

# West Yorkshire Zero Emission Bus Regional Area (ZEBRA) Programme

## Full Business Case

January 2022

In partnership with:



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## Foreword

**When seeking election as the Mayor of West Yorkshire I laid out a series of manifesto commitments that I would champion if I was elected. These commitments have evolved into my Mayoral pledges and this programme speaks to two of those pledges – addressing the climate emergency and bringing buses back into public control, introducing simpler fares, contactless ticketing, and greener buses.**

West Yorkshire is currently in the midst of a climate and ecological emergency. Doing nothing is not an option and urgent and decisive action is needed and needed now if the region is to continue to thrive and be a great place for people to live and work. That's why we have set one of the most challenging but achievable decarbonisation targets in the country aiming to reach net-zero carbon by 2038, 12 years before the national target to achieve the same goal.

As our highest emitting sector, the urgency to decarbonise is especially keen in the transport sector, where emissions are dominated by road transport and the private car. Achieving our target will require more journeys to be taken by modes of transport other than the private car, and this means ensuring we have a transport system that is more affordable, convenient to use and better for the environment and our health.

Given the necessary transition of journeys from the private car the bus has a significant part to play in reducing emissions. Our recently published Bus Service Improvement Plan (BSIP) lays out our ambition for making buses the first choice for travel in West Yorkshire and to capitalise on the emission reduction this would bring we need to ensure the vehicles people travel on are zero emission.

That is why we have established an ambition for the West Yorkshire bus fleet to be zero emission by 2036. We have built on this ambition and the strong relationships we have with bus operators in the region to produce a strong and robust business case, and it is with this in mind I am pleased to support the Zero Emission Bus Regional Area (ZEBRA) programme to government. The funding being sought will enable the introduction of 111 zero emission buses throughout the region, ensuring that 10% of the bus fleet are zero emissions and some of the dirtiest buses are taken off the roads of the region, improving not just the environment but the people of West Yorkshire's health.

This programme however is not the sum of our efforts to introduce zero emission buses within West Yorkshire. We want to do much more! It is one part of wider plans for the deployment of zero emission buses in the region. These projects in combination with ZEBRA will move the proportion of the bus fleet that are zero emission up towards 20% of all buses operating in the region. This would be a significant achievement given only 2% of the bus fleet are currently zero emission

and should be something that is supported by government in granting the Combined Authority and its bus operator partners funding.

A handwritten signature in black ink, appearing to read 'Tracy Brabin', enclosed within a thin black rectangular border.

**Tracy Brabin, Mayor of West Yorkshire (January 2022)**

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# 1. Executive Summary

## 1.1. Introduction

- 1.1.1. This West Yorkshire Zero Emission Bus Regional Area (ZEBRA) programme is part of a wider approach to addressing emissions from the region's bus fleet.
- 1.1.2. It forms part of West Yorkshire's approach to addressing the climate emergency and contributing to the regional target to be net-zero carbon by 2038 increasing the percentage of zero-emission fleet from 2% to 10% and removing 50 tonnes of NoX/year.
- 1.1.3. In 2016, the Public Health Outcomes Indicator for air pollution showed that poor air quality in West Yorkshire accounts for 1 in 20 deaths, whilst it has also been recognised that unless action is taken, government targets on the level of nitrogen dioxide emissions in the air will not fall below targets.
- 1.1.4. Across West Yorkshire districts there are currently 36 Air Quality Management Areas, all of these areas exceeding annual/hourly Nitrogen Dioxide statutory limits.
- 1.1.5. The regional zero emission bus (ZEB) approach comprises of:
  - ZEBRA – a £56.2 million programme to introduce 111 ZEBs and associated infrastructure on routes in Bradford, Leeds and Wakefield districts;
  - Transforming Cities Fund (TCF) – a £4 million project to introduce 8 ZEBs and associated infrastructure on routes in Calderdale and Kirklees with specific focus on exploring the impact of topography and converting smaller operators running tendered services over to ZEBs; and
  - City Region Sustainable Transport Settlement (CRSTS) – a minimum £21 million project to introduce ZEBs and associated infrastructure.
- 1.1.6. While this Executive Summary is focussed on providing a summary of the ZEBRA programme it should be considered within the context of the wider regional approach to deploy ZEBs. In combination with the projects that are referenced above this programme will contribute to between 14% and 19% of the West Yorkshire bus fleet being zero emission, which equates to between 179 and 245 zero emission buses.

## 1.2. ZEBRA Overview

- 1.2.1. The West Yorkshire Combined Authority (Combined Authority) in partnership with bus operators Arriva, First and Transdev has developed this ZEBRA programme in response to a funding call from the Department for Transport (DfT).
- 1.2.2. If successful in securing funding from DfT it will introduce 111 ZEBs onto routes in Bradford, Leeds and Wakefield districts and install appropriate electric vehicle charging infrastructure in the depots where the ZEBs will be based.
- 1.2.3. Where these vehicles are deployed in Bradford and Wakefield districts, they will be the first of their type serving customers in these areas. In Leeds the ZEBs will complement those already operating in the district.
- 1.2.4. The ZEBRA programme has been split into three operator projects, with the total number of ZEBs expected to be introduced set out in Table 1 below. Each project will be developed and delivered by one of the three operators listed in 1.2.1. above and has been informed by their depot capabilities to deliver an increase in ZEBs at scale.

Project	Single-decker	Double-decker
Arriva	-	47
First	32	-
Transdev	15  	-

**Table 1: ZEBs to be introduced through the ZEBRA programme**

- 1.2.5. Through the ZEBRA programme it is expected that the proportion of buses in the region that are zero emission will increase from 2% to 10%.

## 1.3. Objectives

- 1.3.1. The Combined Authority's objectives of the ZEBRA programme are to:
- Introduce ZEBs at scale to support the regional target to become a net-zero carbon economy, reducing emissions and improving air quality in targeted areas;
  - Invest in buses that improve the customer offer, targeting deprived areas and promoting the levelling up agenda;

- Work in partnership with bus operators, bus manufacturers and local stakeholders to deliver ZEBs and supporting infrastructure; and
- Understand the challenges and opportunities of transitioning to ZEBs.

1.3.2. The objectives listed above have been developed in line with the objectives of DfT and the DfT requirements of ZEBRA which can be seen in Table S7.

1.3.3. As referenced in 1.2 the ZEBRA programme complements the wider regional ZEB approach.

## 1.4. Scope of Proposals

1.4.1. As referenced in 1.2.4. the ZEBRA programme has been split into three distinct projects all operated by private sector bus operators. Each project is based around a specific depot or depots to ensure smooth operation and mitigate operational constraints of battery capacity.

1.4.2. Table 2 provides information on the depot locations covered by the ZEBRA project.

Project	Depot location	District(s) served
Arriva	[REDACTED] [REDACTED]	Kirklees, Leeds, Wakefield
First	[REDACTED] [REDACTED]	Leeds
Transdev	[REDACTED] [REDACTED] [REDACTED]	Bradford, Leeds

**Table 2: ZEBRA project depot locations**

1.4.3. Figure 1 shows the entire ZEBRA programme, with Figures 3 to 4 showing a detailed illustration of each operators ZEBRA project. The bus routes that will be served by the ZEBs are shown alongside the depots from which they'll operate.

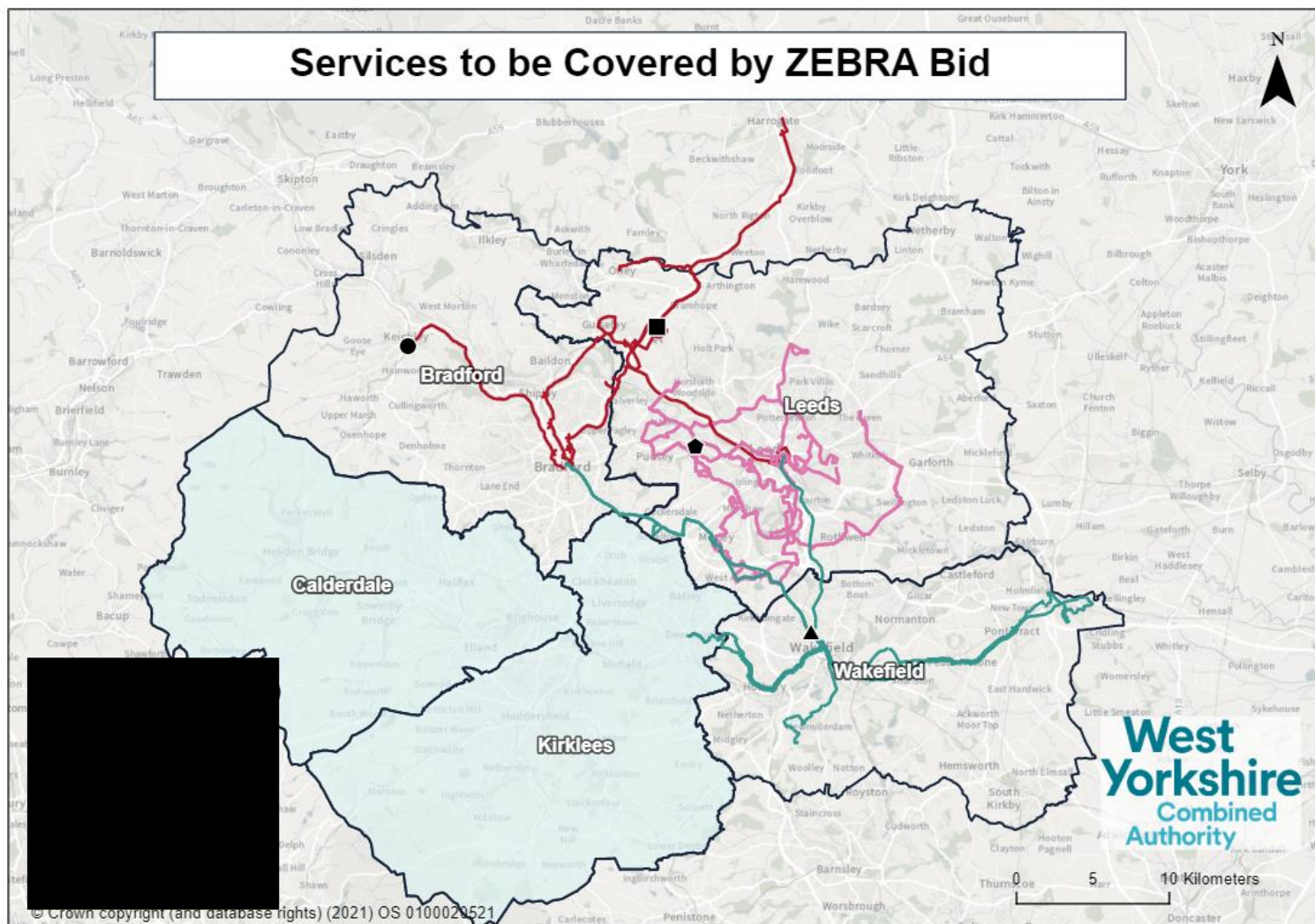
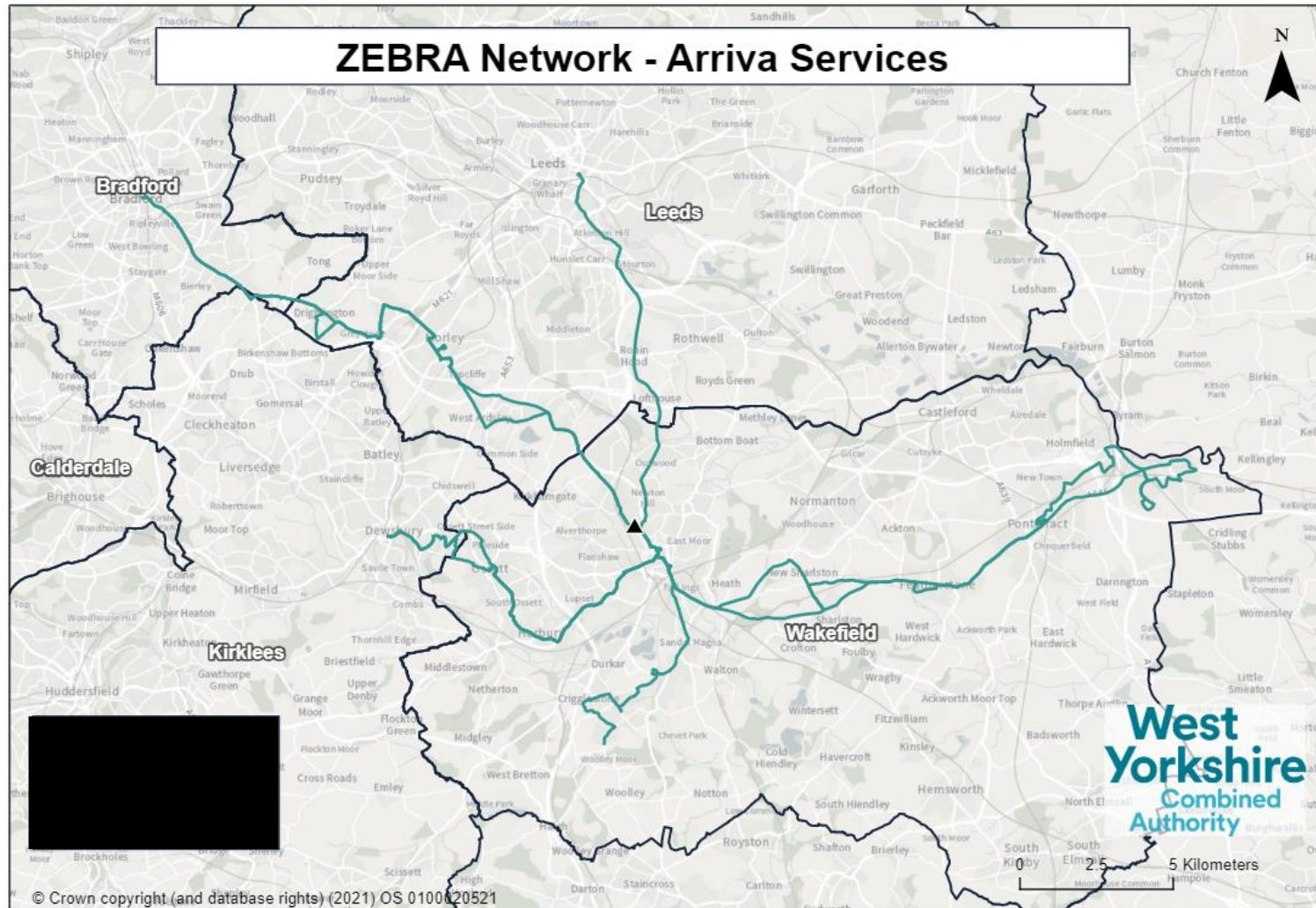


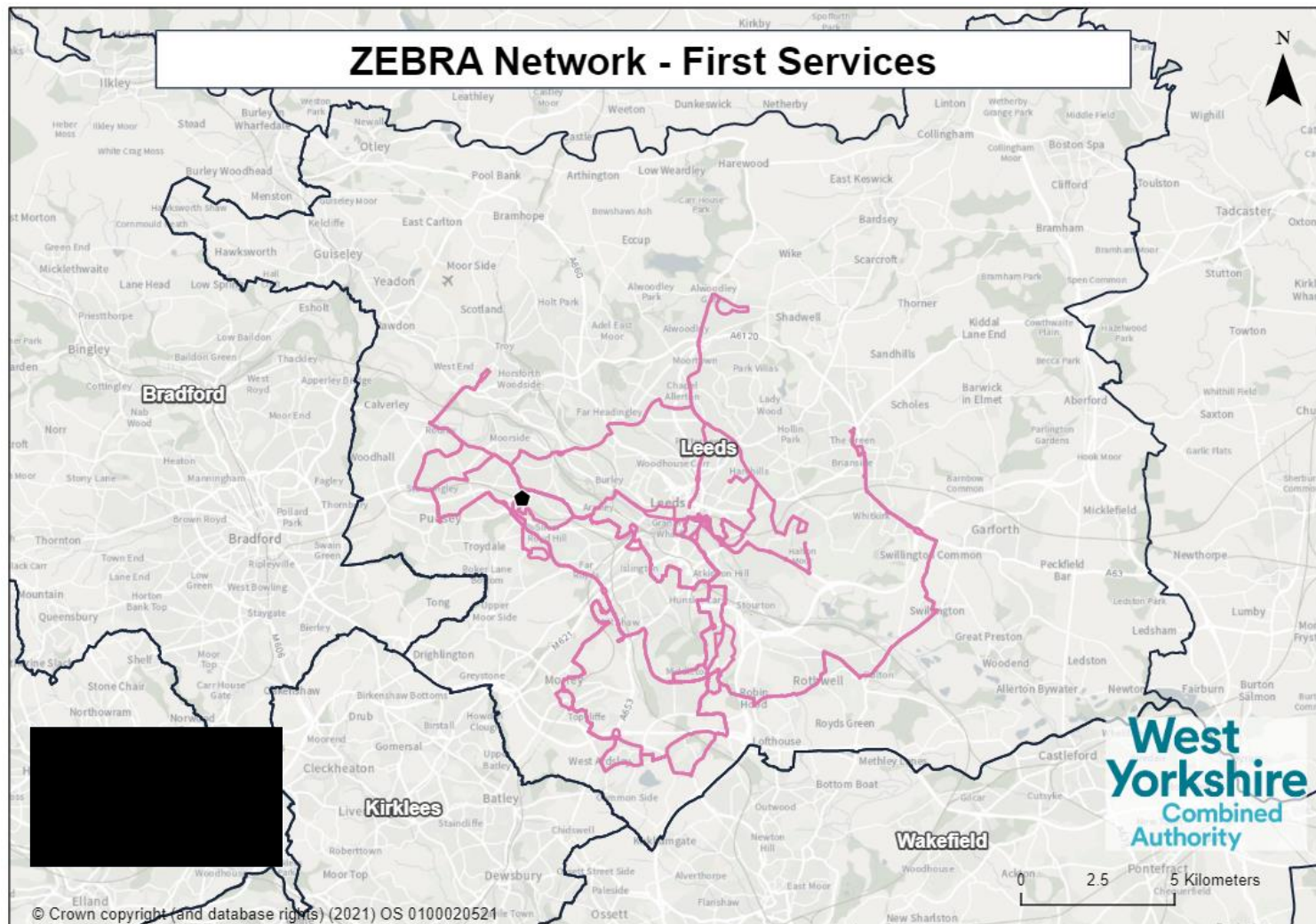
Figure 1: West Yorkshire ZEBRA Programme



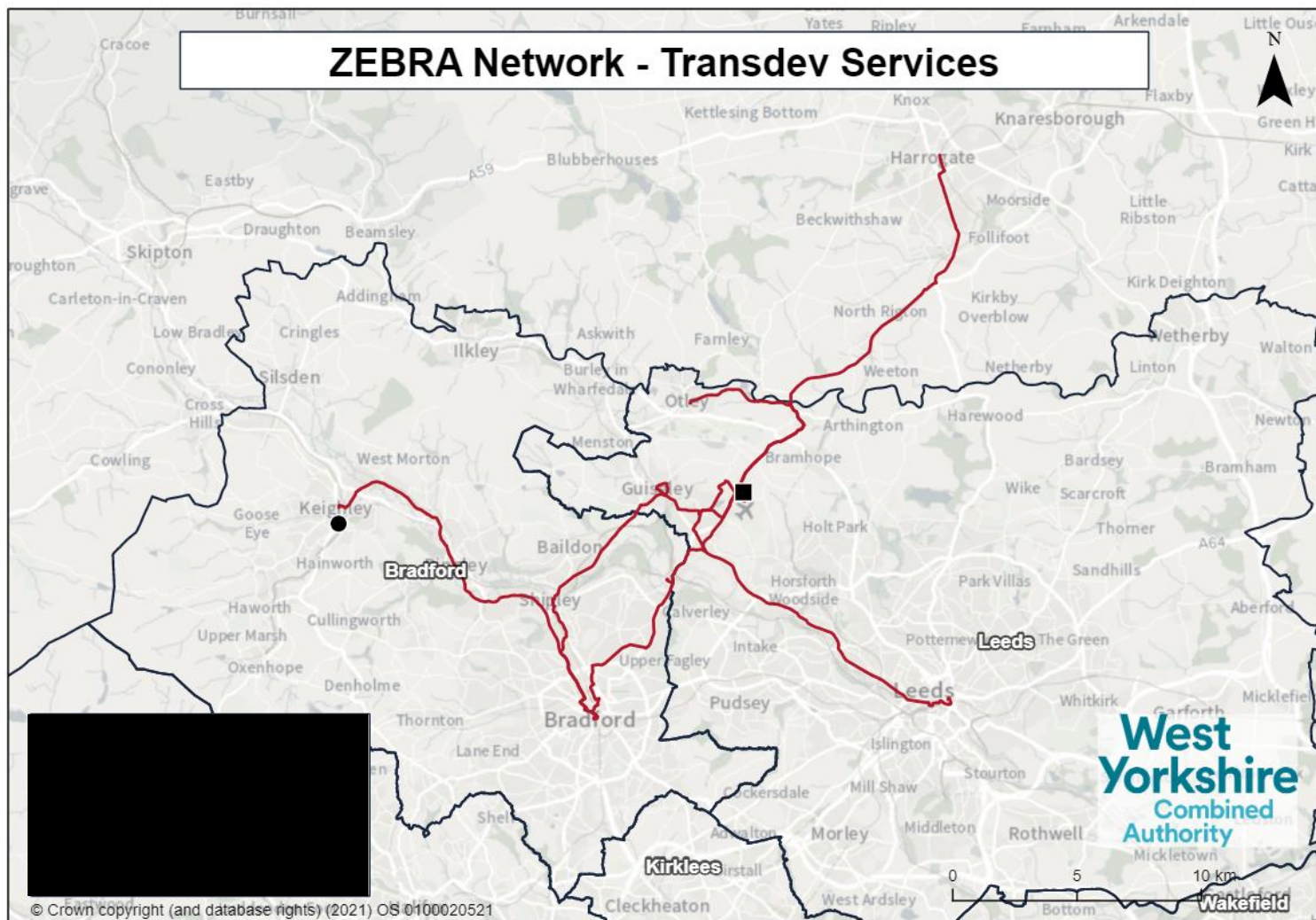


**Figure 2: Arriva ZEBRA project**





**Figure 3: First ZEBRA project**



**Figure 4: Transdev ZEBRA project**

## 1.5. Buses and Infrastructure

[REDACTED]

- 1.5.2. All of the projects covered by the ZEBRA programme will use overnight charging technology with the Transdev project [REDACTED] supplementing overnight charging with opportunity charging via a pantograph due to the length of this bus route.

Operator	Depot	Infrastructure	No. of buses
Arriva	[REDACTED]	[REDACTED] [REDACTED]	47
First	[REDACTED]	[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]	32
Transdev	[REDACTED]	[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]	15
Transdev	[REDACTED] [REDACTED]	[REDACTED] [REDACTED] [REDACTED] [REDACTED]	17

Operator	Depot	Infrastructure	No. of buses

**Table 3: ZEBRA projects summary**

## 1.6. Programme Costs

- 1.6.1. The total value of the ZEBRA programme is £56,728,874 of which £54,140,882 relates to the ZEBs and associated infrastructure and £2,587,992 is a QRA derived contingency.
- 1.6.2. Table 4 below breaks down the costs between operator and DfT grant request.

Project	ZEBs			Infrastructure		
	Total	Grant	Operator	Total	Grant	Operator
Arriva						
First						
Transdev						
<b>Total</b>	<b>£46.6m</b>	<b>£17.4m</b>	<b>£28.6m</b>	<b>£7m</b>	<b>£5.3m</b>	<b>£1.7m</b>

**Table 4: ZEBRA programme costs**

## 1.7. Delivery Track Record

- 1.7.1. The Combined Authority has a strong track record of delivering projects in partnership with bus operators and this long-standing relationship has enabled a strong proposal to be developed.
- 1.7.2. In partnership with the West Yorkshire Bus Alliance the Combined Authority has successfully delivered the Leeds Public Transport Infrastructure Programme (LPTIP), Clean Bus Technology Fund and Ultra-Low Emission Bus Scheme. These projects have seen the delivery

of over 470 retrofitted buses and the delivery of the first fully electric Park and Ride at Stourton in Leeds.

- 1.7.3. Whilst this is significant progress, the ZEBRA programme along with the TCF and CRSTS projects provide an opportunity to build on these strong relationships to move forward and progress plans for a zero-emission bus fleet by 2036 and allow bus to contribute to the region achieving its regional emission reduction target.

## **1.8. Equality Impact Assessment**

- 1.8.1. An Equality Impact Assessment has been carried out for the submission of this Full Business Case which can be found in Appendix A.
- 1.8.2. The buses this funding seeks to introduce will meet enhanced accessibility requirements set out in ZEBRA funding guidance and will incorporate audio-visual announcements, hearing loops and improved space for wheelchairs and prams. This will see a positive impact on many groups with protected characteristics.
- 1.8.3. In addition, the routes selected within this programme largely align to areas of multiple deprivation that have inequalities in health, air quality and income. These areas tend to be more disadvantaged in terms of air quality outcomes and improvements in buses seeks to improve this situation.

## **1.9. Document Structure**

- 1.9.1. This Executive Summary precedes the ZEBRA programme FBC. The FBC is structured across six sections including strategic, economic, financial, commercial and management cases alongside an Equalities Impact Assessment (EqIA), a full version of which is included as an appendix to the FBC (see Appendix A).
- 1.9.2. A summary of the conclusions from the FBC are set out below.
- 1.9.3. The Strategic Case concludes that:
- the ZEBRA programme, along with the TCF and CRSTS projects, paves the way for the introduction of cleaner buses and improved passenger routes that challenge both the scale of carbon emissions and dependency on the private car;
  - ZEBRA will improve air quality and deprivation (interconnected issues) for the benefit of communities in West Yorkshire;
  - the Combined Authority is well placed to lead the ZEBRA programme through its strong delivery track record via the West Yorkshire Bus Alliance and provides an opportunity to utilise this



robust partnership to make significant progress towards meeting the ambition of having a zero-emission bus fleet by 2036; and

- the COVID-19 pandemic has exposed fundamental weaknesses in the existing bus system, however the ZEBRA programme can form part of the response to reconstructing the system in a way that ensures it works for the communities it serves, allowing residents to lead healthier and more prosperous lives.

1.9.4. The Economic Case concludes that:

- the ZEBRA programme provides additional monetised benefits including air quality and vehicle cascade within West Yorkshire;
- non-monetised benefits have been assessed including vehicle cascade outside of West Yorkshire and ZEB depot capacity;
- a QRA has been carried out assessing risks around increased supply chains costs from vehicle and battery manufacturers, DNO capacity and infrastructure costs and depot works and the ZEBRA programme makes an allowance of £2.58 million for the QRA;
- the Benefit Cost Ratio (BCR) is showing a low-medium value for money of 1.3
- sensitivity testing has been carried out to ensure the robustness of estimates.

1.9.5. The Financial Case concludes that:

- the total value of the ZEBRA programme is £56,728,874 of which £54,140,882 relates to the ZEBs and associated infrastructure and £2,587,992 is a QRA derived contingency;
- the overall cost of the ZEBRA programme has reduced by £1,353,887, compared to the EOI;
- overall costs associated with the ZEBs have reduced compared to the EOI by £4,175,743, reflecting detailed discussions with bus manufacturers to refine the initial quotes provided in the EOI;
- the total ZEBRA grant that is being requested for the purchase of ZEBs has reduced with £17,426,577 now being requested compared to £18,641,675 in the EOI;
- the infrastructure element of the programme has seen an increase in costs since EOI stage of £234,134 and can be attributed to operators refining initial quotes with suppliers e.g. civils contractors, DNO, charging equipment suppliers;

- financial risks have been considered and appropriate mitigation action has been implemented; and
- there is legal compliance with subsidy control, state aid and procurement regulations.

1.9.6. The Commercial Case concludes that:

- the Combined Authority will oversee grant funding and passport this to operators on receipt of suitable evidence of spend or orders being placed;
- operators have sufficient project management processes in place to deliver their obligations if the ZEBRA programme was to secure funding;
- procurement timescales indicate that each operator led project align to the DfT timescales for ZEBRA;
- operator approaches to procurement and market engagement are set out, detailing preferred manufacturers;
- outline specifications for ZEBs and supporting infrastructure underpin the ZEBRA programme; and
- a marketing strategy and approach has been developed providing the key messages for the marketing of ZEBs in West Yorkshire.

1.9.7. The Management Case concludes that:

- programme management will be overseen by the Combined Authority and assurance provided through its Assurance Framework;
- programme delivery structure established is suitable for the purpose of delivering the ZEBRA programme, with the Combined Authority demonstrating a track record of delivering similar project in this way;
- the West Yorkshire Bus Alliance offers an effective structure to manage the programme due to previous experience;
- operators are sufficiently resourced to be able to deliver against their obligations through the ZEBRA programme;
- programme risks have been identified and mitigation actions are in place;
- the ZEBRA programme has a wide range of support across partners and wider stakeholders;

- there is a well-established monitoring and evaluation approach at the Combined Authority that will be applied to the ZEBRA programme allowing appropriate data to be collected and analysed;
- there are sufficient contract management controls in place to ensure delivery against proposed programme plans; and
- there is a commitment to work with DfT on the ZEBRA programme to better understand the opportunities and challenges presented by ZEBs and to use this learning to inform future programmes and projects.

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## 2. Introduction

### 2.1. Purpose of this document

- 2.1.1. This Full Business Case has been prepared for submission to the Department for Transport (DfT) to support West Yorkshire Combined Authority's programme for Zero Emission Bus Regional Area (ZEBRA) funding.
- 2.1.2. The Business Case considers three operator led projects across four depots in West Yorkshire, looking to convert 111 buses to battery electric vehicles. The infrastructure to support this conversion, including charging points and grid connections, is also considered.
- 2.1.3. The Full Business Case has been developed in partnership with:
- West Yorkshire Bus Operators: Arriva, First Bus, Transdev, West Yorkshire Bus Alliance
  - External consultancies: Steer (economic case), EY (The DfT's delivery partner)
  - The Department for Transport (DfT)

### 2.2. Changes from EOI stage

- 2.2.1 The changes from EOI stage are included within the Financial Case, in summary:
- The overall cost of the ZEBRA programme has reduced by £1,353,887;
  - overall costs associated with the ZEBs have reduced compared to the EOI by £4,175,743, reflecting detailed discussions with bus manufacturers to refine the initial quotes provided in the EOI;
  - the total ZEBRA grant that is being requested for the purchase of ZEBs has reduced with £17,426,577 now being requested compared to £18,641,675 in the EOI;
  - the infrastructure element of the programme has seen an increase in costs since EOI stage of £234,134 and can be attributed to operators refining initial quotes with suppliers e.g. civils contractors, DNO, charging equipment suppliers.

### 3. Strategic Case

#### 3.1. Overview

- 3.1.1. The strategic case highlights the interconnected nature of deprivation and poor air quality within West Yorkshire and explains the ways in which ZEBRA seeks to improve this correlation for the benefit of the communities living in the region. This programme paves the way for the introduction of cleaner buses and improved passenger routes that challenge the scale of the air quality challenge, carbon emissions and dependency on car. We recognise the value in understanding what our residents want from their bus services, which is why we have placed research on public perceptions at the core of our bus strategy development.
- 3.1.2. West Yorkshire Combined Authority has a strong track record of delivering projects with bus operators through the Bus Alliance, and this ZEBRA programme provides an opportunity to utilise this robust partnership to make significant progress towards meeting our goal of a zero emission bus fleet by 2036.
- 3.1.3. The COVID-19 Pandemic has exposed the fundamental weaknesses of the existing bus system, but with this programme we can begin to reconstruct this system in a way that ensures it works for the communities it serves, allowing our residents to lead healthier and more prosperous lives.

#### 3.2. Defining West Yorkshire

##### The Place

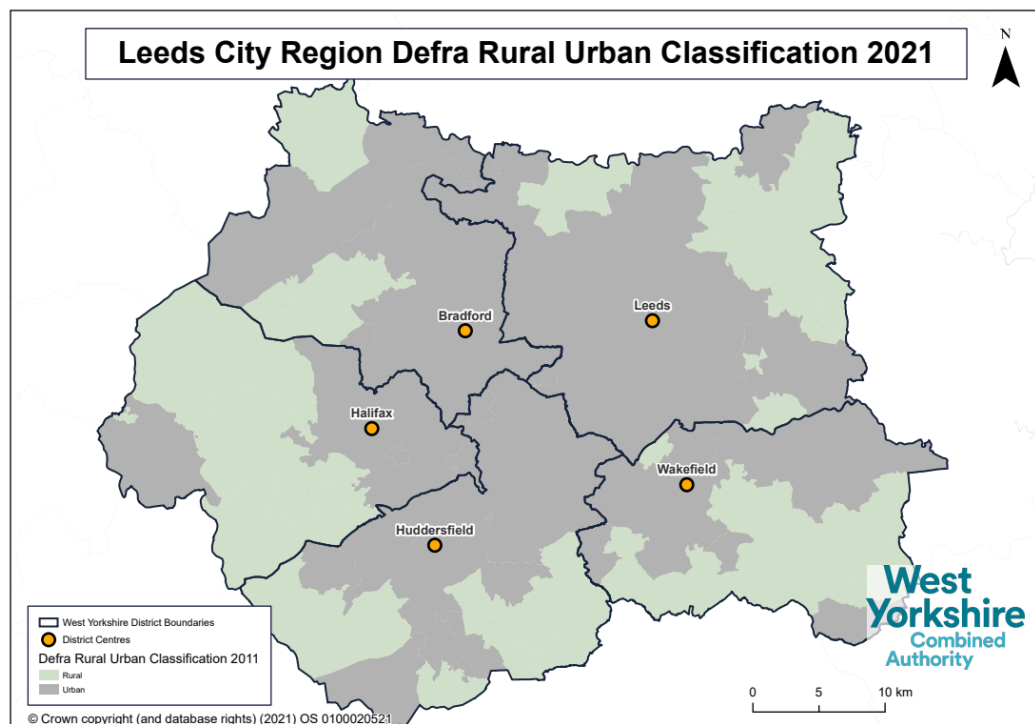
- 3.2.1. The area the programme covers is West Yorkshire, a region covering 780 square miles with a population of over 2.3 million. The region is polycentric in nature and is comprised of five metropolitan districts: Bradford, Calderdale, Kirklees, Leeds and Wakefield. Our district encompasses both urban and rural with an interconnected network of separate urban centres, forming a distinctive region and differing bus markets. This programme will target some of the worst air quality areas within the region, centred around major urban centres.
- 3.2.2. The following table summarises West Yorkshire in terms of population, size, population density and rural/urban split.

Metropolitan Borough	Population (thousands)	Size (square km)	Population Density (pop./sq. km)	Rural / Urban split (Source: DEFRA)
Leeds	789	552	1,429	29% / 71%
Bradford	537	365	1,471	24% / 76%
Calderdale	210	363	579	60% / 40%
Wakefield	345	339	1,018	46% / 54%
Kirklees	439	409	1,073	36% / 64%

Source: Office for National Statistics 2018 Estimates

**Table S1: West Yorkshire in numbers**

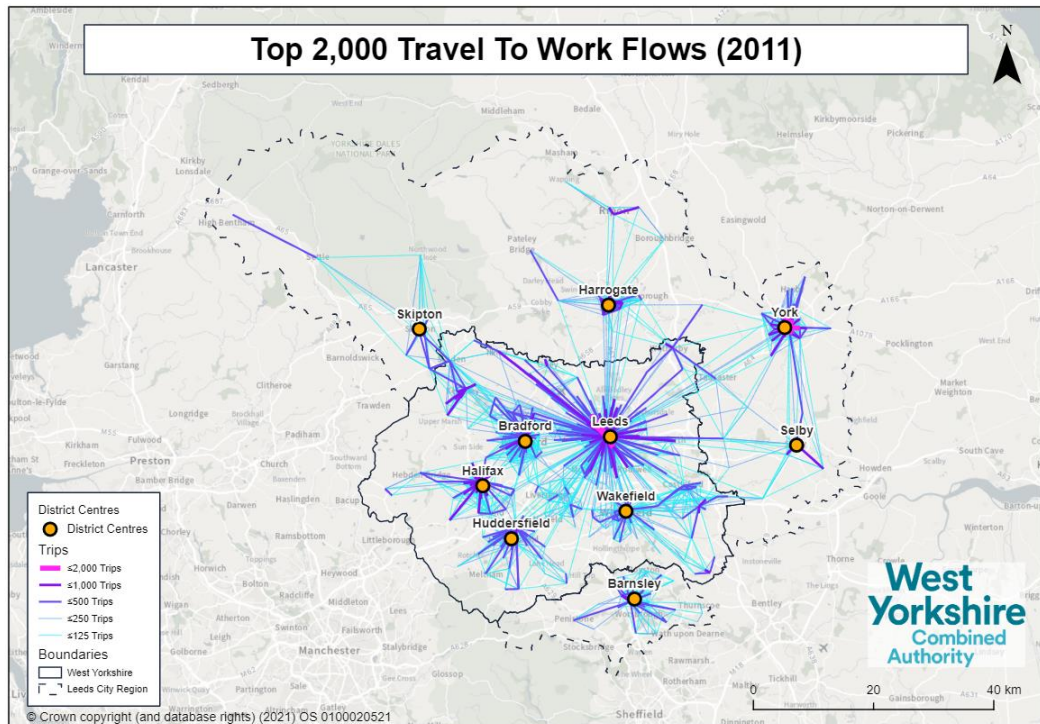
- 3.2.3. Across the five West Yorkshire districts there are currently 36 Air Quality Management Areas, all of these are areas in which Nitrogen Dioxide emissions exceed the annual/hourly statutory limits and that require a Local Air Quality Action Plan to bring levels within the legal limits.
- 3.2.4. Air quality within the region is some of the worst across the UK, with estimates showing that poor air quality accounts for 1 in 20 deaths across West Yorkshire.
- 3.2.5. The Combined Authority, accompanied by all District Councils in the region, declared a climate emergency in 2019, with the ambition of the Leeds City Region becoming a net zero carbon economy by 2038, with significant progress by 2030.
- 3.2.6. The work of the West Yorkshire Combined Authority and the Leeds City Region Enterprise Partnership covers the West Yorkshire authority above and can be seen on the map below.



**Figure S1: West Yorkshire Economic Area**

- 3.2.7. The [State of the Region Report](#) (2021) demonstrates that West Yorkshire is the UK's largest economy and population centre outside of London and generates five percent of England's total economic output - £69.6billion. Outside of London, this makes for the largest city region economy in the UK. The economy within West Yorkshire is increasingly drawing highly skilled, knowledge intensive service sector workers, whilst retaining a strong tourism offer and outstanding cultural and leisure opportunities.
- 3.2.8. West Yorkshire is an interconnected region, made up of large urban centres including Leeds and Bradford, whilst also being home to the cities and major towns of Huddersfield, Halifax and Wakefield. Our cities and towns are strong economic players and are built on distinctive strengths from local communities, for example, the strength of manufacturing in Bradford, Huddersfield and Wakefield. The region is also supported by a network of smaller towns and villages.
- 3.2.9. Levels of commuting between districts are significant, and most commuting trips are contained within West Yorkshire with 90% of residents working within the area. Whilst a fifth of residents' travel to a work destination outside their home district, this is largely within West Yorkshire. Links to the wider City Region are also important, with flows between towns and cities such as Harrogate, Skipton and York also having strong commuter flows.

- 3.2.10. The map below illustrates these commuter flows across the wider City Region, seeing inward commuters into West Yorkshire from Barnsley, Harrogate and Selby, York and Doncaster, with Leeds being the principal destination. Clearly, commuting has been severely disrupted by COVID-19 and there is great uncertainty about future travel-to-work behaviour, see section below for further detail.



**Figure S2 – Commuting flows across Leeds City Region**

- 3.2.11. Table S2 demonstrates that across West Yorkshire there is disparity in the number of commuting trips by bus, with only 9% of commuting trips within the Wakefield district by bus compared to 18% in Leeds. Leeds is the strongest performer in terms of proportion of bus travel for work purposes to and from the district. This could indicate stronger cross-boundary bus links than for other areas and aligns to the district as a net importer of labour. It may also point towards a worse offering of bus service in some areas when compared to others.

	Bradford	Calderdale	Kirklees	Leeds	Wakefield	Total % Outbound Trips
<b>Bradford</b>	12%	11%	10%	6%	4%	10%
<b>Calderdale</b>	6%	12%	8%	3%	2%	10%
<b>Kirklees</b>	8%	9%	10%	7%	5%	9%
<b>Leeds</b>	6%	5%	6%	18%	6%	16%
<b>Wakefield</b>	2%	1%	7%	7%	9%	8%
<b>Total % Inbound Trips</b>	10%	11%	10%	15%	8%	

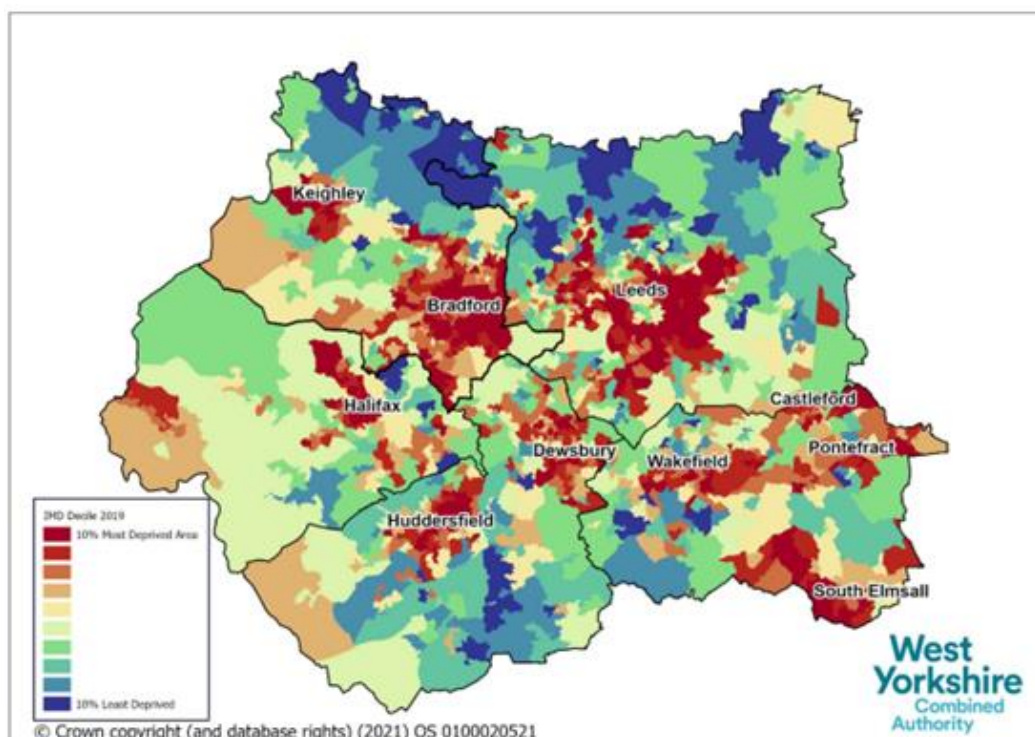
Source: Census 2011, WU03UK

**Table S2: Commuting by bus in West Yorkshire districts**

- 3.2.12. Within West Yorkshire, 20% of neighbourhoods are categorised in the 10% most deprived in England, with significant pockets of deprivation existing across all five of the districts<sup>1</sup>. This is equivalent to more than half a million people. Of the 100 most deprived neighbourhoods in England four are in Bradford, and three are in Leeds. There is significant spatial variation in deprivation at district level with deprivation significantly high within Bradford, 49% of residents living within the most deprived quintile.
- 3.2.13. Within West Yorkshire there is a link between deprivation and air quality, with those areas that experience high levels of deprivation often being those adversely affected by poor air quality, which is discussed below in Figure S23.
- 3.2.14. The deprivation profile of our region has remained relatively unchanged between 2004 and 2019, reflecting the existence of pockets of persistent deprivation. The most disadvantaged areas are clustered around town and city centres and their periphery. A key issue of concern is that a third of residents in the most deprived neighbourhoods are from an ethnic minority group.

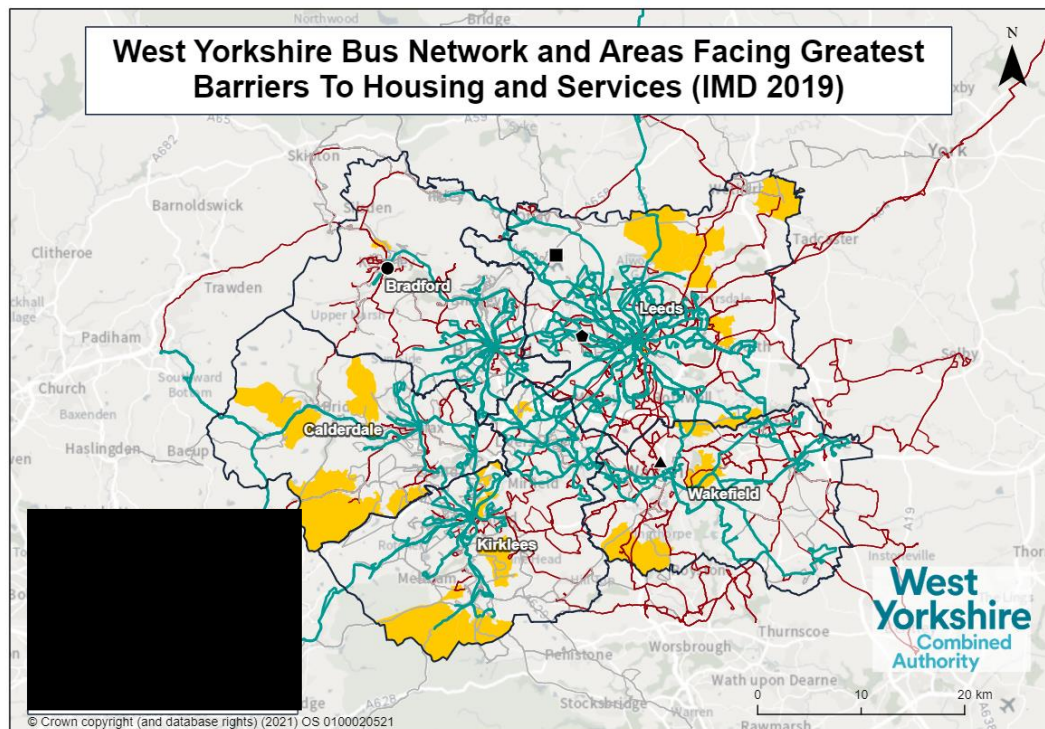
<sup>1</sup> Index of Multiple Deprivation, 2019





**Figure S3 – Deprivation (IMD) across West Yorkshire**

- 3.2.15. This pattern is also reflected in the figure below, which shows the IMD Barriers to Housing & Services alongside the core bus network (4 or more buses an hour). Significant barriers to housing and transport can be seen in the peripheral areas of districts, but what can also be seen are pockets of deprivation close to key urban centres such as those around Bradford, Huddersfield and Wakefield.
- 3.2.16. Again, this highlights that several factors are compounded in deprived areas making the need to invest in transport that improves air quality an important factor in our ZEBRA projects.



**Figure S4 – West Yorkshire High Frequency Bus Network and IMD Barriers to Housing & Services**

3.2.17. There are several spatial challenges within the region which ZEBRA could seek to improve. These all link closely to DfT Strategic Priorities to Grow and Level Up the Economy, Reduce Environmental Impacts and Improve Transport for the User:

- Spatial inequality and deprivation – ZEBRA provides an investment route which would see never, cleaner buses being brought into areas to improve routes for passengers and improve air quality for the communities they run through linking to the DfT ZEBRA objectives to support the roll out of ZEBs.
- Transport as a barrier and car dependence – ZEBRA brings an opportunity to attract new markets through overcoming barriers to car dependency through offering an improved service and improving the image of bus. This links to the DfT ZEBRA objectives to support partnership working, support the roll out of ZEBs.
- Achieving the scale of carbon emission reductions – the region requires all sectors to reduce emissions with transport being the largest emitting sector in the region, ZEBRA can be used as a catalyst for a significant shift towards a zero emission bus fleet across the region. This linking to DfT ZEBRA objectives of supporting decarbonisation of transport, roll-out of ZEBs, supporting



bus manufacturers in developing technology and encouraging partnership working.

#### The customers

- 3.2.18. People are at the heart of our Region having a diverse population with many ethnicities, background and lifestyles represented, bringing great cultural diversity which is celebrated. Our [Bus Service Improvement Plan](#) recognises that understanding what people want from public transport services and their wider travel needs should be at the forefront of improving buses, whilst this value is also at the core of the West Yorkshire Bus Strategy. Therefore, understanding different passengers and their behaviours is crucial to retaining them, attracting new passengers and growing the bus market, and ultimately delivering a better bus service for the region.
- 3.2.19. [The State of the Region Report](#), 2021, demonstrates that across West Yorkshire, the bus accounts for 6% of modal share, compared to 61% by car/van<sup>2</sup>. Car continues to be the predominant mode of travel, both in trips and distance. Although in 2019 its share was slightly higher than the national average of 61%, there has been a substantial reduction from the 2016 baseline, when 67% of all trips were made by car<sup>3</sup>.
- 3.2.20. Preference for car travel is also reflected in the Public Perceptions of Transport survey in 2020 (survey undertaken pre-pandemic) showing that 39% of respondents used bus at least weekly, with 68% driving a car at least weekly<sup>4</sup>. In order for the Combined Authority to achieve its ambition of becoming net zero carbon by 2038 there needs to be a significant modal shift, with modelling indicating a need to reduce car travel by 24-43%<sup>5</sup>.
- 3.2.21. The introduction of new vehicles has also been shown to increase and attract new customers through providing more comfortable journeys and a reduction in vehicle noise and vibration<sup>6</sup>.
- 3.2.22. Over the last 8 years that the survey has been conducted, the proportion of people using bus in West Yorkshire has fluctuated with those using buses most frequently (at least 4 days per week), changing from between

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<sup>2</sup> West Yorkshire Combined Authority "West Yorkshire: State of the Region Report", 2021 ([Microsoft Word - SotR Draft Full Report FINAL 251021 \(westyorks-ca.gov.uk\)](#))

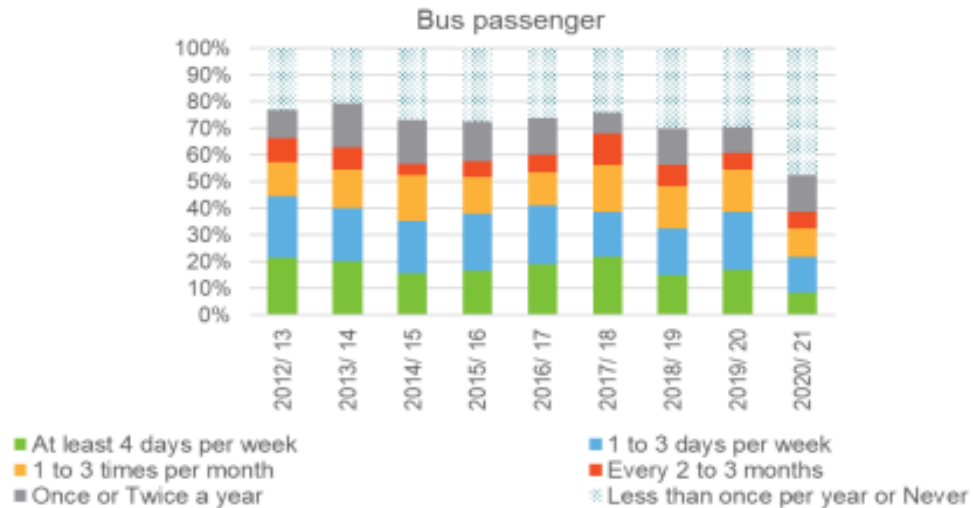
<sup>3</sup> Ibid

<sup>4</sup> West Yorkshire Combined Authority and AECOM "Resident Perceptions of Transport Survey Annual Report" March 2021 ([Report Customer Perceptions of Transport Survey \(westyorks-ca.gov.uk\)](#))

<sup>5</sup> Element Energy "West Yorkshire Carbon Emissions Reduction Pathways" July 2020 ([PowerPoint Presentation \(westyorks-ca.gov.uk\)](#))

<sup>6</sup> Urban Transport Group, "What's driving bus patronage change?", January 2019 ([Urban Transport Group - What's driving bus patronage change FINAL 0.pdf](#))

approximately 15% and 22%<sup>7</sup>. In 2019/20, 17% of bus users were in this category<sup>8</sup>. This shows a fluctuating base in frequent users which may indicate preferences for other modes or a reduction in trips.

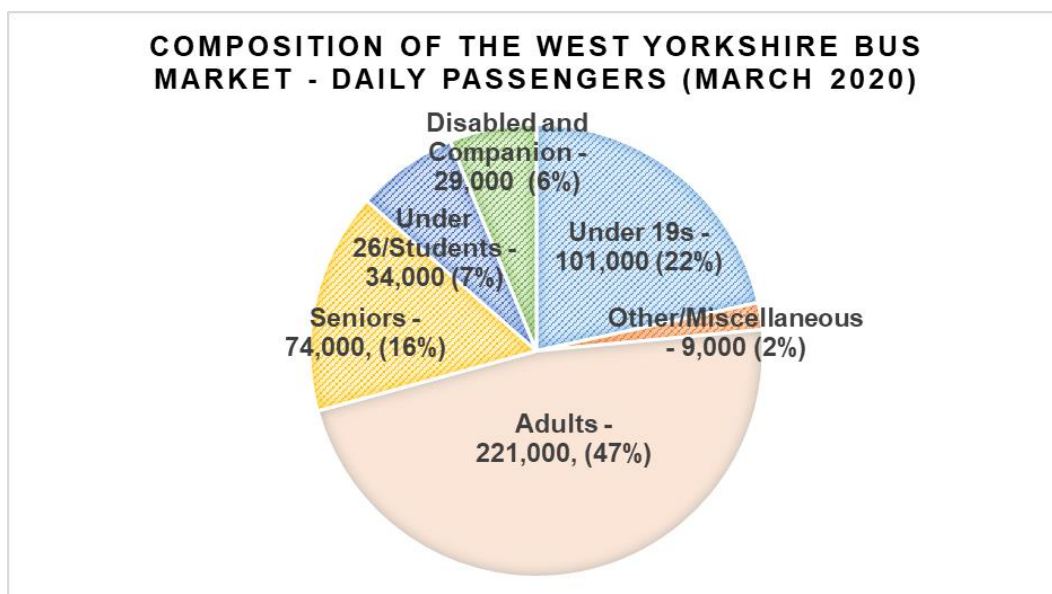


**Figure S5 – Bus passenger demographics**

- 3.2.23. The below pie chart, Figure S6, identifies key passenger categories and the approximate number of these passengers who travelled on bus in West Yorkshire per weekday, prior to the Covid 19 pandemic. This shows the variety of bus users across West Yorkshire, the majority of which (47%) are adults but with a strong under 19s and senior market too.

<sup>7</sup> West Yorkshire Combined Authority and AECOM “Resident Perceptions of Transport Survey Annual Report” March 2021 ([Report Customer Perceptions of Transport Survey \(westyorks-ca.gov.uk\)](https://www.westyorks-ca.gov.uk/report-customer-perceptions-of-transport-survey))

<sup>8</sup> Ibid



**Figure S6 – Composition of the West Yorkshire bus market**

#### Vehicles and operators

- 3.2.24. There are 26 bus operators in West Yorkshire, with First, Arriva and Transdev (including Team Penine), running approximately 90% of the services. A full list of all operators within the West Yorkshire region can be seen in table 4 below.

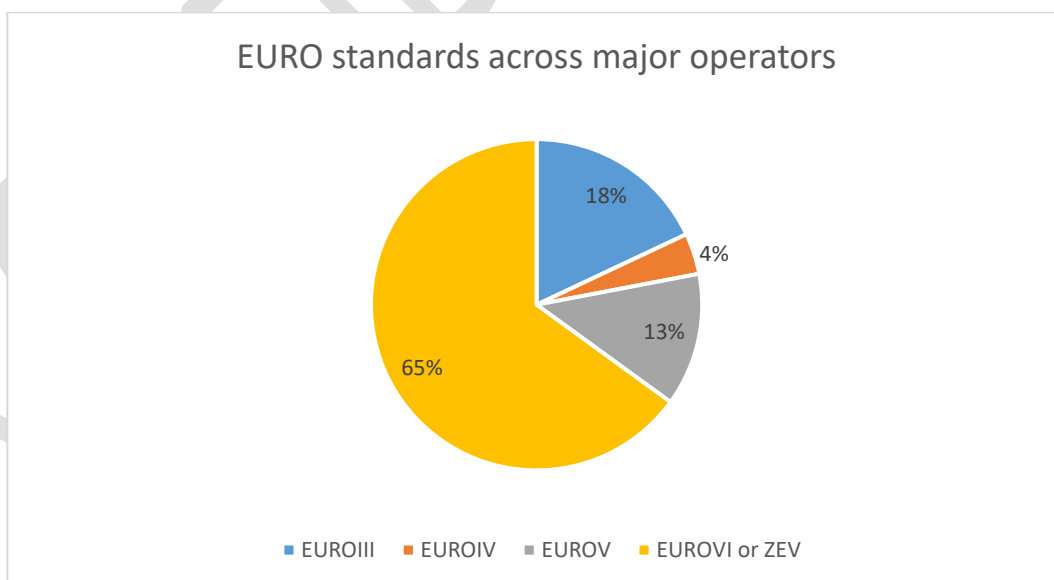
Bus Operators in West Yorkshire	
A Lyles & Son/Longstaff of Mirfield	South Pennine Community Transport CIC
Arriva Yorkshire	Square Peg Bus Ltd
CT Plus Yorkshire CIC/Leeds Alternative Travel Ltd	Station Coaches
Dales & Bowland CIC/ Dales Bus	Stagecoach Yorkshire
D K Travel	Stevenson's Travel Ltd
E Stott & Sons	Streamline
First West Yorkshire	Stringers Pontefract Motorways
Globe Holidays Ltd	Tetley Motor Services Ltd
Harrogate Coach Travel /Connexions	TLC Travel Ltd

Bus Operators in West Yorkshire	
Jacksons of Silsden	TM Travel
J and B Travel	Transdev - Keighley, Harrogate, Coastliner, Flyer
North Yorkshire County Council	Waterson's Coaches
Ross Travel Ltd	York Pullman

**Table S3 – List of operators in West Yorkshire and their parent companies**

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

- 3.2.26. The projects included within this programme see the introduction of an additional 111 ZEBs, increasing the proportion across the region to 10%. The current West Yorkshire Bus Fleet Composition by EURO standard can be seen below.

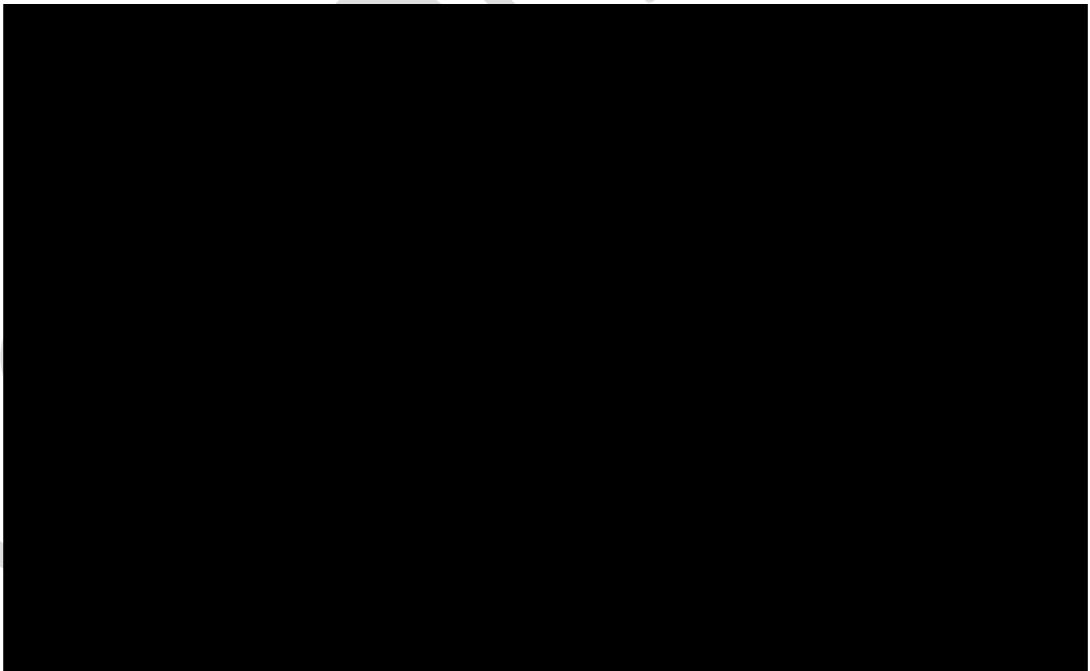


**Figure S7 – Current West Yorkshire EURO Standards (major operators)**

[REDACTED]
[REDACTED]
[REDACTED]

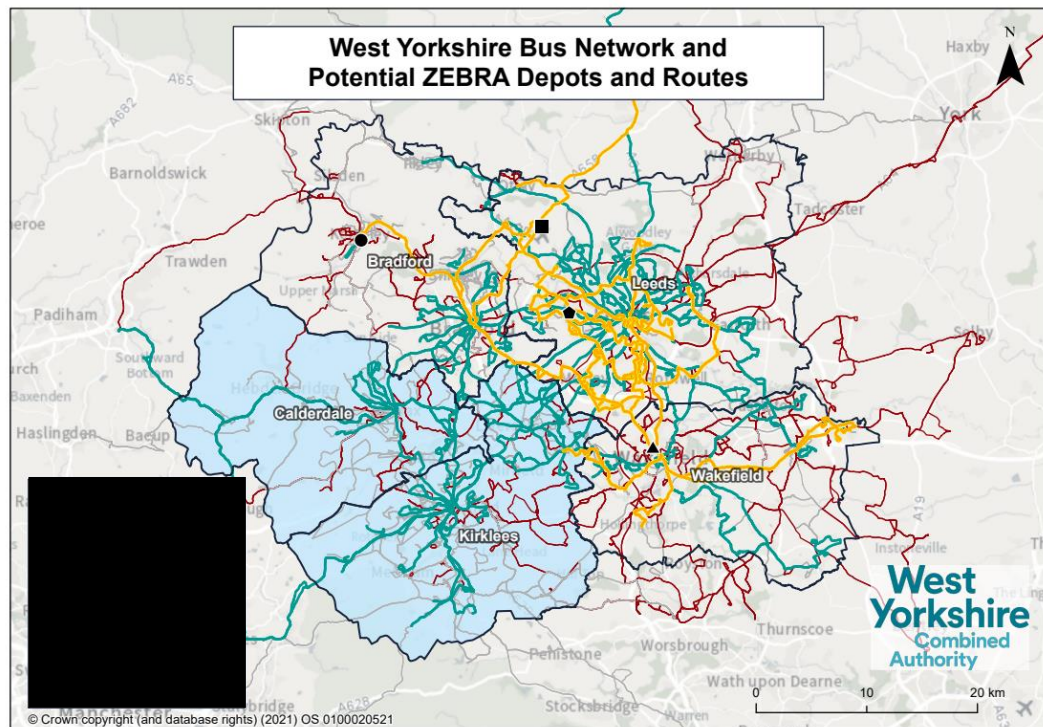


**Figure S8 – Technology of current fleet**



- 3.2.28. The West Yorkshire bus network is dominated by three major operators largely providing radial services into the major towns and cities in the region. They provide 85% of total bus miles on a commercial basis. The remaining 15% (9.5m miles pa) operates under contract with the Combined Authority at a net cost of £16.5m pa.

- 3.2.29. The depots used in the ZEBRA projects are indicated on the map below, showing that they are placed around key urban centres, which are often those disproportionately affected by poor air quality and deprivation.



**Figure S10 – West Yorkshire bus network and ZEBRA depots**

### 3.3. Delivery track record

- 3.3.1. West Yorkshire Combined Authority has a strong track record of delivering projects in partnership with bus operators, demonstrating the strength behind this joint programme.
- 3.3.2. In partnership with the Bus Alliance, the Combined Authority has successfully delivered the Leeds Public Transport Infrastructure Programme, the Clean Bus Technology Fund (2018-2021) and Ultra-Low Emission Bus Scheme (2020-2021). These projects ran in partnership with the Bus Alliance and have seen the delivery of over 470 retrofitted buses and the delivery of all electric buses at Stourton Park and Ride.
- 3.3.3. Whilst this is significant progress, ZEBRA provides an opportunity to use our strong partnership to move forward and progress plans for a zero emission bus fleet by 2036. Partnership working is a key objective of our ZEBRA programme due to our good delivery track record in working with bus operators on similar schemes across West Yorkshire.
- 3.3.4. Other recently completed projects also demonstrate our ability to deliver complex programmes including:

- **Stourton Park and Ride** – launched in September 2021, this Park & Ride is a fully solar powered site and served by 5 zero-emission buses which operate every 10 minutes along dedicated bus lanes, taking just 15 minutes to travel to Leeds City Centre. It has capacity for 1,200 vehicles including 26 electric car charging points, secure cycle storage and dedicated disabled, family and motorcycle bays. This innovative scheme has been developed in partnership with First who are operating the Park and Ride, showing another success in partnership working.
- **Clean Bus Technology Fund** – this project provided capital funding to bus operators to support the retrofit of Clean Vehicles Retrofit Accreditation Scheme (CVRAS) technology to improve tailpipe emissions to EUROVI standard or better. The scheme retrofitted over 470 buses in West Yorkshire, reducing the amount of NOx by retrofitting accredited emission control technology onto older, more polluting buses. This project saw a partnership approach delivered through the West Yorkshire Bus Alliance.
- **East Leeds 'FlexiBus'** – Our FlexiBus scheme provides a bookable demand responsive transport link within a defined area of East Leeds. The Combined Authority own these electric buses and lease them back to the operator. This service makes use of electric mini buses, which are owned and leased to First (the operating company). This demonstrates success in the procurement of electric vehicles and developing a scheme through a tendering agreement.
- **Network Navigation** – an ongoing initiative that is being delivered in partnership between the Combined Authority, our district partners and local operators as part of both the Leeds Public Transport Investment Programme and the Transforming Cities Fund. The project aims to give people greater visibility of the region's core, high-frequency bus network and better support them in understanding, accessing and navigating their way across it as they travel from A to B. It is doing this through the creation of a user-friendly and accessible set of maps and colour coded bus stop plaques, shelters, on-street infrastructure and in bus stations that link to local bus lines, on the high-frequency network. The line names are also represented on the bus destination blinds to provide seamless integration from the bus stop to on-bus. The roll-out of the initial Leeds phase of the project will conclude in November 2021, and the rest of West Yorkshire by 2023. This demonstrates the ability of the Combined Authority and operators to deliver a complex programme in partnership.



### 3.4. Impact of Covid

- 3.4.1. The COVID-19 pandemic, as well as the subsequent social distancing requirements and travel restrictions, has had an unprecedented impact on bus both in West Yorkshire and across the country. While the crisis prompted some good examples of innovation from the industry and greater collaborative working between operators and local authorities, it has highlighted the fundamental weaknesses of the existing system - particularly the fragility of the passenger-demand driven funding structure - and the need to ensure the service offer works for people across all different sections of society.
- 3.4.2. Bus is the dominant mode of public transport in West Yorkshire and whilst patronage has been down across the board, it is now around 75% of pre-pandemic levels<sup>9</sup>.
- 3.4.3. There have been difference in levels of bus use between different passenger cohorts which has highlighted the variation between people in terms of why they travel and the importance of bus to fulfilling these journeys which the pandemic has further altered with the increase in home working observed.
- 3.4.4. Earlier in the pandemic a shift to car as mode of choice for activities such as trips to work and other travel into city centres could be seen, with movement away from bus use, suggesting that travel behaviour had changed. However, the most recent survey, October 2021, demonstrates that in the coming weeks, compared to before COVID, there is a notable decline in those saying they will travel less by bus in the coming weeks (32%) with 59% saying they will travel the same amount and 9% saying they will travel more.
- 3.4.5. Also, of importance to note is that, overall, across all four waves of the survey, 50% of respondents suggested they will travel less by bus compared to before the COVID-19 pandemic.

### 3.5. Current Policy Position

#### 3.5.1. **Overview**

- 3.5.1.1. The following section sets out the key policies and strategies that this business case relates to in relation for the drivers for change.

#### 3.5.2. **Policy Context – National Policy**

National Bus Strategy for England (2021)

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<sup>9</sup> West Yorkshire Combined Authority, "Transport Network Update", January 2022 ([Item 5 - Transport Network Update.pdf \(moderngov.co.uk\)](#)).



- 3.5.2.1. Published in March 2021, [Bus Back Better](#) aims to improve and grow the bus network across England. It sets out future funding commitments and details the conditions needed to secure long term bus funding.
- 3.5.2.2. It acknowledges the role that buses play in wider government priorities, notably:
- Enabling access to work and improving employment outcomes
  - Driving productivity gains and reducing congestion
  - Levelling up through provision of services to the less advantaged
  - Connecting communities and preventing isolation
- 3.5.2.3. Within the strategy, bus is seen as an opportunity to reduce car usage through the provision of an attractive service, whilst also a way to help achieve Net Zero ambitions. Improving modal share of bus also has the potential to reduce congestion and improve air quality for local communities. This shows alignment to ZEBRA which aims to achieve similar ambitions.
- 3.5.2.4. Within the [National Bus Strategy](#) there is a commitment from government to introduce 4,000 zero emission buses nationwide and we believe West Yorkshire is the perfect place to start delivering this commitment using ZEBRA as at catalyst for wider investment in a zero-emissions bus fleet.
- Levelling up agenda
- 3.5.2.5. The UK Government has committed to levelling up regions across the United Kingdom, particularly in recovery from the COVID-19 pandemic. Levelling up looks to support local economic growth, regenerate towns centres and high streets, support people into employment, improve local transport and invest in local culture.
- 3.5.2.6. The Combined Authority also see ZEBRA funding as an opportunity to promote levelling up in transport. Currently only 2% of buses in West Yorkshire are zero emission, whilst other areas have seen more investment in this technology. ZEBRA presents an opportunity to improve the transport offer in the region by removing older, more polluting vehicles which have a lesser onboard provision and provide modern, high class vehicles connecting our key urban centres across the region.
- Net Zero Strategy
- 3.5.2.7. The Government's Net Zero Strategy '[Build Back Greener](#)' was launched in October 2021. The strategy sets out the long term plan to deliver the commitment of the UK becoming net zero by 2050.
- 3.5.2.8. The key principles within the strategy are:

- Working with consumers
- Making the biggest polluters pay
- Protecting the most vulnerable
- Working with businesses in technological developments

3.5.2.9. The strategy contains policies and proposals to ensure that the UK keeps on track for carbon budgets, Nationally Determined Contribution and the vision for a decarbonised economy by 2050.

3.5.2.10. The ZEBRA programme is essential to the [Net Zero Strategy](#) set out by Government and in West Yorkshire will act as the catalyst required to work with business to invest in technological innovation to reduce the impact of climate change.

#### Transport Decarbonisation Plan

3.5.2.11. The Government's commitments to decarbonising the transport system are set out in the [Transport Decarbonisation Plan](#). The plan recognises that transport is one of the largest sources of air pollution in the UK, which is consistent with the picture in West Yorkshire.

3.5.2.12. It outlines a number of priorities for bus reflecting the commitments set out in the National Bus Strategy to introduce more zero emission vehicles and corresponding interventions such as cheaper fares, that will have an indirect effect on decarbonisation through modal shift.

3.5.2.13. A step change in transport decarbonisation could be seen within West Yorkshire, through the introduction of zero emission buses at scale in West Yorkshire as set out in this programme.

### 3.5.3. **Policy context – Pan-Northern Policy**

#### Transport for the North's Decarbonisation Strategy

3.5.3.1. TfN lay's out four scenarios in their [Decarbonisation Strategy](#), in which their decarbonisation trajectory of near zero by 2045 is met in different ways, and to different degrees. All but the worst-case scenario (which would see the UK governments 2050 net zero target missed) require significant increases to the modal share of bus alongside the introduction of zero carbon bus technology. A modal share increase of 11-21% will be required, and clean technology must make up 40% of the bus fleet by 2030, and 70% by 2035. This is an ambitious target, and yet it must be realised if we are to progress towards TfN's objective of near-zero by 2045.

3.5.3.2. Successful implementation of the ZEBRA programme would see the proportion of ZEBs in the West Yorkshire fleet rise from under 2% to 9%

within a couple of years. This represents an excellent start to decarbonisation which can act as a demonstration project to induce further investments by the region's operators.

#### 3.5.4. **Policy Context – Local Policy**

##### Mayoral Pledges and bus reform

3.5.4.1. The West Yorkshire Mayor has identified 10 pledges that will be prioritised for delivery over the Mayoral term, with two of these pledges closely aligned to the objectives of the ZEBRA programme:

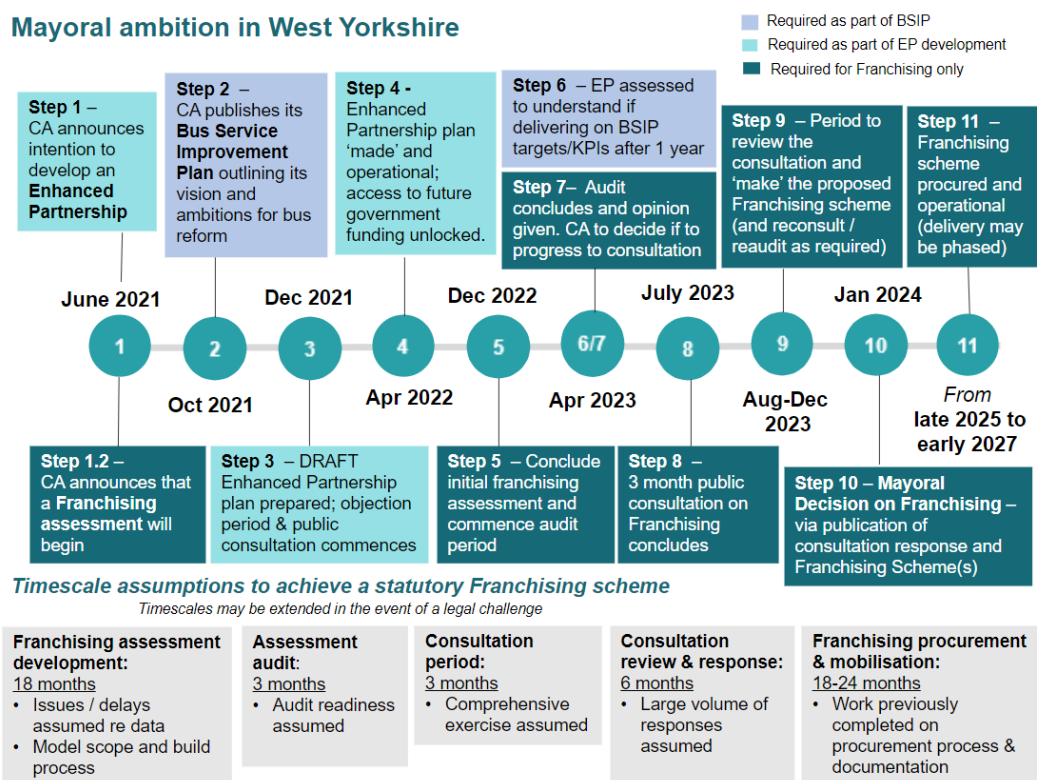
- Bring buses back under public control, introduce simpler fares, contactless ticketing and greener buses
- Tackling the climate emergency and protecting our environment

3.5.4.2. Both pledges are central to our recently submitted [Bus Service Improvement Plan](#) (see below) and shape the direction of bus reform and transport decarbonisation in the coming years.

3.5.4.3. At the Combined Authority meeting on [24th June 2021](#) the Combined Authority approved a Notice for Intent to develop an Enhanced Partnership and a Notice of Intent to undertake an assessment for franchising. An assessment for franchising will be undertaken alongside a formal Enhanced Partnership with bus operators as a means of enabling public direction of bus provision from April 2022, in line with Government timescales. This will enable the Combined Authority to determine the best governance mechanism to deliver on the Mayor's ambition for transformational change of buses within West Yorkshire.

3.5.4.4. Figure S11 below outlines the roadmap to reforming the delivery of bus services, including the establishment of an Enhanced Partnership by April 2022 and a mayoral decision on franchising by January 2024. A potential franchising scheme would not be operational in West Yorkshire until late 2025 at the earliest.

## Mayoral ambition in West Yorkshire



**Figure S11 – Bus Reform Roadmap**

- 3.5.4.5. The ambition of longer-term bus reform within West Yorkshire is of great importance when assessing this ZEBRA programme. It shows the ambition for growing bus patronage and enhancing bus services through improved connectivity, whilst also striving for gains in environmental performance of the bus fleet. This links closely to DfT's priorities to: *grow and level up the economy; reduce environmental impacts / Air quality; and Improve transport for the user.*

### Bus Service Improvement Plan

- 3.5.4.6. The Combined Authority's [Bus Service Improvement Plan](#) (BSIP) builds on the ambitions set out in the [West Yorkshire Transport Strategy \(2040\)](#), the [West Yorkshire Bus Strategy \(2017\)](#) and the [West Yorkshire Connectivity Infrastructure Plan \(2021\)](#) which put connectivity and sustainable travel at heart of a thriving and inclusive regional economy where everyone can build great businesses, careers, and lives.
- 3.5.4.7. The [Bus Service Improvement Plan](#) is centered on the following strategic priorities:

- **A safe and inclusive bus system** – a bus service that is fully accessible which is designed with passengers in mind. This includes new services, extended operating hours and making the bus more flexible, easier to understand, and use

- **Better connected communities** – a bus service which connects communities across the region – particularly areas of high deprivation and rural areas – ensuring access to employment, education and leisure opportunities
- **Decarbonisation and integrated, sustainable travel** – supporting the Combined Authority’s net zero carbon economy by 2038 through enabling modal shift and embedding a zero carbon transport network

3.5.4.8. To support our vision for West Yorkshire, the [Bus Service Improvement Plan](#) must:

- Be inclusive of all groups in society
- Support inclusive growth and social well-being ambitions of West Yorkshire
- Contribute to improved economic productivity in West Yorkshire
- Provide cleaner, greener buses supporting sustainable travel and contributing to the environmental targets of West Yorkshire
- Be as competitive as possible against private car use in urban areas

3.5.4.9. To achieve this, the objectives of the [Bus Service Improvement Plan](#) are to:

- Establish bus as a key mode of choice for travel in West Yorkshire
- Establish a financially sustainable bus service
- Improve operational delivery to provide the passenger with a service they can feel confident in using
- Improve connectivity for communities facing deprivation, inequality, and exclusion
- Ensure the bus service is integrated to deliver sustainable connectivity.

3.5.4.10. To deliver this vision the BSIP outlines key deliverables which will see the delivery of a network that has:

- An enhanced, fully inclusive and more cohesive bus network – which takes people where they need to go, when they need to go
- **Clear and simple fares** – to make paying for bus more affordable, easier, convenient and flexible
- **Improved, more inclusive customer service and support** – so passengers have the tools to travel with confidence and have the help they need if their journey does not go to plan

- **Priority for buses on our roads** – so journeys by bus are quicker, with less time spent stuck in traffic, and are a viable alternative to the private car
- **More green and better vehicles** – to improve the onboard experience and make bus the sustainable choice for travel in West Yorkshire

- 3.5.4.11. Our ZEBRA programme would enable the delivery of our BSIP vision of cleaner, greener buses that are competitive against private car use through the provision of zero emission buses in urban areas. Our BSIP includes targets of having 10% of the West Yorkshire fleet being transitioned to zero emission buses by 2025 and 50% by 2030, before a fully zero emission fleet by 2036.
- 3.5.4.12. Our ZEBRA programme links to bus priority measures that are being introduced through City Region Sustainable Transport Fund, Transforming Cities Fund and Growth Deal funding. Several routes within ZEBRA are aligned to bus priority improvements especially Arriva services through Wakefield and First services running through Leeds City Centre. A full list of related schemes can be found under the Related Projects section below.
- 3.5.4.13. ZEBRA has strong links to the targets included within our BSIP and will act as a catalyst through providing evidence and confidence for further investment in zero emission buses in West Yorkshire.

#### The West Yorkshire Transport Strategy 2040

- 3.5.4.14. The [West Yorkshire Transport Strategy 2040](#) sets out the future vision for transport across the region. It includes ambitious modal shift targets to increase bus patronage by 25%, active travel trips by 300% and rail trips by 75% by 2027. This demonstrates our wider ambition to support public transport and promote modal shift.
- 3.5.4.15. The Strategy's vision is to: **enhance business success and people's lives by providing modern, world-class, well-connected transport that makes travel around West Yorkshire easy and reliable.**
- 3.5.4.16. In order to deliver this vision for transport, the strategy has three objectives of:
- Economy: Create a more reliable, less congested, better connected transport network
  - Environment: Have a positive impact on our built and natural environment



- People and place: Put people first and create a strong sense of place

3.5.4.17. This shows strong links to both the ZEBRA and wider DfT priorities in a commitment to improve transport for the user and promote inclusive growth and decarbonise to reduce the environmental impacts of transport.

#### The West Yorkshire Bus Strategy (2017) and West Yorkshire Bus Alliance

3.5.4.18. The [West Yorkshire Bus Strategy](#) supports the wider regional transport strategy, setting out the long-term ambition for bus services across the region. This strategy aims to improve connectivity to enable economic growth, improve environmental conditions and improve access to key health, education, employment and leisure services.

3.5.4.19. Within the strategy it supports the growth in patronage of bus users by 25% in the first 10 years of the strategy.

3.5.4.20. Related to the Bus Strategy, West Yorkshire formalised the West Yorkshire Bus Alliance in 2019-20. The alliance is based on a Voluntary Partnership Agreement and brings together operators and the Combined Authority to improve customer service, clean air and connectivity. There are various targets included around these themes including an increase in bus patronage by 25% across West Yorkshire and 50% in Leeds.

#### The Connectivity Infrastructure Plan

3.5.4.21. [The Connectivity Infrastructure Plan](#) is a long-term investment pipeline of schemes across all modes of transport. The strategy gives an overview of the capacity challenges and future network needs for West Yorkshire and reflects the importance of transport in accessing jobs, investment and improving health outcomes.

3.5.4.22. It aims to particularly address issues of inclusive growth and enhancing productivity and responding to the region's carbon reduction target.

#### Strategic Bus Network Review (2021)

3.5.4.23. The Strategic Bus Network Review sets out a series of district-specific interventions, that if delivered could generate patronage growth focussed on the Core Bus Network (services with a frequency of every 15 minutes or better). It includes a bus demand assessment and projections for three future years, 2024, 2028 and 2033. The study was used to identify strategic opportunities that will generate new and increased demand for bus use and then to estimate the scale of change required to meet it. The review focused on the core network only (four buses or more per hour) and used ticket machine data from operators to assess levels of demand.

The outcome for each district in West Yorkshire is shown below in table S4.

District	2018 Position	2033 Position	Notes
<b>Bradford</b>	32m annual trips by bus	37m annual trips by bus	35% increase in buses operating to support 2033 levels of bus trips. It is possible that investment would bring social benefits and deliver a self-sufficient bus network. Also need to integrate wider measures such as car parking policies
<b>Calderdale</b>	29m annual trips by bus	32m annual trips by bus	20% increase in buses required but could result in some financial challenges.  Look at providing dedicated service to growth areas (Halifax to Illingworth, Halifax to Bradford and Halifax to Huddersfield) and reduce need to interchange in Halifax.
<b>Kirklees</b>	40% of population are not served by the core network	Demand will increase by 8%	11% more buses required to maintain existing service level in 2033.  Future improvements do not deliver significant demand increases but deliver key connections to development sites which support future financial stability of the network.
<b>Leeds</b>	63m annual trips by bus	74m annual trips by bus	Greatest immediate opportunity is to tackle congestion and provide effective bus priority to support improved journey times and reliability.



District	2018 Position	2033 Position	Notes
Wakefield	97% of addresses in Wakefield are within 400 m of a bus stop; 61% are within 400m of a bus stop served by 4 buses or more during the morning peak	Improving frequencies, providing links to growth areas and investing in bus priority could support 5m trips but require 70 buses by 2033.	Challenging financial sustainability of Wakefield bus network. There is a high social value of the bus offer. To maintain existing levels of travel by bus in 2033 needs 7% more buses which would jeopardises the bus offer.

Source: West Yorkshire Strategic Bus Network Review, 2020

**Table S4: District summaries – West Yorkshire Strategic Bus Network Review, 2020.**

- 3.5.4.24. Future demand and growth in each District impose a specific set of future problems for the bus network. Enhancing the bus network will deliver social values, which may not be reflected in economic value. However, the changes required to balance future demand and commercial viability are difficult in some Districts.

#### The Economic Recovery Plan

- 3.5.4.25. The [Economic Recovery Plan](#) was produced in response to COVID-19 pandemic, covering the priority areas of Good Jobs and Resilient Businesses, Skills and Training and Accelerated Infrastructure with the long-term planning for economic recovery overseen by the West Yorkshire Economic Recovery Board (a working group of the Mayor, Leaders, LEP and partners).
- 3.5.4.26. The vision of the plan is to secure a fair, just and lasting recovery for West Yorkshire with the goals of securing inclusive growth for everyone and tackling the climate and environmental emergency. The action areas for delivery of the economic recovery plan are reflective of the Mayoral pledges and include:
- Connecting people and places
  - Tackling the climate and environment emergency, and
  - Championing great places
- 3.5.4.27. The Plan also sets out how to mitigate the impacts on COVID-19 on the travel network.

- 3.5.4.28. Within the tackling the climate and environment emergency there are specific outcomes related to ZEBRA including focusing on green skills, infrastructure, and business to reach our ambitions to become a net-zero region by 2038, and to accelerate EV charging infrastructure. This will see investment in green skills, future proofing existing jobs in line with the region's net zero ambitions.

West Yorkshire Low Emission Strategy 2016 - 2021

- 3.5.4.29. The [West Yorkshire Low Emissions Strategy](#), due to updated, demonstrates the commitment of the West Yorkshire local authorities, together with West Yorkshire Combined Authority and other key stakeholders to work together to improve air quality for the benefit of all in the region. This Strategy sets out the overall vision, aims and objectives which the WYLES intends to deliver over the next five years. It links to the Strategic Economic Plan (SEP) and the West Yorkshire Transport Strategy looking to reduce carbon emissions, improve efficiency and improve uptake of low carbon technologies.

Climate and Environment Action Plan (2021)

- 3.5.4.30. The Combined Authority declared a climate emergency in 2019 and has set an ambitious target for becoming net zero carbon by 2038, with significant progress by 2030. We commissioned the [Carbon Emission Reduction Pathway \(CERP\)](#) study which analysed key sectors and demonstrated how the Combined Authority can achieve net zero. It identified transport as the largest emitting sector, particularly relating to road transport, resulting in a need to innovate technology and reduce car journeys through modal shift. In order to attain this target investment in modern, zero emission buses is key.
- 3.5.4.31. The [West Yorkshire Climate and Environment Plan 2021-2024](#) is the Mayor's and Combined Authority's response to addressing the climate emergency and delivering mayoral pledges relating to climate, nature, and the green economy. It demonstrates how the region can go further and faster than national government, reinforcing commitments to be net zero carbon by 2038 at the latest.
- 3.5.4.32. Within the Climate and Environment Plan there are commitments to supporting the transition of the bus fleet to zero emissions and requiring all tendered services under our control to be zero emission, or with a comprehensive plan to move to zero emission as soon as possible. There is also a desire to invest more widely in Bus Priority Measures, strongly linked to our BSIP and City Region Sustainable Transport Settlement programmes.

3.5.4.33. The following actions within the Climate and Environment Plan are strongly related to this ZEBRA submission:

- Better neighbourhoods – including priorities for clean energy solutions for public transport
- Road space reallocation – part of bus reform and wider strategy to reduce travel by the private car and enhance bus priority
- Highways demand management – to reduce car trips and provide competitive advantage for bus
- Bus reform – linked to the Bus Service Improvement Plan and the decarbonisation of the bus network including actions to transition the bus fleet to zero emissions and improving infrastructure for buses

#### Clean Air Zones

3.5.4.34. Government legislation was introduced covering several councils identified as those that need to improve air quality in line with European air quality targets. Improved air quality is encouraged through discouraging the use of older, more polluting vehicles.

3.5.4.35. Bradford Metropolitan District Council (BMDC) are introducing a Class C+ Clean Air Zone (CAZ) in early 2022 with charges for all non-compliant vehicles, including buses. The charges for entering the zone can be seen in the table below. Transdev's Shuttle 662 was identified as a priority for Zero Emission Bus Operation in BMDC's Clean Air Zone plan as it serves the sole radial corridor included in the scheme.

Vehicle Class	Daily Charge
HGV/Coach/Bus	£50
Minibus/LGV	£9
Hackney Carriage/Private Hire Vehicle	£12.50

**Table S5 – Bradford Clean Air Zone charges**

3.5.4.36. Leeds are currently reviewing their CAZ plans but were previously looking to introduce a Class C+ CAZ in 2021. This is still relevant to include within this programme as air quality is still an acknowledged issue within the city, especially due to the trend of increased car usage during the pandemic.

#### Leeds City Region Strategic Economic Plan (SEP) and Strategic Economic Framework (SEF)

- 3.5.4.37. In September 2020, the Combined Authority and the LEP agreed to formally adopt the Strategic Economic Framework as the overarching strategic framework for the region, replacing the Strategic Economic Plan (SEP).
- 3.5.4.38. The SEF will guide investment decisions and sets out our vision for West Yorkshire to be “recognised globally as a place with a strong, successful economy where everyone can build great businesses, careers and live supported by a superb environment and world-class infrastructure.” It brings together existing and subsequent policies and strategies under a single banner, ensuring greater alignment between our strategies, priorities and vision for the City Region.
- 3.5.4.39. Priorities which relate to ZEBRA include:
- Tackling the climate emergency – Growing our economy while cutting emissions and caring for our environment
  - Delivering 21<sup>st</sup> century transport – Creating efficient transport infrastructures to connect our communities, making it easier to get to work, do business and connect with each other
  - Securing money and powers – Empowering the region by negotiating a devolution deal and successfully bidding for substantial additional funds.

Inclusive Growth Strategic framework

- 3.5.4.40. To deliver inclusive growth, and eliminate inequalities, the external environment of policies and thriving communities must be focussed around delivering the following, broadly sequential, Strategic Goals:
- Wellbeing
  - Connectivity and Accessibility
  - Transferable and Relevant Skills
  - Good Work
- 3.5.4.41. This relates to ZEBRA through the indicators included within the framework, with air quality being a key indicator within Connectivity and Accessibility. There is also a health measure included within the wellbeing theme, with improved outcomes through improved local air quality.

## 3.6. Drivers for change

### 3.6.1. Overview

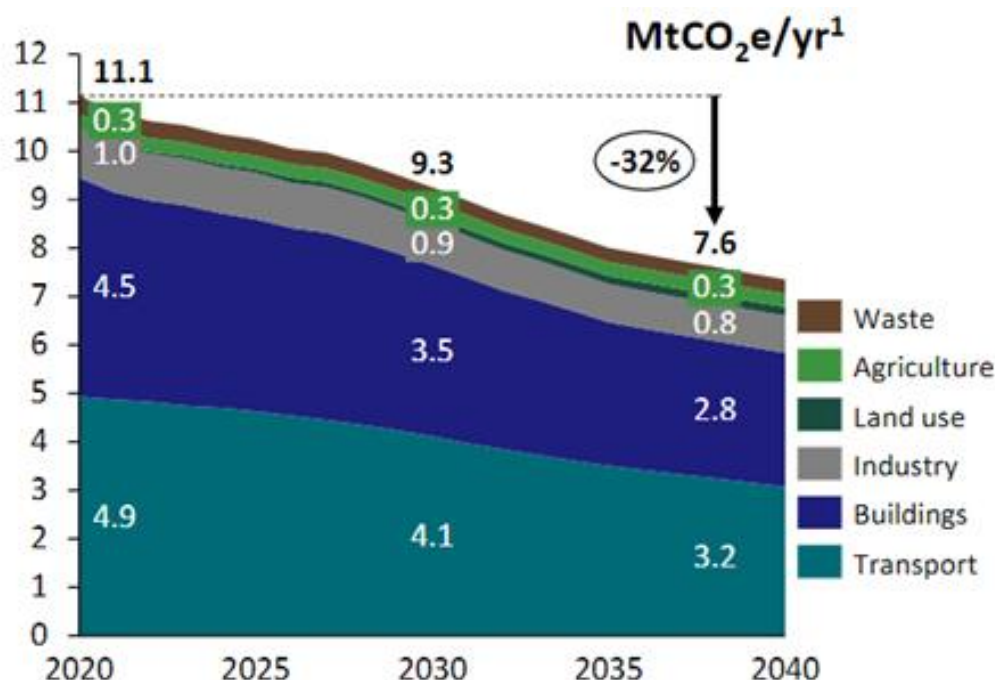
- 3.6.1.1. The drivers for change for the programme have been identified through the DfT Objectives, which are strongly aligned with the Combined Authority's corporate objectives. Each DfT objective is discussed in turn, highlighting the need for the introduction of zero emission buses in West Yorkshire.

### 3.6.2. Reduce environmental impacts/air quality

- 3.6.2.1. The Combined Authority declared a climate emergency in 2019, with the ambition of the Leeds City Region becoming a net zero carbon economy by 2038, with significant progress by 2030. To meet this target, and to comply with the Paris Agreement, emissions must be reduced by 14.5% year-on-year with output levels being halved every five years. This links to the DfT priority to reduce environmental impacts and improve air quality.
- 3.6.2.2. The [West Yorkshire Carbon Emission Reduction Pathways](#) study was undertaken on behalf of the Combined Authority to model current and future emission scenarios. Transport is identified as one of the four sectors and is the largest emitter, dominated by road transport and private vehicle use<sup>10</sup> (see figure below).
- 3.6.2.3. The baseline scenario in the graph below demonstrates the emissions if the Combined Authority continues with business as usual. The transport sector sees the faster decline in emissions due to the advanced nature of technologies such as electric vehicles, but this pathway would significantly miss our net zero goals.

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<sup>10</sup> Element Energy "West Yorkshire Carbon Emissions Reduction Pathways" July 2020 ([PowerPoint Presentation \(westyorks-ca.gov.uk\)](#))



**Figure S15 – Baseline Carbon Emissions Scenario**

- 3.6.2.4. Despite improvements, the baseline scenario above would still see 70% of buses in West Yorkshire would remain diesel, with the rest of the vehicles being hybrid. With intervention and the implementation of a carbon emission reduction pathway (max ambition, high hydrogen or balanced) the fuel technology of buses would see a dramatic change with the assumption that 66% of buses across the region would be battery electric and up to 34% by hydrogen fuel cell by 2040<sup>11</sup>. It is also important to note that across all scenarios, and in line with Government targets, sales of conventional petrol and diesel busses will end by 2031. ZEBRA could therefore be the catalyst to achieve transition to a net zero bus fleet and would provide a just under a sixth of the battery electric bus fleet identified in the carbon emission pathway scenarios.
- 3.6.2.5. Alongside this modelling, a shift to public transport use is vital in achieving the carbon ambition of the region with the need to decrease private car travel and increasing bus patronage. It was acknowledged that significant modal shift is required to achieve net zero through reducing private car travel by 21% and increasing bus travel by 39%<sup>12</sup>. Alongside this it was recommended to increase walking by 78%, travel by bike by 2000% and increase rail travel by 53%<sup>13</sup>.

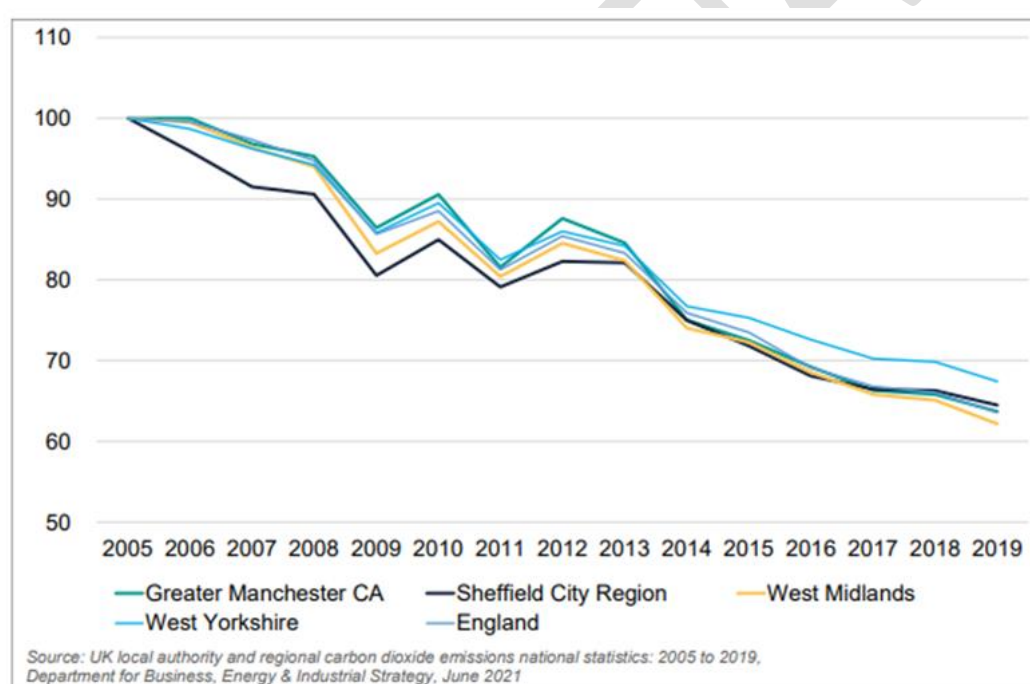
<sup>11</sup> Element Energy "West Yorkshire Carbon Emissions Reduction Pathways" July 2020 ([PowerPoint Presentation \(westyorks-ca.gov.uk\)](https://www.westyorks-ca.gov.uk))

<sup>12</sup> Ibid

<sup>13</sup> Ibid

3.6.2.6. The bus is therefore well centred within the Combined Authority’s environmental policies as a vital component of reducing carbon emissions, demonstrating why ZEBRA funding is crucial to the ambition of the region.

3.6.2.7. The graph below, from the [State of the Region Report](#), tracks carbon dioxide emission decrease over time. The overall trend sees a general decline over time from 100 in 2005 to just under 70 in 2019. Whilst it is positive that West Yorkshire has declining carbon dioxide emissions, there are disparities between comparator city regions, demonstrating progress has been slower than others including West Midlands, Greater Manchester and Sheffield City Region<sup>14</sup>.



**Figure S16 – Trend in carbon dioxide emissions by comparator area index, 2005-2019<sup>15</sup>**

3.6.2.8. When looking at per capita emissions per sector, transport is the highest emitter within West Yorkshire and is higher than the comparator city regions of West Midlands and Greater Manchester<sup>16</sup>.

3.6.2.9. Urban areas in West Yorkshire have been identified as having some of the highest levels of air pollution (nitrogen dioxide concentrations) in the UK outside of London.

<sup>14</sup> West Yorkshire Combined Authority “West Yorkshire: State of the Region Report”, 2021 ([Microsoft Word - SotR Draft Full Report FINAL 251021 \(westyorks-ca.gov.uk\)](#))

<sup>15</sup> Ibid

<sup>16</sup> Ibid

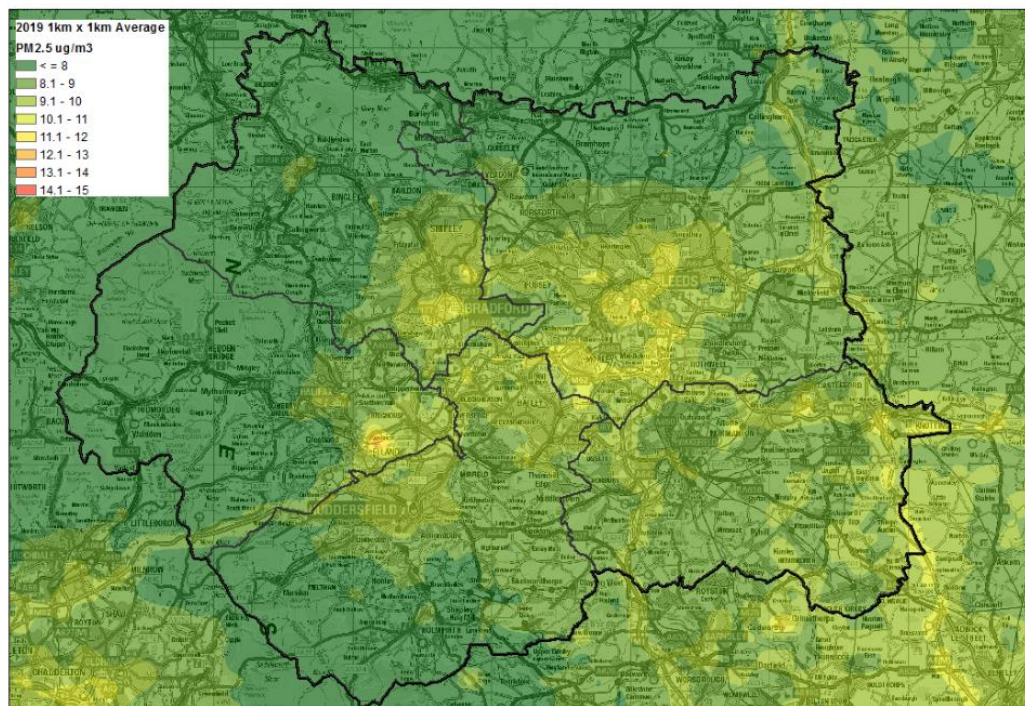


- 3.6.2.10. In 2016, the Public Health Outcomes Indicator for air pollution showed that poor air quality in West Yorkshire accounts for 1 in 20 deaths and previous reports, including the West Yorkshire Low Emissions Strategy (WYLES) have shown that unless action is taken government targets on the level of nitrogen dioxide emissions in the air will not fall below targets<sup>17</sup>. Alongside this, WYLES identifies that carbon dioxide emissions without any change are forecast to rise 28% over the next 20 years in West Yorkshire<sup>18</sup>.
- 3.6.2.11. Figures S17 (left) and S18 (right) show PM2.5 and NO2 concentrations in West Yorkshire based on data collected between 2019-2021 produced by the West Yorkshire Low Emissions Strategy Delivery Group. Leeds centre, Bradford centre, Wakefield, Dewsbury, Huddersfield and the corridors between them show up as key pollution hotspots - indicated by the clusters of yellow and orange on the maps below. Given that  $5 \mu\text{g}/\text{m}^3$  and  $10 \mu\text{g}/\text{m}^3$  are the World Health Organisation's guidelines for ambient PM2.5 and NO2 respectively, it can be seen that significant areas within the scope of this programme exceed these guidelines by a factor of two or more (indicated by the yellow or red. These urban locations have a strong overlap with the routes selected through the ZEBRA programme which look to serve routes running into key urban centres including Leeds, Bradford, Wakefield, Dewsbury and the corridors between. Investment through the Combined Authority's separately funded project will introduce zero-emission buses to Kirklees and Calderdale to ensure balance across the districts. areas).

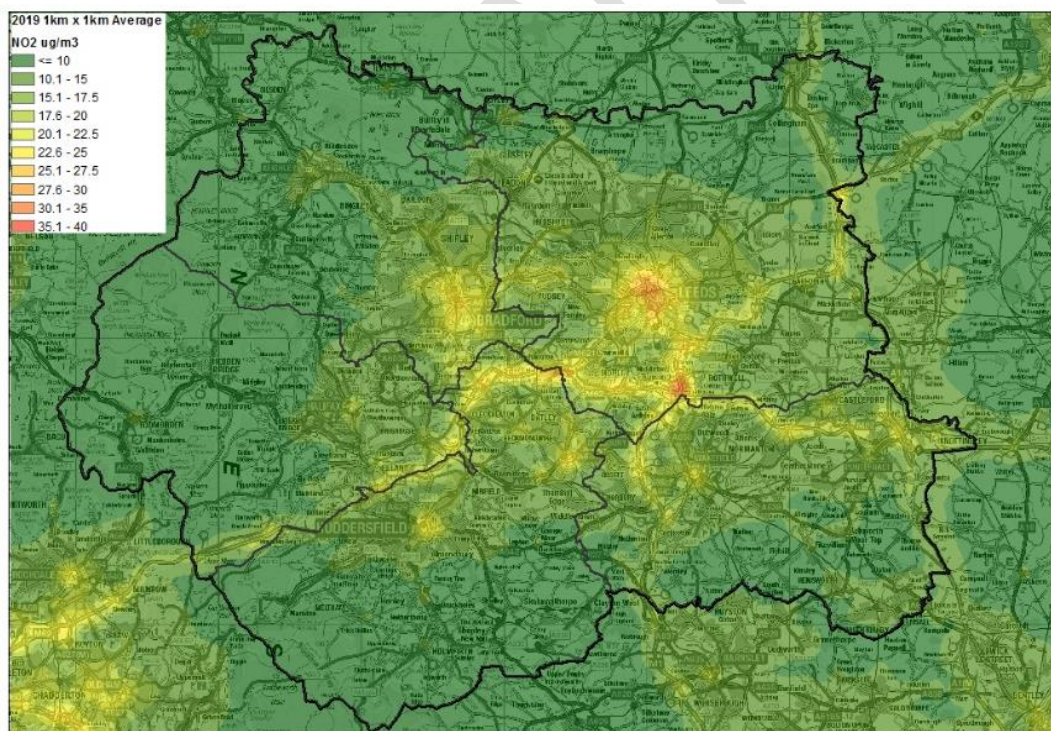
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<sup>17</sup> West Yorkshire Combined Authority, "West Yorkshire Low Emissions Strategy", 2016 (<https://www.bradford.gov.uk/media/3590/west-yorkshire-low-emissions-strategy.pdf>)

<sup>18</sup> Ibid



**Figure S17 – P2.5 in West Yorkshire 2019-21**

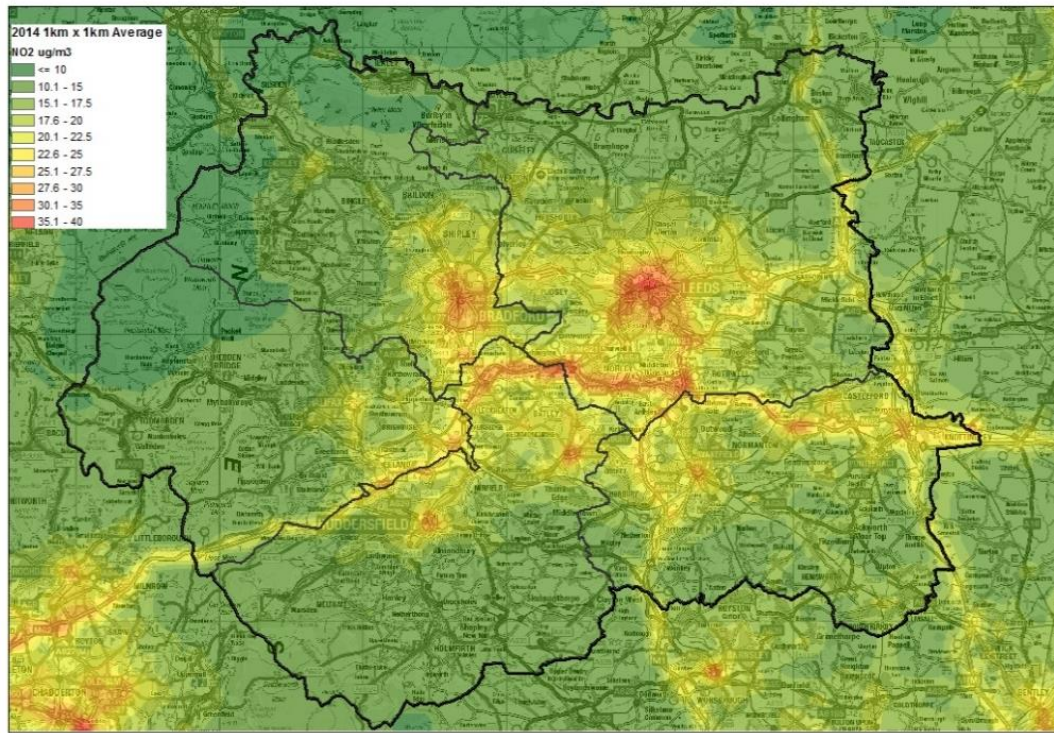


**Figure S18 – NO2 in West Yorkshire 2019-21**

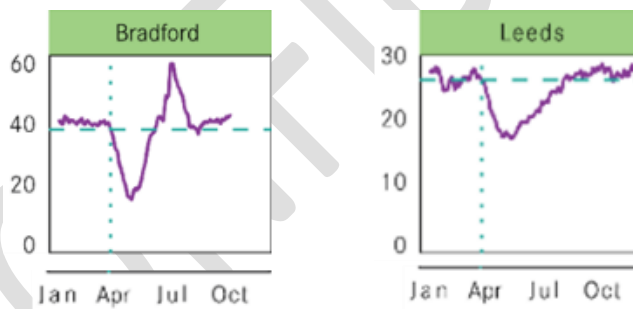
- 3.6.2.12. Figures S17 and S18 show air quality data collected 2019-2021, including both national lockdowns, so the large improvements from 2014 (seen in figure S19 below) could be lost as traffic returns to normal. In the paper *How have the Covid pandemic and lockdown affected air quality in cities?* produced by centreforcities it has been observed that air quality has tended to bounce back to pre-lockdown levels once restrictions have eased. Figure S20 below shows this trend in Leeds and Bradford,



which were 2 of 49 cities where a similar trend was observed. These studies evidence that poor air quality is a serious cause for concern in the West Yorkshire region, specifically in the areas where the ZEBRA programme focuses on delivering cleaner buses.



**Figure S19 – NO2 in West Yorkshire 2014-2016**

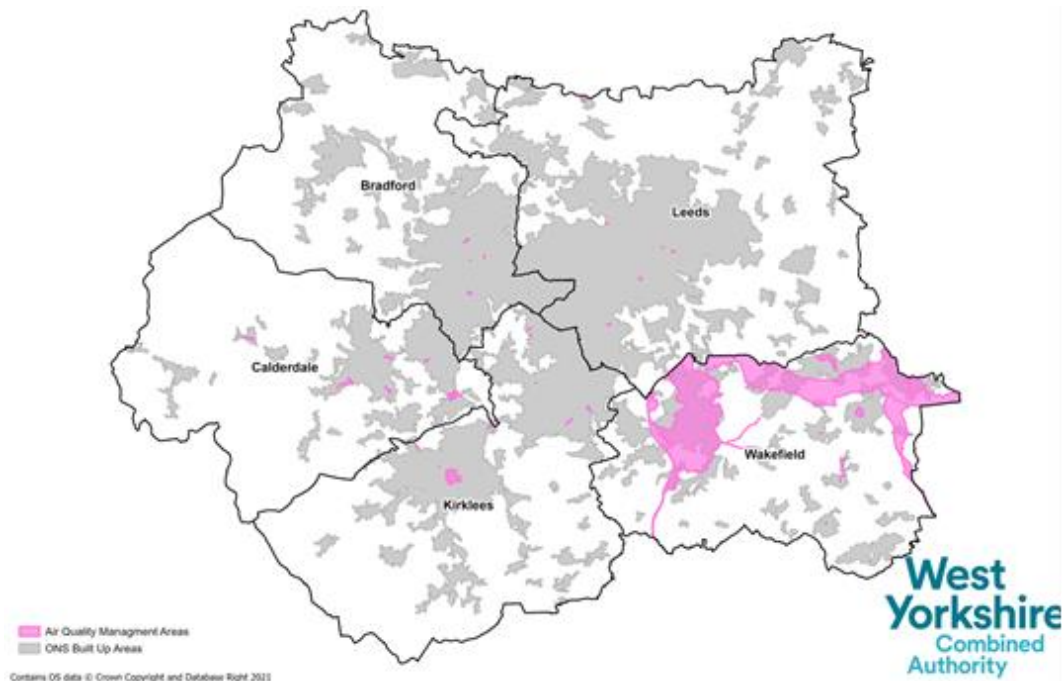


**Figure S20 – NO2 ( $\mu\text{g}/\text{m}^3$ ) in Leeds and Bradford Jan-Oct, where dotted lines show lockdown date and lockdown NO2 concentrations**

- 3.6.2.13. Across the five West Yorkshire districts there are currently 36 Air Quality Management Areas, all of these are areas in which Nitrogen Dioxide emissions exceed the annual/hourly statutory limits and that require a Local Air Quality Action Plan to bring levels within the legal limits. Different districts have taken different approaches with the specification of AQMAs as can be seen by the variance in geographic scope in Figure S21. The approach of Wakefield district varies significantly from the others in that they declared an AQMA across the

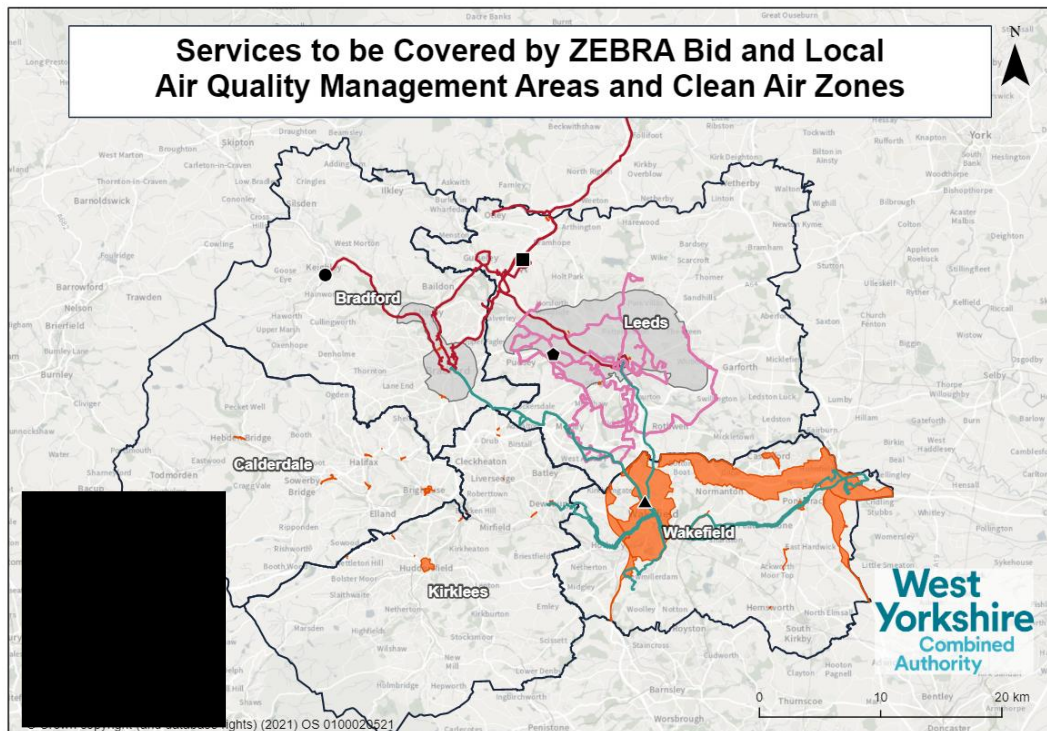
wider area with poor air quality, whereas other districts defined their AQMAs based on specific polluted hotspots.

- 3.6.2.14. The figure below demonstrates the need for the transition of the bus fleet in West Yorkshire to zero emission technology to help improve air quality and reduce harmful pollutants, particularly around our key urban centres.



**Figure S21 – Air Quality Management Areas in West Yorkshire**

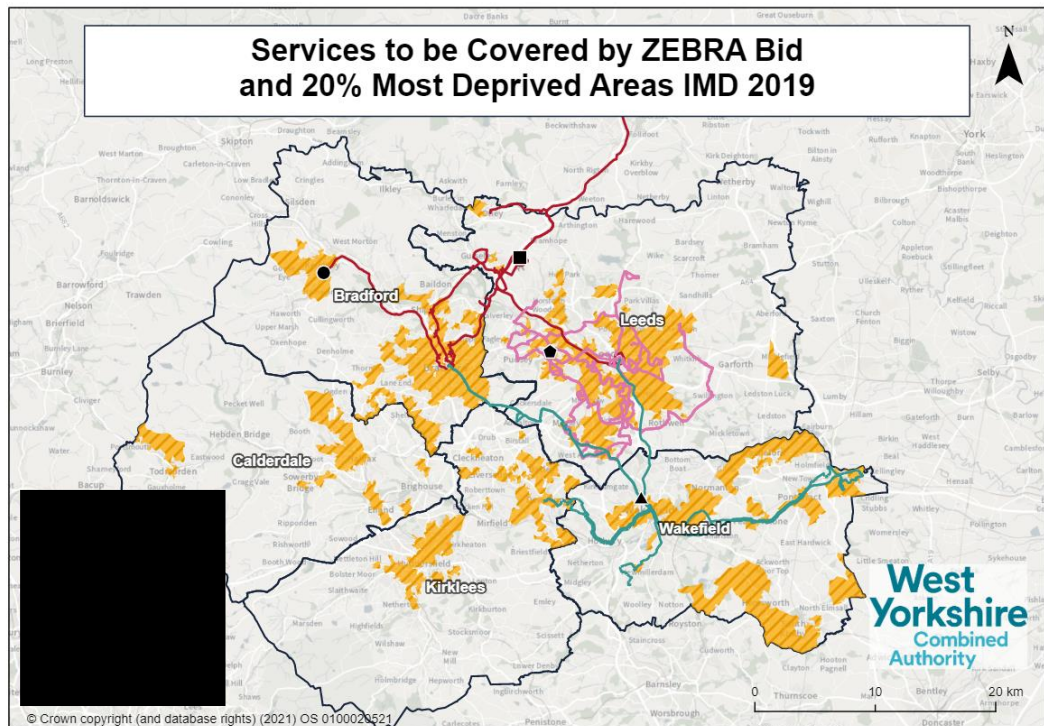
- 3.6.2.15. The Combined Authority commissioned a piece of work to identify how to transition to a zero-emission fleet in 2019. The resulting Zero Emission Bus Roadmap recommended that priority routes for bus upgrades should be those that pass through Clean Air Zones and/or AQMAs as these would provide the most immediate benefits.
- 3.6.2.16. The figure below shows the routes selected for ZEBRA alongside AQMAs and Clean Air Zones, demonstrating ZEBRA effectively targets these areas in line with the Zero Emission Bus Roadmap recommendations. It should be acknowledged that bus routes in nature do not naturally follow areas of poor air quality, but that concentrations of pollutants are more likely in key urban centres of high traffic usage which all ZEBRA routes cover.



**Figure S22 – Bus services to be covered by the ZEBRA programme in West Yorkshire**

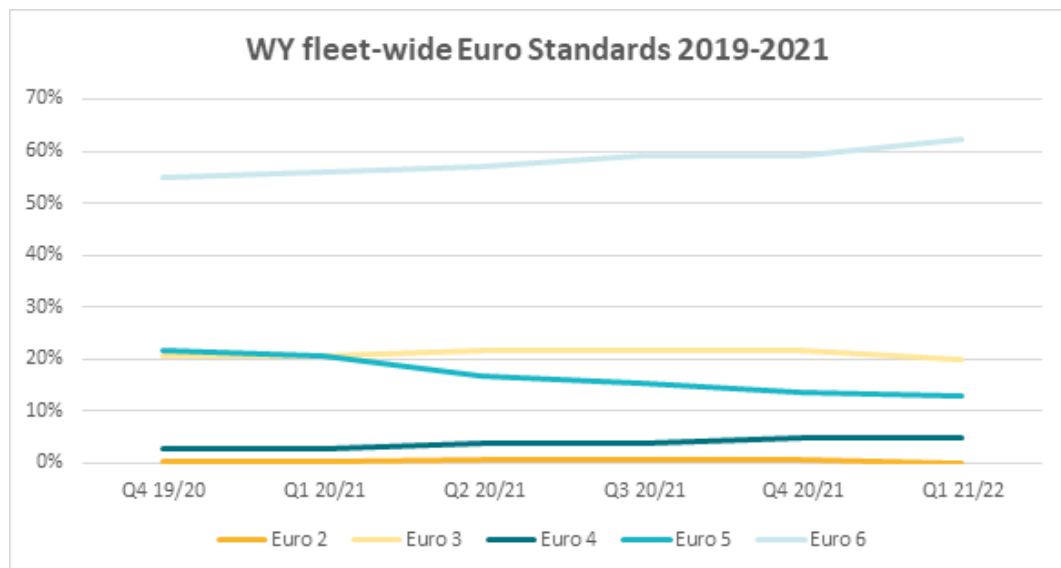
- 3.6.2.17. An added benefit to improved air quality is the impact that it has on local health outcomes. The figure below shows ZEBRA routes mapped alongside the highest areas of health inequality. It demonstrates that all the ZEBRA routes proposed by operators pass through significant areas of health inequality which are concentrated in key urban centres across West Yorkshire including Bradford, Leeds and Wakefield.





**Figure S23 – Bus Services to be covered by ZEBRA and 20% most deprived (IMD health)**

- 3.6.2.18. One of the West Yorkshire Bus Strategy ambitions – to be developed as part of the [Bus Service Improvement Plan](#) - is to create a modern, low carbon bus fleet which contributes to improved air quality.
- 3.6.2.19. The most recent target set regarding emissions standards, was for the bus fleet to be 80% EUROVI or alternative technology by January 2021 and 100% by 2026. There has been progress, with 62% of vehicles across West Yorkshire being EURO VI or alternative by January 2021, however, due to unforeseen impacts including the pandemic, the January 2021 target was missed.
- 3.6.2.20. There are varying EURO Standards percentages across the WY districts, but the desired target of 80% EUROVI by January 2021 is still yet to be reached on a West Yorkshire wide basis. Figure 22 below highlights that progress has been made, but at a slower rate than targeted. While EUROVI numbers have steadily risen, EUROV numbers have fallen while EUROIV numbers have increased, suggesting that whilst the bus fleet has seen improvements, there is still some way to go before it can be seen as zero emission.

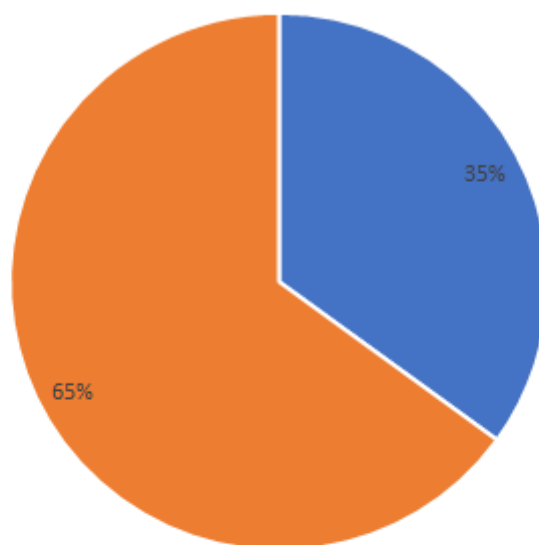


**Figure S24 0 WY Euro Standards (major operators)**

- 3.6.2.21. EUROVI is an important standard because of the significant reductions in emissions compared to lower EURO standards. As laid out in the DFT's [Transport energy model](#), EUROVI diesel double deck buses, for example, release 0.5g/km of Nitrous Oxide (NOx) from the tailpipe - ten times lower than EUROV and roughly twenty times lower than EURO I. Double deck EUROVI buses also release far less Particulate Matter (PM), at 0.0061 g/km, compared to roughly 0.025 g/km for EUROV, or between 0.1 g/km and 0.2 g/km for EURO I through III.
- 3.6.2.22. The figures below provide further evidence that West Yorkshire is in need of intervention to bring its bus fleet up to standard and to progress towards our regional objectives for cleaner air with only 2% of the major operator fleet being zero emission. This provides evidence that investment in zero emission buses in the region has been low, whereas with a successful ZEBRA programme the region would see £57.5m invested in new buses, with over £30m coming from private investment., increasing the proportion from 2% to 10% across West Yorkshire.

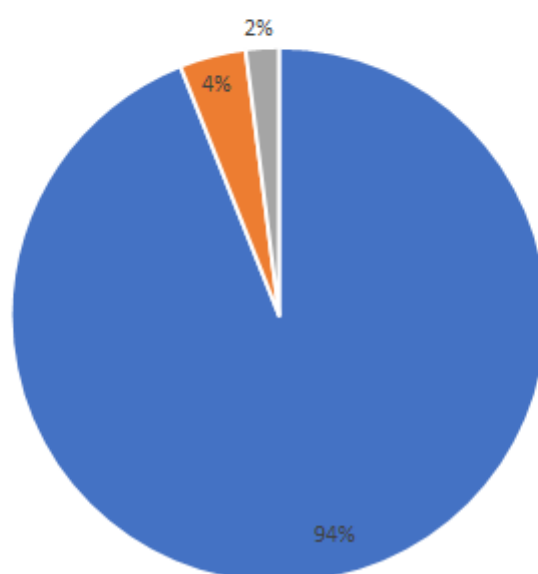


### EURO Emission standard EUROV and below vs. EUROVI



■ EUROIII - EUROV ■ EUROVI or ZEV

### Technology of fleet (major operators combined)



■ Diesel ■ Diesel (Hybrid) ■ Battery Electric

**Figure S25 – West Yorkshire Bus Fleet EURO Standards and Bus Fleet Technology**

### 3.6.3. **Grow and level up the economy**

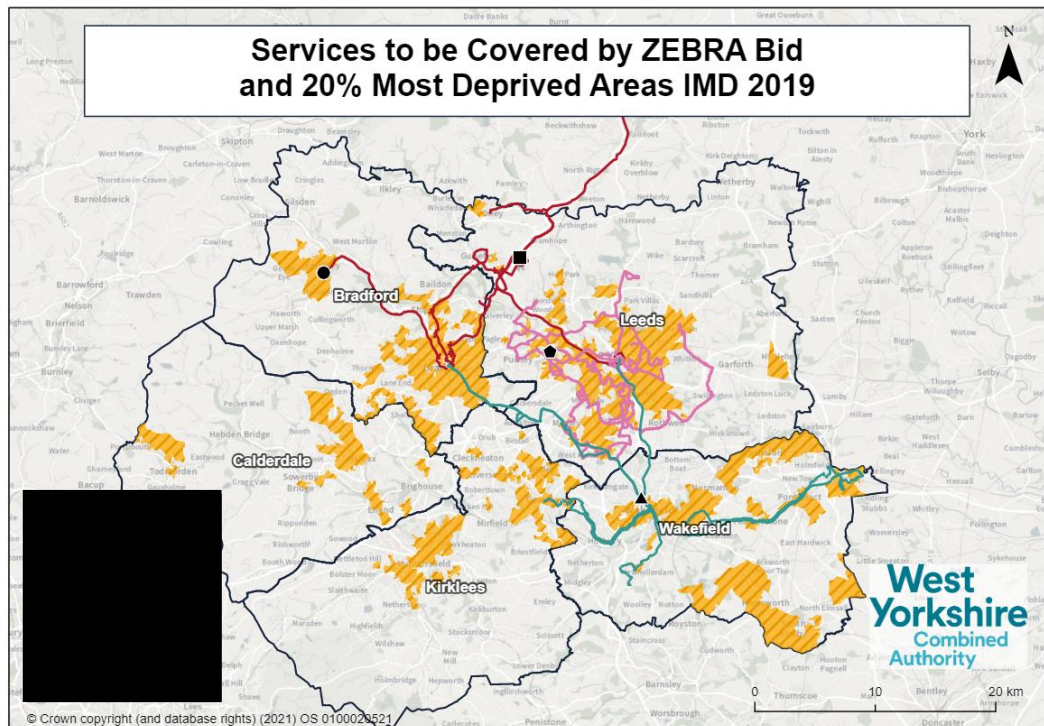
- 3.6.3.1. Enabling Inclusive Growth is one of the key areas that the Combined Authority's work targets, linking to DfT's priority to grow and level up the economy. The drivers for change around this priority which relate to our ZEBRA programme include deprivation, car ownership and access to employment. The bus has a key role in delivering aims included in the Local Industrial Strategy, Strategic Economic Plan and Inclusive Growth Framework as a mode that allows access to employment centres, providing integrated journeys on the most used public transport mode.
- 3.6.3.2. Nationally, the bus is the most-used public transport mode for people on lower incomes. Nearly 9 per cent of all trips by those in the lowest incomes are by local bus, compared to 3 per cent for those on the highest incomes. The figure for private car drivers is 27 per cent and 45 per cent respectively<sup>19</sup>.
- 3.6.3.3. Within West Yorkshire, 20% of neighbourhoods are categorised in the 10% most deprived in England, with significant pockets of deprivation existing across all five of the districts<sup>20</sup>. Of the 100 most deprived neighbourhoods in England four are in Bradford, and three are in Leeds. There is significant spatial variation in deprivation at district level with deprivation significantly high within Bradford, 49% of residents living within the most deprived quintile.
- 3.6.3.4. The figure below shows that ZEBRA routes are largely targeted at those that run through an area classified as 20% most deprived. This demonstrates that our programme has a key role in the levelling-up agenda, providing an improved service and investment in some of the most deprived communities in West Yorkshire. This contributes to the levelling-up agenda and ensures a just and equal transition to net zero which is an important part of our Climate and Environment Plan.

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<sup>19</sup> National Travel Survey:

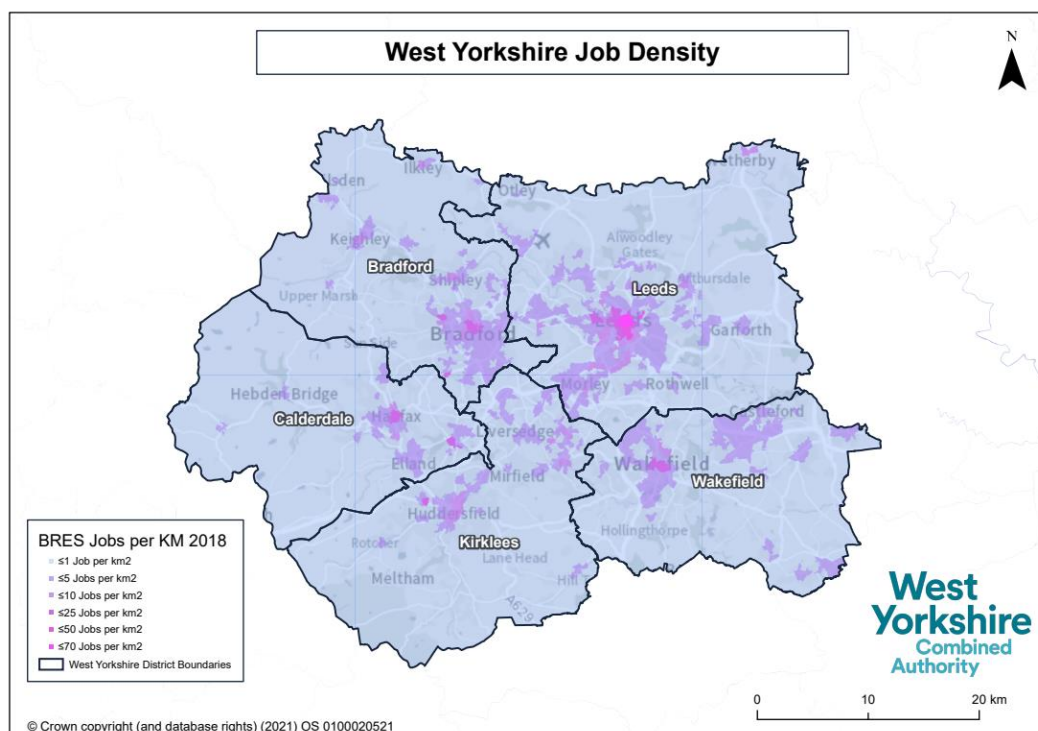
[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/550557/nts0705.xls](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/550557/nts0705.xls)

<sup>20</sup> Index of Multiple Deprivation, 2019



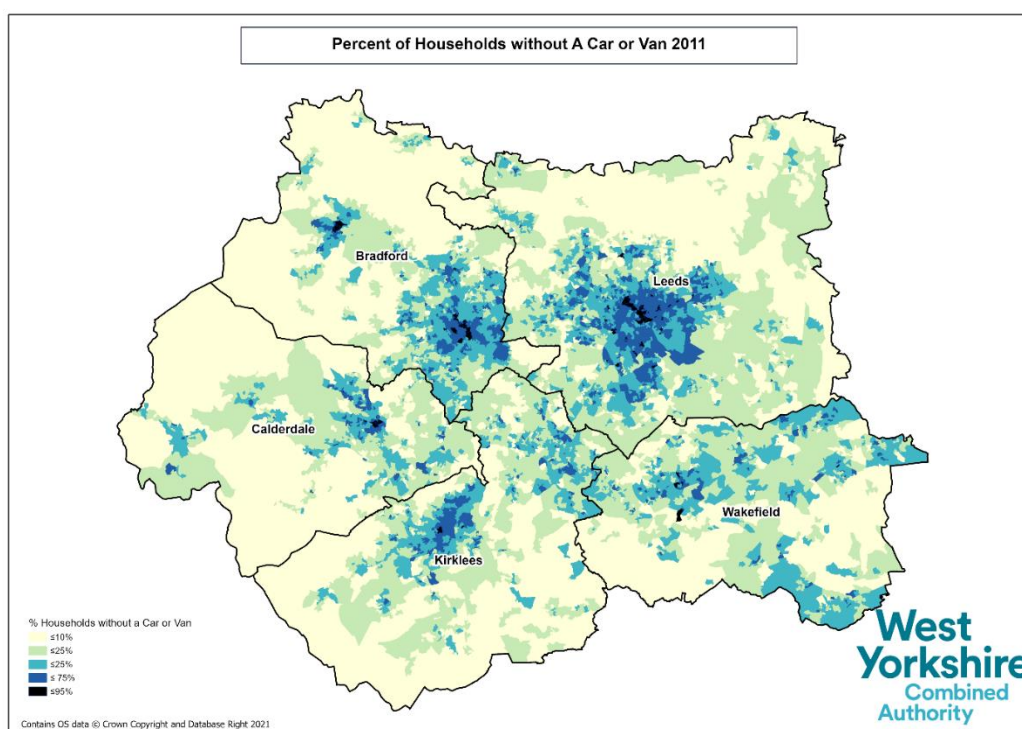
**Figure S12 – ZEBRA services and IMD deprivation**

- 3.6.3.5. Boosting productivity is a corporate objective, with better access to employment, training and education key to achieving this. This links to DfT's priority to grow and level up the economy with ZEBRA achieving this through the provision of an improved bus service which will include the upskilling of depot maintenance and driving staff.
- 3.6.3.6. Figure S13 below shows employment density across West Yorkshire. The general trend is higher employment density in the urban centres of Leeds, Bradford, Huddersfield, Kirklees and to a lesser extent Halifax. The routes selected through ZEBRA aim to serve these key employment areas across Bradford, Wakefield and Leeds making a zero-emission bus more attractive to the city centre commuter and targets key commuter flows as mentioned earlier in this document.



**Figure S13 – Employment Density across West Yorkshire**

- 3.6.3.7. The figure below shows the distribution of households without a car or van. It demonstrates that the level of car ownership is generally lower for communities living in and around key urban centres especially those in the districts of Leeds, Bradford and Kirklees. These are also correlated with areas of deprivation as seen in Figure S12 above. In order to invest in levelling up and economic growth, investment in these areas are key. In relation to ZEBRA, investment in bus corridors running through areas of deprivation is key, ensuring benefits are distributed with bus patronage increases key to driving down the cost of bus travel, as noted in our BSIP.



**Figure S14 – Percentage of households without a car or van**

#### 3.6.4. **Improve transport for the user**

- 3.6.4.1. There is a picture of long-term decline in bus use in West Yorkshire. Ridership fell from around 210 million journeys per year in 1997/8 to just under 133 million journeys in 2019/20. In order to reach our net zero goals bus patronage needs to increase as a percentage of modal share.
- 3.6.4.2. Recent analysis has shown another decline in bus patronage during the Covid-19 pandemic, and evidence built up by WYCA suggests that there may have been some permanent shift in behaviours and attitude to bus travel in a negative direction as a result. To combat this trend, new investment into buses and related infrastructure is needed in West Yorkshire to increase customer satisfaction and encourage a reversal to the trends witnessed during the pandemic.
- 3.6.4.3. Through the Connectivity Strategy there are ambitious plans for an integrated, multi-modal transport system which meets key needs around connecting people to key areas of education and employment. Bus is key to delivering these aims as the most used public transport mode in West Yorkshire
- 3.6.4.4. The recent Bus Service Improvement Plan has the ambition to reduce patronage decline and it based on evidence around the passenger journey in West Yorkshire. Assets and facilities have been shown to affect passenger satisfaction levels and may be reflective of mode choice more generally. For example, The Customer Perceptions of Transport Survey

has shown a falling satisfaction amongst respondents using transport in many areas of public transport. Mean satisfaction scores out of 10 between 2018/19 and 2019/20 show the large decline in satisfaction with local bus services, alongside other issues such as affordability and bus stations. Through investing in local bus services and providing better buses it may encourage higher patronage, a key aim of the National Bus Strategy.

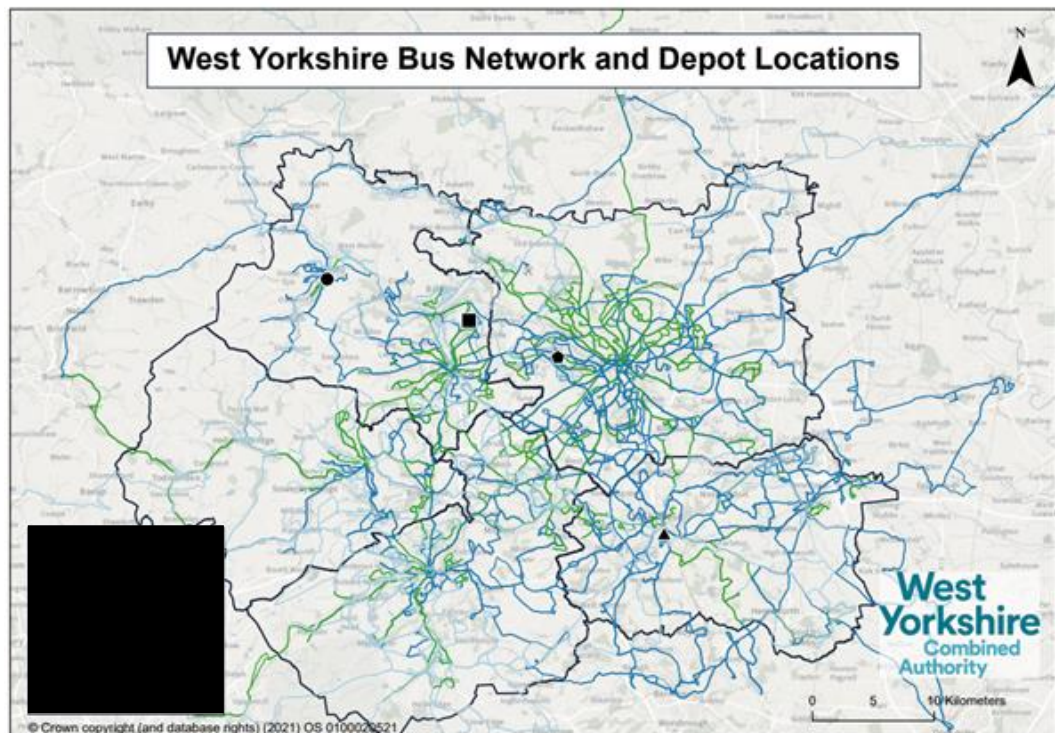
Area	2018/19	2019/20	% Change
<b>Affordability of public transport</b>	6.17	5.24	-15%
<b>Quality of local bus station</b>	7.12	6.32	-11%
<b>Local bus services</b>	6.71	5.99	-11%
<b>Community transport</b>	6.47	6.32	-6%

Source: Based on Table 3.21 in Customer Perceptions of Transport Survey, April 2020

**Table S6 – Satisfaction with bus services**

- 3.6.4.5. The Transport Focus Bus Passenger Survey 2019 has also highlighted the on bus environment and comfort as a key concern for passengers in West Yorkshire. Compared to 2018 there was a 3% drop in satisfaction with the cleanliness and condition of the inside of the bus, with the same drop seen for the cleanliness and condition of the outside of the bus<sup>19</sup>. A decline in satisfaction in these scores demonstrates that improving the bus environment is key in customer satisfaction and is a potential area to target to improve patronage.
- 3.6.4.6. The figure below shows network coverage of the West Yorkshire bus network. The high frequency network, core network, is in green and is defined as bus services that operate four or more buses an hour, with secondary/strategic and community networks also shown.
- 3.6.4.7. The map demonstrates the polycentric nature of the region with the core network centred around key urban centres especially in Leeds and Bradford. The supporting network (less than four buses an hour) looks to serve largely peripheral areas of West Yorkshire and is particularly concentrated in the districts of Kirklees and Wakefield.





**Figure S26 – West Yorkshire Main and High Bus Frequency Network**

- 3.6.4.8. The ZEBRA routes look to provide more modern and environmentally friendly buses across West Yorkshire linking key urban centres across the region. This links to the objective of our BSIP which looks to make the bus more competitive against the private car. Investment in newer, cleaner buses would look to attract more customers through improving the service for existing customers and attracting new customers. This links to the DfT's objective to improve transport for the user, whilst it will also contribute to the levelling up agenda through delivering zero emission buses in districts which currently have none (Bradford and Wakefield).
- 3.6.4.9. Several routes selected for the ZEBRA programme have strong alignment with bus corridor improvements, particularly Arriva and First routes to the South of Wakefield and Leeds.

### 3.7. Objectives

- 3.7.1. The following section outlines the Combined Authority's objectives in regard to the ZEBRA programme, relating this to the proposed scheme and the wider DfT objectives.
- 3.7.2. The objectives for the ZEBRA programme can be seen in the table below.



Objective	Specific	Measurable	Achievable	Relevant	Time Related	Map to ZEBRA Objectives/ DfT Strategic Priority
Introduce zero emission buses at scale to support the Combined Authority's ambition to become a net zero carbon economy, reducing emissions and improving air quality in targeted areas.	Establish projects which target areas of poor air quality with the programme aiming to see a reduction in CO2 emissions for road transport.	KPIs to be agreed to measure the impact of the introduction of zero emission buses on carbon emissions and air quality.	Baseline line established for comparison post introduction of zero emission buses.	Supports WY Transport Strategy, WY Bus Strategy, CA BSIP objectives, CA carbon action plan, National Bus Strategy and government commitment to decarbonisation	Within programme operation period of 2022-24	Supports the government's commitment to decarbonisation and to reduce the transport sector's contribution to CO2 emissions  Supports the roll-out of the 4,000 Zero Emission Buses that the government committed to in Feb 2020  Reduce environmental impacts / Air quality
Invest in buses that improve the customer offer, targeting deprived areas to promote the levelling up agenda	Establish projects which introduce extra zero emission buses into the network in West Yorkshire, targeting areas of poor air quality.	Monitor number of zero emission buses being introduced, measure proportion across WY.	Baseline line established and compared with after introduction as comparison looking at proportion of zero emission buses across WY.	Supports WY Transport Strategy, WY Bus Strategy, CA BSIP objectives, CA carbon action plan, National Bus Strategy and government	Within programme operation period of 2022-24	Support bus manufacturers in the development of zero emission bus technology  Grow and level up the economy  Improve transport for the user

				commitment to decarbonisation		
Work in partnership with bus operators, bus manufacturers and local stakeholders as set out in the NBS	Deliver projects in partnership with bus operators, manufactures and stakeholders to test the viability and specification requirements of zero emission bus technology in West Yorkshire	Establish KPIs in partnership with bus operators	Baseline established and compared with after study as comparison looking at cost, specification and subsidy requirements.	Supports WY Transport Strategy, WY Bus Strategy, CA BSIP objectives, CA carbon action plan, National Bus Strategy and government commitment to decarbonisation	Within programme operation period of 2022-24	Support partnership working between Local Transport Authorities, bus operators, and other local stakeholders as set out in the NBS  Support bus manufacturers in the development of zero emission bus technology  Grow and level up the economy
Conduct research into the challenges and opportunities of introducing zero emission buses and supporting infrastructure	Use the projects as a case study to understanding challenges, opportunities and the business case for introducing zero emission buses in West Yorkshire	Compile KPIs to feed into monitoring and evaluation report to understand economic, social and environmental benefits.	Baseline data to be compared at regular intervals to understand the economic, social and environmental impacts.	Supports WY Transport Strategy, WY Bus Strategy, CA BSIP objectives, CA carbon action plan, National Bus Strategy and government commitment to decarbonisation	Within programme operation period of 2022-24	Understand better the challenges of introducing zero emission buses and supporting infrastructure to inform future government support for ZEBs

**Table S7 – ZEBRA objectives**

### 3.8. Overview of approach to shortlisting/prioritisation

#### 3.8.1. Operator Proposals

- 3.8.1.1. The West Yorkshire Bus Alliance is an existing governance mechanism available to West Yorkshire Combined Authority, bringing together the three large operators across the region alongside a representative for the smaller operators.
- 3.8.1.2. A paper on ZEBRA was submitted to the Bus Alliance asking all operators to identify projects which would fit with the objectives of the funding stream. The paper outlined the criteria set out in the guidance for the Expression of Interest. This call for projects produced a package of routes and measures proposed from Arriva, First and Transdev.
- 3.8.1.3. This paper included criteria for prioritisation, with the initial aim to select one project to progress with. The criteria included:
- Place – number/proportion of zero emission buses delivered in an area, operational efficiency (will the number of ZEBs allow for same service level)
  - Ambition – vision for decarbonisation, how the proposal supports local bus services, contribution to patronage growth/active travel, additional community benefits, support/engagement for proposal
  - Value for money – environmental and social impacts, BCR, third party funding
  - Deliverability – timescales for implementation, permissions required, monitoring and evaluation
- 3.8.1.4. Each of the proposals received is summarised in the table below, note these were the only proposals received.

	Number of buses	Vehicle technology	Infrastructure required	Geography
<b>Arriva</b>	47 double deck	Electric	Overnight charging stations	Wakefield with some routes running into Leeds and Bradford
<b>First</b>	32 single deck	Electric	Overnight charging stations	Leeds

<b>Transdev</b>	32 single deck	Electric	Overnight charging stations, plus opportunity charging [REDACTED]	Bradford and Leeds
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**Table S8 – Summary of operator proposals**

### 3.8.2. Options appraisal

- 3.8.2.1. From the proposals received from operators the Combined Authority undertook an options assessment considering the following scenarios: do nothing, do minimum, do something, do everything.

Option	Option Name	Option Description	Operator option
1	Do Nothing	No proactive intervention into the market – allow commercial operators to invest in zero emission technology as part of fleet renewal.	No operator proposals taken forward
2	Do Minimum	Use funding readily available through Transforming Cities Fund (Carbon Mitigation) to invest in 10 electric buses to operate on tendered routes. Do not apply for additional ZEBRA funding.	No operator proposals taken forward
3	Do something	Apply for ZEBRA funding with shortlisted, preferred option presented by single operator and progress with Combined Authority funded small scale tendered route approach.	One ZEBRA project taken forward through shortlisting process
4	Do everything	Apply for ZEBRA funding to support all three operator proposals alongside progressing with Combined Authority funded small scale tendered route approach.	All operator projects taken forward

**Table S9 – Long list of options**

- 3.8.2.2. The list of options was then compared against the critical success factors determined by the Combined Authority.

CSF	CSF Name	CSF Description
1	Environmental benefits	A project that promotes better environmental outcomes through reduced carbon emissions and improvements in air quality.
2	Partnership working	A project that makes best use of partnership working across the bus industry to drive the best outcomes.
3	Improved customer outcomes/modal shift	A project that benefits users of buses through the introduction of newer buses, improving the customer experience.
4	Innovation in zero emission technology	A project that prompts investment and allows the region to level through the introduction of zero emission technology.
5	Scalability and deliverability	A project that is deliverable, that operates at a scale which can demonstrate challenges and opportunities for the introduction of zero emission buses.

**Table S10 – Critical Success Factors**

	Option	Advantages	Disadvantages
1	Do nothing	<p>Not reliant on subsidies and financial support for delivery.</p> <p>Services evolve as the commercial environment changes.</p> <p>Rollout of ZEBs is not funded by the taxpayer.</p>	No environmental benefits, does not build on partnership, no improvements for customers, no innovation or investment and not scalable to understand challenges and opportunities.
2	Do minimum	Some investment in zero emission buses which can be used as a trial for future investment.	Programme does not operate at a scale that demonstrates the application of zero emission technology across the region.

		<p>Finance already secured and not at risk.</p> <p>Limited environmental benefits.</p>	<p>Environmental and customer benefits are limited due to the small amount of buses available.</p>
3	Do something	<p>Environmental benefits targeted at specific area, operating out of one depot.</p> <p>Larger customer benefit than do minimum scenario due to larger number of buses.</p> <p>Some partnership working evident.</p> <p>Programme would operate a scale to facilitate further learning.</p>	<p>Ambition of programme does not match ambition of net zero carbon region.</p> <p>Benefits would be targeted at specific area.</p> <p>Further short listing required which may impact tight deadline.</p>
4	Do everything	<p>Environment benefits across the West Yorkshire region.</p> <p>Partnership working across the voluntary partnership.</p> <p>Customer benefits across the region with wider potential for modal shift.</p> <p>Ambition in line with local and regional policies for decarbonisation.</p> <p>Programme large enough to demonstrate challenges and opportunities.</p>	<p>Large programme requires stronger partnership working and more Combined Authority oversight/resources.</p>

## Table S11 – Advantages and Disadvantages of options

- 3.8.2.3. The preferred approach is the do everything scenario due to the ability to deliver at a scale that meets the Combined Authority's environmental and climate, economic and social ambitions.

## 3.9. The Preferred Solution

### 3.9.1. Overview

- 3.9.1.1. The preferred approach is the do everything scenario due to the ability to deliver at a scale that meets the Combined Authority's environmental and climate, economic and social ambitions. This can be seen in Figure S27 below which demonstrates the routes that will be covered and depots that will be served. The Potential Combined Authority Routes are part of the wider zero-emission bus ambition and are areas which will benefit from a separately funded £4million from Transforming Cities Fund to introduce electric buses and infrastructure.

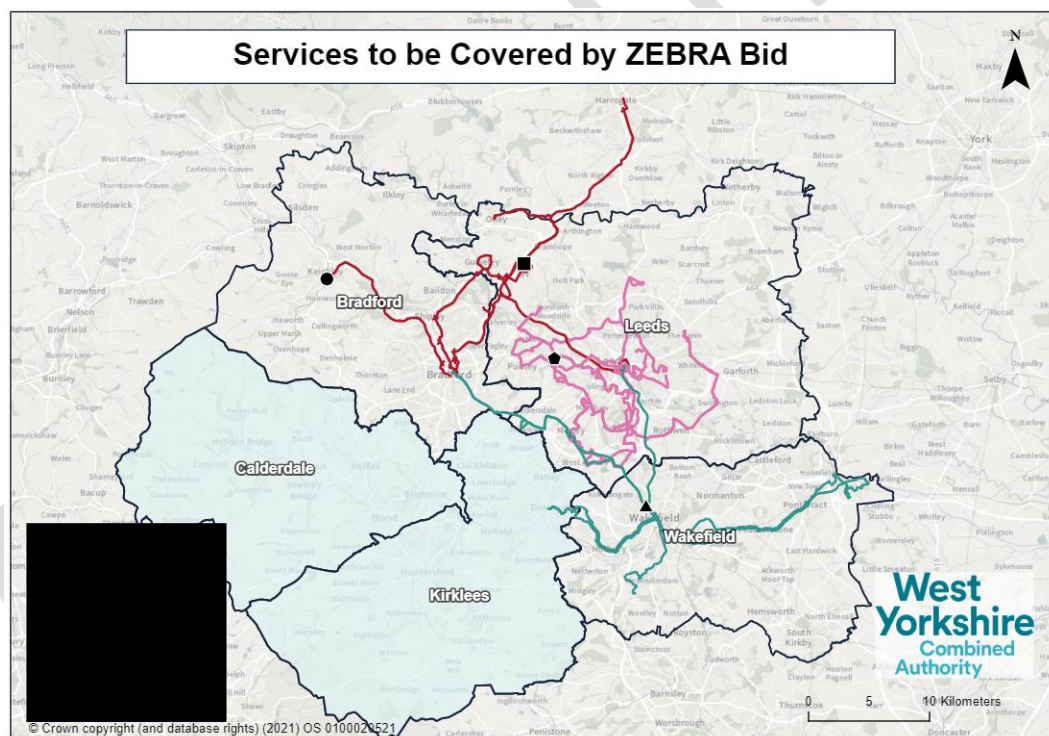


Figure S27 – West Yorkshire ZEBRA Programme

- 3.9.1.2. This fits with the Combined Authority's targets around zero emission, transitioning the fleet by 2036. It also complements separate projects included within our introduction of electric buses in Calderdale and Kirklees through Transforming Cities Fund, City Region Sustainable Transport Settlement (CRSTS) and BSIP programme. The ZEBRA projects are seen as a catalyst for this future investment, providing a blueprint for our future zero emission bus programme. ZEBRA will present



a separate funding stream to demonstrate to operators, the market and the Combined Authority the benefits of zero emission buses.

3.9.1.3. This approach would see the delivery of three operator led projects, seeking DfT financial support alongside match funding from operators.

3.9.1.4. The details of the programme are expanded on below.

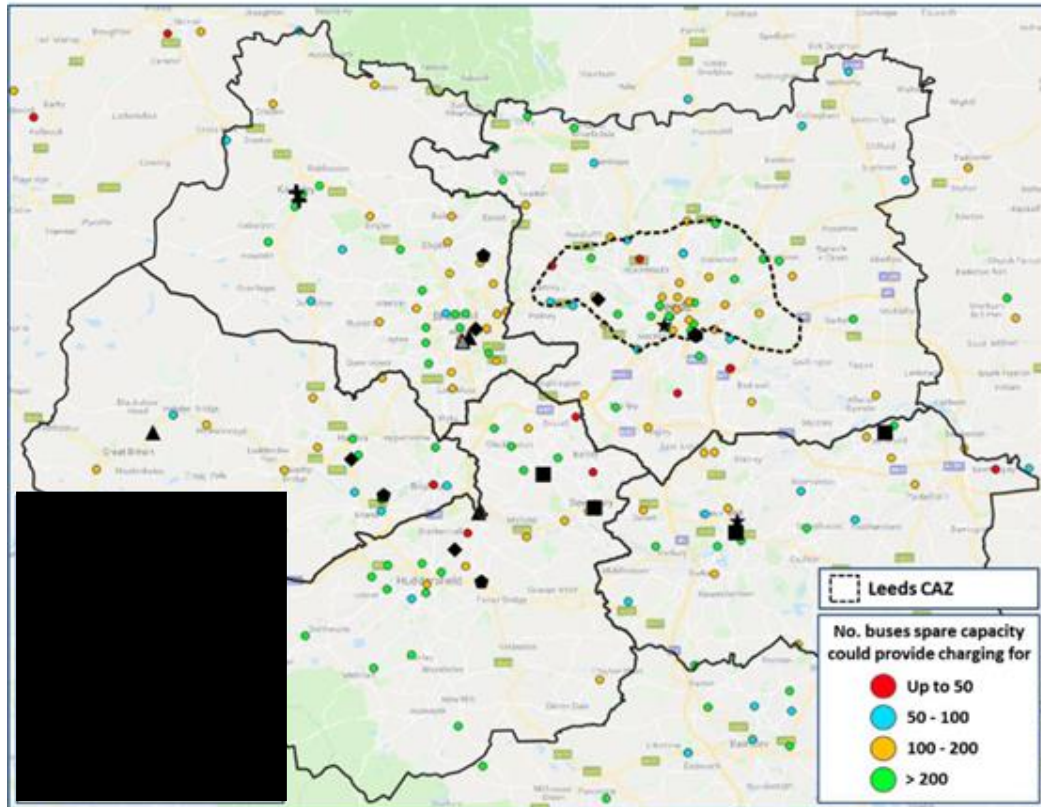
### 3.9.2. **Choice of technology – vehicle and charging method**

#### Vehicle

3.9.2.1. Whilst the call for schemes did not specify technology, it was broadly discussed that battery electric may be the best solution for the early deployment of zero emission vehicles within West Yorkshire. Operators noted the mature technology of electric buses within their responses and also that electric technology was more suited to current investments within their fleet renewal strategies, including Transdev's electric fleet in Harrogate and First's electric fleet in Leeds.

3.9.2.2. West Yorkshire has a fairly unique opportunity to introduce electric buses across the region due to the significant amount of spare capacity available at primary substations. The figure below demonstrates the electricity grid capacity at substations mapped against operator depots in West Yorkshire (please note that some ownership of depots has changed since 2019 when the report was written, notably the transfer of Yorkshire Tiger to Transdev).

3.9.2.3. The grid capacity analysis undertaken by Element Energy in the Zero Emission Bus Roadmap report (Appendix H) shows that across West Yorkshire there is generally a significant amount of spare capacity available at primary substations, with 75% of substations able to accommodate charging infrastructure for over 100 buses. This demonstrates that grid capacity is not a significant barrier to bus operators deploying electric buses in the region. The grid analysis also demonstrated that several bus depots were located very close to primary substations and therefore limits the costs of any high voltage cable upgrades. In terms of the depots used for ZEBRA, the figure demonstrates the existing grid capacity to deliver either between 100-200 electric buses or >200.



**Figure S28 – Depots and grid capacity**

- 3.9.2.4. The Element Energy report also looked into hydrogen solutions for the deployment of zero emissions buses across the region. The suggested approach for early hydrogen deployment in West Yorkshire involved using delivered hydrogen for use over longer and more rural routes. It was seen that in the case of early investment in zero emission buses, electricity provided a better option due to operator experience, lack of grid capacity constraints and existing buses within the region. Battery electric is therefore the best technology for immediate deployment, with more development work required for hydrogen buses, which remains a longer-term ambition.

#### **Arriva**

- 3.9.2.5. Arriva have selected electric vehicles for their ZEBRA project whilst acknowledging that it is likely that both electric and hydrogen technologies will have a place in the market. For West Yorkshire the local operation, topography and stakeholders mean that a zero-emission fleet with battery technology is a good fit, and a lack of locally-produced green hydrogen means this isn't the right location for a fuel cell or H2 combustion option. Arriva have experience with battery electric vehicles across Europe and this implementation will further build our experience in Yorkshire's challenging environment.

- 3.9.2.6. More detail on the specification of Arriva's preferred manufacturer is detailed within the Commercial Case – Outline Procurement Strategy and Market Engagement adding further detail to as why the battery electric vehicle is preferred for their project.

***First***

- 3.9.2.7. First have detailed their choice in line with the advanced state of the market for Battery Electric, the confidence First Bus has developed through operating Battery Electric Vehicle's (BEV) in Leeds, York and Glasgow from a number of manufacturers and the understanding they have of being able to install and safely operate the infrastructure and vehicles. The development of alternative fuelled vehicles such as hydrogen remains a continually assessed element of a longer-term strategy for First, however the current position of the BEV market, the timelines for deployment required for this funding, and the price point of available BEV verses hydrogen vehicles makes battery electric the most suitable choice for this deployment.
- 3.9.2.8. First also saw the operational benefits of their selected battery electric vehicle in terms of their capacity to operate the full day's range, with the flexibility of additional route mileage caused by route alterations or emergency diversions.
- 3.9.2.9. The vehicle battery is a very expensive element of the vehicle and is surrounded with warranty clauses. V2G possibly has a place in the future but partnership and risk management will be an obvious essential requirement. First know that the second life of this battery can provide a potential storage solution which could be charged, and the electricity could be drawn by the grid when required. It is however noted that electrifying depots reduces space for buses due to chargers and infrastructure so battery storage may need more thought. It does however demonstrate an additional benefit for batteries at end of use which could bring societal benefits by decarbonising depots and looking into alternative uses.
- 3.9.2.10. More detail on the specification of First's preferred manufacturer is detailed within the Commercial Case – Outline Procurement Strategy and Market Engagement adding further detail to as why the battery electric vehicle is preferred for their project.

***Transdev***

- 3.9.2.11. Transdev has chosen Electric Bus technology for its investment based on experience of operating these vehicles in North Yorkshire and the relative maturity of the technology compared to Hydrogen. This maturity means they have access to a larger supply market and richer data

for their associates to model the driver cycles and ensure the solutions are fit for purpose.

- 3.9.2.12. More detail on the specification of Transdev's preferred manufacturer is detailed within the Commercial Case – Outline Procurement Strategy and Market Engagement adding further detail to as why the battery electric vehicle is preferred for their project.

3.9.3. Choice of infrastructure/charging method

- 3.9.3.1. The infrastructure and charging method selected was largely dependent on the choice of technology as outlined above. Other factors that the Combined Authority felt were important to the programme included the benefits brought to place – the number/proportion of buses in particular areas and how infrastructure could be installed and supplied to support existing priority areas.

- 3.9.3.2. For zero emission buses these are areas with poor air quality, for easy deployment on local routes; infrastructure that was deliverable within the timescales for implementation; and infrastructure that could fully realise the wider decarbonisation vision of the Combined Authority.

**Arriva**

- 3.9.3.3. Arriva's choice is for a depot charging solution with vehicles which give sufficient range for the operation and greater operating autonomy during the day, without recourse to a top-up requirement. The properties, access and infrastructure agreements for opportunity chargers can be difficult and Arriva believe a depot solution can offer the best for the operation and the greatest parity with the current diesel operation, recognising the challenges in change management.

- 3.9.3.4. Overnight charging through depot chargers with a high power capability allows the greatest flexibility in preparing the fleet each night; the charging load can be diversified to lower charging rates, improving the life of the vehicle batteries and spreading the peak through the night to cheaper, greener electricity from the UK's base load capacity (generally a greater proportion of nuclear and wind generation through the night).

**First**

- 3.9.3.5. First have selected overnight in depot charging as it retains a level of operational flexibility over the on-route charging options for the routes selected within this proposal. The operational benefits of battery electric with a suitable capacity to operate the full day's range benefits First's proposal due to lack of suitable locations for opportunity charging requirements allowing flexibility of route alterations or emergency

diversions which are not readily usable if vehicles must return to specific locations at points within their duty cycle.

[REDACTED]

3.9.3.7. Additional benefits of First's chosen charging model include the future potential for depots for shared use of charging equipment to benefit the wider community as well as ensuring compatibility with future vehicles through common charging protocols. First Bus is investigating solutions to dual utilise Rapid Electric Vehicle Chargers during the day which will enable other Business users to transition to Electric vehicles without the need to invest in their own Chargers and Infrastructure.

3.9.3.8. First's operational requirement means that Chargers will be used to buses overnight meaning that the DC Rapid Dual headed CCS plug chargers which are interoperable with the majority of EV Manufactures vehicles could be used to provide a daytime charging solution to other business users. [REDACTED]

[REDACTED]

[REDACTED] This brings wider societal benefits to the area and allows for a quicker pace of the decarbonisation of the transport sector within West Yorkshire.

3.9.3.9. Additional benefits that the choice of vehicle and technology bring link to First's aim to decarbonise depots and reduce their requirement on the electrical grid. First Bus are currently working with DNO's to investigate the feasibility of storage and potentially the use of the vehicles as an energy source and to also ensure that they make best use of vehicle electrical requirements.

- 3.9.3.10. In their decarbonisation plans, First Bus are investigating the use of PV. They are currently reviewing the technologies with a view of maximising fitment space other than existing roofs. It is thought that car ports or possibly bus ports may provide more space, but this will be site dependent and they may have to consider landlords in properties they do not own alongside issues such as length of leases.

#### ***Transdev***

- 3.9.3.11. Transdev undertook modelling to understand the technology options available to them to deliver fully electric routes on those selected. When the ZEBRA competition was announced Transdev [REDACTED] model three different routes to determine if buses can operate consistently within the charging parameters. Overnight charging is modelled to work well on the Keighley route, with no additional on-route charging required. [REDACTED]

- 3.9.3.12. [REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]

#### 3.9.4. Routes proposed

- 3.9.4.1. As discussed above, when seeking expressions of interest from operators for participation in this programme, several criteria were considered. This ensured alignment with the initial DfT Expression of Interest objectives and could also be aligned with our wider strategies.
- 3.9.4.2. As has been demonstrated in the Strategic Case above each of the operators proposals aligns well with AQMAs and declared Clean Air Zones (Figure 23). In addition, the routes also show good alignment with areas of deprivation (figure 13) and health deprivation (Figure 24).
- 3.9.4.3. In addition to these factors, the operators have provided detail on operational characteristics and route selection which show further suitability for these routes.

#### ***Arriva***

- 3.9.4.4. The routes selected for this ZEBRA programme by Arriva reflect the heart of their bus operations in Wakefield. These routes run within Wakefield City's Air Quality Management Area (AQMA) and present a real opportunity to improve air quality, directly through displacing older vehicles.

- 3.9.4.5. The routes align with areas of high levels of deprivation, as discussed earlier in the document, with Figure S23 demonstrating that Arriva's routes particularly to the East and centre of the district target areas of multiple deprivation. The routes also align to the areas of poor air quality in the district with buses running to the North East/Centre and North West of Wakefield district.
- 3.9.4.6. Four routes have been selected that are very well used core network services, spreading benefits across multiple areas and meeting local political aspirations:
- 110 Leeds-Wakefield is Arriva Yorkshire's premier service, the backbone of the Wakefield operation, and is currently run by a mix of 2 year old and 6 year old and 6 year old Sapphire vehicles
  - 126/127 Dewsbury-Ossett-Wakefield is another well used service, currently run by 13 year old vehicles. This service links Wakefield with Dewsbury in Kirklees. Dewsbury is a key development area for the council
  - 148/149 Wakefield-Pontefract-Knottingley covers a large span of the Wakefield district and is primarily operated by 15 year old vehicles that are close to life-expiry
  - 425/427 Bradford-Wakefield is currently operated by 8 year old Hybrid vehicles. This route runs across four West Yorkshire districts



- 3.9.4.8. The routes proposed by Arriva align well to areas of poor air quality within the Wakefield district and enable investment in areas of multiple deprivation.

***First***

- 3.9.4.9. The selection of routes for First's project was a multistage process led by the Managing Director of the Operating Company and their Commercial leadership, initially a set of routes was selected based on the expected available range of electric vehicles and the known local operating environment, including known topographical features and commercial performance of the services. These routes were then analysed for their suitability for vehicle type, given the current proposed vehicle for this project is a single deck product, capacity analysis was vital to ensure that routes were only being offered that could suitably be operated by single deck bus. First Bus Data and Analytics team were then able to collate



route information for the selected routes and assess the impact of single deck operation to ensure that capacity was sufficient. The capacity data was used from 01-Sep-2019 – 30-Nov-2019 to ensure a pre pandemic ‘normal’ world figure, with First very mindful of the changing passenger behaviour as we emerge from the pandemic and regular reviews are undertaken to ensure suitable capacity is deployed across routes. The analysis was reviewed with the Operating Company team and a final set of routes then agreed upon to bid.

3.9.4.10. In Leeds the decision was taken to focus on Bramley depot given its route selection suiting roll out of Single Deck vehicles including the operational implications of on route low bridges. With existing EVs being based at Hunslet, the opportunity to electrify First’s depot in West Leeds opens up that side of the city for further electric deployment. The route selection covers a range of areas and will allow for a notable improvement in the air quality locally and the passenger experience of a large proportion of customers in the area.

3.9.4.11. The routes selected by First align well with the Combined Authority’s priorities of targeting areas of poor air quality and areas that suffer from multiple deprivation.

#### ***Transdev***

3.9.4.12. Transdev have prioritised the routes within the proposal for a number of reasons including:

- Stakeholder priority – Bradford Council’s Clean Air Zone which is due for introduction in 2022 includes the corridor serviced by the 662 and A3. [REDACTED]
- Operational effectiveness – the technical solutions were available for the routes included
- Asset renewal – the selected routes either had vehicles which were at the end of life or vehicles could be easily cascaded to replace other end of life buses

[REDACTED] The routes that Transdev have selected align well to the air quality ambitions of the Combined Authority, coinciding with a target corridor within the Bradford Clean Air Zone. [REDACTED]

### 3.9.5. Number of buses

- 3.9.5.1. As discussed in the criteria set out to bus operators above, it was important that in addition to operational efficiency, the introduction of zero emission buses would bring benefits to local bus services, with numbers of buses large enough to demonstrate the ambition that West Yorkshire has in decarbonisation.
- 3.9.5.2. In addition, the majority of buses introduced through operator projects would replace older, more polluting vehicles. Where this is not the case, cascade plans will allow improvement across operator fleets more generally.

#### ***Arriva***

- 3.9.5.3. The fleet proposed gives a workable cohort of vehicles to allow Arriva to understand the impact, challenges and potential for growth from zero-emission vehicles, balancing the risk and capital requirement to bring these into the fleet with a trial at sufficient scale to indicate the direction for our larger subsequent rollout. Vehicles will be specified to meet the requirements of PSVAR+.

Service	Depot	Vehicle requirement	Route served
106		7	Wakefield to Hall Green
110		11	Wakefield to Leeds
126/127		11	Wakefield to Dewsbury
148/148A/149		11	Wakefield to Knottingley
425/425A/427		7	Wakefield to Bradford

**Table S11 – Services introduced by Arriva**

#### ***First***

- 3.9.5.5. First Bus's commitment within their project is for 32 single deck electric vehicles. The number of buses is based on the existing frequency and coverage of current routes (all routes are

monitored and reviewed in line with local agreements). Vehicles will be specified to meet the requirements of PSVAR+.

Service	Depot	Vehicle requirement	Route served
9A	[REDACTED]	2	Horsforth to White Rose via Farsley and Pudsey
15	[REDACTED]	4	Leeds to Old Farnley via Armley and Bramley
91	[REDACTED]	5	Pudsey to Halton Moor via Bramley, Kirkstall and Chapelton
74	[REDACTED]	7	Middleton circular via Leeds
75	[REDACTED]	3	Leeds to Middleton via Holbeck
46/47/48	[REDACTED] [REDACTED]	7	Leeds to White Rose Centre via Middleton and Cottingley (Leeds to Morley 48)
62	[REDACTED] [REDACTED]	1	Leeds circular via East End Park
86/87	[REDACTED]	3	Rodley to Middleton via Holbeck and Armley

**Table S12 – Services introduced by First**

### ***Transdev***

- 3.9.5.6. Transdev's proposals would allow the transition of current services to electric buses. [REDACTED]

[REDACTED]  
[REDACTED]

[REDACTED] Vehicles will be specified to meet the requirements of PSVAR+.

[REDACTED]  
[REDACTED]

- 3.9.5.7. For Transdev, there will be two EUROVI diesel spares to be used from the current fleet and not funded through their ZEBRA project.

Service	Depot	Vehicle requirement	Route served
662	██████	15	Keighley to Bradford
A1	██████	5	Leeds Bradford Airport to Leeds
A2	██████	4	Bradford to Leeds Bradford Airport then Harrogate
A3	██████	4	Bradford to Shipley then Leeds Bradford Airport and Otley

**Table S13 – Services introduced by Transdev**

### 3.10. How will the programme deliver objectives?

#### 3.10.1. Overview

- 3.10.1.1. Table 14 below summarises why the selected solution is the most preferable in terms of delivering against the objectives set by the Combined Authority. It demonstrates that do nothing will not deliver against any objectives, whilst the do everything solution will deliver against all objectives.

		Do Nothing	Do Minimum	Do Something	Do Everything
<b>Objectives</b>	Introduce zero emission buses at scale to support the Combined Authority's ambition to become a net zero carbon economy, reducing emissions and improving air quality in targeted areas.	✗	✓	✓	✓
	Invest in buses that improve the customer offer, targeting deprived areas to promote the levelling up agenda	✗	✗	✗	✓

	Work in partnership with bus operators, bus manufacturers and local stakeholders <i>as set out in the NBS</i>	x.	✓.	✓.	✓.
	Conduct research into the challenges and opportunities of introducing zero emission buses and supporting infrastructure	x.	✓.	✓.	✓.
<b>Critical success factor</b>	Environmental benefits	x.	✓.	✓.	✓.
	Partnership working	x.	✓.	✓.	✓.
	Improved customer outcomes / modal shift	x.	✓.	✓.	✓.
	Innovation in zero emission technology	x.	✓.	✓.	✓.
	Scalability and deliverability	x.	x.	x.	✓.

**Table S14 – Shortlisting of options**

- 3.10.1.2. The following sections briefly discuss each DfT priority in turn, demonstrating how the programme will deliver against these. This information is summarised in Table S15 below.
- 3.10.1.3. A logic map demonstrating the links between project objectives, outputs and monitoring and evaluation can be found in the Management Case, Figure M12

Programme Objectives	Map to local priorities	Map to ZEBRA Objectives/ DfT Strategic Priority	How do the outcomes of the programme meet the objective?
Introduce zero emission buses at scale to support the Combined Authority's ambition to become a net zero carbon economy, reducing emissions and improving air quality in targeted areas.	<p><i>Mayoral Climate Pledge</i></p> <p><i>BSIP</i></p> <p><i>Connectivity Infrastructure Plan</i></p> <p><i>Climate and Environment Action Plan</i></p> <p><i>Clean Air Zones</i></p>	<p><i>Supports the government's commitment to decarbonisation and to reduce the transport sector's contribution to CO2 emissions</i></p> <p><i>Supports the roll-out of the 4,000 Zero Emission Buses that the government committed to in Feb 2020</i></p> <p><i>Reduce environmental impacts / Air quality</i></p>	<p>New buses will deliver 50 tonnes annual NOx savings</p> <p>New buses will remove particulate matter</p> <p>New buses will increase proportion of zero emission buses from 2% to 10% in West Yorkshire.</p>
Invest in buses that improve the customer offer, targeting deprived areas to promote the levelling up agenda	<p><i>BSIP</i></p> <p><i>Transport Strategy 2040</i></p>	<p><i>Support bus manufacturers in the development of zero emission bus technology</i></p> <p><i>Grow and level up the economy</i></p> <p><i>Improve transport for the user</i></p>	<p>Introduce 111 electric buses to West Yorkshire alongside the infrastructure to support roll out.</p> <p>New buses will increase proportion of zero emission buses from 2% to 10% in West Yorkshire</p>
Work in partnership with bus operators, bus manufacturers and local	<p><i>BSIP</i></p> <p><i>Economic Recovery Plan</i></p>	<p><i>Support partnership working between Local Transport Authorities, bus operators, and</i></p>	<p>Work through existing governance structures to deliver 111 zero emissions buses</p>






stakeholders as set out in the NBS	Transport Strategy 2040	other local stakeholders as set out in the NBS  Support bus manufacturers in the development of zero emission bus technology  Grow and level up the economy	
Conduct research into the challenges and opportunities of introducing zero emission buses and supporting infrastructure	BSIP Transport Strategy 2040 Climate and Environment Action Plan	Understand better the challenges of introducing zero emission buses and supporting infrastructure to inform future government support for ZEBs	Compile case study to evaluate success of introduction of buses.  Monitoring and evaluation plan to understand challenges and opportunities within West Yorkshire context.

**Table S15 – Deliverability against objectives**

3.10.2. Reduce environmental impacts/improve air quality

- 3.10.2.1. The introduction of zero emission buses will greatly improve air quality, as can be seen in the table below. This helps meet the wider DfT priorities and reducing environmental impact through meeting the ZEBRA objectives around decarbonisation of the transport sector and roll out zero emission buses. Many of the more polluting vehicles in the table below are end of life, allowing for a greater impact on the West Yorkshire fleet through their removal.

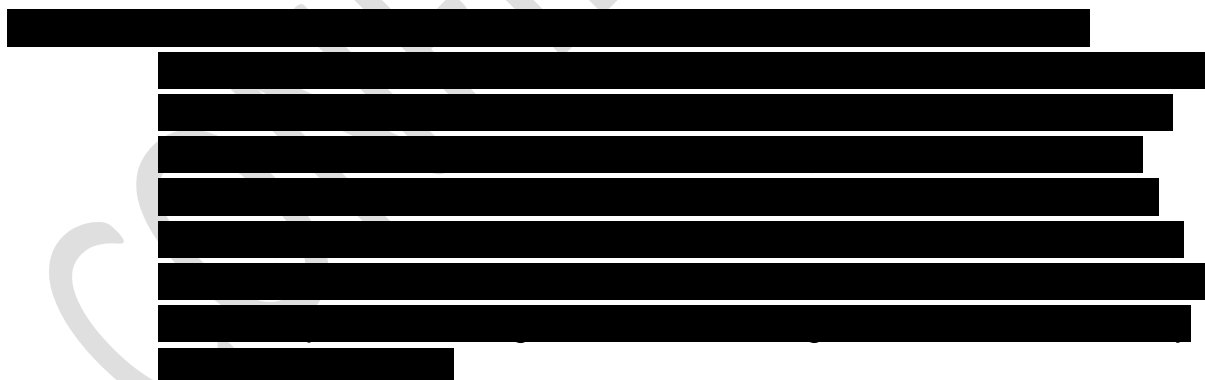
Project	Current buses	Estimated annual NOx savings (g)**
Arriva		11,362,731

<b>First</b>		21,707,904
<b>Transdev*</b>		17, 298, 486
<b>Total</b>	111	50,369,121

\*Two Transdev EUROVI vehicles kept as spares

\*\* Figures based on approx. NOx emissions per EURO standard (g/km), multiplied by mileage in Vfm proforma and number of ZEBs

**Table S16 – Estimated NOx savings**



First will be replacing buses that are on average 15 years old, with estimates that this will reduce carbon emissions by 1,300 tonnes<sup>1</sup> with estimated reduction in air quality related emissions (NOx and PM2.5) of circa 11.7 tonnes (11,700 kg)<sup>2</sup>. First will also be using a [REDACTED] [REDACTED] which further supports the air quality improvements through use of renewably sourced energy. As part of the wider First UK Bus division, each intake of vehicles allows for the direct disposal of vehicles, but also cascade of vehicles between depots or operating companies to maximise the benefits accrued – i.e. an indirect

\_\_\_\_\_



[REDACTED]

[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]

## Grow and level up the economy

- Through the introduction of 111 electric buses in West Yorkshire it will support operators in the roll out of zero emission buses whilst shows innovation within the West Yorkshire network.
- The ZEBRA funding will see investment, through the form of buses and infrastructure, in towns and cities which require this investment to deliver a healthier, low emission future.
- The investment would also be an investment in training and skills, reflecting the Mayoral pledge to introduce 1000 green jobs in West Yorkshire. This would be seen by operators upskilling, retraining and potentially recruiting more staff to maintain electric vehicles. The introduction of electrical infrastructure at scale across four depots in West Yorkshire would therefore require upskilling of existing workforce to ensure that personnel were accredited in the maintenance of ZEBs. [REDACTED]
- [REDACTED]
- Through the delivery of this programme, the Operators have confirmed that the following training will be provided to their employees:





demonstrates that linking investment in road infrastructure and policies for modal shift, plus converting to zero-emission buses can have an impact on customer satisfaction and therefore increase passenger levels – a core objective of our Bus Service Improvement Plan.

### 3.11. Related projects

#### Transforming Cities Fund and Zero Emission Buses

- 3.11.1. Transforming Cities Fund is funded an investment [REDACTED] as part of the wider Zero-Emission Bus roll out across West Yorkshire.

[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]

- 3.11.3. Work is currently ongoing to shortlist the routes that the ZEBs could be deployed on and the timescales for contract renewal in the context of lead in times for the delivery of ZEBs.
- 3.11.4. The model will replicate the East Leeds Flexibus scheme with the Combined Authority directly purchasing the ZEBs and leasing them to operators to run on the routes which have been selected for ZEB deployment.
- 3.11.5. As with the East Leeds Flexibus scheme, support will also be provided to operators that run the ZEBs to upgrade their depot infrastructure to facilitate charging of the vehicles.
- 3.11.6. The requirement to operate the ZEBs will be integrated into the contracts that are let for the specific routes that have been identified for ZEB deployment.

#### City Region Sustainable Transport Settlement Zero Emission Buses

- 3.11.7. [REDACTED] allocated for the deployment of ZEBs in the City Region Sustainable Transport Settlement (CRSTS) programme to fund between [REDACTED] additional ZEBs to those that are funded through TCF and hopefully ZEBRA. These ZEBs will be deployed on more routes throughout the region.
- 3.11.8. The project is at an early stage of planning and the delivery model has yet to be decided upon. Several factors will influence the delivery route that is taken including appetite from operators to contribute in addition to what they are already contributing through ZEBRA, the identification of suitable tendered services to operate ZEBs on, and market availability of suitable ZEBs, especially in more challenging areas of the region e.g. upland areas.



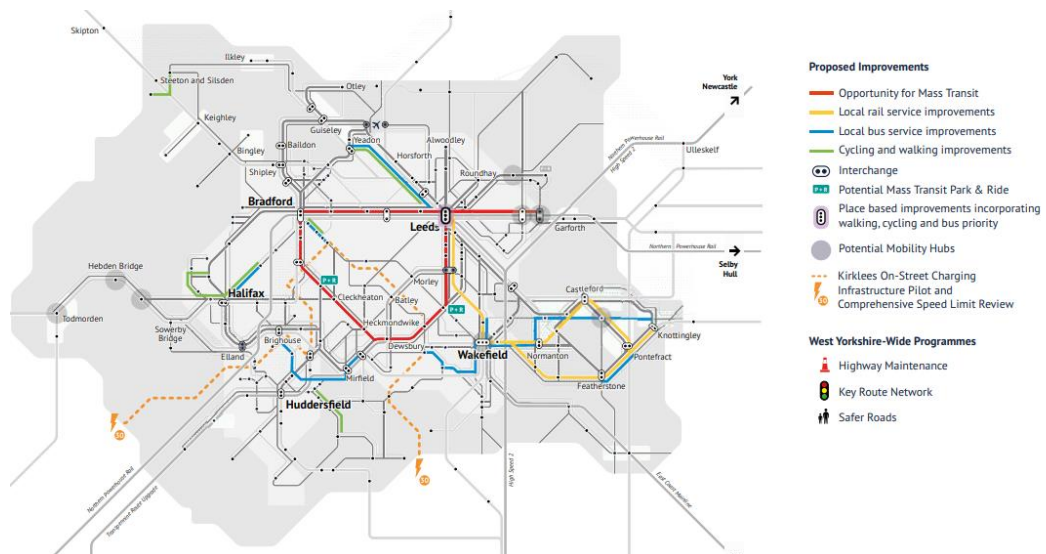
- 3.11.9. Due to the smaller number of ZEBs being deployed in Calderdale and Kirklees through TCF and ZEBRA it is likely that a significant proportion of the vehicles will be deployed in these districts where appropriate.

ZEBRA and bus priority alignment

- 3.11.10. The table below shows alignment between Bus Priority Measures funded through other means and the routes selected in this proposal. It demonstrates strong alignment, demonstrating that these services will see further improvements.

Bus priority scheme	Funding	Description	ZEBRA routes affected
A61 Leeds - Wakefield	CRSTS	Bus priority measures including bus lanes and bus priority at junctions	Arriva services (Wakefield – Leeds)
Wakefield City Centre	CRSTS	Bus priority measures within Wakefield City Centre	Arriva services
Leeds City Centre	CRSTS	Reallocation of roadspace to sustainable transport modes	First services
Heath Common - Knottingley	CRSTS	Bus priority measures including bus lanes and bus priority at junctions	Arriva services
Horbury – Wakefield / Osset - Wakefield	CRSTS	Bus priority measures including bus lanes and bus priority at junctions	Arriva services
Safety Access and Efficiency Programme	CRSTS	Improving accessibility for disabled passengers across the bus network and reducing the impact of bus infrastructure through Invest to Save and Efficiency Programmes	All services

**Table S17 – ZEBRA projects and bus priority alignment**



**Figure S29 – CRSTS scheme map**

### 3.12. Stakeholder engagement and marketing

- 3.12.1. As part of the development of the ZEBRA programme, consultation with key stakeholders, such as the West Yorkshire Districts, the LEP and North East and Yorkshire Energy Hub have been undertaken. Letters of support from these stakeholders are included in Appendix C.
- 3.12.2. The marketing for the ZEBRA programme comprises of two main parts – an overarching scheme ran through the Bus Alliance supported by operator specific marketing campaigns. This was to ensure that both the regional and more local aspects of the projects could be marketed and celebrated appropriately.
- 3.12.3. More detail of the stakeholder and communication and engagement plans, along with marketing activities proposed by operators can be found in the Management Case.

### 3.13. Conclusion

- 3.13.1. The strategic case underlines the importance of this programme/project in terms of the multifaceted benefits it can bring both to the region of West Yorkshire and to the country as a whole.
- 3.13.2. This case underlines the interconnected nature of poor air quality and deprivation within the region of West Yorkshire, clarifying the ways in which ZEBRA seeks to challenge this correlation. The introduction of cleaner buses and improved passenger routes tackles both the scale of carbon emissions and prevailing dependency on car, enabling us to make

significant progress towards reaching our goal of a zero-emissions bus fleet by 2036.

- 3.13.3. Commuting flows have been severely disrupted by COVID-19 across the region, and whilst the future of travel-to-work behaviour remains uncertain, this programme has an important role to play in championing bus as an attractive and reliable choice for the commuter when they do return to the workplace. West Yorkshire generates five percent of England's economic output, and the improved connectivity that results from the ZEBRA will play an important role in boosting economic growth and opportunity.
- 3.13.4. West Yorkshire Combined Authority has a strong track record of delivering projects in partnership with operators through the Bus Alliance, demonstrating our ability to deliver complete programmes at pace.
- 3.13.5. The Combined Authority's objectives for ZEBRA strongly align with those of DfT, with this case highlighting the potential benefits and learning the ZEBRA programme could deliver.
- 3.13.6. Alignment of the deliverables, alongside the objectives can be seen through:
- **Introduce zero emission buses at scale to support the Combined Authority's ambition to become a net zero carbon economy, reducing emissions and improving air quality in targeted areas.** Delivery of 111 zero-emission buses across four operator depots, reducing NOx emissions by 50 tonnes.
  - **Invest in buses that improve the customer offer, targeting deprived areas to promote the levelling up agenda.** The majority of new buses will see a stepchange in the customer offer with additional onboard facilities including additional wheelchair/pram space, audio-visual next stop announcements and induction loops as standard.
  - **Work in partnership with bus operators, bus manufacturers and local stakeholders as set out in the NBS.** Delivery of this funding will be through an existing partnership agreement, the West Yorkshire Bus Alliance, which has worked on this programme collaboratively throughout.
  - **Conduct research into the challenges and opportunities of introducing zero emission buses and supporting infrastructure.** The Combined Authority's Monitoring and Evaluation team will use this information for internal best practice, sharing this with bus operators and DfT.

## 4. Economic Case

### 4.1. Executive Summary

#### 4.1.1. Overview

- 4.1.1.1. According to the Business Case Development Guidance<sup>22</sup>, the purpose of the Economic Case is to identify and understand the impacts that will determine the value for money. The impacts analysed in this Economic Case include the costs and benefits to the environment, society, businesses and government.

[REDACTED]

- 4.1.1.3. Based on the non-monetised benefits, the positive distributional impacts of the programme benefiting vulnerable populations, and the strength of the Strategic Case, the programme has been assessed as medium value for money overall. Indicating a BCR of 1.5 to 2.

[REDACTED]

### 4.2. Programme Costs

#### 4.2.1. Overview

- 4.2.1.1. The three operators who are partnering with WYCA to deliver this programme have been responsible for specifying the requirements for their proposed services and engaging with the market to develop robust costings. The capital and battery replacement / warranty costs are discussed in detail below. The ZEB operating costs for all three operators are based on the standard GBT assumptions.

#### 4.2.2. Arriva

- 4.2.2.1. At a group level Arriva has undertaken extensive market engagement on vehicle procurement, charging equipment and work to fit out depots for ZEBs. This has included involvement with three successful ZEBRA bids

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<sup>22</sup> Department for Transport, Zero Emission Bus Regional Areas (ZEBRA) Scheme Phase 2: Business Case Development Guidance, June 2021.

from the fast-track programme. As a result, it has a strong understanding of the market and the cost required to deliver ZEB fleets. On this basis it has estimated the costs associated with its services, which are described in the table below.

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Category/Item	Costs	Data Source
<b>Vehicles</b>		
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Category/Item	Costs	Data Source
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**Table E1: Arriva cost estimates**

4.2.3. First

4.2.3.1. First has engaged with various suppliers to develop specific quotes for this project. These have been assured for value for money, based on group level understanding of the supplier market.

4.2.3.2. The costs and quotes referenced in Table E2 can be found in Appendix B for infrastructure and Appendix D for vehicles.



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**Table E2: First cost estimates**

4.2.4. Transdev

Transdev has engaged with various suppliers to develop specific quotes for this project. These have been assured for value for money based group level understanding of the supplier market.

4.2.4.2. The costs and quotes referenced in Table E2 can be found in Appendix B for infrastructure and Appendix D for vehicles.

Keighley, Marriner Road Depot		
Category/Item	Costs	Data Source
<b>Vehicles</b>		
██████████	██	██████████████████ ██████████████████ ██████████
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Airport Depot		
Category/Item	Costs	Data Source
<i>Vehicles</i>		
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██████████	██████████ ██████████ ██████ ██████████ ██████ ██████████ ██████████ ██████████ ██████	
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**Table E3: Transdev cost estimates**

4.2.4.3. The total costs for the programme are summarised in the table below.



Operator	No. ZEBs	ZEB Costs	Extended Battery Warranty Costs	Infrastructure Costs
██████	█	██████	██████	██████
██████	█	██████	█	██████
████████	█	██████	██████	██████

**Table E4: Operator total costs**

### 4.3. Considerations of Uncertainties & Risks

#### 4.3.1. Overview

- 4.3.1.1. A quantified risk assessment (QRA) has been carried out considering the potential risks for the programme. The key risks are:
1. As a result of increased costs within the supply chain of bus manufacturer, increases in supplier prices may occur, which would lead to an increase in vehicle costs for the programme.
  2. As a result of limited battery manufacturing capacity within the electric bus supply chain, increases in the cost of batteries may occur, which would lead to an increase in vehicle costs for the programme.
  3. As a result of lower than expected headroom at DNO substations, grid infrastructure upgrades or change in the point of connection may occur, which would lead to an increase in depot power connection costs.
  4. As a result of increased costs within the supply chain of charging equipment OEMs, increases in supplier prices may occur, which would lead to an increase in the cost of charging equipment.
  5. As a result of unforeseen depot works required to install charging equipment, tender price being exceeded may occur, which would lead to an increase in charging infrastructure installation cost.
- 4.3.1.2. The QRA estimates a quantum of funding to be added on to the total cost of the programme based on the likelihood and potential impact on capital costs should risks materialise. The risks identified are only relevant to the costs of ZEBs and associated infrastructure and do not impact the price of equivalent diesel buses used as the reference case. Within the Economic Case the cost risk should be covered by optimism bias, prescribed for

ZEBRA projects at 3%. Following TAG, the estimated QRA should be lower this figure is only included in the Financial Case, in lieu of optimism bias.

- 4.3.1.3. The calculation of QRA uses a score for impact and a score for likelihood. The impact and likelihood scoring ranges are shown in the table below.

Impact	Start Range	End Range
1	£10,000	£30,000
2	£50,000	£100,000
3	£150,000	£225,000
4	£300,000	£400,000
5	£500,000	£1,500,000

**Table E5: QRA impact scores**

Likelihood	Start Range	End Range
1	0%	20%
2	20%	40%
3	40%	60%
4	60%	80%
5	80%	100%

**Table E6: QRA likelihood scores**

- 4.3.1.4. The scoring of each of the five risk is shown in the table below. For each risk the impact and likelihood scoring have been based on information gathered through operator engagement with suppliers.



- The funding request for vehicles is based on 75% of the cost difference between the ZEB and the equivalent diesel bus.
- The ZEB price used to calculate the 'Eligible ZEB Costs' in the table below excludes any optional extended battery warranty or battery leasing costs identified in the Programme Costs section of the Economic Case.

Operator	Eligible ZEB Costs	Equivalent Diesel Bus Cost	Cost Difference	Funding Request
■■■■■	■■■■■	■■■■■	■■■■■	■■■■■
■■■	■■■■■	■■■■■	■■■■■	■■■■■
■■■■■	■■■■■	■■■■■	■■■■■	■■■■■
■■■	■■■■■	■■■■■	■■■■■	■■■■■

**Table E8: Vehicle funding requirements**

4.4.1.2. This funding ask is based on the estimates produced by operators and do not include QRA

4.4.2. Infrastructure

4.4.2.1. In line with the ZEBRA funding criteria:

- The funding request for infrastructure is based on 75% of the total cost.

Operator	Total Infrastructure Capital Cost	Funding Request
■■■■■	■■■■■	■■■■■
■■■	■■■■■	■■■■■
■■■■■	■■■■■	■■■■■
■■■	■■■■■	■■■■■

**Table E9: Infrastructure funding requirements**

4.4.2.2. This funding ask is based on the estimates produced by operators and do not include QRA

#### 4.4.3. Summary

Operator	Vehicle	Infrastructure	Total
████	██████████	██████████	██████████
██	██████████	██████████	██████████
██████	██████████	██████████	██████████
██	██████████	██████████	██████████

**Table E10: Total funding requirements**

- 4.4.3.1. In addition to the ask of £22,624,178 based on the cost specified by operators an additional £1,940,994 will be included in the total ask based on 75% of the £2,587,992 QRA.
- 4.4.3.2. The total ZEBRA grant requested for this programme is: **£24,565,171** with operators contributing a total of £32,163,703 .

### 4.5. **Greener Bus Tool**

#### 4.5.1. Overview

- 4.5.1.1. The Greener Bus Tool (GBT) has been developed by DfT to estimate the benefit cost ratio (BCR), taking into consideration the costs and benefits of investing in zero emission buses. The costs considered in the GBT include capital costs – the costs to purchase electric buses and its associated infrastructure, as well as ongoing operational and maintenance costs. It captures the benefits from reduced emissions of greenhouse gases alongside the health impacts of reduced emissions of particulate matter (PMs) and Nitrous Oxide (NOx).

#### 4.5.2. Assumptions

- 4.5.2.1. The assumptions used for the appraisal are detailed in the table below.

Category/Item	Value/Parameter
<b>Average Annual Vehicle Kilometrage</b>	
██████	██████
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████	████
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████	████
████	████
██████	████



<b><i>Optimism Bias (Applied to Capital Costs)</i></b>	
██████	██
████	██
████████	██

**Table E11: Appraisal assumptions**

- 4.5.2.2. The average annual vehicle kilometres have been calculated based on the total annual kilometres operated on the proposed ZEB routes divided by the vehicle requirement.
- 4.5.2.3. The average annual vehicle kilometres have been provided by each operator who have modelled their ZEB routes on this mileage.
- 4.5.3. **Greener Bus Tool Outputs**
- 4.5.3.1. The outputs of the GBT are summarised in the table below for each operator and the programme as a whole.



████████████████████	1	1	1	1
████████████████████	1	1	1	1
████████████████████	1	1	1	1
████████████████████	1	1	1	1
████████████████████	1	1	1	1
████████	████	████	████	████
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████████████████████	████	████	████	████
████████████████████	████	████	████	████

Table E12: GBT outputs

## 5.6. Additional Monetised Benefits

### 5.6.1. Additional Air Quality Benefits

#### Vehicles using EuroIII, EuroIV and EuroV engines, directly replaced by ZEBs

- 5.6.1.1. The GBT assumes that all vehicles being replaced use engines of a EuroVI standard. For this programme, many of the buses being replaced use EuroV, EuroIV and even EuroIII. This is summarised in the table below.

Operator	No. EuroIII	No. EuroIV	No. EuroV	No. EuroVI
████	█	1	1	█
████	█	1	1	
████████	█	1	█	1

■	■	■	■	
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**Table E13: Engine specifications by operator**

- 5.6.1.2. By not accounting for the other engine standards that are used in the existing fleet, the GBT undervalues the air quality benefits of the programme. As shown in the table below, the particulate (PM10/2.5) and the Nitrous Oxide (NOx) emissions are significantly higher for the older engine standards.

Engine Standard	NOx limit (g/km)	PM2.5 limit (g/km)
Euro VI	0.40	0.01
Euro V	2.00	0.02
Euro IV	3.50	0.02
Euro III	5.00	0.10
Euro II	7.00	0.15
Euro I	8.00	0.36

**Table E14: NOx and PM2.5 emissions by engine standard**

- 5.6.1.3. Replacing vehicles with these older engine types will have a greater impact in reducing the concentrations of these harmful compounds in the areas surrounding the routes which will further reduce their resulting impacts on health, wellbeing and life expectancy.
- 5.6.1.4. The approach to quantifying additional air quality benefits mirrors the approach used in the GBT, by adapting it to include non-EuroVI engine standards. These additional air quality benefits have been measured based on the assumption that, in the do minimum scenario without ZEBs, the existing diesel vehicles with euroV or lower engine types continue to be used until the end of their normal life of 15 years, after which they would be replaced by vehicles using EuroVI engines. The actual emissions are quantified using the average annual mileage for the vehicles on the routes in question.

### **Cascading of vehicles**

- 5.6.1.5. Many of the buses which are replaced by ZEBs will be relatively new, using the lowest emission EuroVI engines. As shown in the table below, some of these vehicles will be cascaded by operators to other routes in

West Yorkshire to replace vehicles at the end of their life using older engine standards. The impact of this is not captured in the GBT but, as discussed above, this will also be material to air quality impacts given the lower particulate and Nitrous Oxide emissions of EuroVI engines relative to the older engine standards.

Operator	No. EuroIII	No. EuroIV	No. EuroV	No. EuroVI
■■■■■	■	■	■	■
■■■	■	■	■	
■■■■■	■	■	■	■
■■■■■	■	■	■	

**Table E15: Vehicles cascaded to other routes in West Yorkshire**

### 5.6.2. Monetised Benefit (latest figures)

- 5.6.2.1. For the proposed programme, the additional reduction in emissions for replacing bus with EuroIII, EuroIV, and EuroV engines (both directly and through cascading in WY) will be:
- NOx – 1.15 Tonnes
  - PM2.5 – 85.4 Tonnes
- 5.6.2.2. This additional abatement will occur between 2023 (ZEB fleet fully deployed) and 2026 (end life of oldest non-EuroVI diesel bus).
- 5.6.2.3. These additional air quality benefits have been monetised using the same appraisal approach applied in the GBT. Based on the total emissions above, for directly replaced and cascaded vehicles, this generates an additional value of £1.15m 2021 pv in benefits.

## 5.7. Non-Monetised Benefits

### 5.7.1. ZEB Operation in AQMAs

- 5.7.1.1. Air quality management areas (AQMAs) are specific zones or regions where particularly poor air quality has been identified and are therefore prioritised for interventions to reduce pollutants. The higher the concentration of pollutants in an area, the greater the value of emissions reductions from sources within its boundary. The reduction of particulate and nitrous oxide emissions from buses will therefore have a greater impact in AQMAs.

- 5.7.1.2. The GBT values for air quality impacts are taken from the TAG databook. These values are based on modelled averages of roadside pollutant levels which will be lower than the levels within AQMAs. The value of the impacts should therefore be higher in AQMAs. As 35% of the route kilometres for the proposed ZEBRA routes will run through AQMAs this would indicate a higher benefit for air quality impacts than captured by the GBT.

## 5.8. Distributional Impacts

### 5.8.1. Overview

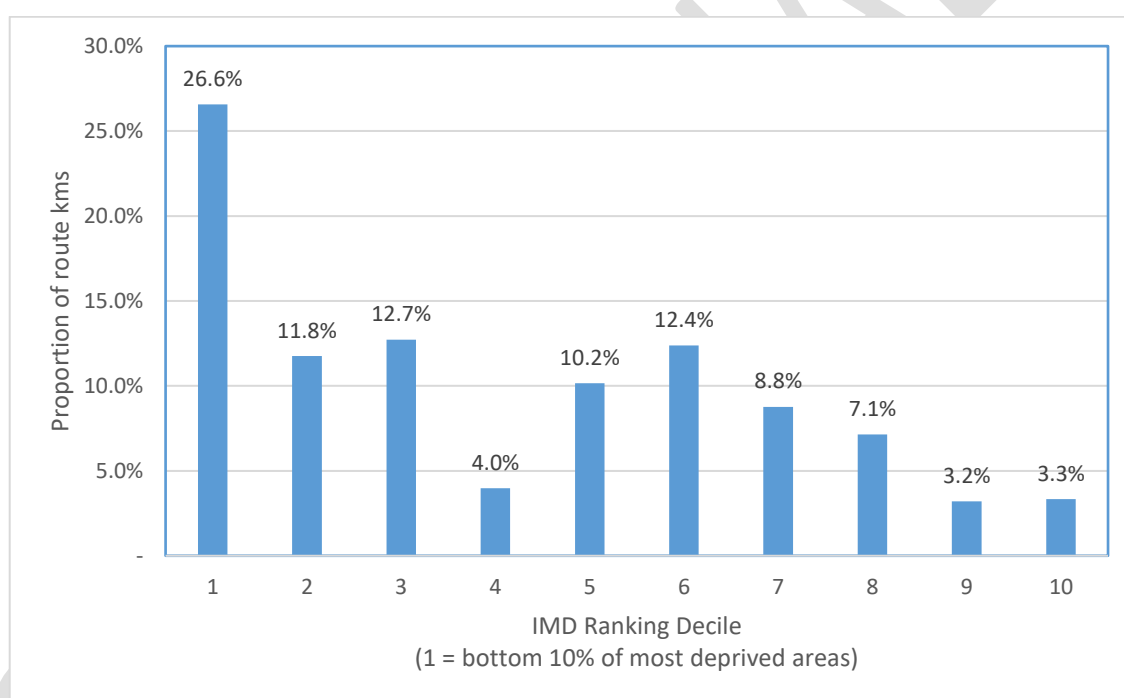
- 5.8.1.1. As part of appraising the overall benefit of a transport scheme, it is important to assess how the impacts are distributed amongst different populations within the UK. Particularly the impact felt by vulnerable groups, such as people experiencing significant deprivation, young people, old people, and those with protected characteristics. This is to ensure that these groups receive at least a commensurate proportion of the scheme benefits and conversely disbenefits do not disproportionately affect these groups.
- 5.8.1.2. The main benefits of ZEBs are the abatement of greenhouse gas emission (GHGs), particulate matter (PMs), and nitrous oxide (NOx). The impact of GHG emissions is a global issue, therefore the distribution of their impacts not directly pertinent to this business case.
- 5.8.1.3. PMs and NOx have very localised effects on air quality. Their impacts are most severe close to the point of emission where concentrations are highest. The further away from the source, emissions are dispersed. Concentrations will be significantly lower with correspondingly fewer health impacts. In the context of this programme, the health impacts will be most significant directly adjacent to bus routes within the scope of this programme.

### 5.8.2. Impact on Deprived Populations

- 5.8.2.1. People experience deprivation in multiple ways. The key indicators are income, employment, education, health, crime, access to housing and services, and their living environment. People experiencing deprivation are directly more vulnerable to the impacts of poor air quality. They also often face greater exposure to poor air quality due to having less choice and agency about where they live and as a result move in response to poor living environments.

5.8.2.2. The index of multiple deprivation (IMD) is a statistical indicator that assesses the level of deprivation experienced by the population in small areas. Each area is ranked based on a scoring of the six indicators described above.

5.8.2.3. **Error! Reference source not found.** shows the proposed ZEBRA routes and the IMD centile of each middle super output area (MSOA) in West Yorkshire region. It can clearly be seen that ZEBRA routes pass through many of the most deprived areas in West Yorkshire. As shown in the figure below, the routes operate proportionally much more in MSOAs with a lower IMD ranking. More than 25% in areas with IMD ranking in the lowest decile (i.e. the 10% most deprived areas) and more than 50% in areas ranking in the lowest third.

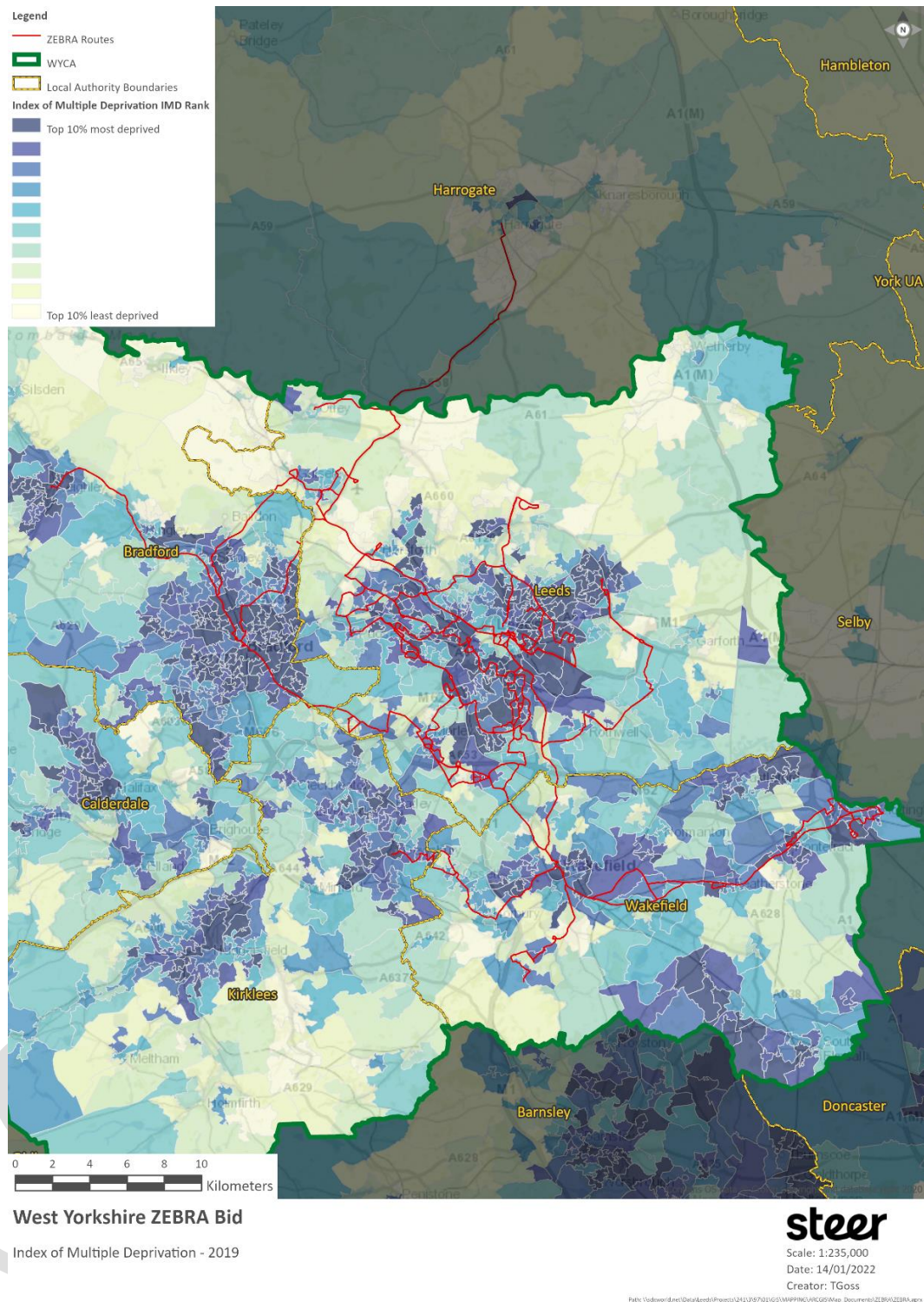


**Figure E1: Proportion of total ZEBRA route km operated each MSOA by IMD decile**

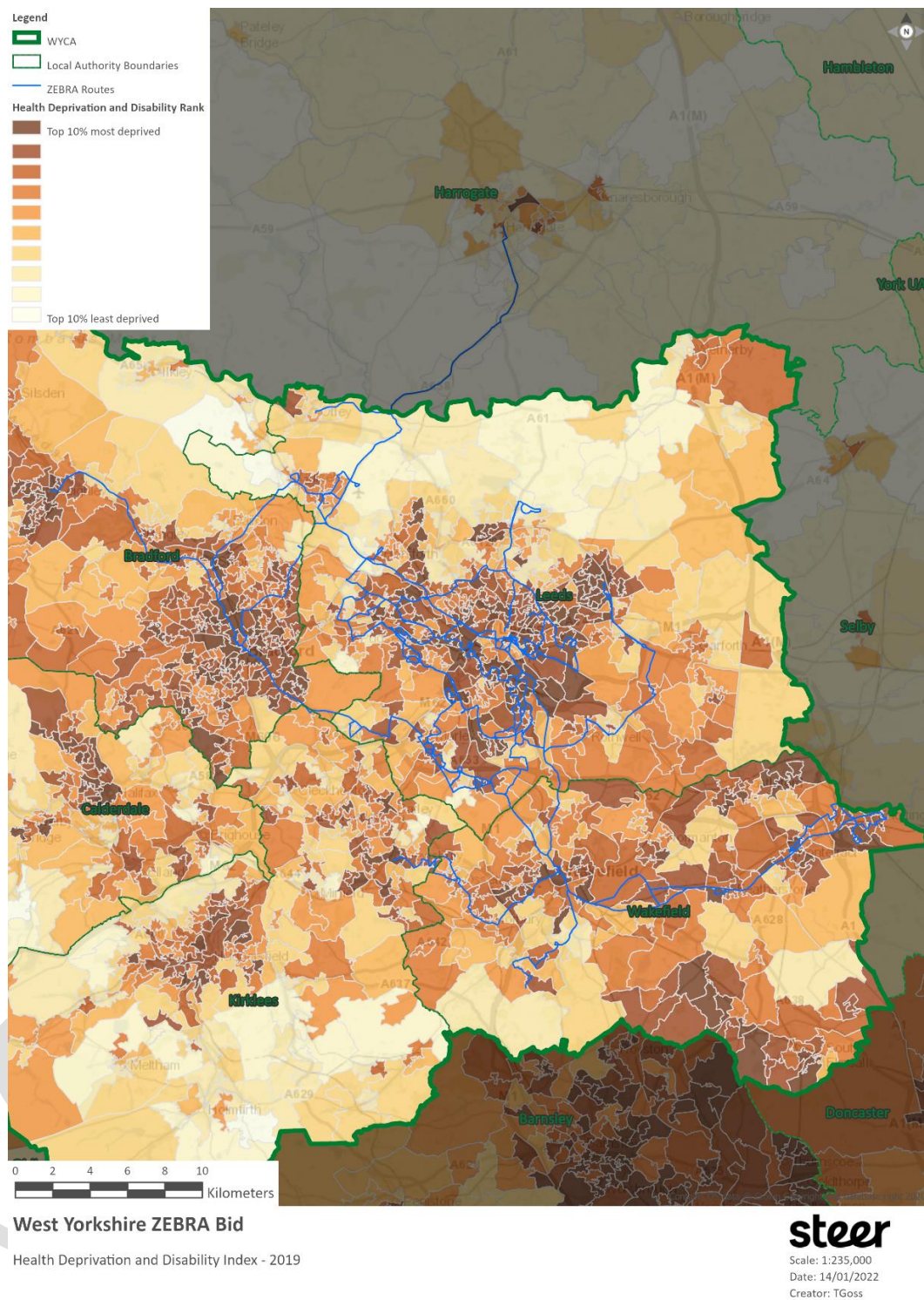
### 5.8.3. Impact on Sensitive Receptors

5.8.3.1. The effects of deprivation are complex and the interactions between the different indicators mean that all are relevant to the effects of poor air quality. However, those who have poor health indicators are particularly vulnerable. The map below shows the ranking of the index of health deprivation (IoHD) at an MSOA level and the ZEBRA routes running through them.





**Figure E2. Map of ZEBRA routes and MSAO by IMD decile**

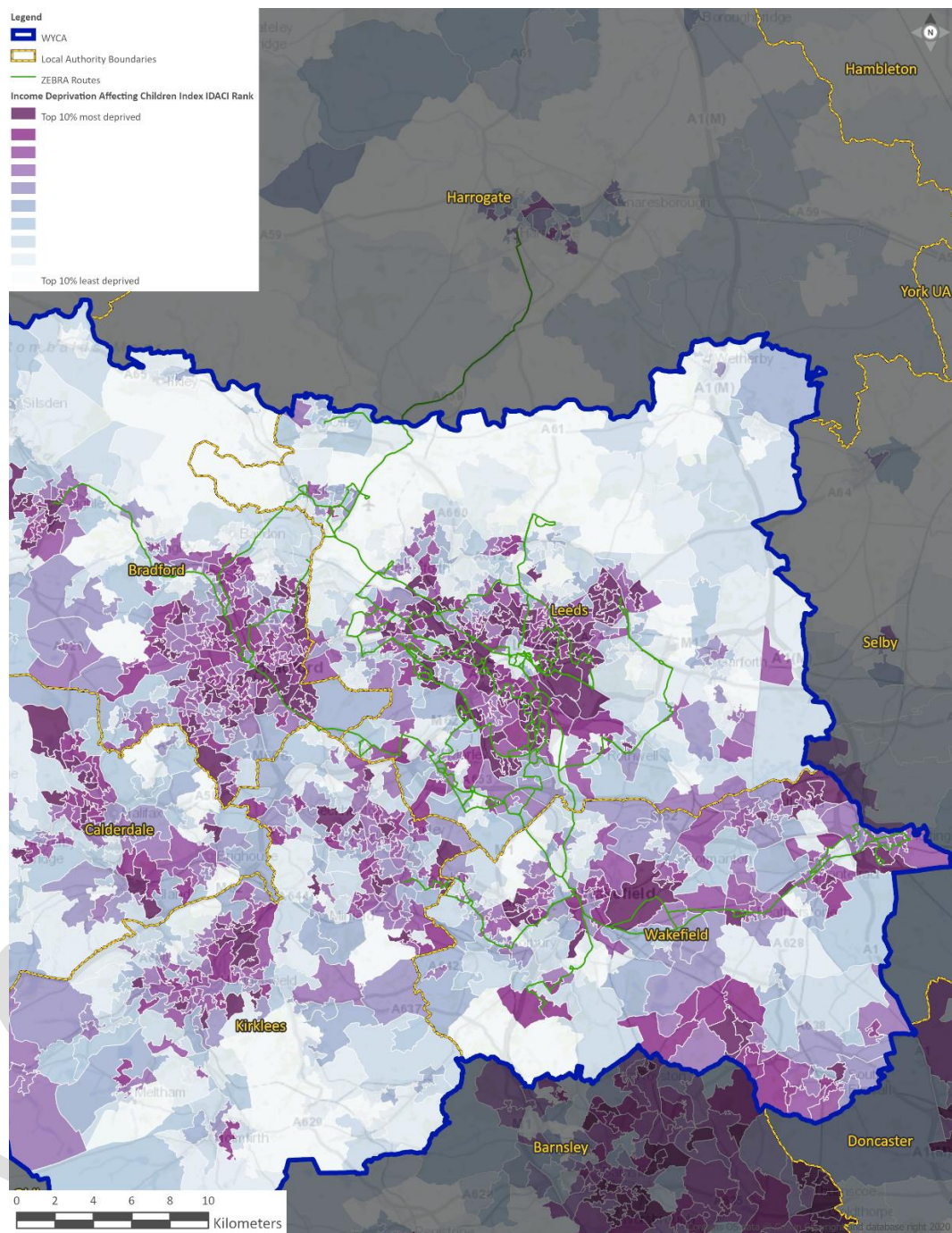


**Figure E1: Map of ZEBRA routes and MSOA by loHD decile**

- 5.8.3.2. The map shows a similar pattern of health deprivation to the IMD indicating that air quality impacts of the ZEBRA services will be skewed towards the lower loHD deciles.
- 5.8.3.3. Two other key populations who are especially vulnerable to poor air quality are children and the elderly. As with the wider population those



groups are especially vulnerable when connected to the effects of deprivation. The maps below show the ranking of MSOAs for the specific deprivation indices for the two groups in relation to the ZEBRA routes.



West Yorkshire ZEBRA Bid

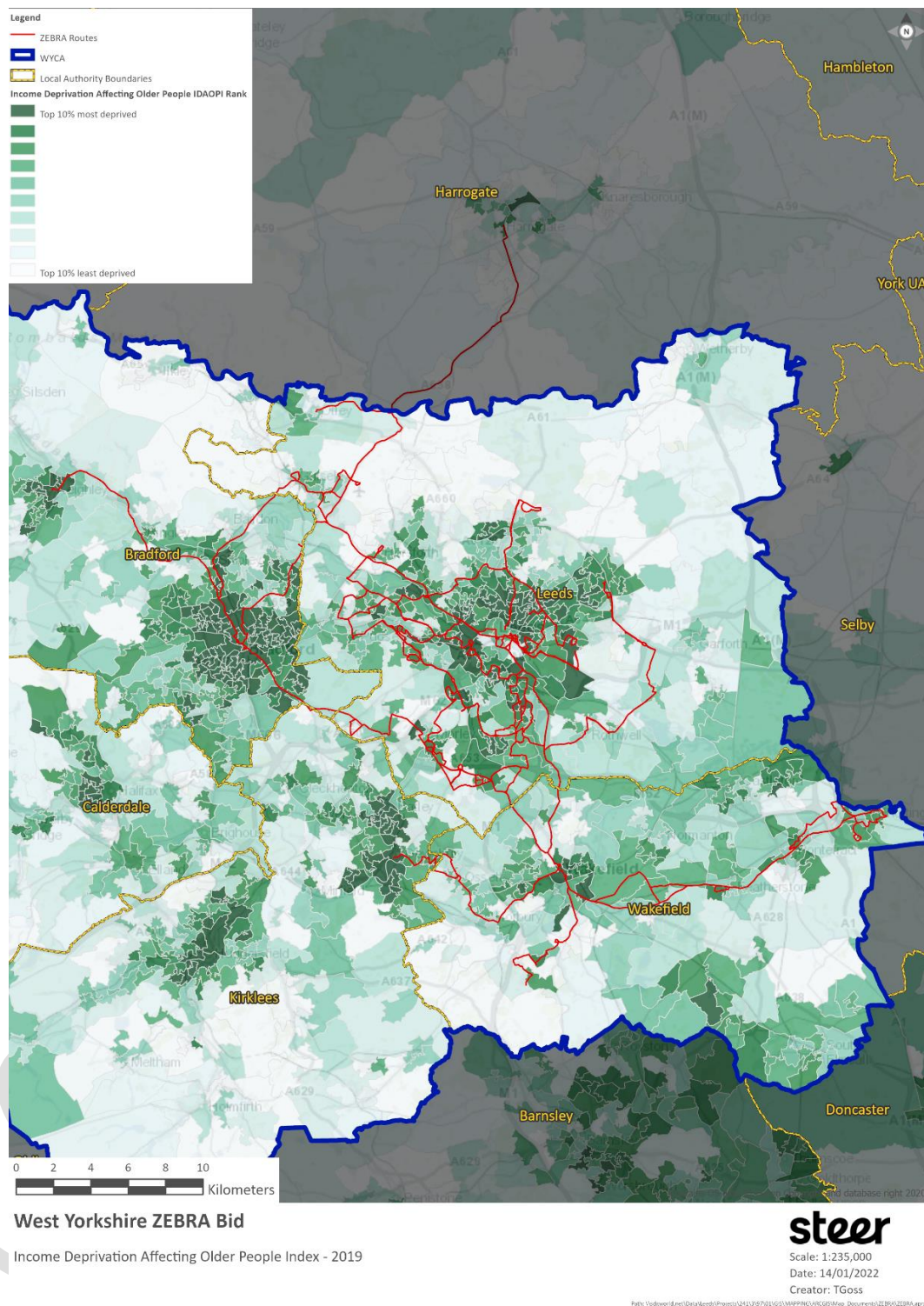
Income Deprivation Affecting Children Index - 2019

**steer**

Scale: 1:235,000  
Date: 14/01/2022  
Creator: TGoss

Path: \\odpserver\drive\Documents\Projects\2411\9701\GIS\Map\Map\Documents\ZEBRA\ZEBRA.aprx

**Figure E2: Map of ZEBRA routes and MSOA by IDACI (Income Deprivation Affecting Children Index) decile**

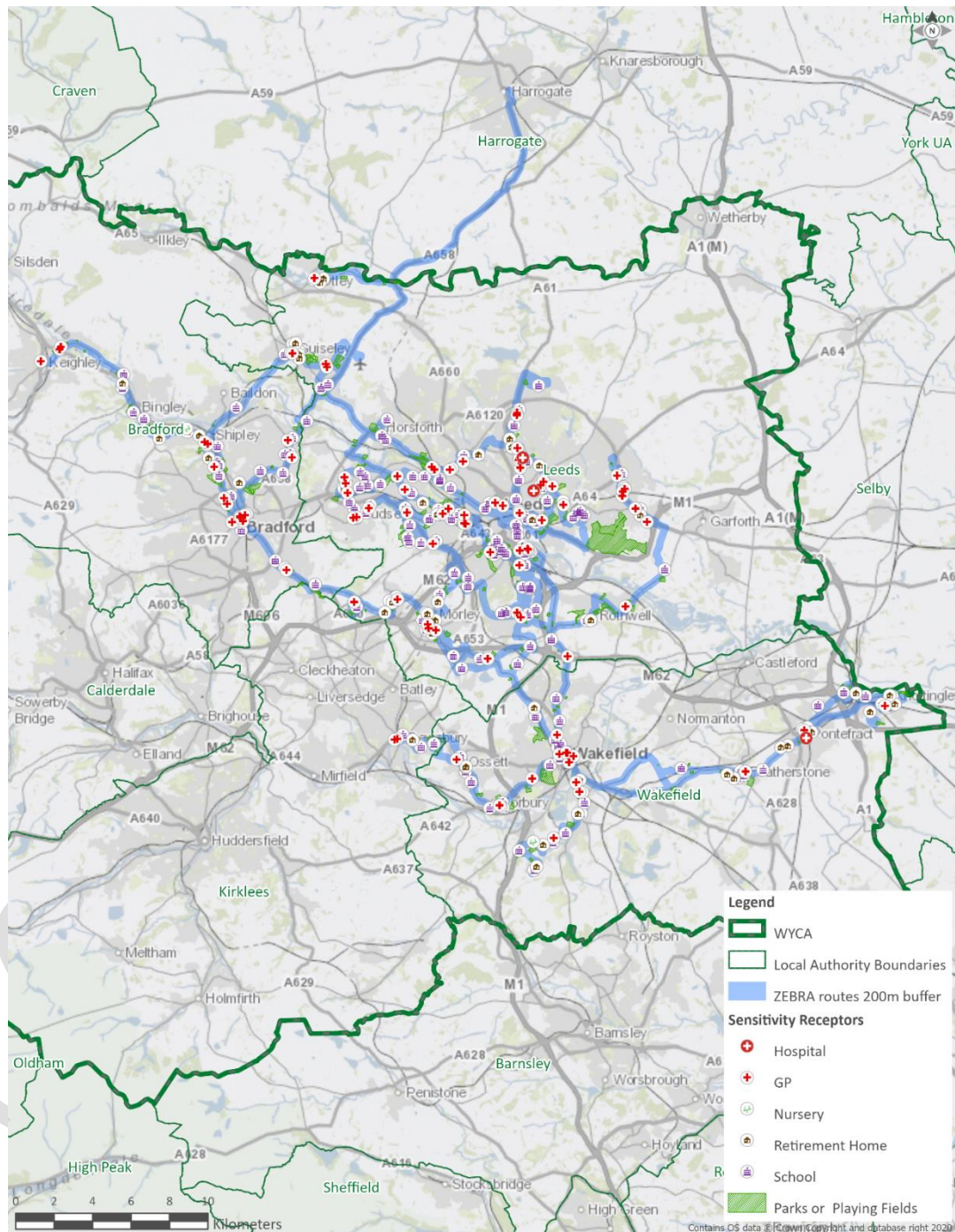


**Figure E3: Map of ZEBRA routes and MSOA by IDAOPPI (Income Deprivation Affecting Old People Index) decile**

- 5.8.3.4. As with the broad IMD, the ZEBRA routes pass through many of the deprived areas in the region.
- 5.8.3.5. The three groups with elevated sensitivity to air quality are the primary users of facilities, such as schools, health care services and retirement home, which are often located next to major roads and transport links,



facilitating access. The use of these facilities may therefore increase these groups exposure to poor air quality. The map below shows locations of these facilities adjacent (within 200 m) to the ZEBRA routes in West Yorkshire.



**Figure E4: Map of Health, Educational, Recreational and Retirement Facilities within 200m of ZEBRA bus routes**

- 5.8.3.6. The proportion of the total facilities within the West Yorkshire area within 200 m of a ZEBRA route is detailed in the table below.

Type	Total Facilities in WYCA	% of within 200m of ZEBRA routes
Retirement Facility	288	20.8%
Hospital	16	18.8%
GP	331	27.8% <sup>2</sup>
Schools / Nurseries	1,012	16.4%
Retirement Facility	2,346	15.3%

**Table E16: Proportion of total facilities within 200m of ZEBRA routes**

- 5.8.3.7. The ZEBRA routes chosen, impact a great proportion of these facilities than might be suggest by their share of the total bus network kilometres 12%.
- 5.8.3.8. The analysis of the distributional impacts of the proposed ZEBRA services clearly shows that that is a positive distribution towards populations who are more vulnerable to the impacts of poor air quality. This positive distribution suggests that the value of air quality benefits should be higher than captured by the GBT as the cost associated with emission is based on the typical demographic split of the population. As vulnerable populations are impacted to a greater degree the associated benefits of pollution abatement will be higher.

## 5.9. Summary - Value for Money

### 5.9.1. Overview

- 5.9.1.1. The Value for Money Framework<sup>23</sup> describes value for money as “using public resources in a way that creates and maximises public value”. The economic case appraises the economic, social and environmental impacts, including monetised and non-monetised costs and benefits.

#### **Benefit Cost Ratio (BCR)**

- 5.9.1.2. The BCR provides the relation between costs and benefits by using the present value of benefits and pres

#### **Net Present Value (NPV)**

<sup>23</sup> Department for Transport, Value for Money Framework – Moving Britain Ahead, 2015

- 5.9.1.3. The NPV measures the total impact on value, given by the monetised present benefits and costs:  $NPV = \text{Present Value of Benefits} - \text{Present Value of Costs}$

5.9.2. Value for Money Statement

VfM Category	Implied by
Very High	BCR greater than or equal to 4
High	BCR between 2 and 4
Medium	BCR between 1.5 and 2
Low	BCR between 1 and 1.5
Poor	BCR between 0 and 1
Very Poor	BCR less than or equal to 0

**Table E17: VfM statement**

- 5.9.2.1. The benefits and cost monetised in the GBT and the resultant BCR are summarised below.

	Arriva	First	Transdev	Total
████████████████████	██████	██████	██████	██████
████████████████████	██████	██████	██████	██████
████████████████████	██████	██████	██████	██████
Initial Benefit Cost Ratio	██████	██████	██████	1.30

**Table E18: Initial benefit cost ratio**

- 5.9.2.2. The outputs of the GBT suggests the programme VfM is low. If the additional benefits (£1.15m PV) of non EuroVI bus being replaced directly and through cascading are included this increases the BCR slightly from 1.30 to 1.35 but does not change the value for money category. The non-monetised benefits and distributional impacts suggest the air quality benefits are undervalued by the GBT. However, the relative size of the air quality benefits would not move the VfM into the medium category.



## 5.10. Sensitivities

5.10.1. The GBT has been used to assess the sensitivities related to the programme. The key sensitivities assessed are:

- Variation in the average km covered by ZEBs (+/- 10%). The carbon and air quality benefits are directly related to the distance the vehicles travel and as a result materially affect the benefits of the programme if they change.
- BSOG rates for ZEBs returns to 6p per km. The analysis does not reflect the change in commercial position for operators.
- Change in the impact values for carbon, NO<sub>x</sub> and PMs. The value placed on these impacts is inherently uncertain. WebTAG provides high and low values for each these emissions to reflect the differing values placed on them.
- 10% increase in vehicle and infrastructure costs. Relative to the QRA, which estimated a maximum cost risk (at 95% certainty) of 5% of the total capital cost of the programme, this is a prudent assessment.
- Reduced vehicle life. There is uncertainty about the lifespan of the ZEBs being currently manufactured, including in terms of useful battery life. The core GBT assumption is 17 years but 15-year life has been tested as sensitivity.

5.10.2. The table below summarises the outputs of the sensitivity testing:

Scenario	PVB	PVC	NPV	BCR
Central Case	£29m	£23m	£7m	1.3
ZEB Mileage + 10%	£31m	£23m	£8m	1.4
ZEB Mileage - 10%	£24m	£23m	£1m	1.0
BSOG 6p	£17m	£10m	£7m	1.6
High Emission Values	£44m	£23m	£21m	1.9
Low Emission Values	£13m	£23m	£-10m	0.6
Cost Increases - (10%)	£26m	£24m	£1m	1.1
Reduced vehicle life	£25m	£22m	£2m	1.1

**Table E19: Sensitivity testing outputs**

- 5.10.3. The VfM category only moves to medium when the high emissions values for GHGs and pollutants are used. With the exception of the low emissions values, the sensitivity tests only move the BCR to slightly below 1, if the distributional impact and non-monetised benefits are considered it would be reasonable to suggest the BCR should remain just above one and therefore a low VfM.
- 5.10.4. The low emission values have a significant impact on the BCR. However, GHG emission values are currently under review and the expectation is that they will increase. As discussed, the value of air quality benefits is also unlikely to be near the low end of the range given they are occurring in areas with existing high concentrations of pollutants and disproportionately affect vulnerable people who will more significantly impacted.
- 5.10.5. Although the economic appraisal of the programme returns a low value for money, it does not fully capture the strengths of the strategic rational as discussed in the Strategic Case. Given this and that the base BCR is robustly above 1, it is reasonable to suggest that the programme at least returns **Medium** value for money.

## 6. Commercial Case

### 6.1. Introduction

6.1.1. The purpose of this Commercial Case is to propose at a high-level how the West Yorkshire Combined Authority (Combined Authority) and local bus operators plan to engage the market to deliver the buses and related infrastructure which are the subject of this full business case.

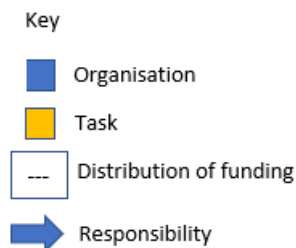
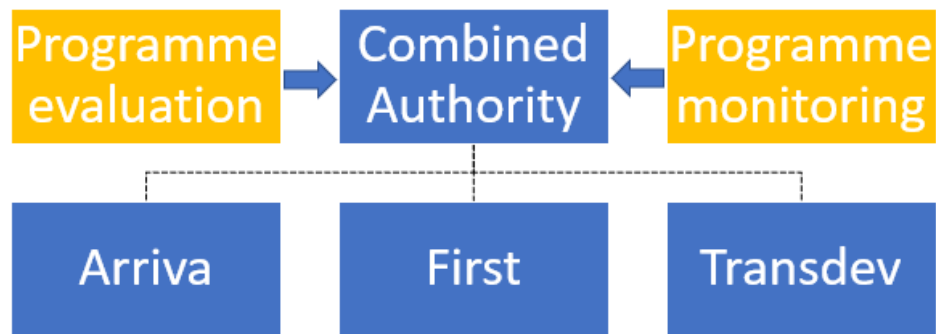
6.1.2. It is split into six sections:

- Commercial strategy
- Outline procurement strategy
- Market engagement
- Marketing strategy
- Procurement, subsidy control and Trade and Cooperation Agreement compliance
- Commercial case summary

6.1.3. The ZEBRA programme is made up of four separate projects, one each operated by the three major bus operators running services in West Yorkshire and the other on services tendered by the Combined Authority. The following sets out information relating to each of the four projects in terms of the six sections identified above.

### 6.2. Commercial Strategy

6.2.1. At a programme level the Combined Authority will provide oversight, evaluation and monitoring for the ZEBRA programme. It will also provide administration and distribution of grant funding to Arriva, First and Transdev for their procurement of required vehicles and associated infrastructure. This can be seen in the figure below.



**Figure C1 – Programme oversight flows**

- 6.2.2. The Combined Authority's Delivery Directorate will provide oversight for the programme to deliver ZEBs in West Yorkshire via a dedicated ZEBRA Programme Manager (see Management Case for further information). This post will be funded via the already secured TCF funding for a minimum of three years and if successful will include the ZEBRA programme and £21m of funding allocated for ZEBs through the CRSTS in addition to the eight buses to be funded through TCF.
- 6.2.3. The Programme Manager will be responsible for monitoring the delivery of programme level outputs, outcomes, benefits and risks, administering grant funding to the bus operators, and reporting progress to the Department of Transport. In addition, the Programme Manager will work closely with the organisations delivering each project making up the ZEBRA programme.
- 6.2.4. This builds and uses the same governance structure (see management case) of the successful delivery of other government funded transport schemes which have been delivered through the Bus Alliance partnership. In partnership with the Bus Alliance, the Combined Authority has successfully delivered the Leeds Public Transport Infrastructure Programme, the Clean Bus Technology Fund (2018-2021) and Ultra-Low

Emission Bus Scheme (2020-2021). These projects ran in partnership with the Bus Alliance and have seen the delivery of over 470 retrofitted buses and the delivery of all electric buses at Stourton Park and Ride. In addition, the recently launched East Leeds Demand Responsive Transport network has seen the Combined Authority work with an operator to purchase and lease vehicles back.

- 6.2.5. Full details of the programme delivery teams for the Combined Authority and operators can be found in the Management Case.

### **Commercial Model**

- 6.2.6. The operator projects are being delivered directly by the three bus operators. Under this approach the Combined Authority will act as the intermediary for grant funding the operators to procure ZEBs and infrastructure. All procured ZEBs and infrastructure will become the property of the respective bus operators – Arriva, First and Transdev. As the ZEBs will not enter service on new routes they will replace diesel equivalents operating on existing routes. Where these vehicles are not end of life, they will be cascaded down through operators existing services both within West Yorkshire and further afield. The effect of this is to eventually remove, through the cascade effect, the older, most polluting buses from the operators' services at a company level.
- 6.2.7. Engagement with operators through our ongoing partnership in the bus alliance prior to our EOI quickly highlighted a strong preference for a model whereby full ownership of the ZEB's was to be granted to each operator. This model fits into operators existing operational structures, thereby allowing for a greater amount of match funding.
- 6.2.8. We have recent project experience of this model through the electric bus element of the Stourton Park and Ride scheme delivered in partnership with First Bus and Leeds City Council. This scheme proves the deliverability of this model and shows how it strengthens our partnership working going forwards.
- 6.2.9. Further details concerning market engagement to ensure best value for public money and how commercial relationships have developed through this programme can be found in the Market Engagement Strategy below.

### **Grant Drawdown**

- 6.2.10. To ensure the Combined Authority has up to date, accurate and consistent information that is saved in one secure place, the organisation implemented the Portfolio Information Management System (PIMS) in April 2018. This has made the monitoring and reporting more consistent and comprehensive. It has and will continue to help ensure that projects

are delivered successfully by providing accurate information to allow decision makers to make informed decisions. It brings consistency and rigour to the Combined Authority's programme and project management processes and, ultimately, ensures that programmes / projects deliver and benefits the people that live and work in our region.

- 6.2.11. PIMS will be used for the ZEBRA programme and will be used by the Zero Emission Bus Programme Manager to provide spend and programme forecasts and to make claims. The system will ensure that the Combined Authority has accurate, up to date and transparent information about how the programme and projects within it are progressing.
- 6.2.12. Financial risks are managed through the Combined Authority's Assurance Approvals Process and the Grant Funding Agreement put in place with the three bus operators. The programme costs outlined in this FBC will be agreed and integrated into the Grant Funding Agreement prior to delivery.
- 6.2.13. The Zero Emission Bus Programme Manager will oversee the disbursement of grant funding to operators. The conditions on which grant funding will be authorised, including required evidence of spend / orders, will be agreed with operators if the ZEBRA programme is successful and prior to project commencement.
- 6.2.14. The QRA will be managed as a programme level contingency and in consultation with operators 'Exceptional Circumstances' will be agreed where the Combined Authority may release this contingency if the agreed exception criteria are met, programme contingency is available and is approved by the Combined Authority. The process will be managed as change management through the Assurance Framework.
- 6.2.15. The Combined Authority will develop a Grant Funding Agreement covering the ZEBRA programme if successful. This will set out the terms and conditions on which the grant is being made to partners to ensure they implement appropriate monitoring arrangements and follow the Assurance Framework and the requirements of PIMS. This helps to ensure that the grant is used for the purpose for which it is awarded and that the projects delivers and benefits as per the business case.

### **6.3. Outline procurement strategy**

- 6.3.1. A single procurement strategy is not proposed for the three projects that make up the ZEBRA programme, therefore this section addresses the procurement routes that will be taken by each project in turn.
- 6.3.2. Each operator will be responsible for procurement of both buses and infrastructure within their project. This is due to previous success of this

and the expert knowledge they have within their internal teams for procuring buses and infrastructure.

6.3.3. The key procurement timeline and output milestones can be seen in the table below. Further information on milestones can be seen within the programme plan in the Management Case which gives operator specific deadlines.

6.3.4. Note the broad timeframes seen in Table C1 reflect the differences in projects across the three operators, with some operators seeing a greater lead in time than others for specific reasons.

Procurement stage	Procurement description	Start	Finish
1	Internal approval of Full Business Case	██████ ██████	██████████
2	Confirmation of ZEBRA funding	██████ ██████	██████████
3	Confirmation of infrastructure specification	██████████ ██████	██████████
4	Infrastructure procurement	██████████ ██████	██████████
5	Electricity order placed	██████████	██████████
6	Confirmation of vehicle specification	██████████	██████████
7	Charging infrastructure order placed	██████████	██████████
8	Vehicle procurement	██████████	██████████
9	Vehicle order placed	██████████	██████████
10	Infrastructure and connections installation complete	██████████ ██████	██████████
11	Vehicle delivery	██████████	██████████

**Table C1 – Procurement timeline**



Arriva

- 6.3.5. The procurement strategy that will be pursued by Arriva will be in line with the Arriva UK Bus Procurement Policy (please see Appendix E). It sets out the standardised, division-wide, controlled procurement policy which is applied to the sourcing of all direct and indirect goods and services over £75,000.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

First

- 6.3.9. The procurement strategy that will be pursued by First Bus will be in line with the First Group Procurement Policy (UK). It sets out the policy that should be applied for all procurement activity undertaken by First Group.

[REDACTED]

[REDACTED]

[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]

[REDACTED]  
[REDACTED]  
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[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]

[REDACTED]  
[REDACTED]

#### Transdev

[REDACTED] Transdev have engaged with three organisations to design the installation based on International experience of the group. [REDACTED]  
[REDACTED]  
[REDACTED]

6.3.15. [REDACTED]  
[REDACTED]  
[REDACTED] A letter of support can be found in Appendix C which was provided for the submission of the Expression of Interest in July 2021. This confirms the commitment from [REDACTED] in supporting the ZEBRA project to continue Transdev's aspirations for zero emission buses in the region.

- 6.3.16. On receipt of funding Transdev would issue an ITT for buses. Transdev have engaged with a variety of electric bus suppliers thus far with their preferred supplier for this project being [REDACTED]. The full procurement following funding allocation will allow the evaluation of the latest models of buses onto the market and ensure that best value for money is sought.
- 6.3.17. The full procurement process will follow the steps set out in the market engagement section, these being:
- Needs assessment (ongoing)
  - Initial engagement and shortlisting
  - Invitation to tender and confirmation of requirements
  - Appoint preferred supplier – negotiations and contract award

## 6.4. Market Engagement

- 6.4.1. Operators proposing projects have detailed the engagement they have taken part in, with letters of support and evidence included as Appendix C. Further details on engagement for specific projects is below.

### Arriva

- 6.4.2. Arriva maintain regular dialogue with the major vehicle manufacturers and have existing relationships with depot infrastructure suppliers from projects elsewhere in the UK.
- 6.4.3. They have ongoing and continuous procurement engagement with all of the UK bus manufacturers, as they operate more than 5000 buses in the UK and more than 14,000 buses across the whole of Europe. [REDACTED]  
[REDACTED]  
[REDACTED] charging infrastructure over the next five years, as well as established ongoing relationships from the rollout and continuing support of electric vehicles and charging at two London sites and one Liverpool site to date. Arriva have regular reviews with strategic suppliers and continuing engagement with smaller suppliers and new entrants to ensure they maintain a portfolio of contacts to give best value across the wider fleet.
- 6.4.4. The current electric vehicle sites that Arriva operate out of use different infrastructure suppliers to maintain diversity across the market. Their procurement work with other electric vehicle projects have helped to populate a 'total cost of ownership' model, combining with experience across Europe to ensure that battery vehicles can complete the required daily mileages, both 'as new' and within the anticipated battery ageing parameters. Arriva's experience is helping to validate and adjust these expectations, reducing the delivery risk for these fleets throughout their

operational lives. An exciting opportunity sits within Arriva's telematics tendering, where they will be able to use live operational data from vehicles to diagnose issues and optimise use of the vehicles; this work is emerging from a separate workstream.

First

Vehicle manufacturers

6.4.6. First engage with vehicle manufacturers in two main ways:

6.4.7.

- Quick quote: price and delivery schedule with a volume of vehicle to a standard specification
- Full tender: where First have a requirement that is for a product they haven't bought before or need a standard product that includes bespoke items, a full tender is required.

6.4.8. First have supported the EOI with an [REDACTED] vehicle after a market engagement exercise was undertaken. [REDACTED]

[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

6.4.10.

[REDACTED]  
[REDACTED]  
[REDACTED]:

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

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[REDACTED]

[REDACTED]

[REDACTED]

Civils contractor

6.4.18.

[REDACTED]

## Transdev

- 6.4.19. Transdev have engaged with three organisations to design the installation based on International experience of the group. The outcome of this engagement was selecting [REDACTED] to partner with and help deliver their ZEBRA project.
- 6.4.20. [REDACTED] was selected due to their experience in the UK market and will be appointed to oversee all aspects of the design and installation of the infrastructure. A letter of support can be found in Appendix C which was provided for the submission of the Expression of Interest in July 2021. This confirms the commitment from [REDACTED] in supporting the ZEBRA bid to continue Transdev's aspirations for zero emission buses in the region.
- 6.4.21. Transdev engaged locally and internationally as a group with several manufacturers who each provided a vehicle for evaluation. These manufacturers [REDACTED]. From this process two suppliers have short listed to progress to a final choice ahead of the final programme submission. These are [REDACTED]. Both [REDACTED] have provided vehicles for evaluation in service and are engaging in modelling.
- 6.4.22. Transdev also plan future engagement with local brands including key shopping and leisure destinations, major employers, schools & colleges and other interested parties that will help drive further customers to buses. Transdev's successful CommuterClub programme has been instrumental in creating customer growth from large employers such as the NHS and we are keen to replicate this elsewhere.

## 6.5. Specification

### Key assumptions

- 6.5.1. A summary of the key information on specification is shown in the table below.



Operator	Bus Model	Battery capacity	Battery warranty	Price inclusive of battery replacement	Infrastructure
Arriva	[REDACTED] [REDACTED] [REDACTED]	[REDACTED]	[REDACTED]  [REDACTED] [REDACTED] [REDACTED] [REDACTED]	[REDACTED]	[REDACTED]
First	[REDACTED]	[REDACTED] [REDACTED] [REDACTED] [REDACTED]	[REDACTED]	[REDACTED]	[REDACTED] [REDACTED]
Transdev	[REDACTED] [REDACTED] [REDACTED]	[REDACTED]	[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]	[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]	[REDACTED] [REDACTED] [REDACTED]

**Table C2 – Key assumptions**

6.5.2. The below section discusses the bus specification, charging infrastructure and bus features in more detail for each operator.

Arriva

6.5.3. Arriva have engaged with [REDACTED] to produce estimates of the cost for the infrastructure element, however the final choice of supplier will be subject to a procurement exercise.

6.5.4. Arriva has engaged with several potential suppliers of battery electric bus, including [REDACTED] during the ZEBRA process and this business case is modelled on [REDACTED]. The bus manufacturer will be chosen based on a procurement exercise in early 2022. Any buses used will be go beyond being fully PSVAR compliant, with a full complement of on-board features which can be seen in Table C3 below. Further information

6.5.5. An example of a similar vehicle can be seen in the figure below, illustrating the quality of buses to be procured.

### Table C3 – Arriva bus specification

### Table C4 – Arriva bus features

### Table C5 – Arriva infrastructure



[Redacted]

First

- 6.5.6. First have indicated a preference to work with the ZEB supplier [Redacted] procure 32 single deck BEBs. [Redacted]

[Redacted]

[Redacted]

[Redacted] As such the project has been based on this vehicle, whilst also maintaining ongoing market assessment and financial modelling to ensure the project will also suit an alternative manufacturers electric product.

- 6.5.7. [Redacted]  
[Redacted]. Any buses used will be go beyond being fully PSVAR compliant, with a full complement of on-board features which can be seen in Table C6 below. The vehicles will have a full complement of focused measures including a flat floor and step free access to all seats. Further detail on Equality and diversity will be included in the Equality Impact Assessment. The information on specification known at this stage is included in the tables below and an example image of the bus in Figure C1.

- 6.5.8. First have estimated the costs of charging infrastructure through market engagement, [Redacted] [Redacted]

[Redacted] [Redacted] [Redacted]

[REDACTED]

6.5.9. Mobile chargers were added into the infrastructure works as a lesson learned response to existing First Bus infrastructure deployments. The ability to include the flexibility of mobile chargers which have the potential to be used both within, and external to First Bus depots provides greater operational security. They can be deployed in the instance of a fixed charger being taken out of action or a vehicle needing to park in an alternate location, reducing the operational impact to service by ensuring charge. The mobile chargers can also be carried in a van allowing charge to be taken to a vehicle roadside if required.

6.5.10. [REDACTED]

Element	Total cost	New bus type	Model	Battery capacity (kWh)	Range (km)	Yearly km	Life expectancy	Age of existing buses
ZEBs	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
		[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]		[REDACTED]
		[REDACTED]		[REDACTED]	[REDACTED]			[REDACTED]
				[REDACTED]	[REDACTED]			[REDACTED]
				[REDACTED]	[REDACTED]			[REDACTED]
				[REDACTED]	[REDACTED]			[REDACTED]
				[REDACTED]	[REDACTED]			[REDACTED]
				[REDACTED]	[REDACTED]			[REDACTED]

**Table C6 – First bus specification**

Element	AV information	Wifi	Charging	Audio-visual announcements	Real-time stop information	Hearing induction loops	Wheelchair space
Bus features	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

**Table C7 – First bus features**

Element	Charging infrastructure cost	Charging method	Cost of Opp charging	Maintenance (annual £)	Charger model	Charger supplier
Infrastructure						

**Table C8 – First infrastructure**



Transdev

- 6.5.11. Transdev have indicated a preference for 32 single deck ZEBs provided by [REDACTED] however this is subject to a procurement exercise and may change. These will be replacing existing buses in two phases; a first phase replacing 15 buses that are approaching the end of their lifetime, and a second phase replacing 17 EUROVI buses, which will be cascaded elsewhere to replace older and higher emitting buses. The first phase of 15 buses will utilise depot charging only, whereas some opportunity charging will be used for the second phase of 17 buses.

[REDACTED]

[REDACTED]

As with the vehicle element, this is subject to a procurement exercise and could change. Details of the specification are given in the tables below.

- 6.5.12. Details of the on board facilities for the preferred buses are given in the third table, showing alignment with PSVAR standards – further information on equality and considerations of protected characteristics is given in the Equality Impact Assessment.

Element	Total cost	New bus type	Model	Battery capacity (kWh)	Worst case energy efficiency (kWh/km)	Yearly km	Life expectancy	Age of existing buses
ZEBs								

**Table C9 – Transdev bus specification**

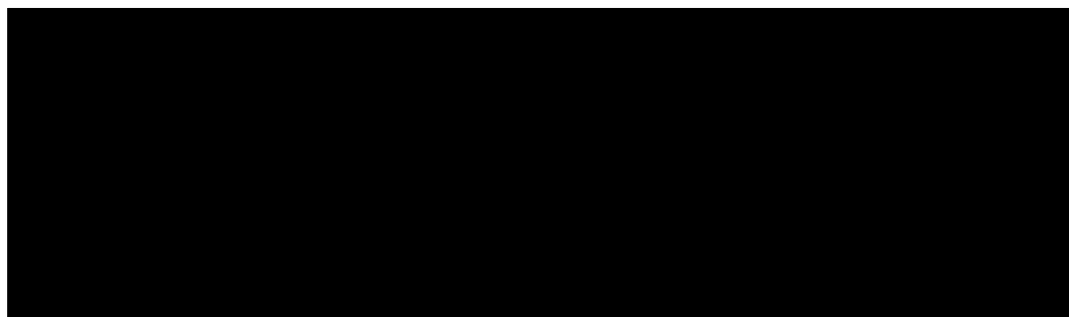
Element	AV information	Wifi	Charging	Audio-visual announcements	Real-time stop information	Hearing induction loops	Wheelchair space
Bus features							

**Table C10 – Transdev bus features**

Element	<u>Charging infrastructure</u>	Total cost	Charging method	Maintenance (% of capex)	Charger model	Charger supplier
Infrastructure Keighley						
Infrastructure LBA						

--	--	--	--	--	--

**Table C11 – Transdev infrastructure**



**Figure C4 – Example Transdev bus**

## 6.6. Marketing Strategy

- 6.6.1. The ZEBRA programme presents a step change in the provision of zero emission vehicles in West Yorkshire and it is important that a strong marketing and communications plan is developed. The launch of all-electric buses provides a significant opportunity for the Combined Authority to show and demonstrate how new technologies can be used to deliver public transport.
- 6.6.2. The marketing and communications strategy for the roll out of electric buses will see an overarching West Yorkshire campaign being undertaken through the Bus Alliance, with operator specific campaigns for the specific routes the routes that operators are covering. This reflects the different procurement timescales involved in the programme with some operators launching before others.
- 6.6.3. It has been discussed through operator colleagues that a common branded icon could be used on all buses introduced through the ZEBRA programme, whilst the strong route specific branding remains. This would signify the importance of the West Yorkshire Bus Alliance whilst retaining a recognised customer offer. An example of this is included in Figure M13 within the Management Case.
- 6.6.4. As a Combined Authority and with our partners, we will build on the experience we have in delivering programmes such as Connecting Leeds and East Leeds DRT where we have successfully engaged with and launched new transport services.
- 6.6.5. More detail on our stakeholder and communications plan can be found in the Management Case.

### Arriva

- 6.6.6. These vehicles will generate growth and modal shift as part of Arriva's investment in the fleet; they'll maximise this and generate considerable local attention through an integrated marketing campaign to promote the features and benefits of this new fleet, building on the success of Arriva's work under the Sapphire brand for route 110 which is already delivering in Wakefield.
- 6.6.7. Arriva are owner-operators of Wakefield bus station and they would use this highly visible location to launch the fleet, with some high impact photography for marketing activities before and during operation, demonstrating the volume and geographical reach of the investment in the area. Arriva have strong links with many local businesses including through Wakefield BID, and they would invite these to our launch event, looking for promotional cooperation with these partners. For example, Arriva have meaningful connections with CAPA College who could put on some impactful stage entertainment for us, and they sponsor Rhubarb Radio (a Wakefield based radio station) and would tie in with them for the launch and wider publicity around the launch.
- 6.6.8. These vehicles will be launched with a splash and continuously promoted throughout their lives, growing our patronage and addressing congestion and local air quality issues at source through successful modal shift.

### First

- 6.6.9. The deployment of new vehicles is often cause for notable marketing activity and all of First Bus's electric deployments to date have been accompanied by additional marketing especially highlighting the environmental benefits of the new vehicles and of making the transition from private car into a low carbon public transport network. First would work collaboratively with all partners in this ZEBRA programme.
- 6.6.10. This would build on the work and branding already carried out when electric buses have been introduced into Leeds by First including the number 5 fully electric service and the Stourton Park & Ride service.

### Transdev

- 6.6.11. Transdev have a strong track record in marketing brands and would underpin this project with an extensive campaign. This would include door to door mailings, free taster tickets and distinctive branding – as well as a strong digital presence on social media, YouTube, and using the existing and the already popular TransdevGo app, and [keighleybus.co.uk](http://keighleybus.co.uk) and [flyerbuses.co.uk](http://flyerbuses.co.uk) websites.



- 6.6.12. The buses themselves will be a key selling point, with space used to promote the bus as a product. Transdev see a great opportunity to blend local bus messaging alongside that of great local brands and destinations – truly emphasising the bus as the local's choice and give further ownership towards the local community. This can be included within the livery, mega rears and as part of the bus interior messages.

## **6.7. Commercial Risk**

- 6.7.1. A number of commercial risks are discussed throughout this document including within the Economic Case (Quantified Risk Assessment), Financial Case (key financial risks) and Management Case (Monitoring and Evaluation).
- 6.7.2. All the programme risks are compiled in the ZEBRA risk register which forms Appendix F of this document. This allocates risks to a designated risk owner – this being the Director of Transport and Property Services for risks overseen by the Combined Authority, and at operator project level, the Programme Manager for Arriva, First and Transdev.
- 6.7.3. It should be noted that any financial implications, such as increases in infrastructure or bus costs will be met by the operator.
- 6.7.4. Further details around risk management can be found in the Management Case, Risk Management Strategy and Appendix F.

## **6.8. Conclusion**

- 6.8.1. The Combined Authority will provide oversight, evaluation and monitoring for the ZEBRA programme. It will also provide administration and distribution of grant funding to Arriva, First and Transdev for their procurement of required vehicles and associated infrastructure.
- 6.8.2. Procurement strategies for each operator have been appended to this document which shows the detail relating to the procurement approach from each operator. A procurement timeline accompanies this outlining key milestones throughout the delivery of the ZEBRA programme.
- 6.8.3. Market engagement has been demonstrated to demonstrate the discussions that operators have had in regards to vehicle, infrastructure and civil engineering work, providing evidence to why the preferred solution best fits the criteria for the ZEBRA programme.
- 6.8.4. Specifications for each operator in regard to vehicles and infrastructure is discussed, showing the deliverables which would be funded if this programme is successful.
- 6.8.5. An overall Marketing Strategy is discussed, demonstrating the importance to West Yorkshire bus operators of delivering zero-emission buses at

scale. It is noted from all operators that the introduction of these buses would mark a milestone, which is further reflected in the Communications and Stakeholder Plan in the Management Case.

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## 7. Financial Case

### 7.1. Overview

7.1.1. The purpose of this Financial Case is to demonstrate the affordability and long-term sustainability of West Yorkshire's ZEBRA programme alongside securing the support of stakeholders and customers.

7.1.2. This Financial Case is broken down into four sections and is framed around the three projects that make up West Yorkshire's ZEBRA programme:

- **Programme Summary:** summarising the financial costs, including changes in costs that have come to light since the submission of the EOI.
- **Funding Profile:** providing detailed information on financial costs, including whole life costs.
- **Long-Term Financial Viability:** providing detailed information on the long-term commitment of the Combined Authority and operators to deliver the outcomes of the ZEBRA programme.
- **Risk Management Strategy:** summarising the financial risks and mitigation / contingency arrangements.

### 7.2. Programme Summary

7.2.1. The total value of the ZEBRA programme is £56,161,738 of which £53,573,746 relates to the ZEBs and associated infrastructure and £2,587,992 is a QRA derived contingency across all three projects.

7.2.2. Of the total value, £24,565,171 is requested from DfT through the ZEBRA grant with the remaining £31,596,567 provided by the private sector bus operators partnering the Combined Authority on this programme.

7.2.3. In terms of the split of capital funding allocated to ZEBs and infrastructure, £46,643,612 is allocated for the purchase of 111 ZEBs with £6,930,134 related to the installation of charging equipment and associated works at four depots.

7.2.4. For the ZEBs the funding ask of DfT through ZEBRA is £17,426,577 with the remaining £29,217,035 being funded by the private sector bus operators. For the infrastructure the bus operators will contribute £1,732,533 with the remaining £5,197,601 provided by the ZEBRA grant.

7.2.5.

[REDACTED]

7.2.6. [REDACTED]

7.2.7. [REDACTED]

7.2.8. [REDACTED]

7.2.9. As would be expected of a programme of this value there are several financial risks that will need to be monitored as part of programme delivery. These range from bus operators having less resources to invest in vehicles / infrastructure as a result of the pandemic , through to changes in costs associated with ZEBs / infrastructure and higher than expected inflation or exchange rates. To reflect these risks a programme level QRA of £2,587,992 has been allocated to the programme, of which £1,940,994 is an ask on the ZEBRA grant with the remaining £646,998 covered by the private sector bus operators.

7.2.10. All parties to this ZEBRA programme have a long-term commitment to the delivery of ZEBs in West Yorkshire through the West Yorkshire Bus Alliance's (of which all parties are members) ambition for a zero emission bus fleet by 2036. [REDACTED]

[REDACTED]

[REDACTED]

- [REDACTED]
- [REDACTED]
- 7.2.12. In terms of affordability an analysis has been carried out as part of this programme and has identified that the relative cost of ZEBs is currently less than the diesel equivalents (between £42,362 and £879,956 in 2023) and is expected to continue to decrease over the operating life of the vehicles (between £51,401 and £1,067,706 in 2040).

#### **Changes from the EOI**

- 7.2.13. Table F1 below illustrates the change in costs that have occurred since the EOI was submitted. It shows that the overall cost of the ZEBRA programme has reduced by £1,353,887.
- 7.2.14. This reduction can largely be attributed to the removal of the Combined Authority's element which, in consultation with DfT, has been removed as a result of not directly seeking funding from ZEBRA.
- 7.2.15. Due to the initial cost of ZEBs the largest reduction can be attributed to the removal of the 10 ZEBs that are to be purchased by the Combined Authority through its separate funding allocation in the TCF.
- 7.2.16. In terms of the costs associated with the projects being led by the three private sector operators partnering with the Combined Authority on this programme overall costs have risen by £58,121 excluding the QRA. An explanation of these increases in costs are documented below.
- 7.2.17. For the ZEBs covered by this programme overall costs have reduced compared to the EOI by £4,175,743. This is mainly as referenced above due to the removal of the 10 buses that would have been included in the Combined Authority's project. However, if the £3,200,000 that was allocated to the purchase of ZEBs by the Combined Authority is not considered the overall costs for ZEBs have reduced by £975,743 and reflect detailed discussions with bus manufacturers to refine the initial quotes provided in the EOI. It does not reflect a reduction in ZEBs by the operators.
- 7.2.18. The reduction in costs is also reflected in the total ZEBRA grant that is being requested for the purchase of ZEBs with £17,426,577 now being requested compared to £18,641,675 in the EOI. As the ZEBRA grant was never intended to contribute to the Combined Authority's 10 ZEBs this saving is purely in relation to the ZEBs to be purchased by operators.
- 7.2.19. While overall the ZEBRA programme has seen a decrease in costs, this has not been the case for the infrastructure element of the programme. A £234,134 increase over the EOI has been calculated for the infrastructure elements, however if the £800,000 allocated to infrastructure included in

the Combined Authority's project is factored in the increase is actually £1,034,134 for the projects being delivered by the three operators. The increase can be attributed to operators refining initial quotes with suppliers e.g. civils contractors, DNO, charging equipment suppliers.

	Total	2022	2023	2024
<b>ZEBs</b>				
<b>ZEBs in service</b>				
EOI	121	15	27	79
FBC	111	0	79	32
Change	-10	-15	52	-47
<b>Total cost</b>				
EOI	£ 50,819,355	£ 6,448,125	£ 10,507,875	£ 33,863,355
FBC	£ 46,643,612	£ 0	£ 33,063,612	£ 13,580,000
Change	-£ 4,175,743	-£ 6,448,125	£ 22,555,737	-£ 20,283,355
<b>ZEBRA grant</b>				
EOI	£ 18,641,675	£ 2,812,500	£ 3,187,500	£ 12,641,675
FBC	£ 17,426,577	£ 0	£ 12,392,577	£ 5,034,000
Change	-£ 1,215,098	-£ 2,812,500	£ 9,205,077	-£ 7,607,675
<b>Bus operators</b>				
EOI	£ 28,977,680	£ 3,635,625	£ 4,120,375	£ 21,221,680
FBC	£ 29,217,035	£ 0	£ 20,671,035	£ 8,546,000
Change	-£ 239,355	-£ 3,635,625	£ 16,551,000	-£ 12,675,680
<b>Infrastructure</b>				
<b>Total cost</b>				

	Total	2022	2023	2024
EOI	£ 6,696,000	£ 2,064,000	£ 4,632,000	£ 0
FBC	£ 6,930,134	£ 4,856,538	£ 2,073,596	£ 0
Change	£ 234,134	£ 2,792,538	-£ 2,558,404	£ 0
<b>ZEBRA grant</b>				
EOI	£ 4,422,250	£ 1,548,000	£ 2,874,250	£ 0
FBC	£ 5,197,600	£ 3,642,403	£ 1,555,197	£ 0
Change	£ 775,350	£ 2,094,403	-£ 1,319,053	£ 0
<b>Bus operators</b>				
EOI	£ 1,473,750	£ 516,000	£ 957,750	£ 0
FBC	£ 1,732,533	£ 1,214,134	£ 518,399	£ 0
Change	£ 258,783	£ 698,134	£ 439,351	£ 0
<b>QRA</b>				
<b>Total cost</b>				
EOI	£ 0	n/a	n/a	n/a
FBC	£ 2,587,992	n/a	n/a	n/a
Change	£ 2,587,992	n/a	n/a	n/a
<b>ZEBRA grant</b>				
EOI	£ 0	n/a	n/a	n/a
FBC	£ 1,940,994	n/a	n/a	n/a
Change	£ 1,940,994	n/a	n/a	n/a
<b>Bus operators</b>				

	Total	2022	2023	2024
EOI	£ 0	n/a	n/a	n/a
FBC	£ 646,998	n/a	n/a	n/a
Change	£ 646,998	n/a	n/a	n/a
<b>Total capital costs<sup>24</sup></b>				
<b>Total</b>				
EOI	£ 57,515,355	£ 8,512,125	£ 15,139,875	£ 33,863,355
FBC	£ 56,161,468	£ 4,856,538	£ 35,137,208	£ 13,580,000
Change	-£ 1,353,887	-£ 3,655,587	£ 19,997,333	-£ 20,283,355
<b>ZEBRA grant</b>				
EOI	£ 23,063,925	£ 4,360,500	£ 6,061,750	£ 12,641,675
FBC	£ 24,565,171	£ 3,642,403	£ 13,947,774	£ 5,034,000
Change	£ 1,501,246	-£ 718,097	£ 7,886,024	-£ 6,579,925
<b>Bus operators</b>				
EOI	£ 30,451,430	£ 4,151,625	£ 5,078,125	£ 21,221,680
FBC	£ 31,596,567	£ 1,214,134	£ 21,189,434	£ 8,546,000
Change	£ 1,145,137	-£ 2,937,491	£ 16,111,309	-£ 12,675,680

**Table F1. Cost change between EOI and FBC**

### 7.3. Funding Profile

- 7.3.1. West Yorkshire's ZEBRA programme consists of three separate projects across three operators. Each project differs in size and scope resulting in different cost profiles. The information contained in the following section sets out these costs.

<sup>24</sup> Please note the total column and yearly columns do not add up to the same amount reflecting that the QRA is not allocated to one particular year or operator.



7.3.2. Table F2 below summarises the capital costs across the life of the ZEBRA programme for the three operators. All costs exclude VAT. They have been determined as a result of robust conversations with manufacturers and suppliers and this ZEBRA programme is predicated on these costs with any cost overruns and in life operational costs covered by the private sector bus operators. No further funding will be sought from DfT for the ZEBRA programme.

7.3.3. It is proposed that the ZEBRA programme is funded through the ZEBRA grant and via contributions from the three bus operators who are direct recipients of the ZEBRA funding. Total funding allocated via each of these sources is also documented in Table F2. In terms of the source of funding for the private sector bus operators

[REDACTED]

	Total	2022	2023	2024
<b>ZEBs</b>				
<b>Total</b>	111	0	79	32
Arriva no.	47	0	27	20
Arriva type	Double-decker			
First no.	32	0	20	12
First type	Single-decker			
Transdev no.	32	0	32	0
Transdev type	Single-decker			
<b>Total</b>	£ 46,643,612	£ 0	£ 33,063,612	£ 13,580,000
Arriva	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
First	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Transdev	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

	Total	2022	2023	2024
<b>Grant</b>	£ 17,426,577	£ 0	£ 12,392,577	£ 5,034,000
Arriva				
First				
Transdev				
<b>Operators</b>	£ 29,217,035	£ 0	£ 20,671,035	£ 8,546,000
Arriva				
First				
Transdev				
<b>Infrastructure</b>				
<b>Total</b>	£ 6,930,134	£ 4,856,538	£ 2,073,596	£ 0
Arriva				
First				
Transdev				
<b>Grant</b>	£ 5,197,601	£ 3,642,403	£ 1,555,197	£ 0
Arriva				
First				
Transdev				
<b>Operators</b>	£ 1,732,533	£ 1,214,134	£ 518,399	£ 0
Arriva				
First				
Transdev				

	Total	2022	2023	2024
<b>Total programme costs</b>				
<b>Total</b>	£ 53,573,746	£ 4,856,538	£ 35,137,208	£ 13,580,000
Arriva				
First				
Transdev				
<b>Grant</b>	£ 22,624,177	£ 3,642,403	£ 13,947,774	£ 5,034,000
Arriva				
First				
Transdev				
<b>Operators</b>	£ 30,949,569	£ 1,214,134	£ 21,189,434	£ 8,546,000
Arriva				
First				
Transdev				

**Table F2. ZEBRA programme capital costs**

- 7.3.4. Table F3 below shows the profile of the proposed capital funding streams throughout the life of the ZEBRA programme and their contribution to overall costs by year. All costs exclude VAT. All costs other than the ZEBRA grant will be covered by the private sector bus operators.

	Total	2022	2023	2024
ZEBRA Programme	£ 53,573,746	£ 4,856,538	£ 35,137,208	£ 13,580,000
<b>ZEBRA grant</b>				
Cost	£ 22,624,177	£ 3,642,403	£ 13,947,774	£ 5,034,000
Contribution	42.2%	75.0%	39.7%	37.1%

	Total	2022	2023	2024
<b>Private sector (Bus Operators)</b>				
Cost	£ 30,949,569	£ 1,214,134	£ 21,189,434	£ 8,546,000
Contribution	57.8%	25.0%	60.3%	62.9%

**Table F3. ZEBRA programme capital funding streams**

7.3.5. Tables F4 to F6 below provide a breakdown of whole life costs for the ZEBRA programme by individual project.

<b>Arriva</b>			
Item	Number	Unit Cost	Total Cost
<b>Buses: double-deckers</b>			
Diesel (replacement)	47		
ZEB (new)	47		
Battery warranty costs	47		
<b>Infrastructure</b>			
Grid connection			
Charging equipment, installation, depot works			
Maintenance costs (over 17 years)			

**Table F4. Arriva whole life costs**

<b>First</b>			
Item	Number	Unit Cost	Total Cost
<b>Buses: single-decker</b>			
Diesel (replacement)	32		
ZEB (new)	32		

First			
Item	Number	Unit Cost	Total Cost
<b>Infrastructure</b>			
Grid connection			
Charging equipment capex			
Charging equipment opex (over 15 years)			
Depot infrastructure and works			
Contingency			
Design, planning, project management and technical consultants			

**Table F5. First whole life costs**

Transdev			
Item	Number	Unit Cost	Total Cost
<b>Buses</b> single-decker			
Diesel (replacement)	15		
ZEB (new)	15		
Battery management fee (over 17 years)			
<b>Buses</b> single-decker			
Diesel (replacement)	17		
ZEB (new)	17		
Battery management fee (over 17 years)			
<b>Infrastructure</b>			

Transdev			
Item	Number	Unit Cost	Total Cost
Grid connection			
Charging equipment capex			
Charging equipment opex (over 17 years) (both depots) (includes inflation using WebTAG GDP Deflator as per the Greener Bus Tool)			
Depot infrastructure and works			
Contingency			
Design, planning, project management and technical consultants			
<b>Infrastructure</b>			
Grid connection			
Charging equipment capex			
Charging equipment opportunity charging			
Depot infrastructure and works			
Contingency			
Design, planning, project management and technical consultants			

**Table F6. Transdev whole life costs**

- 7.3.6. The costings provided in the tables above have been provided to the Combined Authority by each individual operator. They have been informed by a variety of credible sources and/or industry knowledge. The sources of costing information are set out in Tables F7 to F9 below.

Arriva	
Category / Item	Source
<b>Vehicles</b>	
Total ZEBs	[REDACTED]
Diesel unit cost	[REDACTED]
ZEB unit cost	[REDACTED]
Battery warranty costs	[REDACTED]
<b>Infrastructure</b>	
Grid connection	Arriva (based on operator estimate from wider project experience as final decision on depot tbc) (2021/22 prices)
Charging equipment, installation, depot works	Arriva (based on operator estimate from wider project experience as final decision on depot tbc) (2021/22 prices)
Maintenance costs (over 17 years)	Arriva (based on operator estimate from wider project experience as final decision on depot tbc) (2021/22 prices)

**Table F7. Arriva costing information sources**

First	
Category / Item	Source
<b>Vehicles</b>	
Total ZEBs	First (based on 1 to 1 replacement of current fleet)
Diesel unit cost	[REDACTED]

First	
Category / Item	Source
ZEB unit cost	
<b>Infrastructure</b>	
Grid connection	
Charging equipment capex	
Charging equipment opex	
Depot infrastructure and works	

**Table F8. First costing information sources**

Transdev	
Category / Item	Source
<b>Vehicles</b>	
Total ZEBs	Transdev (based on 1 to 1 replacement of current fleet)
Diesel unit cost	
ZEB unit cost	
Battery management fee	
<b>Infrastructure</b>	
Grid connection	



Transdev	
Category / Item	Source
Charging equipment capex	
Charging equipment opex	
Depot infrastructure and works	

**Table F9. Transdev costing information sources**

- 7.3.7. Letters of support have been provided from the relevant stakeholders e.g. bus manufacturers, infrastructure providers, civils contractors, providing confirmation of the costs highlighted in this Financial Case. These letters of support are provided in Appendix C and also feature within our Management Case under Senior Level support.

## 7.4. Long-Term Financial Viability

### Affordability analysis

- 7.4.1. West Yorkshire's ZEBRA programme is being delivered across three individual projects by the partner operators Arriva, First and Transdev. All three are experienced commercial operators with a strong track record of running services across the UK. The services covered as part of this programme are all commercially run and on this basis, the operators will want to ensure these services continue to be commercially viable. This implies that the costs of running ZEBs should either be cheaper, once grant funding is factored in, or any increase in cost can be absorbed by the operator's profit margins<sup>25</sup>.
- 7.4.2. All three operators have confirmed that they believe their parts of the programme to be affordable for at least the five years they are expected to run the vehicles within West Yorkshire. Presented below is an independent affordability analysis for each operator.
- 7.4.3. The operators incur specific additional costs associated with vehicles and infrastructure in transitioning to a ZEB fleet. On an annual basis, this is the depreciation cost (less the ZEBRA grant) of the capital outlay by operators for purchasing ZEBs as well as the depreciation and maintenance costs of the supporting infrastructure. Whilst this represents a cost increase to operators this is offset by other changes to the cost base relative to diesel, namely:

<sup>25</sup> The bid is predicated on the total combined income from farebox revenue and operator subsidy being comparable to levels prior to the start of the COVID-19 pandemic.

- decrease in fuel costs;
- decrease in maintenance costs; and
- increase in BSOG on a per kilometre basis.

7.4.4. These various cost impacts have been considered for each operator and the cost assumptions and operator parameters are summarised in Tables F11 to F13 below. All other significant costs are assumed to be comparable for diesel buses and ZEBs.

Cost item	Arriva	First	Transdev	Notes
Diesel buses				
ZEBs				
Infrastructure				
Battery leasing				

Table F11. Operator specific costs for ZEBRA projects

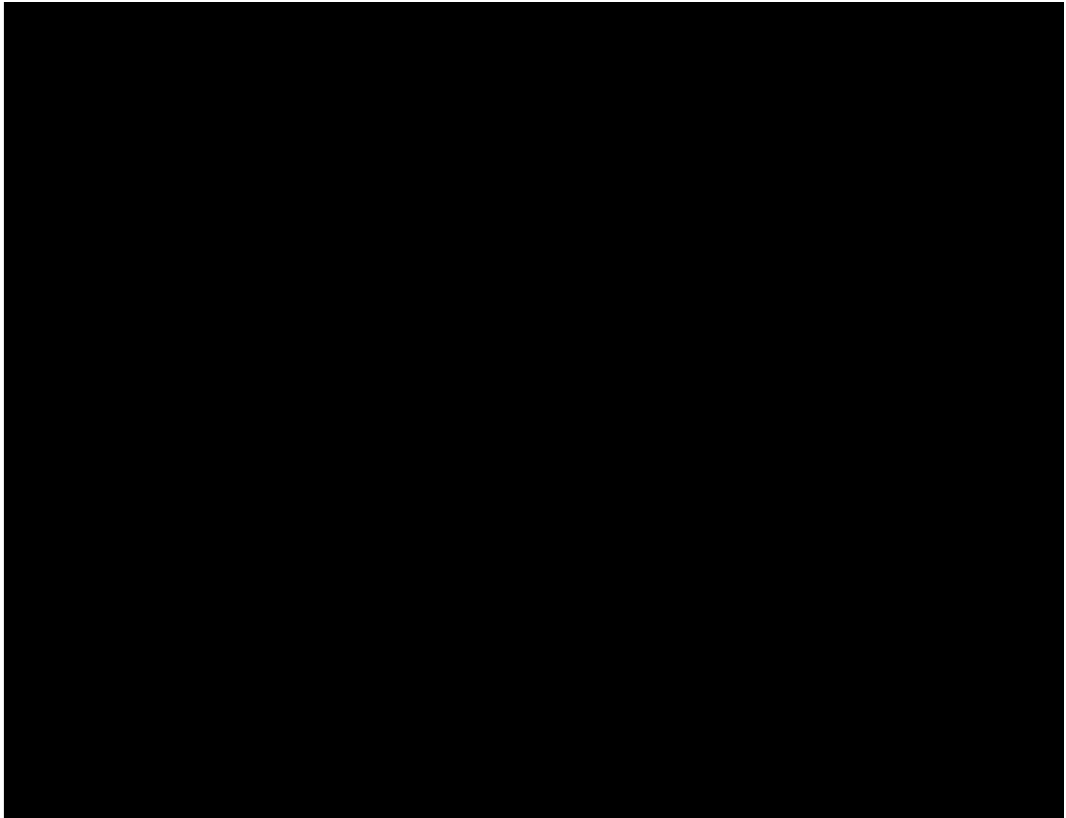
	Arriva	First	Transdev
Average operating km			
Vehicles			

Table F12. ZEBRA operator fleet size and average operating kms

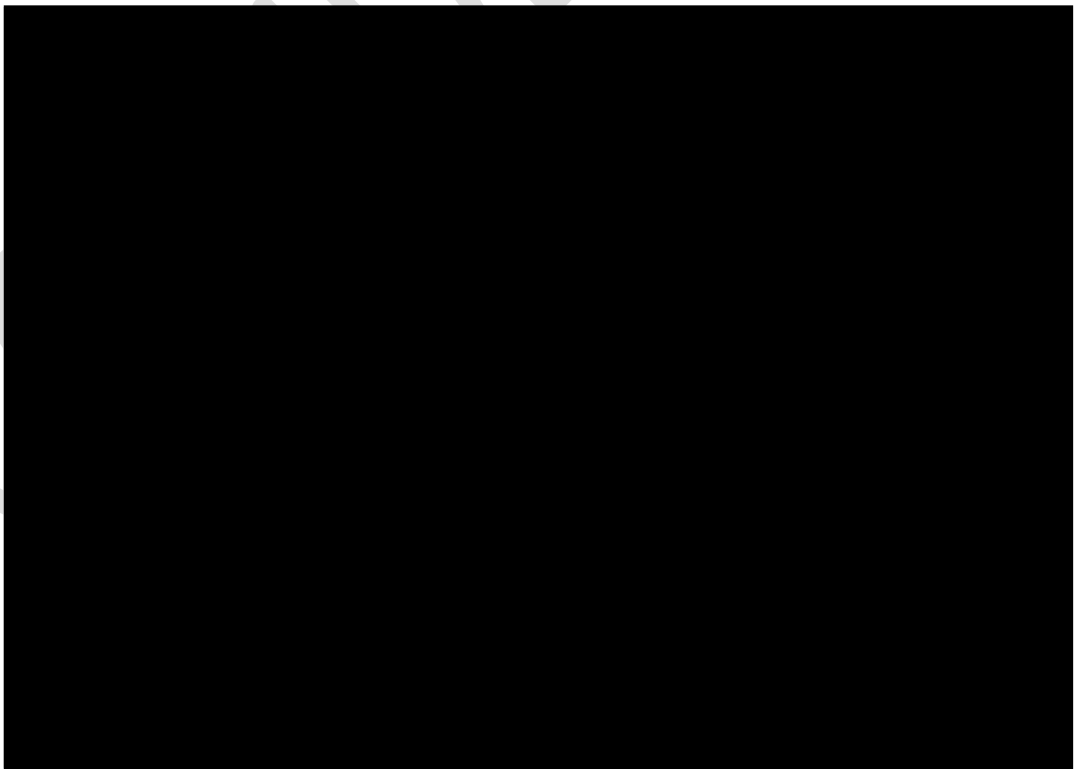
	Diesel bus	ZEB	Notes
Arriva fuel / energy costs (£/km) (2023)	████	████	████████████████████ ████████████████████ ████████████████
First fuel / energy costs (£/km) (2023)	████	████	████████████████████ ████
Transdev fuel / energy costs (£/km) (2023)	████	████	████████████████████ ████████████████████ ████████████████████ ████████████████
Arriva and Transdev maintenance costs (£/km) (2023)	████	████	████████████████ ████████████
First maintenance costs (£/km) (2023)	████	████	████████████████████ ████████████████████ ████████████
BSOG (£/km)	████	████	████████████████ ████████████████████ ████

**Table F13. Unit operating costs for diesel buses and ZEBs**

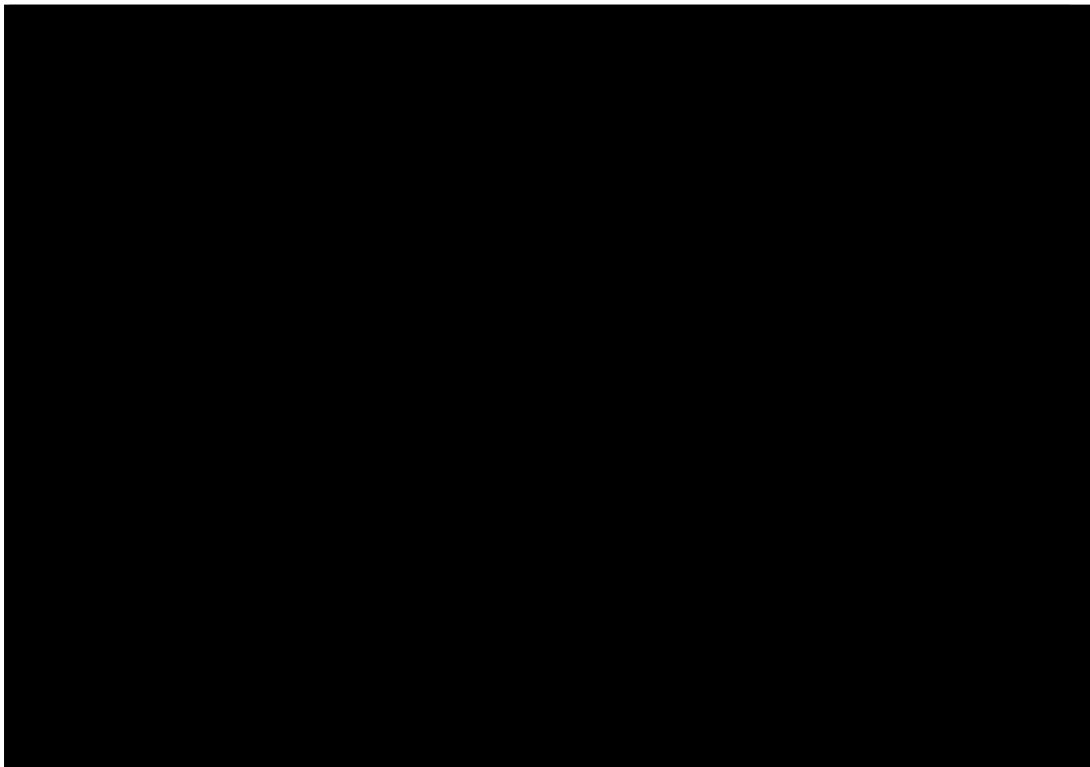
7.4.5. Figures F1 to F3 below show a comparison of the costs of the ZEB fleet compared to the diesel equivalent for each operator.



**Figure F1. Arriva cost comparison**



**Figure F2. First cost comparison**



**Figure F3. Transdev cost comparison**

7.4.6. For all three operators the net impact of these cost drivers represents a cost saving for operating ZEBs<sup>26</sup>. This is particularly pronounced for [REDACTED] as their actual diesel costs are significantly higher than the assumed TAG values along with slightly lower energy costs the cost is relatively higher due to the ongoing battery leasing costs. If [REDACTED] also have significantly higher fuel costs this would further increase the relative cost savings of ZEBs.

7.4.7. As shown in Table F14 below, based on project price inflation for electricity / diesel and bus maintenance, the relative cost of ZEBs are expected to continue to decrease over the operating life of the vehicles.

Operator	2023	2040
Arriva	[REDACTED]	[REDACTED]
First	[REDACTED]	[REDACTED]
Transdev	[REDACTED]	[REDACTED]

**Table F14. Diesel bus / ZEB cost difference per project**

<sup>26</sup> Cost less ZEBRA grant

### Contingency

- 7.4.8. Each of the three projects that make up the ZEBRA programme have undertaken rigorous costing work, including engagement and negotiation with suppliers and manufacturers, to inform this Financial Case. Each of the three private sector bus operators takes full responsibility for estimating and controlling project costs in their entirety. An additional level of monitoring and reporting will be undertaken by the Combined Authority's Zero Emission Bus Programme Manager to ensure project costs are being managed in line with the terms of the grant agreement.
- 7.4.9. However, to account for unknown costs that may arise prior to implementation, particularly with regard to infrastructure costs, a QRA amount of £2,587,992 is included in addition to the costings provided earlier in this Financial Case (for further details see the Risk Management Strategy section below).
- 7.4.10. Of the total QRA the ask of DfT is £1,940,994 with the remaining £646,998 provided by operators. This operator amount is in addition to contingencies already identified by [REDACTED]. The QRA will be held in reserve by the Combined Authority and will only be accessed by the operators on receipt of suitable evidence to demonstrate an overspend that was not accounted for. Where an operator wishes to access the QRA funds this will be in compliance with the terms of the ZEBRA grant funding.
- 7.4.11. With the inclusion of the QRA amount all parties to the ZEBRA programme acknowledge that the ZEBRA grant will not be increased post submission of the final business case i.e. to cover cost increases, and accept financial responsibility for the programme going forward.

### Strategic approach

- 7.4.12. As referenced in the Strategic Case, West Yorkshire has a long-term commitment to addressing the climate emergency having set a target to be net-zero carbon by 2038, 12 years ahead of the national target.
- 7.4.13. Buses have a key part to play in achieving the target and West Yorkshire has ambitions for the ensure bus fleet in the region to be zero emission by 2036 at the latest.
- 7.4.14. The ZEBRA programme is but part of a longer-term strategic approach to achieving this goal and forms a small element of a larger programme of work to implement ZEBs on bus routes throughout the region. For example, the Combined Authority has recently secured £21 million through its CRSTS and £4 million from TCF for the implementation of ZEBs. In combination with this ZEBRA programme these projects will increase the

proportion of the regions bus fleet that are zero emission to between 14% and 19%.

## 7.5. Legal Advice

- 7.5.1. The Combined Authority has taken independent legal advice on the compliance of the ZEBRA programme with subsidy control and public procurement legislation. A summary of the advice that has been received is set out below with the full advice provided at Appendix G.

*The proposed business case for ZEBRA funding (Business Case) should be capable of implementation consistent with the current UK government position on subsidy control, in particular in compliance with the principles set out in the TCA, and also in compliance with your (and the relevant operator's) obligations in respect of public procurement.*

*The risks associated with delivery will be mitigated by ensuring that all operators are funded on the basis set out in the business case, and that they comply with the procurement strategies and procurement policies, both as set out in the Business Case and as shared with [REDACTED].*

*We understand that all services which are being provided with electric vehicles are commercially operated by the relevant operators, save for one service which was commercially tendered. From a procurement perspective, if any of the commercial services or the current tendered service are tendered in the future, WYCA will need to ensure that it does this on a basis which does not distort competition in the market, and in particular does not provide an advantage to the operator whose vehicles have been funded through this bid.*

**[REDACTED] UK LLP (31 January 2022)**

## 7.6. Risk Management Strategy

- 7.6.1. A risk register for the ZEBRA programme has been produced and is documented in detail as part of the Management Case. Table F15 below highlights the key financial risks that have been identified for the programme, the consequences that would arise if the risk was to be realised and the mitigation action currently being taken to manage the risk.

Risk description	Consequences	Mitigation	RAG rating
Due to slow recovery from the pandemic operators have less resource and are unable to invest in new vehicles	May result in operators not being able to fully deliver the number of buses set out in their respective ZEBRA projects	<p>Fleet renewal responding to other pressures e.g. Bradford Clean Air Zone, net-zero targets, end to sales of diesel buses</p> <p>ZEBRA grant guards against increase in investment</p> <p>Continued dialogue with bus operators to understand issues</p> <p>Regular reporting to the Combined Authority on spend and risks</p>	
Due lower than expected headroom at DNO substations, grid infrastructure upgrades or change in the point of connection may occur, which would lead to an increase in depot power connection costs.	May result in increased connection costs	<p>Assess grid capacity against depot locations</p> <p>Undertake dialogue with DNO and secure capacity in advance of implementation</p>	
Due to depot electrical infrastructure not being designed/priced/specified with sufficient robustness, contractor tender returns higher than estimated may occur. As a result of increased costs within the supply chain of charging equipment OEMs, increases in supplier prices may occur, which would lead	May lead to an increase in charging infrastructure installation costs	<p>Engage with suppliers / manufacturers to ensure requirements can be met</p> <p>Obtain quotes for delivery of infrastructure</p> <p>Allocate contingency to cover unforeseen increases</p>	



Risk description	Consequences	Mitigation	RAG rating
to an increase in the cost of charging equipment.			
Due to increased costs within the supply chain (including higher than expected inflation or exchange rates) of bus manufacturer, increases in supplier prices may occur, which would lead to an increase in vehicle costs for the programme.	May lead to an increase in overall programme costs	Allocate contingency to cover unforeseen increases	
Due to limited battery manufacturing capacity within the electric bus supply chain, increases in the cost of batteries may occur, which would lead to an increase in vehicle costs for the programme.	May lead to an increase in overall programme costs	Different battery solutions are continually assessed by operators with warranties and leasing agreements overcoming price shocks.  Allocate contingency to cover unforeseen increases.	

**Table F15 – ZEBRA programme financial risks**

- 7.6.2. The risks identified above have been used as the basis for the production of a QRA for the ZEBRA programme. More information is provided in the Economic Case on the QRA, however for the purpose of this Financial Case it is worth stating the outcome of this process has been an increase in programme level costs and an increase in the requested ZEBRA grant as a QRA derived contingency.
- 7.6.3. The QRA suggested increase amounts to £2,587,992 of which £805,971 is attributable to the ZEBs and £1,782,021 for the infrastructure. This reflects the greater level of uncertainty over depot equipment purchase and installation when compared to the ZEBs. The QRA derived contingency is not applicable to a specific delivery year therefore is not documented in the programme-level tables outlined within this Financial Case.

## 7.7 Conclusion

- 7.7.1 The total value of the ZEBRA programme is £56,161,738 of which £53,573,746 relates to the ZEBs and associated infrastructure and £2,587,992 is a QRA derived contingency across all three projects.
- 7.7.2 Of the total value, £24,565,171 is requested from DfT through the ZEBRA grant with the remaining £31,596,567 provided by the private sector bus operators partnering the Combined Authority on this programme.
- 7.7.3 Of the total value, £46,643,612 is allocated for the purchase of 111 ZEBs with £6,930,134 related to the installation of charging equipment and associated works at four depots.
- 7.7.4 There is a clear risk management strategy, with a full risk register appended to this document (Appendix F). It highlights several financial risks, but demonstrates that appropriate mitigations are in place to counter these. In addition, a QRA has been included in the Economic Case which covers any unforeseen financial costs of the programme.
- 7.7.5 Legal advice has indicated that the business case is compliant with all necessary legal requirements.

## 8. Management Case

### 8.1. Introduction and overview

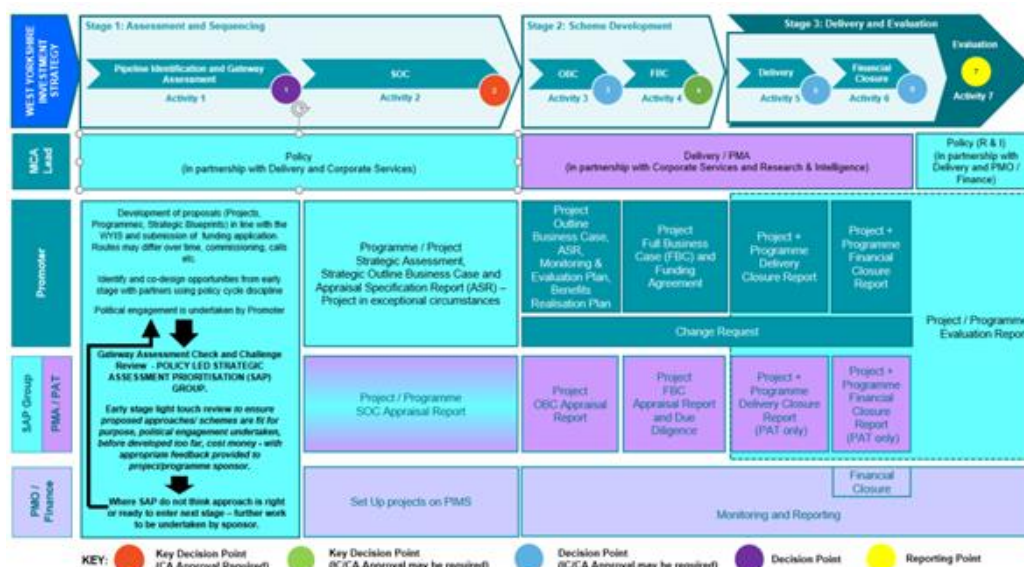
- 8.1.1. The ZEBRA programme will be overseen by the Combined Authority, who will facilitate grant drawdown and it will be passed through the Combined Authority's Assurance Framework by an appointed Programme Manager.
- 8.1.2. The existing Bus Alliance structure has been successful in delivering similar projects with operators and will form the programme board into which operator teams feed into. The board will then feed into political decision-making panels at the Combined Authority for reasons of transparency.
- 8.1.3. There will be an internal Combined Authority delivery team, which will work with operator delivery teams to coordinate the programmed delivery, with the timeframes set out in programme plans in the following sections.
- 8.1.4. Programme risks will be monitored throughout the programme through a high-level programme risk register found in Appendix F, with the Combined Authority's Programme Manager responsible for updating and reporting into the Programme Board on a monthly basis.
- 8.1.5. West Yorkshire Combined Authority has developed a robust approach to evaluation aligned with *Magenta Book* guidance and standards which will be used to evaluate the ZEBRA programme and which operators will feed data into.

### 8.2. Assurance Framework

- 8.2.1. The ZEBRA programme will be overseen by the Combined Authority's Assurance Framework as the Combined Authority will facilitate grant drawdown to each partner organisation.
- 8.2.2. The programme will utilise the well-established project and programme management systems the Combined Authority has in place for managing all large programmes and capital investments (PRINCE2 and Managing Successful Programmes).
- 8.2.3. The programme will also be assured through the Combined Authority's Portfolio Appraisal Team (PMA) and our adopted Assurance Framework which covers expenditure on programmes and schemes funded by Government or local sources across the Leeds City Region.
- 8.2.4. The purpose of this Assurance Framework is to ensure that the necessary systems and processes are in place to manage ZEBRA funding effectively, and to ensure the successful delivery of our Strategic Economic Framework (SEF) ambitions. In regard to the ZEBRA

programme, it is most linked to the SEF priorities of tackling the climate emergency and delivering 21<sup>st</sup> Century transport.

- 8.2.5. The Assurance Framework will ensure that necessary practices and standards are implemented to provide the Government, Combined Authority, the LEP and local partners with assurance that decisions over funding (and the means by which these decisions are implemented) are proper, transparent and deliver value for money. This framework also sets out the respective roles and responsibilities of the Combined Authority and the LEP, including how the formal accountability relationship between the Combined Authority and the LEP works
- 8.2.6. The Seven Principles of Public Life (the Nolan principles) underpin this Assurance Framework to ensure that the Combined Authority and the LEP, their members and officers, are upholding the highest standards of conduct and ensuring robust stewardship of the resources they have at their disposal.
- 8.2.7. The assurance process (set out below) has three stages; Stage 1: Assessment and Sequencing, Stage 2: Scheme Development, Stage 3: Delivery and Evaluation. It provides a practical 'step-by-step' framework to aid the development of business cases, to ensure successful delivery and to enable monitoring and evaluation. The assurance process is transparent and proportionate and offers a structured process for appraising, developing, planning, delivering and evaluation that is in line with HM Treasury guidance to deliver best public value.
- 8.2.8. Under each stage outlined there are a series of activities (7 in total) that need to be carried out in order to progress a given scheme. The ZEBRA programme will see a fast-tracked process to Full Business Case by March 2022 (when funding is awarded). This will ensure the ZEBRA programme progresses in line with the programme timeline.



**Figure M1 – Assurance process**

### 8.3. Governance for delivery

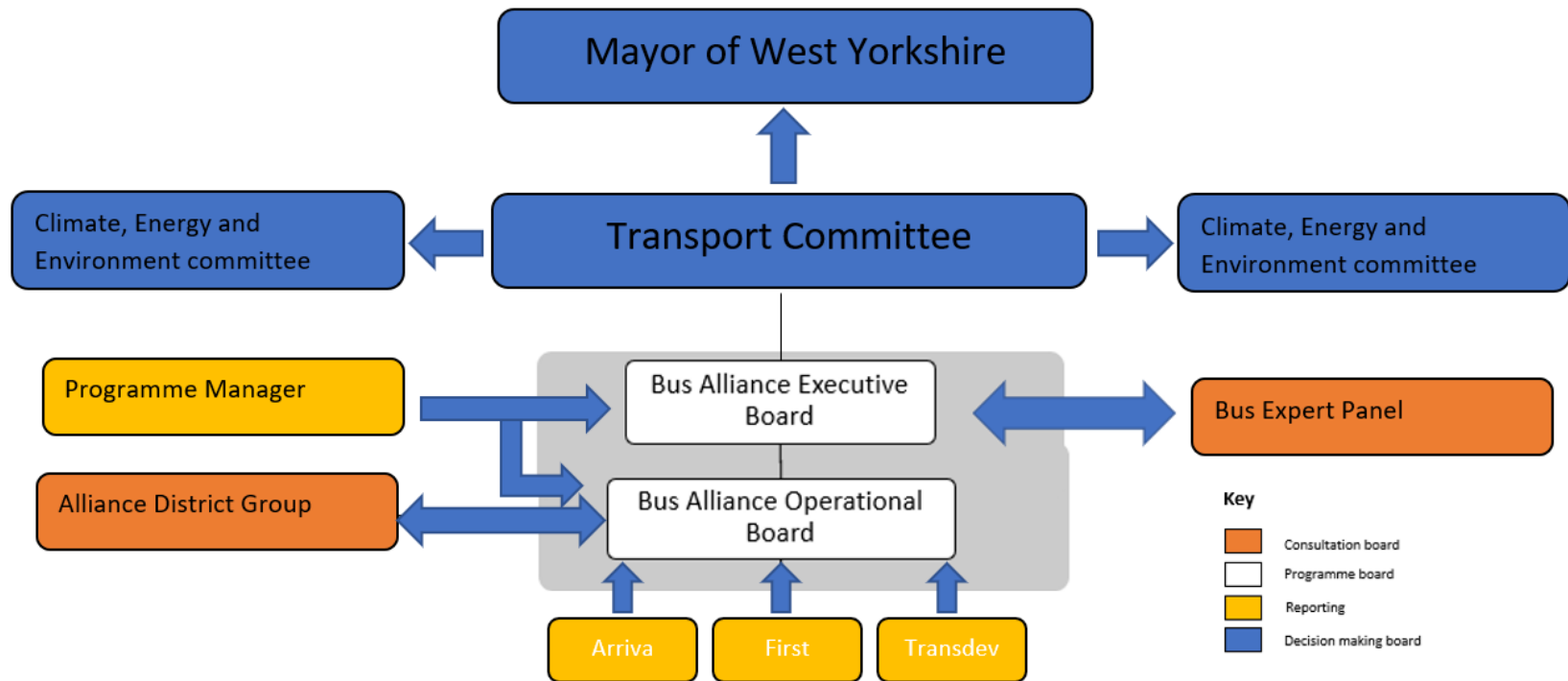
- 8.3.1. This programme has been developed through the Combined Authority's existing Voluntary Partnership Agreement, the West Yorkshire Bus Alliance. The Alliance brings together the Combined Authority, the region's largest bus operators (Arriva, First and Transdev) and smaller bus companies through the Association of Bus Operators in West Yorkshire – see table M1-with participating members. This partnership approach will continue throughout the programme and throughout delivery and evaluation. The Bus Alliance will be the programme board that will report into the wider Combined Authority governance mechanism decision making boards and will allow partnership work from bus operators and district partners. Each operator will maintain their internal project management boards for the delivery of the ZEBRA programme who will be responsible for reporting to the Bus Alliance (see figure M2 below). Further details on the project management from each operator are provided in the Operator Project Delivery Structure section below.
- 8.3.2. The Bus Alliance Executive Board meets on a quarterly basis, whilst the Operational Board meets monthly. This will allow close oversight of the programme on a monthly basis. The West Yorkshire Bus Alliance will provide strategic senior oversight at the Executive Board, with local oversight at the operational board. These boards will form the programme board.
- 8.3.3. The Alliance will provide updates through the Programme Manager (see Figure M2) to Transport Committee, Climate, Energy and Environment Committee and Finance and Resources Committee to ensure key

stakeholders are updated on progress. The approvals and assurance process will be taken through these committees, with the Mayor providing final oversight and receiving regular briefings.

- 8.3.4. The Bus Expert Panel, a peer review group, and the Alliance District Group will be additional consultation groups. These groups will be used to update and discuss any specific updates affecting particular projects. The Bus Expert Panel is built from UK wide members and will be a useful group to consult with as projects and future projects develop.

Bus Alliance members
West Yorkshire Combined Authority
Lead Member for Public Transport (Transport Committee)
Arriva
First
Transdev
ABOWY (Association of Bus Operators in West Yorkshire)
Ticko (ticketing company)
Transport Focus
West Yorkshire District Councils

**Table M1 – Bus Alliance membership**

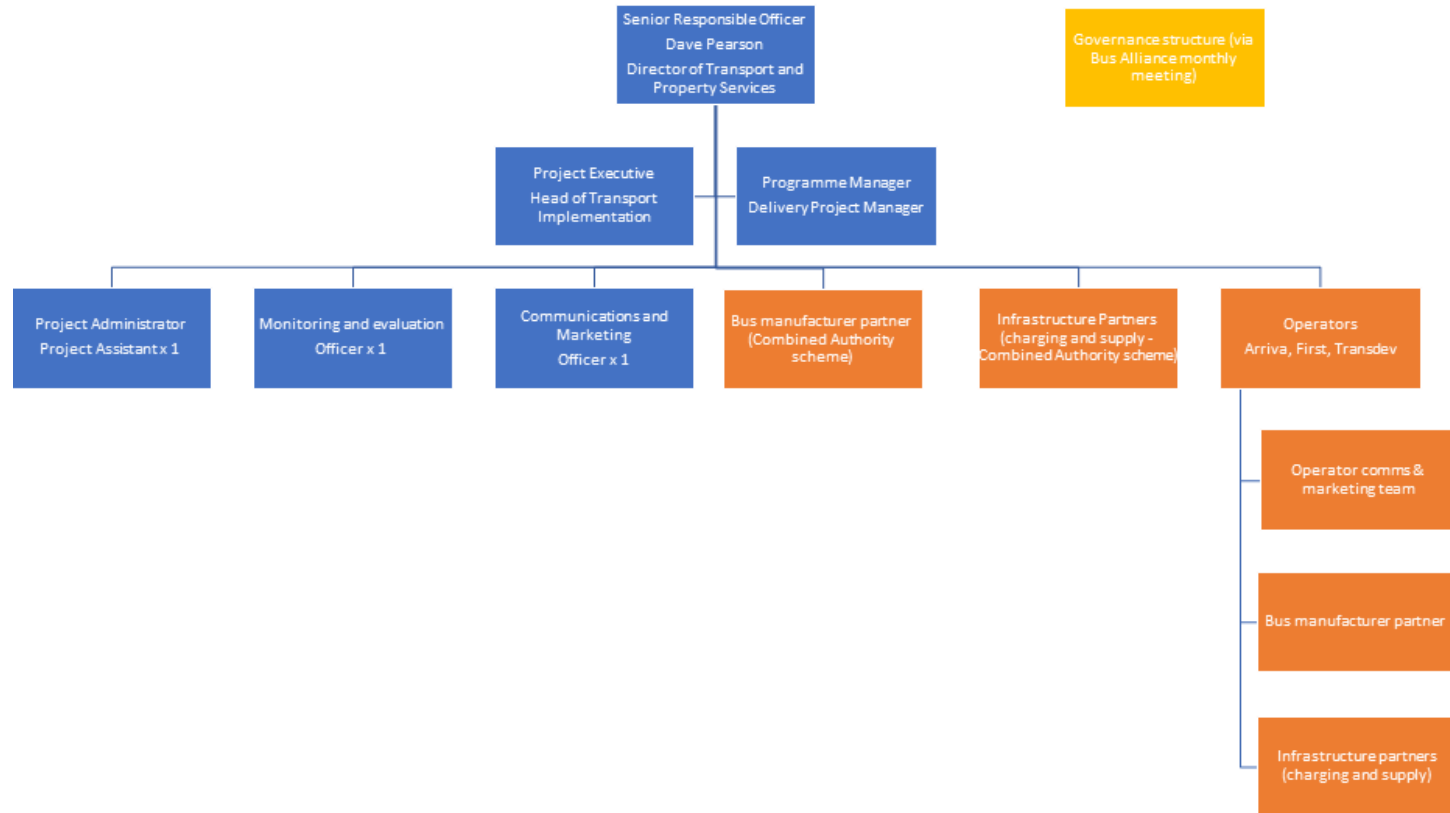


**Figure M2 – Programme Approvals / Governance Structure**

## 8.4. Programme delivery structure

- 8.4.1. Each operator is responsible for the progression of their project through their internal process through their nominated Project Manager. The section below gives further details on the roles assumed by each operator.
- 8.4.2. The programme delivery team is built from existing resource within the Combined Authority. The Programme Manager will be appointed directly to the ZEBRA programme, following the usual internal processes, for a fixed term period of three years (see Commercial case). Resource from the monitoring and evaluation team and communications and marketing team will be secured in a similar way. It is not envisaged that a full time officer will be required to support the monitoring and evaluation and communications and marketing team, but it is recognised that they play a key role during the launch and ongoing management of the team.
- 8.4.3. As the ZEBRA programme sits within a workstream of the Bus Service Improvement Plan Programme, the Director for Transport & Property Services, as Senior Responsible Owner for Bus Delivery, will have overall responsibility for ensuring the delivery of this package, including responsibility for feeding into the governance structure outlined above. This will remain consistent across the ZEBRA delivery and ongoing management process. The SRO will be responsible for providing monthly updates at the Alliance meetings and quarterly updates to the Transport Committee and associated approval boards.
- 8.4.4. The Project Executive has the delegated authority from the Senior Responsible Owner and Chair of Bus Alliance Executive Board to allow effective management and delivery of the programme, needing only to return for key approvals, with the Project Executive for this programme being the Head of Transport Implementation. This will remain consistent across the ZEBRA delivery and ongoing management process.





**Figure M3 – Programme delivery team**

- 8.4.5. The Programme Manager will manage aspects of the approvals, delivery, and ongoing management of the programme including:
- Programme management and reporting into the governance structure;
  - Coordination of the programme development and delivery including liaison with external partners;
  - Identifying and obtaining support and advice required for the management, planning and control of the programme;
  - Communications and liaison between stakeholders;
  - Co-ordinating end programme evaluation;
  - Liaising with communications and marketing to ensure effective promotion of service;
  - Financial management and reporting to the Programme Board including grant approval to operators;
  - Ownership of the risk register
- 8.4.6. The project administrator will help support the Programme Manager with their above responsibilities.
- 8.4.7. The monitoring and evaluation resource will, with input from Programme Manager and Operators, undertake:
- Collation of data on a quarterly basis in line with current data reporting requirements of the Alliance
  - Providing outputs to the Programme Manager to report into the governance structure
- 8.4.8. The communications and marketing resource identified in the programme structure below will assist with:
- Communications and marketing strategy
  - Communications plans for launch of electric bus projects (including joint Alliance comms)
- 8.4.9. The operators will have their own individual project delivery details as shown in Figure M3 and will report directly into the Combined Authority's Programme Manager. Further details of the responsibilities and structure can be found below in the Operator Project Delivery Structure section.

### Key roles and responsibilities

- 8.4.10. To demonstrate the broad roles and responsibilities across the Combined Authority the diagram below summarises key teams and responsibilities of those teams that are not detailed above, with further detail provided in Table M2.
- 8.4.11. It should be noted, as detailed above, no specific additional resource will be brought into internal teams for the ZEBRA projects. The usual internal process in the delivery team will procure a specific Programme Manager from existing pools whilst the SRO and Project Executive are existing post holders.
- 8.4.12. For all other teams included within the figure below it will also follow business as usual process.



**Figure M4 – Resource requirements**

Key roles	Responsibility
Senior Responsible Officer  Director of Transport & Property Services	Overall responsibility for ensuring the delivery of this package
Project Executive  Head of Transport Implementation	Delegated authority from the Senior Responsible Owner and Chair of Bus Alliance Executive Board to allow effective management and delivery of the programme.
Programme Manager	Project manage operator projects.

Project Manager (Transport Implementation)	Oversight of monitoring & evaluation input.  Reporting into Governance Structure.  Oversight of financial reporting and grant payments.
Project Administrator  Delivery Assistant	Collation of data for reporting to internal and external boards.  Day to day contact for operators.
Research & Intelligence  Officer – resource TBC	Monitoring and evaluation input, including data processing.
Communications & marketing  Officer – resource TBC	Design of comms & marketing strategy.  Ongoing comms to support roll out of buses.
Portfolio Management & Appraisal	Take programme through internal assurance and appraisal processes.
Legal & Governance	Advise on any legal & governance during the development of the programme.
Transport Operations – Bus Services	Guide development of Combined Authority Scheme include tenders for services.
Finance	Advise on grant agreements.  Distribute funding at applicable points.
Energy & Sustainability	Keep informed as to programme progress – feed into Climate & Environment Plan and Mayoral Climate Pledge

Operator partners	<p>Project manage own schemes including procurement of infrastructure and vehicles.</p> <p>Provide ongoing data to allow monitoring and evaluation.</p> <p>Maintenance and upkeep of vehicles and infrastructure.</p>
Operator comms & marketing teams	<p>Design of comms &amp; marketing strategy.</p> <p>Ongoing comms to support roll out of buses.</p>
Infrastructure partners	<p>Provide and install infrastructure required – to include power partners and charging providers.</p> <p>Maintenance as/when required.</p>
Bus manufacturers	<p>Provide vehicles required to operators and Combined Authority.</p> <p>Maintenance as/when required.</p>

**Table M2 – Key roles and responsibilities**

## 8.5. Operator project delivery structure

- 8.5.1. The operators will have their own internal teams and structures. It is their responsibility to manage the delivery of their individual projects with regular reporting into the Combined Authority Programme Manager. The programme managers from each operator will be required to submit written bi-monthly updates to the Combined Authority's Programme Manager within the first 12 months of the programme (this will coincide with key milestones) and operators will be asked to provide data on a quarterly basis which will be reported at Bus Alliance Executive Boards. The Programme Manager at the Combined Authority will escalate any particular issues to the SRO as appropriate. As the structure chart demonstrates some of the key teams for operators to manage include

marketing & comms teams, manufacturer partners and infrastructure partners. Individual detail is given below.

#### Arriva

8.5.2. To facilitate this project there are three nominated lead points of contact for the Combined Authority, which feed into the wider Arriva matrix. For the Combined Authority's purposes these are:

- Programme delivery, reporting and governance [REDACTED]
- Programme content, technical and strategy [REDACTED]
- Operations, local and site [REDACTED]

8.5.3 Programme management will be provided by a dedicated team within Arriva's integrated 'Engineering, Safety, Improvement and Programme' group. This close working allows us to work alongside the matrix structure within the local operating company. This project team will include Procurement, Properties and Legal representatives to ensure agile decision-making, strong governance and an open working culture. This group will drive the governance and reporting for the project, and appointment of an internal project sponsor will give a single point of contact for the local authority for escalation of any queries during the rollout.

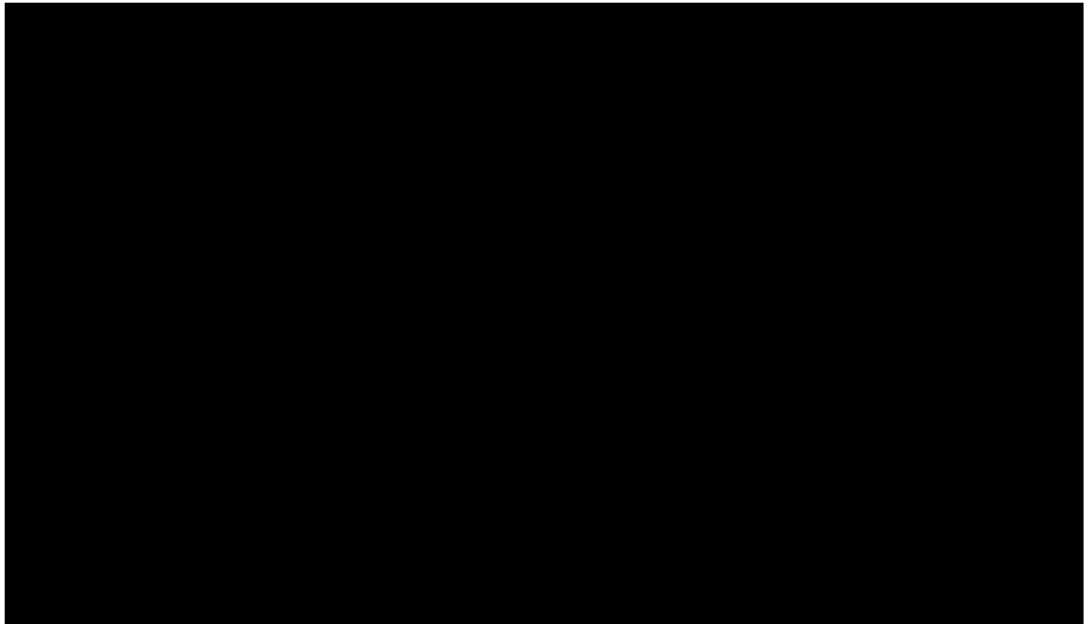
#### First

8.5.4 On the ground management of the project will be provided by First Bus who will appoint a Project Manager from their Project Management Office. Oversight for the project will be provided by the Combined Authority.

8.5.5 The Project Manager will oversee the full deployment of the project, liaising closely with the First Bus Property Team. In addition to the Project Manager appointed to oversee full deployment, the First Bus Property Team will appoint a Project Manager to control the infrastructure upgrade at the Bramley Depot.

8.5.6 A close working relationship will always be maintained both internally, with the Combined Authority, and other relevant partners. Clear reporting will be undertaken with First Bus's Senior Leadership Team to ensure any operational risks are mitigated and managed. The Combined Authority's Programme Manager will also be made aware of any significant operational risks associated with the project.

8.5.7 A summary of First's strategic project management methodology can be seen in figure M4 below:



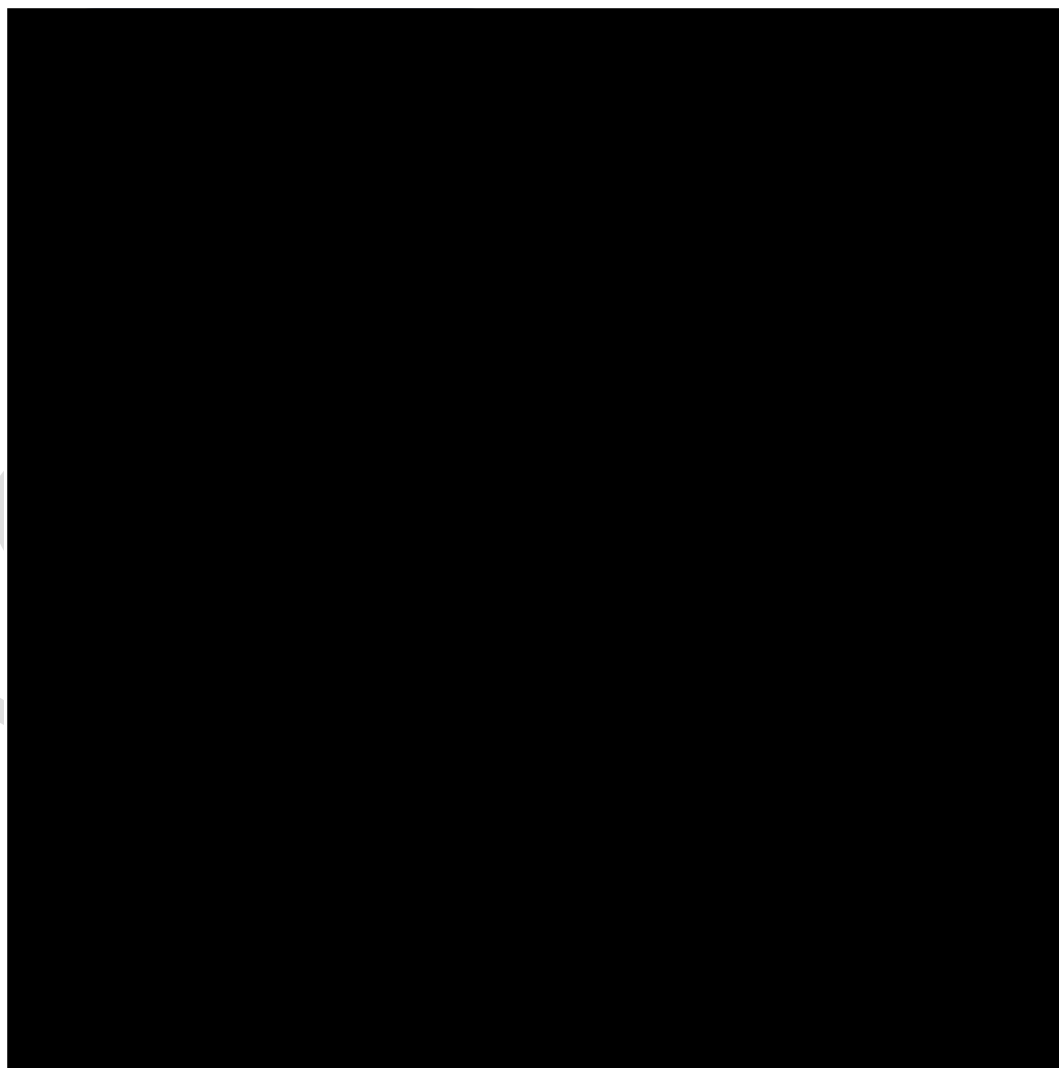
**Figure M5 – First project management methodology**

8.5.8 The project management structure for First can be seen below, the Project Manager will have the responsibility to report into the Bus Alliance structure discussed above. The roles and responsibilities are as follows.

- Project Board External – Receives updates on project progress and facilitates decision making at a joint working Council and Operator perspective.
- Project Board Internal – Management Board of the project, receive regular project updates to track progress and support in any required decision making, exec level attendees act as escalation channel if required.
- First Bus Programme Manager – overall coordination of deployment, liaising with all work streams leads internally and externally to ensure a timeline delivery of all areas. Compiling and presenting update reports to the steering boards internally and externally as well as ensuring all Central Function teams that impact or are impacted by the deployment are engaged.
- Property Project Manager – leads Infrastructure delivery, owning relationships with DNO, Civils Contractors, Architects and key suppliers for successful infrastructure delivery.
- Depot Project Lead – Coordinates the readiness of the Operating Company to accept the vehicles, working collaboratively with the PM

and Property PM the Depot Lead engages their business and ensures information is shared to the correct colleagues. They will take the lead on ensuring training is undertaken by the required staff.

- Head of Fleet – Owns relationship with vehicle manufacturer, final approval of specification and manages updates to and from manufacturer.
- Head of Procurement (and team) – leads on all aspects of procurement.
- Legal support – drafts and reviews all contracts.
- First Bus Central Functions – all pan-business departments are impacted by the deployment of new vehicles. These teams include Retail Operations, Commercial, IT, Marketing, Business Development and the Strategic Change Team.



**Figure M6 – First project management structure**



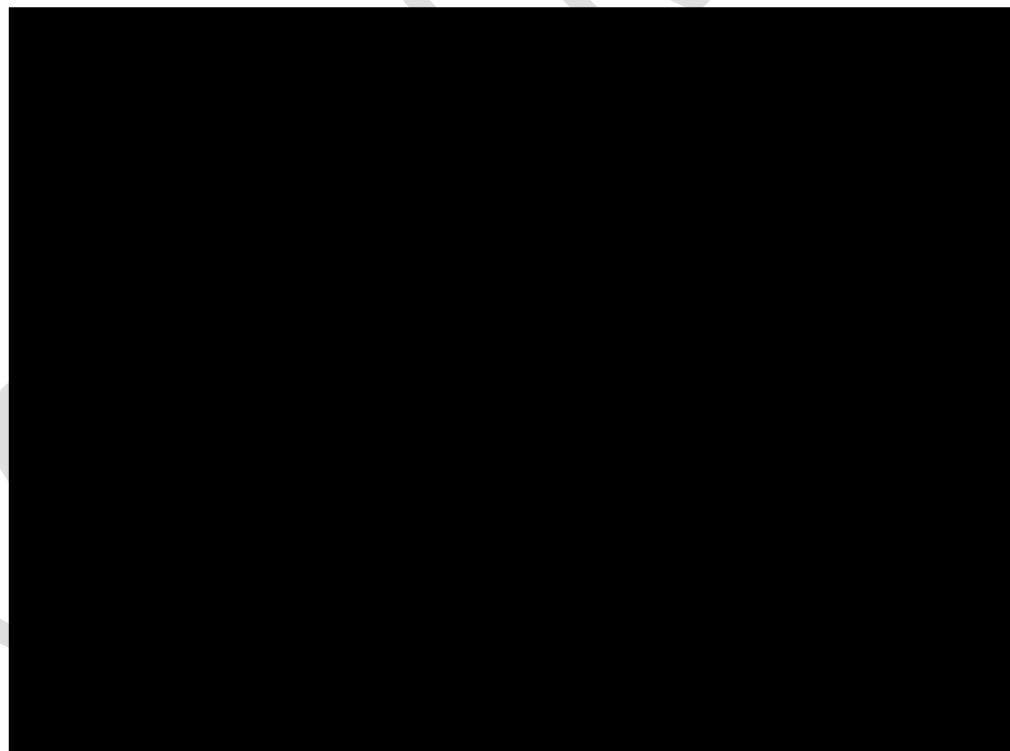
### Transdev

- 8.5.3. Transdev's Operations Director would act as project manager and engage with WYCA colleagues. [REDACTED]

[REDACTED]  
[REDACTED]. [REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED].

- February 2023 completion of [REDACTED] and introduction of buses
- July 2023 completion of new depot build [REDACTED] and introduction of buses

- 8.5.9 Roles and responsibilities for the Transdev project can be seen in the figure below, updates will be given to the Combined Authority through the Transdev representatives who currently sit on the Bus Alliance.



**Figure M7 – Roles and responsibilities for Transdev**

### Senior level support

- 8.5.10 Each of the three main operators, making up 90% of the bus market in West Yorkshire, indicated interest in submitting a project through the ZEBRA Expression of Interest.

- 8.5.11 Letters of support from each of these participating operators can be found in Appendix C which demonstrate support from the national Chief Executive of each operator in bringing the programme forward.
- 8.5.12 All three of these operators are keen to invest in zero emission buses within the West Yorkshire region, indicated by the projects that have been brought forward for this programme. This supports the commitment made by operators in the West Yorkshire Bus Alliance, with a target for 100% of buses to be EUROVI or alternative technology by 2026.

## 8.6 Contract Management

### The Combined Authority

- 8.6.3 The Combined Authority will ask Programme Managers from each operator to provide bi-monthly reports. It is expected that any contract management issues are escalated to the Combined Authority for discussion at Bus Alliance.

### Arriva

[REDACTED]

### First

- 8.6.5 [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Transdev

[REDACTED]

## 8.7 Capability to deliver

- 8.7.3 The West Yorkshire Combined Authority has a very successful track record of delivering a variety of schemes across transport, housing and regeneration, and environmental resilience. This includes the Leeds Public Transport Investment Programme (LPTIP), a £170million programme of measures including bus priority corridors, bus park and ride, low emission buses and improvements to the public realm. The ability of the Combined Authority to provide a programme management role, as proposed through this ZEBRA programme, is clear with the ability to deliver successful projects within timescales
- 8.7.4 The Bus Alliance has already seen the successful delivery of several programmes and projects including the Clean Bus Technology programme retrofitting over 470 buses to EUROVI emissions standards, demonstrating the ability of the voluntary partnership to deliver complex schemes.
- 8.7.5 First Bus has existing experience of deploying battery electric vehicles of varying sizes into service at a number of locations in the UK, including, York, Leeds, Glasgow and Hydrogen vehicles in Aberdeen. The

centralised support functions who work collaboratively with local and regional business management teams are able to collate and share best practice and learning from each undertaking to enhance the next project. It is this increasing knowledge base twinned with the buying power of an organisation who are committed to convert the entire operational fleet to Zero Emissions in the next 15 years that have enabled constructive and open relationships to be formed with major suppliers. The project team from a delivery, property and engineering perspective are continuing to develop individuals and the wider business capabilities.

## 8.8 Programme plan

- 8.8.3 The programme plan below (figure M8) is an outline plan for the overall programme, with timescales informed by project experience and input from operators. Due to the differing timescales involved throughout the project, a more detailed plan is provided for each operator (figure M9, M10, M11) to understand the detail behind the high-level timescales.
- 8.8.4 From the programme plan it can be seen that following funding allocation the programme will go through an internal and operator approval process. The infrastructure orders will start being placed in May 2022 with delivery complete by August 2023.
- 8.8.5 Potential risks and mitigation measures are to be included in the risks section of the management case and will reference the tasks outlined in the programme plan. Vehicle orders will start being placed in August 2022 and delivery of all vehicles will take place by December 2023.
- 8.8.6 This programme plan demonstrates that the ZEBRA programme proposed by the Combined Authority can comply with timescales set out by DfT and will facilitate a large uptake in electric vehicles within the West Yorkshire region.
- 8.8.7 A summary of the key deliverables (set out by date of final completion), by operator is set out in the table below.

Item/Operator	Arriva	First	Transdev
<b>Infrastructure procurement</b>	July 2022	Complete	Complete
<b>Infrastructure order</b>	August 2022	June 2022	May 2022
<b>Infrastructure installation</b>	November 2023	February 2023	January 2023 (Keighley)

			July 2023 (LBA)
<b>Vehicle procurement</b>	December 2022	August 2022	March 2022
<b>Vehicle order</b>	January 2023	September 2022	April 2022
<b>Vehicle delivery</b>	December - March 2024	April 2023 - March 2024	February 2023 (Keighley)  June 2023 (LBA)
<b>Staff training</b>	Continuous	Continuous	Continuous
<b>Full operation</b>	March 2024	March 2024	August 2023

**Table M3 – Key project deliverables**

<b>ZEBRA Programme</b>	Year	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	4	4	4
<b>Deliverable</b>	Month	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24
<b>Zero Emission Bus delivery</b>																											
ZEBRA Full Business Case submitted																											
Decision																											
Funding allocated																											
<b>Assurance and approval</b>																											
PAT process (WYCA)																											
Operator's internal approval																											
<b>Infrastructure/Vehicles</b>																											
Selection of charging method	Jul-21																										
Charging infrastructure order placed																											
Infrastructure Completed																											
Final Specification																											
Procurement bidding and review																											
Vehicle Order Placed																											
Initial Vehicle Launch																											
<b>Marketing and Comms</b>																											
Joint comms campaign																											
Marketing strategy outline																											
Marketing campaign launch																											
<b>Key</b>																											
Completed element	month																										
Element to be completed																											
Key dependency																											

**Figure M8 – High-level programme plan**

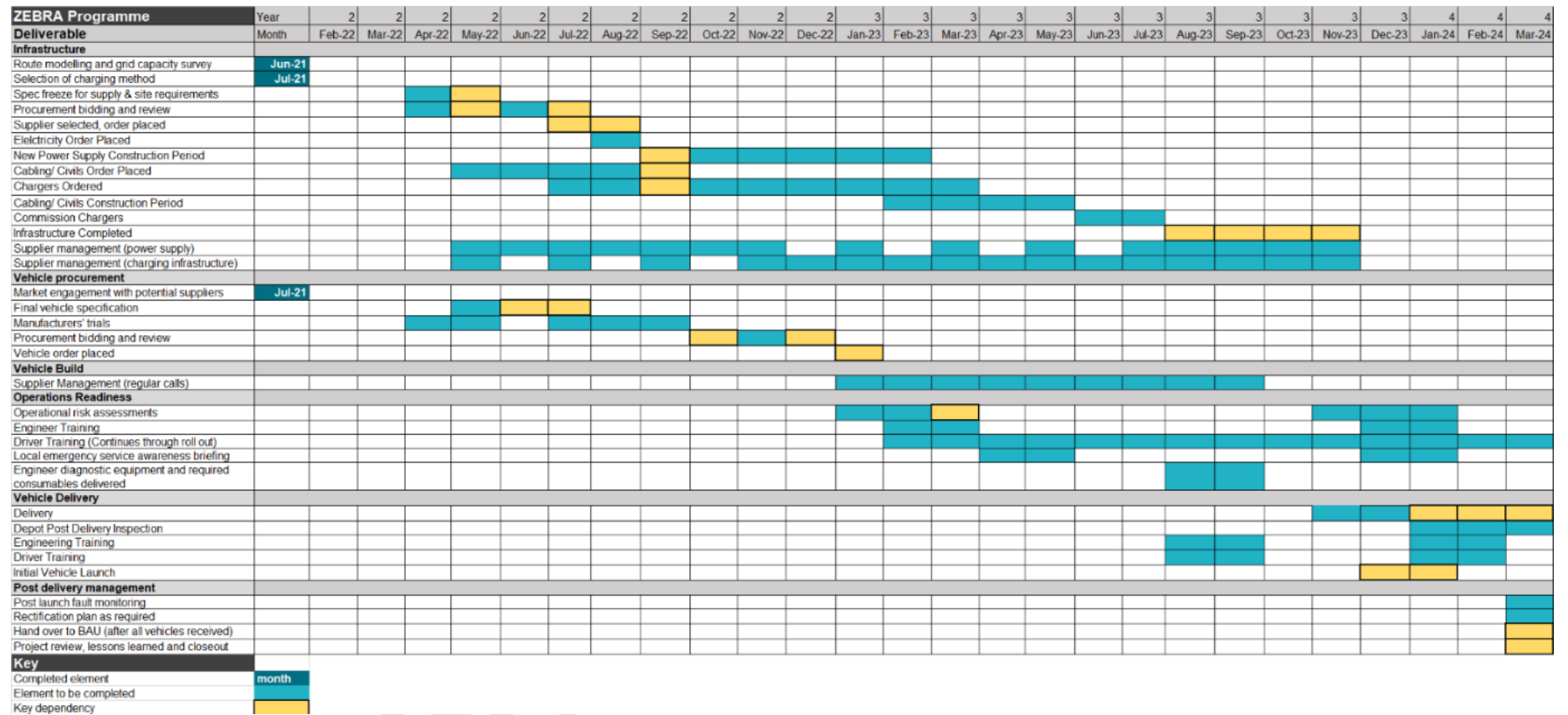


Figure M9 – Arriva project plan

ZEBRA Programme	Year	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	4	4	4
Deliverable	Month	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24		
<b>Funding</b>																													
ZEBRA Full Business Case submitted																													
Decision																													
Funding allocated																													
<b>Infrastructure</b>																													
Capex Approval																													
<b>Power Upgrade</b>																													
Electricity Order Placed (DNO)																													
Appoint Consultants and Contract to carry out Design (DB)																													
Develop Design Drawing and Confirm Construction Costs																													
Lead Time for New Substation (inc wayleaves, Stat Approvals)																													
Construction / Installation of New Power Supply																													
<b>Design and Permissions</b>																													
Detail Design Package Signed off																													
Review Costs and Finalise Contract																													
Appoint Contractor / Contract Signed																													
Develop Planning Drawings																													
Submit Planning Application For Works																													
Planning Application Approval Period																													
Planning Granted																													
<b>Construction Phase - Infrastructure On Site</b>																													
Lead Time for Works																													
Construction Period / Testing / Commissioning																													
Order Chargers - Heliox																													
Heliox Manufacture Time																													
Chargers Delivered to Site																													
Heliox Commission / Trial with Bus / Set Up Smart Charging																													
Construction Works Complete and Chargers Live																													
<b>Key</b>																													
Completed element																													
Element to be completed																													
Key dependency																													

Figure M10 – First project plan



ZEBRA Programme		Year	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	4	4	4
Deliverable	Month	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24
<b>Procurement</b>																											
Final Arrival Specification																											
Arrival trial (Leeds)																											
Arrival Procurement condition - Homologation																											
Arrival Procurement condition - Trial success																											
Arrival Procurement condition - Initial vehicle builds																											
Contracting/ Order placed																											
Alternative OEM Procurement window																											
Cut off for alternative OEM order																											
<b>Vehicle Build</b>																											
Supplier Management (regular calls)																											
<b>Operations Readiness</b>																											
Operational risk assessments																											
Engineer Training																											
Driver Training (Continues through roll out)																											
Local emergency service awareness briefing (Fire)																											
Safety Change submission to Head of Safety																											
Stagegate for Charger readiness																											
Engineer diagnostic equipment and consumables delivered																											
<b>Vehicle Delivery</b>																											
Factory vehicle inspection - Stagegate for Bus acceptance																											
Delivery 1																											
Delivery 2																											
Delivery 3																											
Delivery 4																											
Depot Post Delivery Inspection																											
<b>Post delivery management</b>																											
Post launch fault monitoring																											
Rectification plan as required																											
Hand over to BAU (after all vehicles received)																											
<b>Key</b>																											
Completed element	month																										
Element to be completed																											
Key dependency																											

Figure M10 – First project plan continued

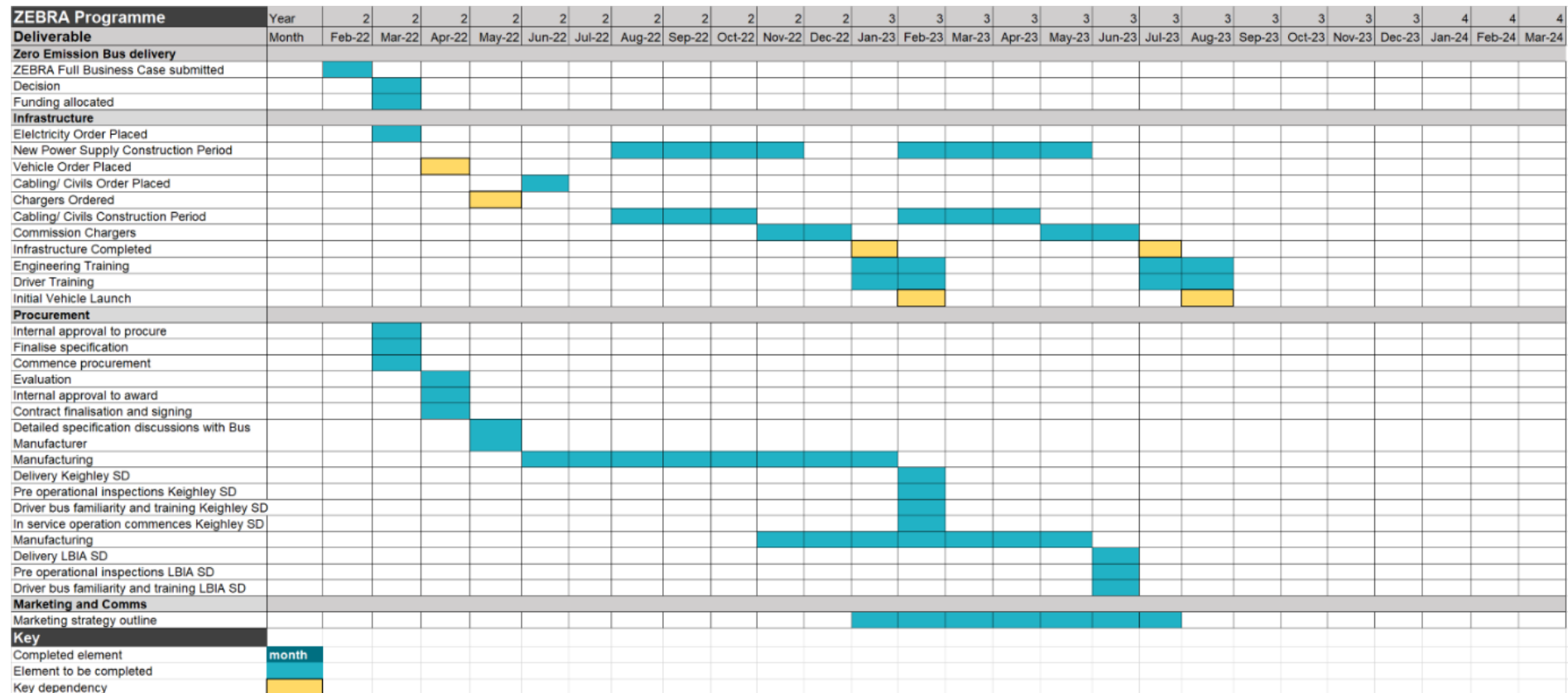


Figure M11 – Transdev project plan

## **8.9 Risk and issues management**

- 8.9.3 Programme risks will be monitored throughout the programme through a high-level programme risk register found in Appendix F. It is the responsibility of the Programme Manager to keep the risk register updated and report into the Programme Board on a monthly basis as part of the monthly reporting requirements of the ZEBRA programme described in the governance arrangements above. Any relevant risks will be escalated to the SRO who will take the appropriate action required.
- 8.9.4 For this document, a summary of the headline risks associated with this programme have been outlined below in Table M4. This table shows programme level risks, impact, mitigation measures and overall risk level. The headline risks for the programme have been defined as those with a risk rating of high – this is determined by the Combined Authority's risk matrix and combines likelihood and severity. A full risk register is included as Appendix F.
- 8.9.5 In addition to the programme level risks, each operator is responsible for the monitoring and logging of any new risks specific to their programme. Specific risks associated with each operator are also included within the Risk Register in Appendix F, with a tab for each operator. These specific risks have all be accounted for and sufficient mitigations are in place.
- 8.9.6 Further to this a Quantified Risk Assessment has been produced, outlining the costs associated with several headline risks. This can be found within the Financial Case.

Description	Impact	Mitigation	Likelihood	Impact	Risk Level
Due to delays in procurement, or inability for the market to deliver, vehicles and infrastructure cannot be manufactured or delivered within the programme timescales	Which may result in delays to the delivery timescales of the vehicles included within the programme.	Operators have had initial conversations with bus manufacturers and no concerns flagged. On issuing of ZEBRA EOI DfT confirmed that discussions had been had with the market to ensure delivery timescales were realistic. Continued engagement with bus operators, regular reporting into Programme Manager to highlight any risks.	3 Possible	4 Serious	High
Due to slow recovery from pandemic operators have less resource and are unable to invest in new vehicles.	Which may result in operators not being able to deliver or not being able to fully deliver the number of buses set out in the ZEBRA programme.	All operators have programmes for fleet renewal and this is required across ZEBRA routes due to other priorities eg. CAZ in Bradford, net zero carbon targets, Government ending sale of diesel vehicles. The grant from DfT guards against increase in investment. Continued engagement with bus operators, regular reporting into Programme Manager to highlight any risks.	3 Possible	4 Serious	High
As a result of not being able to secure sufficient guarantees from manufacturers on the quoted price or performance of ZEBs, the manufacturer may increase prices, or a change in supplier or change in vehicle specification may occur.	Which may result to an increase in price of vehicles and overall cost of the ZEBRA programme.	Operators have engaged with manufacturers and have a range of manufacturers they can engage with if costs increase. Operators have agreed to the specifications set out in the ZEBRA schemes.	3 Possible	4 Serious	High
Due to the Combined Authority's investigation into the feasibility of franchising, there is a risk that the current positive relationship with the bus operators is undermined	Which may result in the Bus Alliance Partnership breaking down impacting the successful delivery of the projects.	The Combined Authority keeps information relating to the bus options work confidential, and continues to work closely with the operators to ensure that the customer offer is not materially impacted. The decision on franchising is less likely to impact ZEBRA due to the longer timescales involved.	3 Possible	4 Serious	High

**Table M4 – Headline programme risk**

## 8.10 Monitoring and evaluation

### Overview

- 8.10.3 The section below outlines the monitoring and evaluation approach, using the West Yorkshire Combined Authority's robust evaluation criteria.
- 8.10.4 There are further details on linking the Combined Authority's ZEBRA objectives to those of DfT and ZEBRA programme alongside the data collection required to monitor against these.

### Monitoring and evaluation approach

- 8.10.5 West Yorkshire Combined Authority has developed a robust approach to evaluation aligned with *Magenta Book* guidance and standards. The Combined Authority Evaluation Strategy operates under the following key principles:
- Evaluation planning is an integral part of developing the business case;
  - The focus of evaluation reflects the business case;
  - Evaluation efforts are proportional to the intervention's scale and complexity;
  - Monitoring and evaluation data are consistent across policy;
  - Evaluation will be undertaken independently of delivery;
  - Evaluation is a learning process and a key component in policy development
  - Evaluation data and findings are disseminated effectively
- 8.10.6 Evaluation of transport schemes is undertaken in line with the DfT Monitoring and Evaluation Framework for Local Authority Major Schemes (2012). Given the value of the proposed investment, the ZEBRA programme will be subject to 'enhanced monitoring' including the collection of, noise, local air quality and accidents data (DfT 2012). Further, the innovative nature of the programme, gaps in the existing evidence base, and the need to develop learning that effectively feeds back into policy and practice, makes it suitable for a 'fuller evaluation' approach, covering three strands of enquiry: process, impact and economic (DfT 2012).

- 8.10.7 Process evaluation is crucial to meet programme objectives and to develop learning that engages stakeholder at all levels. Alongside the ongoing collection of programme-build and delivery data, this would incorporate an initial stakeholder mapping exercise and consultation process, opportunities for regular reflection and the recording of lessons learned throughout the implementation of the services.
- 8.10.8 Post-delivery, a stakeholder survey, and dedicated workshop/learning event would take place to develop and maximise learning relevant across the partnership and beyond. This would include the development of a case study to best consolidate learning building on how partnerships develop, the summary of key challenges, and good practice, alongside VfM and lessons learnt. Baseline data will be collected pre and post-delivery, starting from funding award, in order to evaluate impact in relation to programme objectives, travel behaviour, and impacts on air quality.
- 8.10.9 Economic evaluation will be undertaken to determine whether the costs of the intervention have been or will be outweighed by the benefits achieved. Outturn appraisal assumptions will be monitored throughout the lifecycle of the programme. Opportunities to develop enhanced understanding of net impacts and relative cost effectiveness of the programme, through comparison with existing schemes outside the area will also be explored.
- 8.10.10 Finally, as well as ensuring a robust approach to local evaluation, WYCA will comply with further guidance from DfT in order to fulfil the requirements of the national evaluation of the programme as we have done through previous funding for active travel and Transforming Cities Fund.
- 8.10.11 An allowance for monitoring and evaluation, £70,000, is included as part of the Combined Authority's Transforming Cities Fund Carbon Mitigation allocation for zero-emission buses.

#### Programme objectives

- 8.10.12 The programme objectives for the ZEBRA programme can be seen in the table below. This maps the programme objectives defined by the Combined Authority to local priorities, ZEBRA objectives and DfT Strategic Priorities.

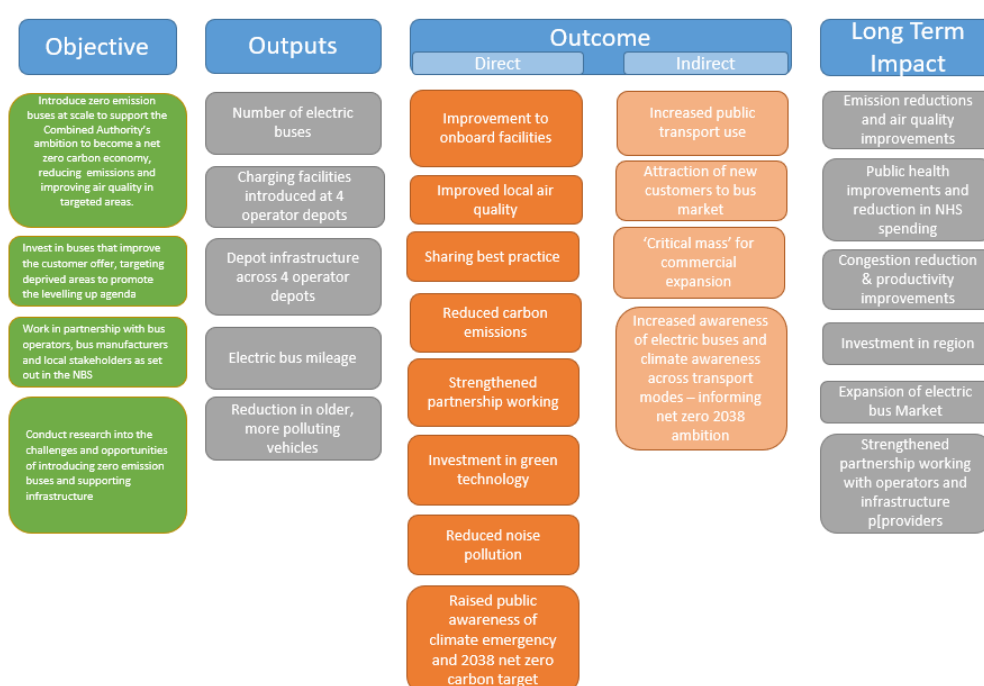
Programme Objectives	Map to local priorities	Map to ZEBRA Objectives/ DfT Strategic Priority	DfT Strategic Priority
Introduce zero emission buses at scale to support the Combined Authority's ambition to become a net zero carbon economy, reducing emissions and improving air quality in targeted areas.	<p><i>Mayoral Climate Pledge</i></p> <p><i>BSIP</i></p> <p><i>Connectivity Infrastructure Plan</i></p> <p><i>Climate and Environment Action Plan</i></p> <p><i>Clean Air Zones</i></p> <p><i>Net Zero Region by 2038</i></p>	<p><i>Supports the government's commitment to decarbonisation and to reduce the transport sector's contribution to CO2 emissions</i></p> <p><i>Supports the roll-out of the 4,000 Zero Emission Buses that the government committed to in Feb 2020</i></p>	<i>Reduce environmental impacts / Air quality</i>
Invest in buses that improve the customer offer, targeting deprived areas to promote the levelling up agenda	<p><i>BSIP</i></p> <p><i>Transport Strategy 2040</i></p>	<i>Support bus manufacturers in the development of zero emission bus technology</i>	<p><i>Grow and level up the economy</i></p> <p><i>Improve transport for the user</i></p>
Work in partnership with bus operators, bus manufacturers and local stakeholders as set out in the NBS	<p><i>BSIP</i></p> <p><i>Economic Recovery Plan</i></p> <p><i>Transport Strategy 2040</i></p>	<p><i>Support partnership working between Local Transport Authorities, bus operators, and other local stakeholders as set out in the NBS</i></p> <p><i>Support bus manufacturers in the development of zero emission bus technology</i></p>	<i>Grow and level up the economy</i>
Conduct research into the challenges and opportunities of introducing zero emission buses and supporting infrastructure	<p><i>BSIP</i></p> <p><i>Transport Strategy 2040</i></p>	<i>Understand better the challenges of introducing zero emission buses and supporting infrastructure to inform future government support for ZEBs</i>	<p><i>Grow and level up the economy</i></p> <p><i>Improve transport for the user</i></p> <p><i>Reduce environmental</i></p>

	<i>Climate and Environment Action Plan</i>		<i>impacts / Air quality</i>
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**Table M5 – Programme objectives, ZEBRA objectives and DfT strategic priorities**

### Measuring against objectives

- 8.10.13 The below logic map demonstrates the links between programme objectives, outputs and monitoring and evaluation.



**Figure M12 – Logic Map**

### Data Requirements and collection methods

- 8.10.14 The table below shows the objectives alongside outputs, outcomes and impacts the programme will have. This is mapped on the measures, reporting frequency and source of data.
- 8.10.15 The majority of data will be reported to the DfT every quarter which will coincide with the quarterly Bus Alliance Executive Boards which form the governance structure (see Figure M2). The exception to this is the data being collected by customer surveys and operator surveys which will be undertaken yearly to understand lessons learnt from the introduction of electric buses.



- 8.10.16 As stated in the overall approach, it is intended that a report will be produced following all vehicles entering operation (March 2024) to understand lessons learnt from the procurement and build process. A report will follow a year after full introduction of the buses to evaluate the performance and further report five years post introduction. This will incorporate environmental, social and economic evaluation ensuring that VfM projections for the projects are fully evaluated.
- 8.10.17 Collection of data will also consist of customer surveys taken onboard the new buses, asking a range of questions to understand travel behaviour and whether the bus user has seen improvements since the introduction of electric buses on the service. The Combined Authority will be overseeing the design and completion of the customer surveys, this will be alongside the annual Perceptions Public of Transport Survey which will indicate patronage levels and reasons to travel by bus. The surveys conducted will combine online and onboard survey responses to ensure that evidence about attitudes of both non bus users and current bus users are collated. This will help inform any changes in passenger behaviour, such as new passengers that have opted to travel by bus due to the zero-emission electric upgrade.
- 8.10.18 As stated above, baseline data collection will be carried out on confirmation of funding to compare March 2022 to March 2024 once all vehicles are in operation with baselines already in place for any BSIP measures. It is acknowledged that some of these data sets are best suited to monitoring long term changes, however, they are still useful to include to inform our wider zero emission bus strategy which will encompass the time period up to our target date of 2036 for all buses to become zero-emission.
- 8.10.19 Exploration of the counterfactual will be explored using historic data and use of comparator areas.
- 8.10.20 Note, measures in the table below which are listed as BSIP KPIs are already collated on a yearly basis and will continue to be collected. Patronage data is especially important in understanding trends around bus users and will help inform targets set out in the Transport Strategy, to increase bus patronage by 25% by 2027.
- 8.10.21 A data sharing agreement is in place to collect operator data. During the programme preparations, it has been agreed with Arriva and Transdev that the current NDA covers data sharing for the purposes of ZEBRA as it relates to the objectives of the Combined Authority's BSIP. An additional NDA has been in place with First Bus during the preparation of their project due to confidentiality around their choice of bus manufacturer. This NDA will continue to cover the data sharing arrangements through

ZEBRA. The provisions in place will allow the Combined Authority to share the collected data with DfT in line with the agreed reporting periods and will reported to DfT in Excel format.

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Objective	Outputs/outcomes	Measure	Reporting frequency	Source
Introduce zero emission buses at scale to support the Combined Authority's ambition to become a net zero carbon economy, reducing emissions and improving air quality in targeted areas.	Number of electric buses	Number of buses purchased	Quarterly	Operator reports
		Number of buses in operation		
		Number and type of internal combustion engine (ICE) buses replaced		
	Charging facilities introduced at 4 operator depots	Number (and capacity) of charging facilities introduced	Quarterly	Operator reports
		Type of charging point installed		
	Depot infrastructure across 4 operator depots	Number of grid connections installed	Quarterly	Operator reports
		Connection capacity at depot		
	Infrastructure provision for tendered routes	Number of grid connections installed	Quarterly	Operator reports
		Connection capacity at depot		

	Improved local air quality	Number and type of internal combustion engine (ICE) buses replaced	Quarterly	Operator reports
		Average daily ZEB mileage	Quarterly	Operator reports
		Average daily ZEB energy consumption	Quarterly	Operator reports
		Average daily diesel mileage and fuel consumption for each route (i.e. baseline / comparator data)	Quarterly	Operator reports
		Average ZEB well-to-wheel greenhouse gas emissions	Quarterly	Operator reports
		AQMA monitoring	Yearly	Local authority monitoring
	Reduction in carbon emissions	Average daily ZEB mileage	Quarterly	Operator reports
		Average daily ZEB energy consumption		
		Average daily diesel mileage and fuel consumption for each route (i.e. baseline / comparator data)		

		Time of day ZEB charged and electricity tariff (including electricity generation source)		
Invest in buses that improve the customer offer, targeting deprived areas to promote the levelling up agenda	Improvement to onboard facilities	Number of buses purchased	Quarterly	Operator reports
		Specification of new buses against baseline	Quarterly	Operator reports
		Customer satisfaction with onboard facilities/buses	Yearly	Customer survey
	Increased public transport use/ attraction of new customers to bus market	Bus patronage data and modal share	Quarterly	BSIP KPI
		Customer satisfaction with onboard facilities/buses	Yearly	Customer survey
	Congestion reduction & productivity gain	Punctuality and reliability data	Quarterly	BSIP KPI
Work in partnership with bus operators, bus manufacturers and local stakeholders as set out in the NBS	Promotion of partnership working	Operator feedback	Yearly	Operator survey
	Investment in green technology	Number of buses purchased	Quarterly	Operator report

	Critical mass for commercial expansion/expansion of electric bus market	Zero emission bus market activity	Yearly	Operator survey
	Investment in region	Number of investments in zero emission technology in the region	Yearly	Operator survey
	Sharing of electric bus bets practice	Feedback between Combined Authority, operators and other ZEBRA regions	Ad-hoc	Informal feedback
Conduct research into the challenges and opportunities of introducing zero emission buses and supporting infrastructure	Electric bus mileage	Average operational cost (incl. maintenance and infrastructure) per ZEB (£ per month)	Quarterly	Operator report
		Operated bus mileage		
	Raised awareness of climate emergency	Knowledge of climate emergency and implications	Yearly	Customer survey
	Increased awareness and acceptance of electric buses	Customer satisfaction	Yearly	Customer survey
	Public health improvements and reduced NHS spending	IMD monitoring	Yearly	IMD data release

**Table M6 – Measuring outputs and outcomes**

### Monitoring and evaluation timeline

- 8.10.22 A table showing the key milestones within this work can be seen below. This explores the key points at which monitoring and evaluation of the projects will take place.
- 8.10.23 It should be noted that data will be collated on vehicles once in operation, with the March 2024 timeframe of monthly reporting across all operators relating to the time when all buses will be in service.

Milestone	Timeframe
Confirmation of ZEBRA funding	March 2022
Baseline monitoring information	March – November 2022
Monthly reporting to Programme Manager initiates	March 2022
Infrastructure installation (capacity)	January 2023 – November 2023
Initial vehicle operations	June 2023 – March 2024
Establishment of monthly reporting across all operators	March 2024
Operator survey	March 2024
Customer survey	March 2025

**Table M7 – Milestones and timeline for Monitoring and Evaluation**

### **Economic evaluation and VfM monitoring**

- 8.10.24 The VfM and BCR calculations undertaken in the Economic Case of this Business Case will be used to better evaluate the economic business case for introducing zero emissions buses.
- 8.10.25 The economic appraisal of the projects returned a low value for money, however it is acknowledged that this does not fully capture the strengths of the strategic rationale as discussed in the Strategic Case. Given this and that the base BCR is robustly above 1, it is reasonable to suggest that the project at least returns **Medium** value for money.
- 8.10.26 Monitoring and evaluation of programme costs will allow for the VfM and BCR to be assessed based on actual spend. This will link into the Combined Authority objective of research into the challenges and opportunities of introducing zero-emission buses.

### Plans for resourcing and governance of the M&E plan

- 8.10.27 The monitoring and evaluation will be undertaken and resourced by internal teams at the Combined Authority who will be responsible for processing the data that is collated. This process will be overseen by the Programme Manager who will report to the Bus Alliance as part of monthly progress updates. This is reflected in the governance structure diagram (Figure M2) and programme delivery diagram (figure M3) above. The data will report through decision making committees to ensure that elected officials at the Combined Authority have sight of the progress of the programme. The data collated will be reported to DfT on a quarterly basis.
- 8.10.28 Data collation will rely on regular dialogue with operator colleagues who will provide quarterly data reports to the Programme Manager. The data expected to be reported by operators can be seen in the table above. A reporting structure will be provided for operators for ease of use, however it will be the responsibility of operators to ensure that data is provided in a timely manner. It is likely to coincide with BSIP data collection which occurs on a quarterly basis, due to ZEBRA having an intrinsic link to the BSIP.
- 8.10.29 Quality assurance of data will be carried out by the monitoring and evaluation team on receipt of data, who will follow out any discrepancies or missing data directly with the bus operators. It is acknowledged that data reports from operators use different formats, so for this programme a standardised reporting template will be shared. This will ensure that data is shared in a consistent manner from operators and will reduce data processing time for the Combined Authority.
- 8.10.30 The budget for monitoring and evaluation is £70,000 and is funded through the Transforming Cities Fund, Carbon Mitigation allocation.
- 8.10.31 The Bus Alliance boards, as programme level boards, will be capturing lessons learnt throughout the programme. The Programme Manager will collate these as the programme progresses with regular opportunities for operators to feed in through their individual project managers and the Bus Alliance meetings. A report will be produced following final implementation and completion of the programme which will incorporate these lessons learnt and regular reviews will be ongoing throughout the lifetime of the project – including a formal review 5 years after implementation of the electric buses.
- 8.10.32 Specific risks associated with data collection and processing have been set out in the table below and are included within the full risk register in Appendix F.



Description	Impact	Mitigation	Risk Level
Due to the different timescales of operator projects consistent data collection may be difficult.	Which may lead to insufficient data capture.	It is acknowledged that each operators project will be working to different timescales and some operators will report orders/installations at a faster pace than others.	V. Low
Due to the sensitivity of the data, operators may not forthcoming in data supply.	Which may lead to insufficient data capture.	A data agreement is already in place which covers this programme. Quality assurance will be provided from the monitoring and evaluation and Programme Manager at the Combined Authority.	Low
Due to the complexity of data requests, operators and partners may find it difficult to provide data in a timely manner.	Which may lead to insufficient data capture.	A spreadsheet will be supplied to operators for ease of completion. On submission of the FBC operators have agreed to the data collection set out. Quality Assurance will be provided by Combined Authority teams.	Medium

**Table M8 – Risks associated with data reporting and collation**

Linkages and interdependencies

8.10.33 There are no linkages or interdependencies between the projects within this Full Business Case as each scheme is . All projects have different procurement routes and sources within them.

8.10.34 [REDACTED]  
[REDACTED]  
[REDACTED].

8.10.35 A few key direct dependencies to note include:

- Charging equipment cannot be procured or purchased before it is known what bus model/manufacture is being used

- For the charging equipment to be commissioned the required grid connections and power upgrades need to be completed
- Once commissioned, the power upgrade to any sites must be utilised within 2 years
- For projects involving new depots, Arriva and Transdev LBA, the depot build must be completed promptly to ensure infrastructure installation is not delayed
- The entire programme is dependent on grant release from the DfT

8.10.36 Dependencies and impacts will be overseen by the Programme Manager at the Combined Authority who will escalate to the SRO if appropriate.

## 8.11 Communications and Stakeholder Plan

### Overview

8.11.3 In order to consult and communicate the programme, a communications and stakeholder management plan will be developed. This will ensure that stakeholders are engaged throughout the process and will include partner districts, political representatives and the public. This will feed into our monitoring and evaluation framework and allow for key learning to be drawn out from these projects.

### Stakeholder engagement

8.11.4 There is widespread support for the adoption of ZEBs across the West Yorkshire fleet. First, Arriva and Transdev have all supported this programme and have provided letters of support that are included in Appendix C.

8.11.5 A stakeholder matrix below identifies some of the key stakeholders that have already been engaged or will be engaged throughout the development of the programme along with planned interventions.

Stakeholder group	Information needs	Purpose	Influence	Interest	Action/engagement
<b>Internal</b>					
Mayor of West Yorkshire	ZEBRA briefing Progress updates	Decision maker Sign off process	High	High	Provide regular briefings as programme progresses.
West Yorkshire District Leaders and Chief Executives	ZEBRA briefing Progress updates	Decision makers Sign off process	High	High	Provide regular briefings as programme progresses.
Senior Leadership Team	ZEBRA briefing Progress updates	Decision makers Sign off process	High	High	Provide regular briefings as programme progresses.
Combined Authority member committees:  Transport Committee; Finance, Resources and Corporate	ZEBRA briefing Progress updates	Sign off process	High	Medium	Provide regular briefings as programme progresses.

Committee; Climate, Energy and Environment Committee					
Transport Services	ZEBRA briefing  Progress updates  Involvement in specification for tendered routes	Ensure specifications are fit for purpose, monitor impact on tendered routes	Medium	High	Engage with at monthly meeting to give progress updates and ensure that specifications are appropriate.
Bus Alliance Board	Decision on programme design  Progress updates  Involvement in programme development	Programme board	Medium	High	Engage with at monthly meetings to monitor meeting progress and escalate any issues requiring action.
<b>External</b>					
Ward councillors	ZEBRA briefing once funding confirmed	Keep informed on introduction of new buses	Medium	Medium	Engage with on announcement of funding.

					Provide regular briefings and updates as required.
Bus operators – Arriva, First Transdev	Development and delivery of programme.  Understanding of any emerging issues.	Ensure delivery of ZEBRA programme	High	High	Engage with via the Programme Manager to ensure programme delivery is on track.
Bus operators – others / not involved	Keep informed	Monitor and inform learning on zero-emission buses	Low	Medium	Engage with via the Bus Alliance and other means to give updates.
Public	Keep informed  Engagement with communities along proposed routes	To gain public support.  To promote scheme and understanding	Medium	Medium	Press release planned for date of submission.  Regular updates throughout programme demonstrating key milestones.  Launch events.

Local BID teams	Keep informed	To continue support of scheme	Low	Low	Regular updates throughout programme demonstrating key milestones.
Environmental groups	Keep informed	To keep informed	Medium	High	Regular updates throughout programme demonstrating key milestones.

**Table M8 – Stakeholder engagement matrix**

- 8.11.6 As part of the development of this programme, consultation with key stakeholders, such as the West Yorkshire Districts, the LEP and North East and Yorkshire Energy Hub have been undertaken. Letters of support from these stakeholders are included in Appendix C.
- 8.11.7 DecarboN8 have also issued a letter of support, in Appendix C, showing how the ZEBRA programme works towards their aims of greater collaboration between government, industry and academia to maximise the adoption of and learnings from innovative new technology.
- 8.11.8 The Combined Authority has also received assurances of support from the Transport and Health working group.
- 8.11.9 Specifically concerning the Arriva project, letters of support have been received from Wakefield Council, Wakefield BID, Trinity Walk shopping centre and The Ridings shopping centre confirming the ZEBRA programme aligns closely with their ambitions (Appendix C).
- 8.11.10 A list of those providing letters of support for this programme are:
- North East and Yorkshire Energy Hub
  - Local Enterprise Partnership
  - West Yorkshire Combined Authority Transport Committee
  - Wakefield Council and Wakefield BID
  - National level CEOs of Arriva, First and Transdev
  - DecarboN8
  - Wakefield Council
  - The Ridings Shopping Centre, Wakefield
  - Trinity Walk Shopping Centre, Wakefield
- 8.11.11 In addition to this, operators have also engaged with the following stakeholders.

Project	Stakeholder engagement
Arriva	Wakefield Council and Wakefield BID - engagement with Wakefield Council and the BID members who support the roll out of electric buses within the area

	The Ridings Shopping Centre, Wakefield
	Trinity Walk Shopping Centre, Wakefield
First	DecarboN8 network – Professor Greg Marsden (University of Leeds)
Transdev	Bradford Metropolitan District Council – supportive of introduction of electric buses on Keighley services due to direct air quality benefit within designated CAZ.  Keighley Town Council - keen to see electric buses operating in the town.  Leeds Bradford Airport - committed to zero emission travel as part of their surface access strategy.

**Table M9 – Stakeholder engagement**

Key messages

- 8.11.12 The ZEBRA programme presents a step change in the provision of zero emission vehicles in West Yorkshire and it is important that a strong marketing and communications plan is developed. The launch of all-electric buses provides a significant opportunity for the Combined Authority to show and demonstrate how new technologies can be used to deliver public transport.
- 8.11.13 The marketing and communications strategy for the roll out of electric buses will see an overarching West Yorkshire campaign being undertaken through the Bus Alliance, with operator specific campaigns for the specific routes the routes that operators are covering.
- 8.11.14 It has been discussed through operator colleagues that a common branded icon will be used on all buses introduced through the ZEBRA programme, see example below from an existing Transdev service, whilst the strong route specific branding remains. This would signify the importance of the West Yorkshire Bus Alliance whilst retaining a recognised customer offer.



### Figure M13 Example branding

- 8.11.15 As a Combined Authority and with our partners, we will build on the experience we have in delivering programmes such as Connecting Leeds and East Leeds DRT where we have successfully engaged with and launched new transport services.
- 8.11.16 The marketing strategy for the introduction of electric buses is also detailed in the commercial case above.

Operator	Key messages
Arriva	<ul style="list-style-type: none"><li>• Growth and modal shift through fleet investment</li><li>• Integrated marketing campaign promoting features and benefits</li><li>• Use of marketing opportunities at Wakefield bus station including launch event</li><li>• Use of local business links</li></ul>
First	<ul style="list-style-type: none"><li>• Focus on the environmental benefits of new buses and low carbon public transport network</li><li>• Customer journey improvement</li><li>• Build on existing electric bus branding within Leeds district</li></ul>
Transdev	<ul style="list-style-type: none"><li>• Launch marketing including door to door mailings, free taste tickets and strong social media presence</li><li>• Use of TransdevGo app</li><li>• Coordinate with marketing of local brands and destinations</li></ul>

**Table M10 – Summary of marketing strategy by operator**

- 8.11.17 The key messages to be used across the ZEBRA programme are:
- ZEBRA will deliver 111 electric buses and is part of the Combined Authority's ambition to become net zero by 2038
  - ZEBRA delivers against the Mayoral Pledge to 'Tackle the climate emergency and protect our environment.

- ZEBRA complements the Combined Authority's TCF funded project to introduce electric buses in Calderdale and Kirklees
- ZEBRA complements the plans in CRSTS to invest in zero-emission buses with the ambition of the entire fleet becoming zero-emission by 2036
- The programme is co-funded by DfT and bus operators
- The programme complements the objective of introducing greener buses which is included in the Combined Authority's BSIP
- Introducing cleaner buses is one way to make improvements to local air quality
- The Combined Authority is committed to investing in a low carbon future, including the promotion of sustainable travel

## 8.12 Conclusion

- 8.12.3 The Management Case demonstrates that there are appropriate assurance and governance processes in place for the Combined Authority to oversee the introduction of the three ZEBRA projects. It also demonstrates how the operator approvals and project delivery structure link into that of the Combined Authority's.
- 8.12.4 The capability to deliver is evidenced through the success of previous projects, with programme plans for each project demonstrating that they can deliver within the stated ZEBRA timescales. This is complemented by the risks and issues management section, that clearly demonstrates that programme risks have been identified and mitigations are in place.
- 8.12.5 There is also evidence of a clear monitoring and evaluation approach which is set out against regular dialogue and reporting to DfT so that lessons learnt can be easily shared.
- 8.12.6 The Communications and Stakeholder Plan that is in place shows the key messages that will be communicated once ZEBRA funding has been secured. It shows a collaborative approach, using the overarching West Yorkshire Bus Alliance for a central campaign supported by specific route campaigns led by operators.

## 9. Equality Impact Assessment

### 9.1. Overview

- 9.1.1. An Equality Impact Assessment has been produced to understand the impact the ZEBRA programme has on the Combined Authority workforce and Leeds City Region residents, including service users.
- 9.1.2. The Equality Impact Assessment produced provides evidence of how we have considered the implications of service changes and demonstrates how the Combined Authority has met our legal Public Sector Equality Duty (Equality Act 2010) obligations in terms of the ZEBRA programme.
- 9.1.3. This exercise has allowed us to capture, demonstrate and publish our rationale of how we have considered our communities and legal responsibilities.
- 9.1.4. The full assessment can be found in Appendix A and is summarised below.
- The Equality Impact Assessment identified that the introduction of buses with improved facilities would benefit service users by providing additional wheelchair/pram space, audio visual announcements and hearing induction loops. It concluded that these buses would improve accessibility and customer service offering.
  - The noise of electric vehicles is noted as a negative impact to and mitigations are in place through planned stakeholder engagement
  - The assessment identified wider benefits for residents in the region by reducing air pollution and noise pollution in the areas where buses operate with the programme also seen as an enabler to the introduction of more zero-emission buses in the region providing wider regional benefits.
  - There was no negative impact perceived on Combined Authority employees with neutral impact, or positive impact where employees are using the vehicles for travel.