cycle City Ambition Grant, Leeds Public Transport Investment Programme and the West Yorkshire Local Cycling and Walking Investment Plan

Figure 30: Airport, Airedale and Wharfedale corridor – alignments for all interventions in the long list



## B.2 Interventions

The initial long-list of options for transport connectivity improvements has been produced by Mott MacDonald consultants. These proposals have been identified through high-level assessment of the evidence. Feasibility work will be required to develop deliverable schemes that best provide the connectivity required. The list has been collated with the long-list outputs of other Case for Change reports and the outputs of aligned workstreams such as the Leeds City Region Rail Vision and Capacity study and the Leeds City Region Emissions Reduction Pathway study to inform the West Yorkshire Connectivity Investment Plan and pipeline. The consolidated initial long-list can be found in Appendix 2 to the WY Connectivity Plan. Programme C - Options for delivery between 2026 – 2040.

