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Appendices

A Details of LTP4 interventions and alignment with future scenarios
1 Introduction

1.1 The convergence of digital and autonomous technologies is driving change; a change that is bigger than transport has seen arguably for many generations. These ‘revolutions’ are altering the way that services are planned and delivered, the choices available to users, and the players involved in the market. This presents a significant level of uncertainty as to which direction the public and private sector market will and should take for the supply and demand for different transport modes, technologies and systems. This is all happening against a setting of ambitious growth in Hertfordshire, and evolving patterns of socio-economic development and shifts in the broader political climate.

1.2 It is difficult to predict the future, but in policy terms we will need to be agile to change. This means that future transport policy, planning, investments and delivery need to be considered carefully given the range of different alternative future scenarios. It is this challenge that this study has sought to address.

1.3 The core aims of the study are to:

- Identify a number of plausible future scenarios that are grounded in the Hertfordshire context that respond to the developments in transport technology and wider socio-economic and political drivers of change from earlier work;
- Present the diverse set of implications for transport in Hertfordshire; test the strategic fit of the interventions being proposed as part of the Local Transport Plan 4 (LTP4) process; and
- Consider other types of interventions that the Council could implement to influence future trends.

Chapter guide

- Section 2 identifies some of the key drivers for change that are likely to influence Hertfordshire in the future
- Section 3 provides a more detailed overview of some of the key technologies and trends that are likely to influence the transport landscape for Hertfordshire
- Section 4 describes our approach to this commission
- Section 5 explores a set of plausible future scenarios for Hertfordshire
- Section 6 reviews the suite of proposed LTP4 interventions for their alignment with the future scenarios
- Section 7 highlights how Hertfordshire County Council could respond to the evolving context
- Section 8 provides some specific examples of interventions that could help them to influence future trends
- Section 9 identifies the implications of this study for LTP4 and the interventions that are taken forward
2 Drivers for change

2.1 Hertfordshire’s future context is subject to a wide range of factors, some of which are within the sphere of influence of Hertfordshire County Council (whether working independently, or in partnership with others), and others which are not.

2.2 All of these will have an influence on the way that people live, work and play in Hertfordshire, the way in which business is undertaken, the demand for investment in certain areas, and the level of growth that needs to be accommodated.

2.3 Figure 2.1 below highlights the main drivers for change in Hertfordshire for 2050. Each of these variables is discussed in more detail below.

Figure 2.1: Drivers for change – Hertfordshire 2050

Socio-economic factors
Transport accessibility
Demographics
Transport technology & futures
Land use
Political context

Socio-economic factors

2.4 By 2050 the context of Hertfordshire’s social economic landscape will be influenced by several factors. Some of these will not be unique to Hertfordshire, but will lead to opportunities and challenges across the Council area.

2.5 Hertfordshire’s proximity to London will provide both challenges and opportunities when set in the context of London’s population growth. By 2050, London will see its population grow to 11.27 million, whilst the number of jobs in the city will grow to 6.3 million. The number of International visitors to London is also set to increase.

2.6 This growth in population and jobs is likely to impact Hertfordshire’s transport infrastructure, with both private and public journeys to see an increase in the number of trips made from the county to London due to the desirability of Hertfordshire as a place to live given the relative ease of access to the capital.

1 London Infrastructure Plan 2050, GLA Intelligence Unit.
2.7 There are shifts in the labour market in some respects. In recent years the way people are employed has been subject to change with the rise of the ‘gig economy’. The gig economy is a labour market that is characterised by the prevalence of short-term contracts or freelance to permanent jobs. Whilst the gig economy offers may be a short-term characteristic, the scenario where people have multiple jobs could arguably continue. This results in shifted travel patterns from the traditional norm.

2.8 It is anticipated that by 2030 there will be 38,600\(^2\) net additional jobs in Hertfordshire with the ambition to grow medium sized business. Residents are also likely to take advantage of flexible working arrangements; improved digital connectivity means residents can work more remotely utilising technology. An ageing population, and an increasing retirement age presents a new challenge – how can people be kept economically active for longer? This in itself generates a new challenge for transport provision as access to economic opportunity plays a vital role.

2.9 The geographic context of Hertfordshire offers it a unique opportunity to compete with other areas across the UK for investment given the desirability of place and the level of connectivity to London and elsewhere. Located in the heart of the ‘Golden Triangle’ Hertfordshire is uniquely placed to benefit from the economic centres of London, Oxford and Cambridge, whilst airport expansion at Heathrow, Luton and Stansted could have impacts on tourism, business and surface access transport to these facilities. This combination is a unique selling point to Hertfordshire and should be used to draw inward investment to the county.

**Transport accessibility**

2.10 Improving transport accessibility will play a key role in shaping Hertfordshire’s future growth aspirations. It is important that any future transport strategy considers both existing and emerging modes, is sustainable, is flexible to adapt to changes in future technology, and is able to influence travel behaviour as well as responding to it.

2.11 Hertfordshire’s existing transport network combined with the population growth of London means that much of the flow of trips is north to south in nature. This puts a unique pressure on both the highway and rail network.

2.12 There are several major transport schemes\(^3\) in Hertfordshire which the Council can help influence and deliver to improve accessibility, these are:

- Smart motorway programmes;
- Croxley Rail Link / Metropolitan Line Extension;
- Thameslink Programme and TSGN Franchise;
- High Speed 2; and
- Crossrail 2.

2.13 As Hertfordshire grows there will be more pressure to provide new houses, which potentially may lead to the expansion of urban areas into green belt land. One way to help minimise this, is to improve public transport accessibility which will allow the densification of development and multi-function land use within existing towns and brownfield sites, enabling people to live and work in the same place to reduce the need to travel.

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\(^2\) Hertfordshire Vision for 2050, Non Transport Vision Report

\(^3\) 2050 Hertfordshire Transport Vision
Offering alternatives to private car use helps reduce congestions, and encourages more sustainable travel. Currently Hertfordshire car ownership rates are higher than the England average; 41% of households in Hertfordshire have two or more cars.

As well as major transport schemes, it is also important to understand how the role of sustainable and active travel can provide a positive impact on a local area. Ensuring that there is suitable infrastructure for walking and cycling trips and integrating these with the existing and future public transport infrastructure will encourage residents to make more trips by non-car modes and promote an active / healthy lifestyle. Incorporating the emerging role of e-bikes for those returning to cycling who may be older or less able to cycle can also contribute to a more active and healthier lifestyle.

**Demographics**

Hertfordshire is going to see a period of substantial population growth over the coming years. By 2035, Hertfordshire’s population is expected to increase by 265,000 from 1.1 million to 1.36 million.

This population increase will be combined with an ageing population which will be pressure on local services and transport infrastructure. By 2035, the number of people aged 65 and over is expected to increase by up to 75% and those aged 85 and over is due to rise by up to 200%.

The transport network has a key role to play in supporting this increasingly ageing, yet economically active, population.

**Technology and futures**

Technology is going to have a major impact on how Hertfordshire residents live, travel and work. Ensuring policies are adaptable to this changing landscape will be vital in making the most of the opportunities and challenges that future technology will bring.

New fuel and energy technologies which include hydrogen, electric, hybrid and liquefied natural gas (LNG) could lead to a shift away from fossil fuels which will help improve air quality at the point of use, but may also help lower the cost of transport for residents. By lowering the cost of travel, this may encourage more people to make more trips. It should however be noted that electrification will have challenges in terms of planning for the power grid and peak demand requirements.

Another key consideration is how autonomous vehicles could impact transport accessibility and also offer several other benefits. It offers the potential to significantly improve access for those that are unable to drive at the present time, whether an aging population, or younger people. Driverless vehicle technology is developing at a rapid pace with trials already taking place on UK roads. Autonomous vehicles could help improve road congestion by allowing cars to drive at consistent speeds and closer together, whilst also allowing passengers to make more efficient use of time and should also lead to improved road safety.

The sharing economy is also changing the way in which people purchase transport services. It is widely anticipated that car ownership levels will fall. Ownership models are changing with a potential shift to purchasing access. People will make more trips in mobility services such as Uber, car clubs and the offer of mobility as a service providing flexible transport that moves away from single trips and personally owned modes of transport.

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4 Hertfordshire Vision for 2050, Non Transport Vision Report
The way residents consume goods and services is also likely to change. More items will be purchased and delivered to households, resulting in fewer trips to town centres and shops, but will increase the number of delivery vehicles. New technology such as 3D printers in households or local centres may also mean that some items no longer need to be transported to a household or production hub, resulting in fewer trips by individuals, but may result in changes to raw material transportation.

This is expanded on in section 3.

### Land use

Hertfordshire’s changing landscape will present many opportunities and challenges across the county.

One of the many challenges will be for the Council to make suitable land available for development that does not impact on Hertfordshire’s rural nature and that avoids closing local and strategic gaps between towns.

There will be pressure to build housing, provide premises for jobs and privately owned firms will be more interested in green space for leisure activities. It is likely that to meet growth projections new settlements will need to be created. These new settlements will need to consider both access to transportation networks and digital networks. Developments should also consider the role of home and hub working.

### Political context

The political environment at both a national and local level will dictate the future scenarios in Hertfordshire and how the challenges and opportunities they present can be developed and mitigated against.

Local government will have a difficult balancing act in ensuring that Hertfordshire thrives’ economically whilst protecting the local environment, public transport is fit for purpose and the residents see Hertfordshire as a desirable place to live.

It will be important for Local Councils to actively encourage political engagement with residents. Using social media will enable two-way engagement with local communities that will aid the democratic process. This will be important when planning and delivering large scale infrastructure projects to ensure the schemes meet the needs of Hertfordshire.

It is also important that policy makers and politicians in Hertfordshire make use of a wide range of funding mechanisms to help deliver the services and infrastructure needed within the County. Further to this, the importance of partnerships is increasing. In the years to come it is likely that there will be more partners in the transport arena with the emergence of a number of digital, data, vehicle manufacturers and new mobility companies. Agility and dialogue will be central to navigating this new setting.

The changing demographics of Hertfordshire will also impact the prioritisation of policies with a Council context. A more ageing population will impact on local services, whilst a raise in the pension age will also see people working for longer.
3 Key emerging technological developments

3.1 A number of key technological developments and trends will influence the future scenarios set out in section 5.

Figure 3.1: Key future trends

3.2 Further details on these trends are described below to provide further context on their relevance.

Connectivity and use of big data

3.3 There have been revolutionary developments in digitalisation in recent years, impacting all aspects of life. The ability to access real-time data from a breadth of networks, products and services, significantly broadens the opportunity for regional operators to respond to the demands of businesses and residents. Today, there is a greater attention on the role of data analytics on grounding future policy, operations and new business models. With the rise in personal data tracking with the use of mobile phone applications and personal devices, there is a need for common standards to enable platforms to complement one another whilst ensuring the security and privacy of users or recipients. Combining data such as this with existing accessible open data feeds i.e. weather or major events, can provide a much more holistic interpretation of a single data set and can have a greater impact understanding and responding to certain behaviours. The One Transport project that Hertfordshire County Council is a member of is an example of an initiative that addresses some of the themes in this area.

3.4 Connectivity and big data have been increasingly at the centre of transportation debates. Optimising data to influence the movement of vehicles and people can possess both economic and social benefits within a region. Evidently, the co-ordination of the expanding transport modes and the demand for 24/7 accessibility has led to more integrated and interactive services. Collaboration between operators to share data benefits users through visibility of travel options, enabling decisions to be made on cost, time and/or environmental impact.

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Source: (L-R) http://www.tampa-xway.com/; Google; IBM/Local Motors; Daimler
3.5 It is evident that the advanced vehicle technologies that are entering the market now and in the next decade operate using vehicle-to-infrastructure interaction and vehicle-to-vehicle interaction. The communication models use super-fast broadband and wireless technologies including 5G to enable vehicles to share information with other vehicles and/or supporting infrastructure. This allows travellers and operators to access and respond to real-time data on traffic congestion, parking, incidents etc. Autonomous vehicles may use vehicle-to-vehicle interaction to interchange local information for greater efficiencies. Autonomous vehicles may require manufacturers to agree communication technology and protocols to enable data on position, speed and direction to be shared amongst operators. Higher layers of architecture establish uncertainties upon journey performance that can be shared via routers to more distant vehicles and/or infrastructures. This as an example demonstrates how cities and regions could be able to control, influence and monitor travel patterns in the future through greater connectivity.

Autonomous

3.6 In recent years we have seen a step change in the level of connectivity and automation within transport. In the automotive sector, consumers have become used to being offered Advanced Driver Assistance Systems (ADAS) on vehicles such as Autonomous Emergency Braking, Lane Departure Warning or Adaptive Cruise Control. However in recent years we have seen a revolution in the application of automation to vehicles to the extent that automotive manufacturers and technology companies are now actively developing products that support full autonomy.

3.7 Automated vehicles can take many forms and are scheduled to support a range of services. Some examples include:

- More highly automated vehicles (either privately owned, or as part of a shared fleet) that could in the shorter term include features such as Auto Valet Park whereby the vehicle can park itself, beyond the line of sight of the driver/passenger in specific environments, or in the longer term operate anywhere, at any time
- Autonomous taxis as being trialled in Pittsburgh, USA by Uber
- Fully autonomous on-demand shuttles vehicles that can carry 8-10 passengers in particular environments (e.g. the services provided by Navya)
- Automated delivery vehicles (as has been trialled in Greenwich and Southwark)
- Small automated pods that could operate in shared spaces at low speeds (as has been trialled in Milton Keynes and Greenwich)

3.8 Automated vehicles, in their various guises present a number of opportunities in Hertfordshire. At the present time, approximately the driver represents approximately 60% of the operational costs of a traditional bus service. This can act as a limiting factor on routes that offer low patronage, particularly outside of peak hours. Automated vehicles operating on-demand can help to significantly bolster the accessibility of different areas, as well as improving their economic activity. Further to this, and taking account of the twin-challenge of an aging local population, and a likely need to remain economically-active for longer, automated vehicles add to the range of mobility options for those who do not have the means, or desire to drive private vehicles.

Figure 3.3: Examples of Automated vehicles

3.9 These vehicles are unlikely to look too different from the vehicles that we see on the roads and pavements today, and in many ways this is a deliberate choice on the part of manufacturers to ensure that they don’t isolate their traditional customer base by introducing something too radical too soon.

3.10 To date, much of the impetus for the development of AVs has come from the private sector, both from established automotive manufacturers such as BMW, Daimler, Ford, Nissan, Volkswagen and Volvo, but also technology giants such as Google, Tesla, and Uber. However,

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6 Clockwise from top-left: nuTonomy vehicle trialled in Singapore, source nuTonomy; Olli shared autonomous shuttle, source: IBM/Local Motors; Lutz Pathfinder pod visualisation, source: Transport Systems Catapult; Local Delivery concept, source: Starship Technologies.
this is not to say that the public sector does not have a role to play in shaping and influencing the introduction of automated vehicles, either individually or collectively given the global market.

3.11 This involvement from the public sector can take various guises. At a national level we have seen efforts from the Department of Transport to This has included the creation of legislative and regulatory measures to shape the way that vehicles are developed, tested and deployed.

3.12 The UK has seen a groundswell of activity in relation to Connected and Autonomous Vehicles (CAV) in recent years. This has been spear-headed by government ambitions to position the UK as a hub for automated vehicles, and to take advantage of the broad array of potential benefits offered by the introduction of CAVs such as:

- Secure a significant share of the global market opportunity
- Position UK as centre for excellence for the testing and development of self-driving vehicles
- Promote UK plc – particularly to position the UKs OEMs and Tier One suppliers at the forefront of the market
- Assure the UK automotive industry’s short, medium and long term vitality
- Improve road safety, reduce congestion, and increase productivity.

3.13 As part of its efforts to secure the UKs positions as a leader in the automotive sector and to establish an ongoing role in the development of CAVs, the UK has undertaken a number of actions to clarify the legislative and regulatory environment for CAVs. This has resulted in the publication of a number of key documents and policy statements which are shaping the testing and deployment automated systems in the UK. This included the following:

- The Pathway to Driverless Cars report (2014) that set out the actions for review of the UK’s regulatory framework
- The preparations of the Modern Transport Bill that set out the plans for regulation for CAVs and sought to clarify the insurance position for CAVs
- The preparation of the Vehicle Technology and Aviation Bill which sets out the insurance rules for automated vehicles and steps to improve the provision of electric vehicle charging points
- The creation of the Code of Practice for testing automated vehicle technologies
- Development of consultations on the use of ADAS and automated vehicle technologies in the UK, and a call for evidence on the need for testing facilities for automated vehicle technologies.

Figure 3.4: UK Driverless Cities programmes (L to R: Project Gateway, UK Autodrive, Venturer)

3.14 In addition to this public sector leadership at a national level, there are also steps that can be taken at a local level. To date, we have seen a number of local authorities get involved in connected and autonomous vehicle research and development programmes such as the
Driverless Cities projects in Bristol (VENTURE), Greenwich (GateWAY), and Milton Keynes/Coventry (UK Autodrive). These projects have enabled the host local authorities to build their understanding of the potential impacts of autonomy in a number of different ways:

- the authorities understanding of how those types of services could be built into their wider set of mobility and accessibility policies
- To understand what the vehicle manufacturers or providers may need from a public body (in terms of support and enabling powers, digital infrastructure, or physical infrastructure)
- To help identify the potential implications for traditional transport modes (e.g. impact on the use of public transport, impact on private cars, implications for the built environment etc.).

3.15 There are significant uncertainty surrounding exactly when highly or fully autonomous vehicles will represent a certain proportion of the fleet, however given the high-levels of investment being made by the private sector, and the positive stance being taken by national government, it is highly likely that they will emerge as a major consideration for transport planners in the near to medium term.

Shared

3.16 Technological and social changes have facilitated new transport innovation in recent years. The evolution of the sharing economy and establishment of a wider range of peer-to-peer services such as Airbnb and JustPark has normalised these business models for the consumer. This is now serving to alter the way that transport services are accessed and the way in which people travel and goods are transported. Ultimately these trends have contributed to the creation of more bike sharing services, car sharing schemes, ridesharing operations, the use of on-demand mini-buses and taxis.

3.17 The application of digital technologies has altered the way that bike hire schemes can be delivered. This is both from the perspective of how the formalised schemes are managed due to enhanced data being available to optimise the way that services are provided, but also the way that peer-to-peer services are delivered through providers such as Spinlister. The use of e-bikes offers other potential benefits in terms of extending the possible range of use for bikes, particularly for occasional users, and widens the range of prospective users.
3.18 Car sharing has been present in London and beyond since 2000, and providers are now embracing a range of different business models to support different needs. As well as the standard ‘round-trip’ hire model, there are now a range of providers (e.g. Drive Now) specialising in other services that can be used on a one-way basis. In addition to these models, there are also a range of peer-to-peer providers emerging (e.g. Turo). Automotive manufacturers are also shifting their stance regarding the balance between vehicle ownership and usership to the extent that nine out of every ten new vehicles are now leased rather than purchased.

3.19 The increased use of data has not only revolutionised the taxi and private hire industry with the likes of Uber and Lyft making use of smartphone technology and data processing mechanisms to link people with vehicles, but also to support the use of ridesharing (e.g. Uber Pool) and on-demand services. In the UK, we are starting to see the creation of data-driven on-demand minibus services such as Slide in Bristol and ArrivaClick in Kent. These services are blurring the barrier between traditionally provided public transport that operate on fixed routes, and the taxi market. This serves to provide users with the flexibility of taxi type services, but at a price point more akin to public transport.
3.20 These new business models, combined with the technological advancements, are helping to redefine the way that people access and use particular types of vehicles. Furthermore, they are allowing people to use the types of vehicles they need when they need them without the expense of ownership.

3.21 These changes are already with us, but the advancement of other associated trends such as automation, greater connectivity and new payment mechanisms means that in recent years, the concept of mobility-as-a-service has been gaining momentum through location aided services, pay-as-you-go models and on-demand applications. It is expected that mobility-as-a-service will dramatically alter city movement, urban design and society’s demands upon existing and future networks.
3.22 Mobility-as-a-service challenges the existing (and questionably, historic) culture to possess assets that have previously been aligned to status and wealth. Evidence suggests that Generation Z have less demand for privately owned assets than previous generations; instead they demand services and alternative business models that increase their disposable income and flexibility for leisure activities. It is suggested there are a number of intangible benefits associated to mobility services, such as the enhanced quality of life, flexibility and value of time. Furthermore, considering future deployment of autonomous vehicles, the opportunities to further progress mobility-as-a-service is extensive, as discussed in the previous section.

3.23 More broadly, a paradigm shift towards services is being exhibited in a range of sectors, enhancing the role of data to co-ordinate operations, increase the breadth of accessible services and maximise efficiencies. Currently, mobility services and system operators on a common platform are most prolific in urban environments. However, evidentially the sector is
expanding to incorporate more services and extending geographically to more sub-urban and rural locations.

**Propulsion and alternative fuels**

3.24 There are a number of factors that are influencing the rate at which auto manufacturers are entering the electric vehicle market and the rate civil society and businesses are adopting electric vehicles. Currently Government have been the key catalyst of market stimulation through various available grants and incentives, across a range of sectors.

3.25 However, there is a consensus in the market that progress is somewhat reliant on the development of lithium ion batteries to increase the range on a single charge at a competitive price. This highlights the embedded driving culture to rely on a 300 mile+ fuel tank and the flexibility that it provides. However, moving towards alternative business models and autonomous vehicles it is questionable whether in future this requirement of extended range will be detached from car driver demands.

**Figure 3.8:** Tesla Super Charging facilities (source: Tesla)

3.26 Entrepreneurial vehicle manufacturers, who do not suffer from large sunk technological costs, have been making significant progress in the electric vehicle market. It has been demonstrated by these technology pioneers the realm of what is possible today, this includes autonomy, extended electric range to an excess of 300 miles and rapid charging on an established global network. These three elements challenge existing scepticism of the future of road transport and demonstrate the impending change.

3.27 Additionally, in recent years operating system developers have entered the automotive industry with advanced technological capabilities in autonomous concept vehicles. This disruption to the market focuses more on data analytics, computing and software; fundamentally changing the historic automotive industry centred on mechanical engineering.
3.28 A further opportunity for EVs to contribute to the broader agenda is through vehicle-to-grid capabilities. Using vehicles as an energy storage asset will have significant opportunities for countries to stabilise energy demand, particularly in peak periods through the introduction of supply & demand business models, as well as assisting in national energy independence. These opportunities are imperative to consider in the context of peak oil, climate change and air quality; independently these global challenges significantly influence policy within the industry and city governance. It should however be noted that while electric vehicles can offer opportunities in this area, they could also represent a significant challenge due to pressure on the grid given peak demands for electric vehicle charging.
4 Approach

4.1 The level of uncertainty generated by the drivers for change listed in section 2 has led to HCC undertaking this exercise to help test the fit of the potential LTP4 interventions against a range of different future scenarios.

4.2 To establish a set of plausible future scenarios for Hertfordshire, we drew upon methodologies previously applied by the New Zealand Ministry of Transport and Chartered Institute of Highways & Transportation (CIHT) to address uncertainty in transport planning. This approach is described below.

Scenario development

4.3 Techniques previously applied in the New Zealand Ministry of Transport’s Future Demand project and the Chartered Institute of Highways & Transportation (CIHT) Futures exercise provided the basis of this exercise; however we adapted these approaches to take account of Hertfordshire and its needs, ambitions and influencing factors.

New Zealand Ministry of Transport – Future Demand project

4.4 The Ministry of Transport’s Future Demand project was led by Professor Glenn Lyons from the University of West England and builds upon the notion that analysing past transport trends to predict future developments and inform transport policies and investments is increasingly insufficient. Specifically a plateauing and/or decrease in car use in developed countries since 2004 combined with radical technological innovation creates big uncertainties for future personal travel demand and its possible impact on public and private travel. By providing a different approach than relying on past trends, the Future Demand project aims to re-think future investments for transport.

4.5 Whilst there are a number of factors affecting future transport demand, the project focuses on two; the cost of fuel and the accessibility preference (i.e. how the society embraces digital technology). These are the two factors that we will utilise in the Hertfordshire case. The two factors create for possible scenarios, as shown in the diagram below.

4.6 In the Hertfordshire context, the development of the four scenarios will be influenced by the local socio-economic and environmental context, as well as technologies available and the local ambitions set out in the LTP3, the 2050 Transport Vision and targets for LTP4.

4.7 Some of the conclusions from the Future Demand project which can act as lessons learned for our project include improving access not just mobility by integrating good spatial planning and improving digital access, looking at social trends and speed in development, applicability and take-up of technologies, and building in flexibility where possible to ensure resilience. Furthermore, a key principle of this exercise involves stepping away from simply predicting future demand and then providing for that demand. Instead investments and policies should

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7 The 2050 Transport Vision Public Consultation report can be found at: https://www.hertfordshire.gov.uk/media-library/documents/about-the-council/consultations/tv2050-consultation-report.pdf

This reported on the emerging content of a new LTP4 and was published in September 2016.
be aligned to shape the pattern of future demand in order to achieve to best possible outcome for the preferred scenario.

Figure 4.1: New Zealand’s Future Scenario Analysis. Source: New Zealand Ministry of Transport

CIHT Futures

4.8 The CIHT Futures project builds upon the same principles of challenging traditional quantitative forecasting and instead using scenario development to explore the variables that are shaping future travel. CIHT workshops introduced the ideas of regime-compliant versus regime-testing pathways. Whereas the former centres on prediction, weak planning, and cost-benefit analysis and sees transport as an enabler of economic prosperity, the latter includes scenario planning, strong planning, real option analysis and multiple enablers of economic, social and environmental prosperity.

4.9 This concept of regime testing is being used in the context of this study, to test the alignment of potential local Transport Plan interventions against the set of plausible future scenarios for Hertfordshire.

Scenario Development for Hertfordshire

4.10 The starting point for the scenario planning exercise was the question ‘How could or should our transport system evolve in order to support mobility in the future?’ We undertook an internal workshop to develop the four future scenarios for Hertfordshire that arise from this process.

4.11 For each of the four scenarios, we will produce narrative descriptions that introduce different pathways. The pathways will provide an indication of the development from the present day to the future state in each scenario and draw upon broader technology and disruptive trends, the wider socio-economic context, and any of the Council’s current and future planned and/or committed transport and planning schemes from the LTP and the 2050 Transport Vision for Hertfordshire.

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8 The numbers included within Figure 4.1 (e.g. 53%) represent the impact that the scenarios could have on total kilometres travelled. It should be noted that those figures represent the context in New Zealand, and involved a further phase of work to model the scenarios – this goes beyond the exercise undertaken in this study.
The following section describes the broader context and drivers for change for Hertfordshire, followed by a section that identifies and describes the narratives for four future plausible scenarios for Hertfordshire.
5 Scenarios

5.1 While there are a multitude of potential scenarios that could emerge in Hertfordshire, it was appropriate to choose a small number of plausible ones against which we could test the strategic alignment of the LTP4 interventions. The intention of this exercise is not to say that one of the scenarios more closely represents where the County is going, or indeed where the County is today.

5.2 The scenarios were generated by considering different axes that could influence the way that people travel in the future. The axes that were settled on were:

- The ‘accessibility preference’ of Hertfordshire’s citizens, ranging from physical means to a more virtual form of travel in the future
- The ‘cost of energy’ as a mechanism that influences users decisions as to how they travel with higher costs of energy influencing in particular the decision to use private modes over public transport or other alternative modes.

5.3 The figure below illustrates the scenarios that have emerged from this set of axes.
These scenarios are largely intended to be passive, recognising the range of influencing factors discussed in the previous section (many of which lie beyond the influence of Hertfordshire County Council).

In addition, we recognise that these scenarios are not likely to be exclusive, and in fact there are many thousands of potential scenarios that could emerge. In reality, there could quite feasibly be overlap between these scenarios, given the element of user choice, behavioural change, the availability of technology and its rate of change. Further to this, different places may experience different conditions at different times.
Travellers Paradise

5.6 Hertfordshire residents, workers and visitors are well served by a range of high-quality, and attractive transport options. Journey times are acceptable, infrastructure is suitable and well-maintained, and the cost of energy is at a level that users are provided with choice between public, private (although measures have been introduced to ensure that the negative externalities are managed), shared, and active modes. Connected and autonomous vehicles have permeated the market, and are available to individuals privately, or on a subscription basis, with due consideration to demand management.

5.7 On a societal level, there is still a desire for face-to-face interactions and the hub and home-working life-style has not yet permeated life in the County to the extent to which it could have once been expected.

5.8 Transport movements to support business-to-business activities are supported by the well-maintained transport network, but also bolstered by the efficiencies gained from making best use of data to optimise the logistics.

5.9 This scenario contains the following challenges for the Council:
- The challenge of securing and making the necessary investments to accommodate growth;
- The need to implement policies to manage congestion and demand;
- The need to introduce policies to shape the use of shared modes.

5.10 The figure below provides an overview of the process of how we may arrive at this scenario.

Figure 5.3: Travellers Paradise – how might we get there?

Digitally Connected Consumers

5.11 The digital society has been realised, and Hertfordshire’s citizens are able to access an ever greater range of services digitally rather than face to face due to the proliferation of enhanced connectivity services has meant that all parts of Hertfordshire have access to ultra-fast internet either at home or on the move. Healthcare consultations take place via a digital interface and predictive diagnostics become prevalent, reducing the need for people to travel to a clinic. Retail has predominantly moved online, and 3D printing has meant that individuals can produce more of their own goods at home or via specialist companies locally. More and more people able to work from home as employers have recognised the benefits of flexible working and have implemented effective methods for collaboration between colleagues using digital tools.

5.12 While the demand for physical travel is lower than today’s levels for some of the time, when people do wish to travel it is using high-quality modes that make use of advanced technology that optimises movements and responds to individual needs. Connected and automated vehicles are available as part of a mobility-based subscription service. There is a positive impact on community life and urban centres as people choose to spend their time and money more locally, embracing active modes and the quantified-self. The environmental impact of

9 ‘Quantified self’ refers to the practice of digitally measuring active lifestyles such as walking, running, cycling etc.
transport is reduced due to not only the lower levels of travel, but also the propulsion technologies used.

5.13 An aging population is able to remain economically active by the use of digital services, and transport modes that meet their needs and lifestyles. Further to this, there are potential healthcare benefits under this scenario due to a greater emphasis on predictive healthcare for a growing ageing population. The range of mobility options available to Hertfordshire's citizens means that different demographic groups, and those living in more rural communities, have enhanced accessibility when they wish to travel.

5.14 This scenario generates some key challenges for the Council and their contribution:

- What could they do to balance the needs of the existing transport investments in the near-medium term against the future needs of more digitally advanced communities?
- What steps could they take to provide appropriate connectivity to enable digital engagement?

5.15 The figure below provides an indication of the trajectory for reaching this scenario.

Figure 5.4: Digitally Connected Consumers – how might we get there?

Cooperative & Close

5.16 Hertfordshire's citizens still have a preference for face-to-face contact and human experiences. Local spatial planning policies and the arrival of large major employers have meant that towns such as Stevenage have densified, with a greater centralisation of services. Looking further into the future, the expansion of major employment hubs such as London

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10 NB – in this figure, the ‘Digital Railway’ refers to the modernisation of the railway by using digital services to improve the operational efficiency and capacity of the network, and to improve the user experience. ‘Digital Highways’ refers to the enhanced connectivity of the road network to bolster the management of the road network, improve safety and enable a wider range of services to support the movement of people and goods.
could encroach on Hertfordshire resulting in a reduction in the need to undertake longer distance commutes at certain times, for certain professions, or for certain tasks, particularly as the local population grows.

5.17 The attractiveness of travel is reduced due to the high cost of energy placing additional pressure on the public transport network. This is particularly exacerbated by a lack of investment in the rail network which has not kept pace with the wider digital agenda, meaning that the rising population cannot be accommodated in the constraints of the current rail network (e.g. the station size means that nothing more than a 12 carriage train can be used, and the lack of signalling improvements means that the current pattern of train paths needs to be retained). Road-based congestion increases as a result of pressures on the railway. People place their value of time on interaction within their community due to a centralisation of services, and a densification of settlements.

5.18 This capacity issue may lead to a behavioural response whereby employers alter the working patterns to enable their staff to have flexibility around peak demand, or employers may create or procure their own transport services to meet the needs of their staff.

5.19 The key challenges associated with this scenario from the Councils perspective include the following:

- Dealing with the congestion challenge;
- The need to target policies at a local transport level, as well as sustain inter-urban connections;
- Influencing decisions outside of their immediate control (e.g. future of railways).

5.20 The figure below sets out a potential trajectory for how this scenario could come to fruition. This includes a lesser role for virtual connectivity that could arise following a situation where the public lack trust in online activity, or a general backlash against virtual connections in favour of more traditional forms of interaction.

Figure 5.5: Cooperative & Close - how might we get there?
5.21 Increased costs of travel due to higher energy prices and a lack of investment, combined with an increasing population and consequentially congestion on corridors between major hubs has increased, have meant that the attractiveness of travel has reduced. Hertfordshire’s citizens are looking more towards digital solutions to undertake day to day activities.

5.22 The levels of travel are less than today’s, with communities concentrated on a more local level. Local transit options serve the needs of those communities, providing the link to other communities by integrating with other transit hubs for longer distance travel. Communities beyond the major urban areas are dispersed, and there is an agglomeration effect, where people cluster on the basis of their interests and talents. There is the potential for there to be stark disparities between those who are digitally capable, and those who are not.

5.23 The key challenges for the Council associated with this scenario include the following:

- Targeting investments at supporting local and micro-movements;
- Supporting the delivery of digital initiatives;
- Support the accessibility of different demographics at a time of budgetary constraint.

5.24 The figure below provides an indication of how this scenario may emerge in the future.

*Figure 5.6: Connected Local Living – how might we get there?*
6 Local Transport Plan 4 Strategies

6.1 Hertfordshire County Council is considering a number of potential interventions that could inform the key movement corridor strategy narratives that are being included in LTP4. As part of this commission we have undertaken a high-level review of those potential interventions to establish their alignment with the four future scenarios examined in section 5. In addition to this, we gave some thought, informed by a workshop with Council Officers, to:

- The potential characteristics that the intervention group may have under each of those future scenarios;
- The other types of interventions that could be considered complimentary;
- The role of technology in influencing that type of intervention;
- Examples of the risks that those interventions might carry.

6.2 The groups of LTP4 interventions that we considered included the following:

Table 6.1: Set of potential Local Transport Plan 4 (LTP4) interventions

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public transit systems</td>
<td>These could include the creation of Bus Rapid Transit schemes or Light Rail/Tram to serve key corridors</td>
</tr>
<tr>
<td>Significant highways junctions upgrades and bypasses</td>
<td>These could include upgrades to specific junctions on the Strategic Road Network, or new bypasses.</td>
</tr>
<tr>
<td>Demand management</td>
<td>These could include enhanced management of car park supply, pricing mechanisms for parking, or the introduction of Park &amp; Ride at key locations.</td>
</tr>
<tr>
<td>Strategic transport hubs concept</td>
<td>These could include the introduction of interchanges (Park &amp; Ride, coachways, cycling and rail parkways) at key points on the Strategic Road Network.</td>
</tr>
<tr>
<td>Bus priority infrastructure</td>
<td>This could encompass the introduction of new bus lanes, junction priority systems, or the addition of bus gates.</td>
</tr>
<tr>
<td>New Rail Stations</td>
<td>Options being considered are new stations to enhance provision at a selection of settlements.</td>
</tr>
<tr>
<td>Interurban cycleways</td>
<td>These include the creation of additional or improved interurban cycling routes between settlements, or along canals to enhance connectivity.</td>
</tr>
<tr>
<td>Urban cycling infrastructure upgrade</td>
<td>These would include the introduction of cycling infrastructure at a higher standard with a greater level of segregation than the current provision.</td>
</tr>
</tbody>
</table>
## Overall alignment

### 6.3

The table below provides a summary of the overall alignment of the groups of interventions against the future scenarios (Travellers Paradise, Cooperative and Close, Digitally Connected Consumers, and Connected Local Living).

**Table 6.2: Overall alignment of potential LTP4 interventions against the scenarios**

<table>
<thead>
<tr>
<th>LTP4 Interventions*</th>
<th>Travellers Paradise</th>
<th>Cooperative &amp; Close</th>
<th>Digitally Connected Consumers</th>
<th>Connected Local Living</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public transit systems</td>
<td>?</td>
<td>✓</td>
<td>x</td>
<td>✓</td>
</tr>
<tr>
<td>Significant highways junction upgrades &amp; bypasses</td>
<td>✓</td>
<td>x</td>
<td>?</td>
<td>x</td>
</tr>
<tr>
<td>Demand management</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Strategic transport hubs concept</td>
<td>✓</td>
<td>✓</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Bus priority infrastructure</td>
<td>✓</td>
<td>✓</td>
<td>?</td>
<td>✓</td>
</tr>
<tr>
<td>New Rail Stations</td>
<td>✓</td>
<td>?</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Inter-urban cycleways</td>
<td>✓</td>
<td>✓</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>Urban cycling infrastructure upgrade</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

* Interventions being considered that could inform the key movement corridor strategy narratives being included in LTP4

### 6.4

Please note: ‘✓’ indicates alignment, ‘?’ means that it is unclear whether there is alignment or not, and ‘x’ indicates weak alignment with the future scenario. Where there is a weak alignment or the alignment is unclear, these are described below. In general terms, the current set of LTP4 interventions (see Table 6.1 for description) align well with the Travellers Paradise scenario, although there is a question as to how effective new public transit systems would be in a scenario where the cost of energy is low, and extensive travel by road is viable and popular. There is a keen emphasis on demand management in this scenario that may need to extend beyond changes to the cost of parking at destinations, to ensure that the predilection towards travel is managed in a way that enables the network to function. To this end, a behaviour change and education programme may need to be implemented to help achieve this objective, whether on the basis of targeting the individual’s behaviour or working with developers and employers to encourage the provision of services that reduce the impact on the surrounding network.

### 6.5

The Cooperative and Close scenario carries a slightly different emphasis to the Travellers Paradise scenario due to a reduction in the attractiveness of travelling longer distances, either as a consequence of increased costs, or a reduction in the levels of investment in the network. On this basis, interventions that serve longer distance movements (e.g. new bypasses) may carry less relevance in this scenario in future years due to changes in technology and associated travel patterns. There is also a question mark over the requirement for new railway stations, although it is possible that sub-urban stations may grow in importance in key settlements if there is a concentration of employment and labour.
6.6 As we move towards the Digitally Connected Consumers scenario, it begins to challenge the alignment of the set of LTP4 interventions for the plausible future scenarios. As discussed, in this scenario users choose to embrace the digital agenda as an effective means to support their lifestyles, augmenting it with high quality transport choices to support local transport movements that emphasise more active modes. Consequently, interventions related to the creation of transit hubs or longer distance travel indicates a weaker alignment.

6.7 This trend of weaker alignment continues at a more pronounced rate under the Connected Local Living scenario. Under this scenario, the volume of longer-distance transport movements is reduced, but is coupled with a reduction in the attractiveness of travel. This limits the alignment of the LTP4 interventions to those that focus on local movements, and particularly active modes.

6.8 We explore the detail behind the strategic alignment of the LTP4 interventions in an appendix to this report.

6.9 The implications for LTP4 of this assessment are set out in section 9.
7 Addressing future interventions and market developments

7.1 The current set of potential LTP4 interventions have been designed to address the current and known future issues which include growth patterns to 2031, and guided by a set of transport objectives to support the realisation of a positive future vision for Hertfordshire. To date, the future uncertainties (generated by the drivers for change) are recognised, but perhaps not well understood in a Hertfordshire context.

7.2 One of the most tangible aspects, particularly given Hertfordshire County Council’s role as transport authority, is the impact that technological changes and future trends may have on the interventions they introduce, the types of tools available to them, and the initiatives and services that could emerge from the market in its own right.

7.3 This study covers a 33 year period. The rate of change today is rampant, and we are currently undergoing what could be described as a series of transport revolutions driven by the trends towards:

- Enhanced connectivity and use of data
- The application of automation and robotics
- A shift in the ways that we access services and the underlying principles of ownership
- New propulsion methods.

7.4 These revolutions are introducing changes that are already affecting the way that transport is delivered and places shaped. It is therefore appropriate at this point to give further consideration to the other interventions that might be necessary to support the future scenarios set out in this study, and Hertfordshire County Council’s role in supporting that.

7.5 Below we have identified a selection of high-level activities for Hertfordshire County Council to consider in relation to future transport needs and the associated interventions. Specific actions that could be undertaken in relation to certain technologies are considered in a later section. The themes associated with the preparations for being agile to change are set out in the figure below.
Build intelligence

7.6 At a time of such rapid change, a key step is to find effective ways to build knowledge of key trends, and to be aware of the prospective issues and opportunities in a Hertfordshire context. A core element of this is to understand when Hertfordshire County Council might need to engage with the market or influencing bodies, and if so to understand what their options might be at that time. Ultimately, this is a very large area of change, and it is important to understand where scarce resources should be focused, and where the learning can be most efficiently accessed or shared.

7.7 Despite this significant level of change in the market place, there is recognition that there are likely relatively few unique issues that face Hertfordshire in respect of future needs; therefore it will be increasingly important to work in partnership with other groups. Examples include the automotive sector who up to this point have not needed to engage with the public sector at all, but are likely to find themselves needing to work more closely with the public sector in the future as they launch more ridesharing-centric services, or look to the public sector to provide more enabling digital (or physical) infrastructure. To this end it may be more appropriate to join certain public sector or industry body working groups understand the wider picture and then address Hertfordshire-specific challenges as they arise.

7.8 There are also steps that can be taken to raise awareness of more specific issues and requirements by engaging in appropriate studies and initiatives to build experience and processes. There are numerous examples of different public bodies becoming involved in trials and research and development initiatives, including the likes of Milton Keynes Council, Bristol City Council and the Royal Borough of Greenwich taking part in the Driverless cities programme, or indeed Hertfordshire engaging in the OneTransport project.

Develop appropriate policies

7.9 Hertfordshire County Council is already considering the impact of future trends on their policies and underlying interventions by commissioning this piece of work, however, there are ongoing efforts to be undertaken to ensure that policies reflect the current and future needs of the County within a national context.
7.10 It is recognised that the future is uncertain, and that the Council needs to continue to make investments in the transport infrastructure to provide support to accommodate the current levels of growth. However, while it is reasonable to focus on the foreseen needs, steps can be taken to ensure that the future needs are also considered. One component of this is to establish wideness in the policies that are outcome focused and as so far as is possible technology agnostic.

7.11 Begin to visit key policies to establish the impact of and resilience to future changes and foreseeable changes. As an example, steps could be taken to understand the sentiment behind policies such as those permitting the use of bus lanes and then establish whether future modes that may be autonomous, on-demand, or shared may fit that criteria and be permitted to access the lanes. The ability of Hertfordshire County Council to be agile to change is likely to be a fundamental feature of the future.

7.12 For Hertfordshire County Council, we propose that there should be a process of identifying:
- What it is that they can control and influence;
- What it is that they cannot control and influence; and
- Which elements/activities they need to remain agile to so that they can react should the occasion demand it and they are relevant and applicable to Hertfordshire.

7.13 There are already examples where public bodies may need to understand how to react to the emergence of autonomous vehicles in the short term. One example of this is Volvo’s DriveMe programme that trials the use of SAE Level 4 fully autonomous vehicles, operating in fully autonomous mode along specific designated sections of highway. This is expected to be operating in North London and Hertfordshire towards the end of 2017. At the time of writing, the specific plans, including the sections of road that would be suitable for autonomous driving, have not been made public. However, this is a real-world example of a situation that the Council may need to react to in the future.

Figure 7.1: Volvo Drive Me autonomous vehicle trial programme (source: Volvo)
Address key barriers

7.14 While many of the legislative or regulatory hurdles for new technologies or services exist at a national level, there are still some steps that could be taken to **reduce the number of barriers to entry at a local level**. Ultimately, this would involve first understanding the needs of a particular service, and then reviewing the options available to the Council. Examples of activities in this area might include reviewing the legislative arrangements for bus priority for example, or perhaps rationalising the taxi and private hire licencing requirements for the County to support the introduction of cross-region services such as Mobility-as-a-Service. Again, it may not be necessary to undertake these steps alone, but rather to tackle these topics through industry groups, alliances with other local authorities, or perhaps by making use of information shared by others.

Implement initiatives and interventions

7.15 There can be a temptation when considering scenarios to only identify with interventions that have relevance in that future scenario; however there is recognition that the Council has a responsibility to serve today’s needs as well as tomorrows. In this regard, it is good practice to pay **consideration to the future trajectory of the particular asset**, service or locale. Put another way, how might that particular facility be used in the future, or how might the broader geographic area change in the future? One example of this might be around the way that interchanges are designed to enable the existing vehicles to park today, but also the needs of autonomous vehicles in the future where there may well be a greater emphasis on pick up/drop off facilities.

7.16 Further to the above, when considering investments, the Council can **monitor the technological interventions that are robust across a range of future scenarios**. Is there benefit in supporting the installation of enhanced connectivity across the County which could support both transport applications, but also remote working initiatives in particular communities?
8 Examples interventions to influence new trends

8.1 There are a range of potential steps that Hertfordshire County Council could take to influence the way that new technologies and trends affect transport in the County. A few examples are set out below.

Connectivity agenda

8.2 There are a number of steps that Hertfordshire County Council could take to influence this area. Examples of these include:

- Establish digital first policies;
- The provision of example mobility applications;
- Support for innovative trials;
- Invest in enhanced connectivity.

8.3 These steps are expanded on below.

8.4 *Establish digital first policies* – The Council could establish policies (e.g. Transport for greater Manchester’s Digital First policy\(^{11}\)) that promote the digital agenda to encourage the provision of services that support the digital economy and promote using digital services that put the user at the centre of their processes. This can be further expanded by making use of data to analyse operations and inform policy decisions, and ultimately influence the way that people choose to travel (The city of Los Angeles has articulated this approach in their Urban Mobility Strategy\(^{12}\)).

8.5 *Provision of example mobility applications* – to demonstrate the effectiveness of open data, Hertfordshire County Council could look to enable others to make use of their data, or create example mobility applications that collate a plethora of data sources from the various transport modes and operators to increase accessibility and visibility to the residents. This could benefit the users of public transport, as well as the County Council and transport operators to maximise service efficiencies and monitor changing travel patterns. Analysing the transport usage data, along with inputs such as demographics, modal shifts and habitual trends, would provide a valuable and holistic set of data to shape future strategy for Hertfordshire.

8.6 In creating mobility applications as described, Hertfordshire could establish momentum within the County to develop shared platforms for greater collaboration with other services. There are significant opportunities for revenue streams within shared services, whilst enhancing the quality of life for those who use them. Hertfordshire County Council could position themselves as thought leaders amongst stakeholders, acting as an independent sponsor to ‘house’ the data sets, ensuring privacy and security.

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8.7 Engage in trials - Steps could be taken towards attracting trials of autonomous vehicles or shared mobility, to the County by entering into funded research and develop programmes supported by the likes of Innovate UK. This could further demonstrate the innovation, practical application and thought leadership of Hertfordshire County Council. Furthermore, trials provide an insight into the existing cultures embedded within society and future demands that may be otherwise unidentified.

8.8 Invest in enhanced connectivity – At an appropriate point, the Council either in its own right, or in conjunction with industry partners could support the roll out of enhanced connectivity, be it superfast broadband, 5G services, or more localised vehicle to infrastructure communications systems.

Automated vehicles

8.9 There are a number of steps that Hertfordshire County Council could take to influence this area. Examples of these include:

- Access channels to discuss issues;
- Engage in trials;
- Consider link to mobility policies;
- Support the deployment of automated vehicles in the County.

8.10 These steps are expanded on below.

8.11 Access channels to discuss issues – As discussed in previous sections, providers of automated vehicles supply to the global market, rather than focusing on the European or even UK market in isolation. Accessing key forums to understand the issues and challenges presented by these developments in technology could represent an effective early step in understanding what the implications might be on a local level, and when they may need to react.

8.12 Engage in trials – The national government is taking steps to position the UK as a place for suppliers of automated vehicles to come and test their technologies. Hertfordshire County Council could take steps to engage in trials of particular services or initiatives in a similar manner to those already underway elsewhere in the UK. Hertfordshire finds itself in within Innovate UK’s target geographical area for establishing a test bed for connected and automated vehicles – this may present opportunities to learn from how the technology is developing and its fit in a local context. Given the close links to London and other major employment zones, Hertfordshire could be considered to be a prime candidate for a Home Counties test bed.

8.13 Consider link to mobility policies – As time progresses, the ability to make practical use of automated vehicles can be encouraged by supportive local mobility policies that either encourage their uptake, or provide enabling mechanisms that reduce the barriers to entry.

8.14 Support the deployment of automated vehicles in the County – The Council could take steps in the longer term to proactively support the deployment of automated vehicles in the County. For example, under certain scenarios, it may be beneficial to introduce autonomous on demand vehicles that can support the accessibility of dispersed communities in a different way to traditional public transport services. The Council could consider the way that they fund or subsidise certain services, and the opportunities presented by these alternatives.
**Shared mobility**

8.15 Hertfordshire County Council could take proactive steps to influence developments in this area. Some examples of the types of initiatives that could support this are set out include:

- Create enabling legislation for shared mobility;
- Undertake feasibility studies;
- Engage with the market;
- Work with major employers and developers;
- Consider procurement mechanisms.

8.16 These steps are expanded on below.

8.17 *Establish enabling legislation and policies* - Much of the regulation that governs the market finds its roots in taxi and private hire regulation, however, this tends to vary from one region to the next, creating additional barriers to entry for new service providers. Hertfordshire County Council could consider actions to undertake a regulatory and legislative review to rationalise aspects such as:

- Which types of vehicle fall under the category of taxi, private hire vehicle or bus
- Whether licensing for services is at a district or county level
- Which vehicles can make use of key infrastructure types, and where restrictions might apply in the County, e.g. can a private hire vehicle utilise a bus lane?

8.18 *Undertake feasibility studies* – Not all shared mobility services will be suitable for all areas of the County. For example, a car club, bike sharing scheme, or Mobility-as-a-Service may serve a particular demographic, or require a particular density of population, or set of complementing services to be a success. Feasibility studies could be undertaken to review the opportunities for shared mobility options in the County to enable targeted development and deployment.

8.19 *Engage with the market* – The shared mobility market consists of multiple players operating under a range of different business models. The types of services that could be provided therefore vary significantly. Engaging with the market will enable the Council to have a deeper understanding of the needs of the market, the plans of key players, and the opportunities offered to the County.

8.20 *Work with developers and employers* - The anticipated level of growth in Hertfordshire may well involve new developers and employers playing a significant role in accommodating the level of growth. The Council could make use of planning consent powers to influence and encourage developers and major employers to ensure that there is appropriate provision in place to meet local transport needs. This level of provision could include a focus on shared mobility options to both provide choice and bolster accessibility, but also to help manage the network impact.

8.21 *Consider procurement mechanisms* - Finally, Hertfordshire County Council and its delivery partners could consider supporting an approach that focuses on procuring transport services by need rather than mode. An example of this could be to specify that a particular service level would need to be provided to enable accessibility for a particular area, but no specify that it had to be a bus service or the equivalent.
Alternative fuels and propulsion technologies

8.22 Hertfordshire County Council could take proactive steps to influence the uptake and use of electric vehicles within the county. Some examples of the types of initiatives that could support this are:

- The installation of charging infrastructure and other fuelling solutions;
- Access to an EV car club; and
- Procurement of EVs within the County Council fleet to lead by example for maintenance services etc.

8.23 These steps are expanded on below.

8.24 Evaluation and installation of appropriate charging infrastructure – Range anxiety is a phenomenon surrounding the EV market, where by drivers fear the battery range will not be sufficient to complete desired journeys. Range anxiety is proven to impact purchase decisions when considering an EV due to the unknown vehicle capabilities. This concern can be overcome through demonstration of available charging infrastructure in local areas. The installation of publicly accessible charging infrastructure increases confidence among drivers, which over time is enhanced through practical use of the vehicle.

8.25 Access to an EV car club where appropriate – Broadening the accessibility of travel modes to residents heightens confidence in alternative technology such as EVs and charging infrastructure. This will typically result in users questioning their ordinary travel choices and considering the application of either EVs and/or alternative business models to outright ownership.

8.26 Procurement of EVs within the County Council fleet – As demonstrated by Central Government (and others), the substitute of internal combustion engine vehicles for EVs has multiple benefits. These include a reduction in carbon emissions, in the number of sick days taken by employees and a decrease in fuel costs. In addition, it is proven that those who experience EVs through a fleet/employer are more likely to purchase an EV privately. This is due to confidence in the vehicle technology and an acceptance of the enhanced benefits i.e. noise pollution, driving comfort, fuel expenditure.

8.27 Conducting a fleet analysis will indicate operations within the County Council that are suitable for EVs and scenarios where by the technology could be introduced on a like-for-like basis. The analysis can incorporate an economic comparison to explore the total costs of ownership associated with internal combustion engines and EVs.

Freight and servicing

8.28 Further to the above, significant consideration should also be given in the role of freight, distribution and servicing in these future scenarios, particularly given the impact that automation, enhanced connectivity and particularly economic trends will have on that sector. The movement of raw materials, finished goods and products and groceries are all a major component in economic activity and have a significant impact on the transport network. The opportunity to use measures such as freight aggregation, time limited deliveries and automated last mile deliveries all present opportunities to reduce the impacts of first mile / last mile particularly in relation to the recent rise of internet based home shopping.
Alignment to scenarios

8.29 The table below provides an overview of the potential interventions that the Council could undertake to influence new trends, and their alignment to the scenarios identified earlier in this report.

Figure 8.1: Alignment of potential interventions for new trends against scenarios

<table>
<thead>
<tr>
<th>Trend area</th>
<th>Potential action</th>
<th>Travellers Paradise</th>
<th>Cooperative &amp; Close</th>
<th>Digital Dependence</th>
<th>Global Local</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connected</td>
<td>Establish digital first policies</td>
<td>?</td>
<td>?</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>The provision of example mobility applications</td>
<td>✓</td>
<td>?</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Support for innovative trials</td>
<td>✓</td>
<td>?</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Invest in enhanced connectivity</td>
<td>?</td>
<td>?</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Autonomous</td>
<td>Access channels to discuss issues</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Engage in trials</td>
<td>✓</td>
<td>?</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Consider link to mobility policies</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Support the deployment of automated vehicles in the region</td>
<td>✓</td>
<td>?</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Shared</td>
<td>Create enabling environment for shared mobility</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Undertake feasibility studies</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Engage with the market</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Work with major employers and developers</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Consider procurement mechanisms</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Electric</td>
<td>Installation of charging infrastructure</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Grey fleet and County Council fleet review</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Support access to an EV car club where appropriate</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Procurement of EVs within the County Council fleet</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

8.30 *Note: ‘✓’ indicates alignment, ‘?’ means that it is unclear whether there is alignment or not, and ‘x’ indicates weak alignment with the future scenario. The highlighted cells indicate that these types of interventions are considered to be particularly central to this type of scenario.

8.31 As can be seen in the figure above, there are certain potential interventions that are showing a strong alignment to particular scenarios.

8.32 Under the Travellers Paradise scenario, it would be expected that there would be a higher level of travel, and autonomous vehicles would potentially become part of that mix. Given the enhanced levels of travel, an important feature is to establish ways to effectively manage the level of demand to ensure that the levels of growth can be accommodated. Measures relating to understanding, and potentially influencing the movements of autonomous vehicles therefore have greater relevance to this scenario.

8.33 Under the Cooperative and Close scenario, there will be an increased need for shared mobility solutions to help alleviate congestion on the network, and to help the travelling public deal with increased travel prices. This scenario leads to a concentration of people, which again lends itself to interventions in this area. It could be argued that interventions relating to an enhanced level of connectivity are less relevant to this scenario due to a reduced level of interest in the digital agenda.
The Digitally Connected Consumers scenario speaks strongly to the trends of enhanced connectivity and autonomy as a means to bring a richer range of mobility choices to users, but also to provide enabling services in a digital realm, whether they are for personal mobility, or to enable the movement of goods and services.

The Connected Local Living scenario places emphasis on the alignment of shared and electric vehicles. Electric vehicles have a particularly strong alignment to this scenario given the reduced distances travelled which reduce the issues associated with range anxiety. A more concentrated population also means that the infrastructure needed to support the increased use of electric vehicles becomes increasingly viable.

The implications for LTP4 of this assessment are set out in section 9.
9 Implications for LTP4

9.1 The exercise undertaken in section 6 and section 8 explores the strategic fit of the different interventions being proposed under LTP4, and some additional interventions that HCC may wish to consider, against the four future scenarios considered in section 5. Following this exercise it is relevant to consider what implications this might have for LTP4 and the interventions that are born from it.

9.2 It is important to reiterate at this stage that those future scenarios, whilst plausible, are hypothetical. They represent situations that Hertfordshire may find itself in given a wider range of factors that are outside of HCC’s control, and some elements that can be shaped locally.

9.3 Further to this it is valuable to underline that the interventions that HCC chooses to deploy under LTP4 need to deliver today, as well as meeting future transport needs and providing a platform for future schemes and initiatives to build upon. Therefore, if a particular intervention does not present a strong alignment with one or more of the future scenarios, it is not necessarily a reason for discounting the scheme as it may address nearer-term transport challenges.

9.4 However, on the basis of this study, what we can discuss is which of the interventions and initiatives offer a stronger fit with a wider range of future scenarios, and therefore, which intervention types potentially provide a greater level of resilience in the future.

9.5 Alignment with all scenarios indicates that type of intervention could have a lasting relevance and ultimately offer greater flexibility for dealing with future scenarios, assuming that the evidence and case for investment is sound.

9.6 With this in mind, the following policy areas could be planned for now, and regardless of future direction toward any one or combination of scenarios, these policies, and related schemes and interventions, would most likely align:

- introduction of new demand management mechanisms;
- active travel schemes; and
- bus priority infrastructure.

9.7 Other policy areas and schemes, for example highways and junction schemes, although not aligning closely with all scenarios, are still likely to continue to play an important role to some extent in delivering the transport objectives of the county in the future regardless. As such, consideration of scenarios helps to prioritise rather than ‘rule’ in or out.

9.8 In addition to the extent, the detail or type of scheme and intervention will change depending on the scenario. For example, under a scenario such as ‘Cooperative and Close’, emphasis may shift from inter-urban to more of an urban focus for transport schemes and interventions, and HCC may need to consider how the focus of that type of intervention could change (i.e. flexibility in the design to accommodate future vehicle types and operating models such as platooning).

9.9 In addition to this, section 8 identified a range of additional measures that could be taken to help HCC influence new trends.
9.10 Many of the potential interventions in this section deal are focused on the near to medium term. The interventions that offered the greatest alignment across the range of future scenarios, and could therefore be considered for further investigation are:

- **General**
  - Establish mechanisms to stay abreast of market developments and trends in relation to connected, autonomous, shared and alternative fuelled vehicles and services
  - Efforts to review the suite of local mobility policies to understand how these trends could be supported

- **Shared mobility**
  - Create an enabling environment for shared mobility (e.g. for a regulatory and legislative standpoint)
  - Undertake feasibility studies to establish where shared services could be best focused
  - Engage with the market to understand appetite for deploying services locally
  - Work with major employers and developers to encourage behaviour that align with HCC’s wider mobility policies
  - Consider the procurement mechanisms for shared mobility services, and whether an adjustment to current practices is necessary

- **Alternative fuels**
  - Install charging infrastructure and other facilities to support low emissions schemes
  - Undertake a review of the Grey fleet and County Council fleet
  - Support access to an electric vehicle car club where appropriate
  - Procure electric vehicles within the County Council fleet to show leadership
### A  Details of LTP4 interventions and alignment with future scenarios

#### Public transit systems

The table below provides an overview of the key features and considerations associated with public transit system interventions given the future scenarios.

**Table 9.1: Key features of potential public transit system interventions**

<table>
<thead>
<tr>
<th>Factor</th>
<th>Travellers Paradise</th>
<th>Cooperative &amp; Close</th>
<th>Digitally Connected Consumers</th>
<th>Connected Local Living</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alignment*</td>
<td>?</td>
<td>✓</td>
<td>x</td>
<td>?</td>
</tr>
</tbody>
</table>

**Rationale (summary)**

There is a question as to how effective new public transit systems would be in a scenario where the cost of energy is low, and extensive travel by road is viable and popular (e.g. Travellers Paradise, Digitally Connected Consumers). The provision of public transit systems carries a stronger alignment with scenarios where people still have a desire and need to travel, but higher energy costs reduce the attractiveness of travelling by private vehicle (e.g. Cooperative and Close) – this places a greater emphasis on the availability of good quality public transit systems.

**Characteristics under this scenario**

- Increased demand for station or stop parking
- Potential conflict for road space in environments where there is no segregation between modes
- Supports good interchanges
- N/A - no clear alignment in this scenario
- This may only be suitable in locations with a greater population density, and strong local economy
<table>
<thead>
<tr>
<th>Factor</th>
<th>Travellers Paradise</th>
<th>Cooperative &amp; Close</th>
<th>Digitally Connected Consumers</th>
<th>Connected Local Living</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Appropriate demand management regime such as efforts to reduce the supply of road space for private or single occupancy vehicles, or increase the cost of parking at key destinations/trip generators</td>
<td>• Spatial planning initiatives that support the densification of settlements could support the attractiveness of public transit schemes&lt;br&gt;- The need for appropriate first and last mile connections means that there is a role for well-planned and provisioned active travel schemes, and local feeder services</td>
<td>• N/A - no clear alignment in this scenario</td>
<td>• Spatial planning initiatives that support the densification of settlements could support the attractiveness of public transit schemes&lt;br&gt;- The need for appropriate first and last mile connections means that there is a role for well-planned and provisioned active travel schemes, and local feeder services</td>
<td></td>
</tr>
</tbody>
</table>

Other complimentary interventions under this scenario

| Examples of situations where technology could influence this type of intervention in the future | • Travel information and smart ticketing (particularly cashless and contactless payments reduce the barriers to entry, as well as the use of accounts that enable users to turn up and make use of the service, rather than needing to consider payment)<br>- Subscription based services where users have a choice of modes, and the barriers to their use are reduced<br>- Automated vehicles offer the potential to reduce operating costs, and are easier to achieve on defined networks<br>- In the shorter-term, transit services equipped with charging facilities and internet connectivity could be used as a working environment to boost productivity (e.g. as per the models used in the US for tech giants) | • Demand for flexibility may lead to a need for more demand responsive services, rather than fixed routes. This could particularly be the case in future land use scenarios where there are more dispersed developments. In areas with a more dispersed population, and particularly where there are multiple key destinations (e.g. for work, play or living), a flexible on-demand service may offer a more compelling business model that can respond to varying travel patterns and geographies with a lower demand, than a traditionally provided service might.<br>- Certain transit schemes carry significant investment costs (e.g. LRT) |

Examples of risks

*Note: ‘✓’ indicates alignment, ‘?’ means that it is unclear whether there is alignment or not, and ‘✗’ indicates weak alignment with the future scenario.*
Significant highways junction upgrades & bypasses

The table below provides an overview of the key features and considerations associated with highways interventions given the future scenarios.

Table 9.2: Key features of potential highways interventions

<table>
<thead>
<tr>
<th>Factor</th>
<th>Travellers Paradise</th>
<th>Cooperative &amp; Close</th>
<th>Digitally Connected Consumers</th>
<th>Connected Local Living</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alignment*</td>
<td>✓</td>
<td>X</td>
<td>![ ]</td>
<td>x</td>
</tr>
</tbody>
</table>

Rationale (summary)

In a world where face-to-face travel continues to be attractive and low energy prices support that (e.g. Travellers Paradise), the provision of interventions focusing on new road infrastructure continues to hold a positive alignment. This is less the case in scenarios where the cost of energy is higher (e.g. Cooperative & Close or Connected Local Living) as a greater demand for cheaper public transport alternatives may hold sway.

Characteristics under this scenario

- Need for additional highway capacity is predicated on growth based on historical trends that do not typically take account of different access models or behavioural responses to technology
- Additional physical and digital capacity can bolster the support for new communities

- Potential to see more inter-peak growth
- Potential to support critical mass on close or clustered developments by supporting access to wider network

- Digitally Connected Consumers will lead to a change in the types of trips undertaken, therefore the emphasis on highways capacity enhancements has a weaker alignment to this scenario
- Higher level of centralised traffic control to influence movements

Other complimentary interventions under this scenario

- Demand management mechanisms
- Alignment with hub services such as Park & Ride (this is particularly the case with scenarios such as Cooperative and Close, and Travellers Paradise) to accommodate increased inter-urban flows

Role of technology / influence of technology

- Digital highways and connectivity can play a key role in optimising the efficiency of networks, providing for improved productivity on the move, and supporting future generations of vehicles
- Consideration of future vehicle requirements is important, for example what will the physical, digital and communications infrastructure needs look like?

Examples of risks

- The provision of additional highway capacity can lead to a level of induced demand

*Note: ‘✓’ indicates alignment, ‘?’ means that it is unclear whether there is alignment or not, and ‘x’ indicates weak alignment with the future scenario.

Demand management

The table below provides an overview of the key features and considerations associated with demand management interventions given the future scenarios.
### Table 9.3: Key features of potential demand management interventions

<table>
<thead>
<tr>
<th>Factor</th>
<th>Travellers Paradise</th>
<th>Cooperative &amp; Close</th>
<th>Digitally Connected Consumers</th>
<th>Connected Local Living</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alignment*</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Rationale (summary)</td>
<td>Demand management used to manage congestion in key settlements or on key parts of the network to influence behaviour</td>
<td>Potential to spread the peak demand</td>
<td>Demand management used to throttle the number of trips taken, particularly in future scenarios involving automated vehicles</td>
<td>Opportunity to influence the re-allocation of space</td>
</tr>
<tr>
<td>Characteristics under this scenario</td>
<td>• Opportunity to more directly influence traffic movements when automated vehicles become more prominent, although that will require a greater level of traffic management coordination from highways authorities</td>
<td>• Demand can be managed in a more proactive way with more data driven services by encouraging and rewarding positive behaviour in a more targeted manner due to the better understanding of the individual users</td>
<td></td>
<td>• Opportunity to influence the re-allocation of space</td>
</tr>
<tr>
<td>Other complimentary interventions under this scenario</td>
<td>• Support for active modes, particularly in scenarios with a reduced number of interurban trips</td>
<td></td>
<td></td>
<td>• Supports the accessibility of new centres</td>
</tr>
<tr>
<td>Role of technology / influence of technology</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Examples of risks</td>
<td></td>
<td></td>
<td></td>
<td>• Hertfordshire is operating in a competitive environment with neighbouring counties, and indeed other regions elsewhere. For that reason, overly heavy demand management techniques could reduce the attractiveness of Hertfordshire as a place for inward investment. For this reason, demand management mechanisms such as demand pricing would need to be very carefully considered.</td>
</tr>
</tbody>
</table>

*Note: ‘✔’ indicates alignment, ‘?’ means that it is unclear whether there is alignment or not, and ‘x’ indicates weak alignment with the future scenario.

### Strategic transport hubs concept

The table below provides an overview of the key features and considerations associated with strategic hub interventions given the future scenarios.

### Table 9.4: Key features of potential strategic hub interventions

<table>
<thead>
<tr>
<th>Factor</th>
<th>Travellers Paradise</th>
<th>Cooperative &amp; Close</th>
<th>Digitally Connected Consumers</th>
<th>Connected Local Living</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alignment*</td>
<td>✔</td>
<td>✔</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Rationale (summary)</td>
<td>There is a stronger alignment for scenarios where users favour face-to-face access (e.g. Travellers Paradise or Cooperative &amp; Close) as the use of strategic hubs could be used to alleviate some of the pressure on the road network. In scenarios such as Digitally Connected Consumers and Connected Local Living, it is characterised that there would be less regular inter-urban travel due to a focus on digital platforms as a means of people undertaking their daily lives.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Characteristics under this scenario

- While travelling by vehicle continues to be attractive, the congestion may increase on the road network. Under this scenario the use of hubs could help to alleviate some of the pressure around key settlements and junctions on the highway network.

### Other complimentary interventions under this scenario

- Important to ensure that the hubs are flexible in their form and function so that they can accommodate future needs around digital lifestyles (e.g. online retail) and first/last mile services such as the use of automated vehicles.

### Role of technology / influence of technology

- Use of data to understand user needs and movements
- Make use of digital engagement tools and travel information services to raise awareness of hubs and services
- Enhance the integration of automated vehicles in the future and ensure that there are appropriate interchange services

### Examples of risks

- Other policy measures outside of the control of Hertfordshire County Council may reduce the need for hubs in the future. Examples of this may include transport related decisions such as the investment in high-speed rail networks, political decisions that reduce the attractiveness of private vehicles, or socio-economic trends that reduce the demand for inter-urban travel.

*Note: ‘✓’ indicates alignment, ‘?’ means that it is unclear whether there is alignment or not, and ‘x’ indicates weak alignment with the future scenario.

## Bus priority infrastructure

### 9.11

The table below provides an overview of the key features and considerations associated with bus priority interventions given the future scenarios.

Table 9.5: Key features of potential bus priority interventions

<table>
<thead>
<tr>
<th>Factor</th>
<th>Travellers Paradise</th>
<th>Cooperative &amp; Close</th>
<th>Digitally Connected Consumers</th>
<th>Connected Local Living</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alignment*</td>
<td>✓</td>
<td>✓</td>
<td>?</td>
<td>✓</td>
</tr>
<tr>
<td>Rationale (summary)</td>
<td>Bus priority represents a demand management tool in scenarios such as Travellers Paradise and Cooperative and Close and as such helps to re-balance the network to ensure that the public transport remains an effective service. This is also potentially the case for Digitally Connected Consumers, although there is a question as to how effective this will be given a reduction in overall demand for the network.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Characteristics under this scenario**

- Support interurban movements
- Offers mechanism to balance demand
- Unclear alignment
- N/A - weak alignment
- N/A - weak alignment

**Role of technology / influence of technology**

- Vehicle to infrastructure communications could optimise the throughput of vehicles at junctions, and provide priority to public transport services (subject to appropriate coordination at a highway management level)

**Examples of risks**

- Needs level of public transport provision to be effective
- Affects the transition time at junctions, and therefore can increase the level of congestion for other road users
- The introduction of vehicle to vehicle communications may impact the use of dedicated bus priority technologies in the future. These systems in the future may need to be more agile, for example, to support on-demand services on non-fixed routes

*Note: ‘✓’ indicates alignment, ‘?’ means that it is unclear whether there is alignment or not, and ‘x’ indicates weak alignment with the future scenario.

**New Rail Stations**

The table below provides an overview of the key features and considerations associated with new railway stations interventions given the future scenarios.

Table 9.6: Key features of potential new railway stations interventions

<table>
<thead>
<tr>
<th>Factor</th>
<th>Travellers Paradise</th>
<th>Cooperative &amp; Close</th>
<th>Digitally Connected Consumers</th>
<th>Connected Local Living</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alignment*</td>
<td>✓</td>
<td>?</td>
<td>X</td>
<td>x</td>
</tr>
<tr>
<td>Characteristics under this scenario</td>
<td>Support interurban movements</td>
<td>Offers mechanism to balance demand</td>
<td>Unclear alignment</td>
<td>N/A - weak alignment</td>
</tr>
</tbody>
</table>
Other complimentary interventions under this scenario

- Important to ensure that the rail stations are flexible in their form and function so that they can accommodate future needs around digital lifestyles (e.g. online retail) and first/last mile services such as the use of automated vehicles

Role of technology / influence of technology

- As the range of mobility options increases, the role of stations as an interchange point increases (e.g. consideration will need to be given to the way that automated vehicles interact with stations in terms of pick up/drop off facilities)
- Smart ticketing and subscription based services for transport will change the way that stations operate, and the prioritisation of space within those facilities
- Parking at stations may need additional consideration - how will automated vehicles be accommodated so that they can park themselves and return when required? Can parking facilities offer electric vehicle charging services?
- Best practice regarding stations innovation and the role of user-centric design is enabled by a greater application of technology to both understand how people interact with spaces, and to provide more personalised experiences and targeted services. Additionally, stations can be managed in different ways to optimise through put and management of the facilities.

Examples of risks

- Other policy measures outside of the control of Hertfordshire County Council may reduce the need for additional rail stations in the future. Examples of this may include transport related decisions such as the investment in high-speed rail networks, spatial planning and land use decisions that change the nature of settlements (e.g. encouraging densification in some areas and not others), or the influence and growth of London could encroach on some of Hertfordshire’s larger settlements.
- The success of new rail stations can be subject to user behaviour and the broader desire to travel. This could be exacerbated in scenarios with a greater emphasis on the use of digital services. In addition to this, new rail stations can be subject to the broader capacity challenge – without signalling improvements to deliver more services, where will the seats come from to serve new stations?

*Note: ‘✓’ indicates alignment, ‘?’ means that it is unclear whether there is alignment or not, and ‘x’ indicates weak alignment with the future scenario.

**Interurban cycleways**

The table below provides an overview of the key features and considerations associated with interurban cycleway-based interventions given the future scenarios.

*Table 9.7: Key features of potential interurban cycleway interventions*

<table>
<thead>
<tr>
<th>Factor</th>
<th>Travellers Paradise</th>
<th>Cooperative &amp; Close</th>
<th>Digitally Connected Consumers</th>
<th>Connected Local Living</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alignment*</td>
<td>✓</td>
<td>✓</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>Rationale</td>
<td>Under the Travellers Paradise and Cooperative &amp; Close scenarios it was felt that inter-urban cycleways offered a positive alignment due to the opportunity to offer an alternative for travelling between key settlements. This is particularly the case if e-bikes become more widely adopted to help broaden the audience for cycling. In scenarios that look more towards digital accessibility (e.g. Digitally Connected Consumers and Connected Local Living) there is a weaker alignment given the preference for local living, whereby active travel is considered to be more of a focus for healthy lifestyles rather than as a means of commuting.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Characteristics under this scenario

- High quality infrastructure needed, along with the associated levels of investment
- Consider increased use of electric bikes, and their secure parking facilities
- Consider the use of freight bikes for local deliveries

Other complimentary interventions under this scenario

- Priority infrastructure for cyclists/pedestrians
- Demand management to balance need for road space
- Secure bike parking facilities at key interchanges, or other facilities (e.g. retail space, workplaces)
- Behaviour change initiatives

Role of technology / influence of technology

- E-bikes could support uptake amongst a wider demographic group, particularly on longer distance routes, or where there are more challenging gradients

Examples of risks

- Dependent on the existing infrastructure and public realm
- In the future, there could be greater conflict between modes (e.g. automated vehicles and cyclists) if proactive measures to manage the interaction are not considered

*Note: ‘✓’ indicates alignment, ‘?’ means that it is unclear whether there is alignment or not, and ‘✗’ indicates weak alignment with the future scenario.

Urban cycling infrastructure upgrade

The table below provides an overview of the key features and considerations associated with urban cycling infrastructure interventions given the future scenarios.

Table 9.8: Key features of potential urban cycling infrastructure interventions

<table>
<thead>
<tr>
<th>Factor</th>
<th>Travellers Paradise</th>
<th>Cooperative &amp; Close</th>
<th>Digitally Connected Consumers</th>
<th>Connected Local Living</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alignment*</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Rationale (summary)</td>
<td>There was positive alignment across the different scenarios for this type of intervention, either as a means to help reduce the pressure on the network in scenarios such as Travellers Paradise or Cooperative &amp; Close, or to play a key role in healthy lifestyles in scenarios such as Digitally Connected Consumers or Connected Local Living.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Characteristics under this scenario

<table>
<thead>
<tr>
<th>Factor</th>
<th>Travellers Paradise</th>
<th>Cooperative &amp; Close</th>
<th>Digitally Connected Consumers</th>
<th>Connected Local Living</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Potential for higher levels of active travel investment and priority to help balance demands on the network, particularly on a local level</td>
<td>• Higher levels of investment needed to support active modes, particularly given the increased levels of congestion on the network</td>
<td>• Potential for higher levels of active travel investment and priority given lower levels of trips</td>
<td>• Potential for higher levels of active travel investment and priority given lower levels of trips</td>
<td></td>
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<tr>
<td>• Greater local emphasis due to decreased levels of attractiveness for interurban travel and greater local resilience</td>
<td></td>
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### Other complimentary interventions under this scenario

<table>
<thead>
<tr>
<th>Role of technology / influence of technology</th>
<th>• Support for e-bikes initiatives to encourage uptake amongst a wider demographic group</th>
<th>• Demand management to balance need for road space</th>
<th>• Secure bike parking facilities at key interchanges, or other facilities (e.g. retail space, workplaces)</th>
<th>• Behaviour change initiatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examples of risks</td>
<td>• The prevalence of automated vehicles and particularly new business models around how vehicles are accessed and owned may mean that there is increased competition for last mile services.</td>
<td>• Careful behaviour change policies will need to be considered</td>
<td></td>
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<tr>
<td></td>
<td>• Dependent on the existing infrastructure and public realm</td>
<td></td>
<td>• In the future, there could be greater conflict between modes (e.g. automated vehicles and cyclists) if proactive measures to manage the interaction are not considered</td>
<td></td>
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</tbody>
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*Note: ‘✓’ indicates alignment, ‘?’ means that it is unclear whether there is alignment or not, and ‘x’ indicates weak alignment with the future scenario.*
### CONTROL INFORMATION

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<thead>
<tr>
<th>Prepared by</th>
<th>Prepared for</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Hertford</td>
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<td></td>
<td>5G13 8DQ</td>
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<tr>
<th>Author/originator</th>
<th>Reviewer/approver</th>
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<tr>
<td>James Long</td>
<td>Steven Bishop (SDG), Giles Perkins (WSP/PB)</td>
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<th>Other contributors</th>
<th>Distribution</th>
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<tr>
<td>Steven Bishop (SDG), Giles Perkins and Stephanie Biggs (both WSP/PB)</td>
<td>Client: James Povey and Matthew Bowles SDG &amp; Authors</td>
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