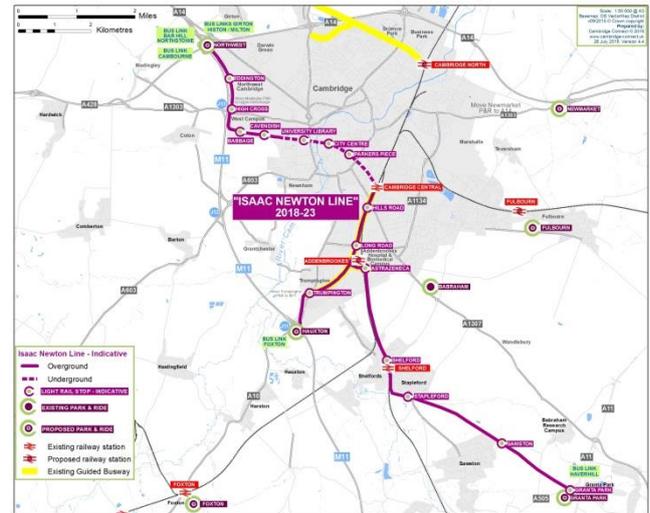


National Infrastructure Commission Oxford – Milton Keynes – Cambridge 'growth corridor' Call for Evidence Cambridge Light Rail



05 August 2016 (v1)



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The following organisations have expressed support for Cambridge Connect approaches to sustainable and enduring solutions for Cambridge transport



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1. Cambridge Light Rail Summary

Cambridge Connect was initiated to promote a strategic and sustainable approach to public transport in Cambridge over the long-term. Emphasis is placed on the potential of light rail as part of that strategy, and on an integrated and multi-modal approach to meeting the transport needs for Cambridge and the surrounding region. We recognise the need to link local solutions into broader regional strategies. The Cambridge – Milton Keynes – Oxford corridor is critical amongst those strategies.

A light rail route to meet priority public transport needs has been identified as a conceptual model, extending over a distance of ~22 km (~14 mi) from the Girton Interchange in the northwest to Granta Park in the southeast. Cambridge Connect calls this route the 'Isaac Newton Line' (Figure 1).

The 'Isaac Newton Line' would follow a route via the University West Campus, city centre, Cambridge Central Rail Station, Addenbrookes, Great Shelford and Sawston. The light rail line would follow existing and former rail alignments, run underground within the historic city core, and follow the busway alignment between Cambridge Central Rail Station and Addenbrookes. Extensions to the 'Isaac Newton Line' light rail backbone may be anticipated, for example to Cambourne, Fulbourn, Cambridge Science Park, Waterbeach and Haverhill (Figure 2).



Cambridge Light Rail is designed to integrate with and support infrastructure developments proposed

in the Oxford – Milton Keynes – Cambridge 'growth corridor'. For the planned strategic linkages in this corridor to be fully effective, and to maximize the economic leverage and benefits, it is important that intra-city and local region transport connections function effectively to cope with the demand, and efficiently service key employment and business centres. In the absence of this integration, and planning as a system, the strategic corridor linkages run the risk of being severely constrained at their intended points of destination.

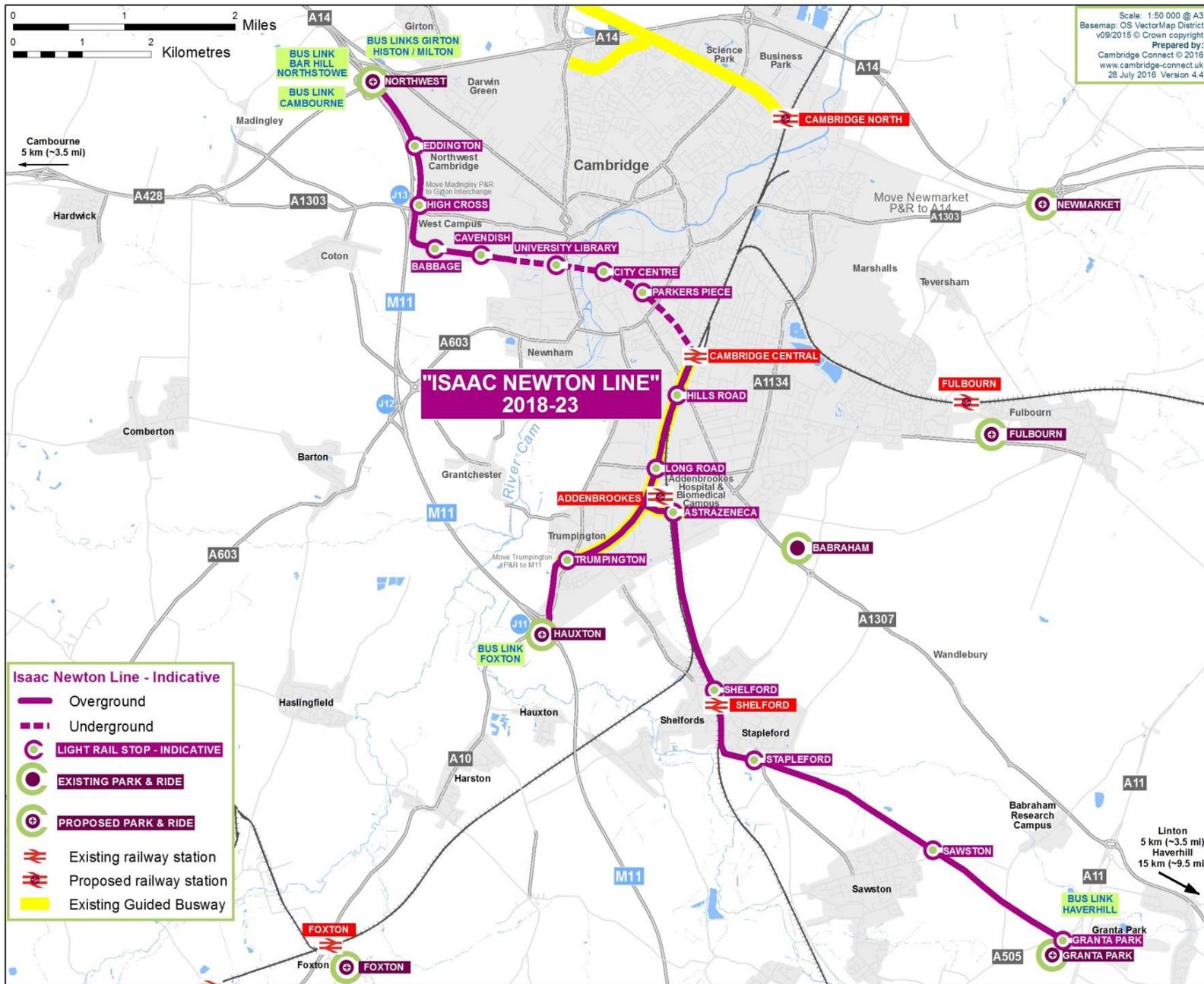
The approach proposed by Cambridge Connect would provide a radical and **long-term solution** for Cambridge that is both **scalable** in terms of capacity and **extendible** to key destinations as demand and finances allow (Figure 2).



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Figure 1. The Cambridge Connect 'Isaac Newton Line'



Cambridge Connect is coordinating with Railfuture and UK Tram in developing these proposals. We are engaging with local and regional organisations and residents to develop the concepts with a view to meeting long-term needs.

Cambridge Connect recognises that the Greater Cambridge City Deal has excluded light rail from consideration because of funding constraints. However, Cambridge Connect believes it remains important to consider light rail when taking a strategic and long-term view of transport needs in Cambridge and the surrounding region. Moreover, we believe that more creative approaches to unlock the funding required may be possible, including initiatives for public – private finance partnerships and by national investment in infrastructure that is in the long term strategic and economic interests of the United Kingdom.

2. Long-term transport planning

Cambridge Connect considers that infrastructure development needs to be fit-for-purpose for the region with a planning horizon of 10 to 30 years and beyond. The key drivers of economy, population, demand, education, science & technology environment & heritage, and social & cultural values all need to be taken into account with a long-term view, and these need to be balanced against the cost and investment needed for future generations.

Cambridge Connect suggests that when considered over an appropriate planning time horizon, the option of light rail represents a realistic, attractive and financially viable alternative that would offer many benefits to Cambridge, regional residents and to help facilitate interconnections more broadly with the Oxford – Milton Keynes – Cambridge ‘growth corridor’. For example, tram-train technology could be employed in a way that would integrate with East-West Rail developments *and* serve city and regional needs.

3. Sustainability

Around one third of energy consumption is used on transport (MacKay, 2009: 118). The evidence shows that rail remains the most energy-efficient means of public transport available, being at least twice as efficient as buses and up to 18 times more efficient than cars. Improving the energy efficiency of our transport systems should be a key consideration in our choices of transport solutions.

This approach is consistent with commitments made at the 2015 Paris Summit on Climate Change, and in particular with respect to the need to adopt more sustainable approaches to city planning and transport. We strongly urge transport infrastructure planners to take these factors explicitly into account.

4. Cambridge transport infrastructure needs

The ‘Isaac Newton Line’ would substantially address transport needs to along a key strategic axis in Cambridge, linking the newly developed and rapidly expanding University of Cambridge West Campus and Eddington centres with the central rail station and city centre, the biomedical campus at Addenbrookes and to important bioscience campuses in the Granta Park, Babraham and Hinxtton region.



The 'Isaac Newton Line' would:

- Provide a light rail 'backbone' extending through the heart of Cambridge from Girton Interchange in the northwest to Granta Park in the southeast;
- Provide a direct link with the proposed A428 Expressway at the Girton Interchange, providing connection between the highway extending east-west between Oxford and Cambridge and a high quality, reliable, frequent and fast public transport system accessing the city centre and key employment hubs;
- Integrate with the heavy rail network at Cambridge Central Rail Station, at Great Shelford Station, and at the proposed new Addenbrookes Station, thus providing a public transport solution that is future-proofed for proposed East-West Rail developments and that takes into account as far as possible all potential specific alignments;
- Provide multimodal links to bus / coach and Park & Ride services at key interchanges – for example the A11 / A505. Similar multimodal links would be provided at Junction 11 on the M11 / A10 and at the Girton Interchange on the A428 / A14 / M11. These links would provide for improved regional integration with a reliable, fast and frequent public transport into the heart of Cambridge, meeting public transport objectives in this region;
- Provide a reliable, fast and frequent link between the three University of Cambridge campuses, which currently are poorly interconnected. Good connections between the campuses in Cambridge would benefit visitors from the London – Oxford corridors, and strengthen overall integration and educational and business connectivity in the region;
- Relieve vehicle traffic pressure on the road network by attracting people onto the light rail and heavy rail routes, reducing the need for road network capacity expansion;
- Provide a strategic backbone of public transport that enables extensions to nearby residential and employment centres, such as Cambourne, Haverhill, Fulbourn, Waterbeach etc;
- Serve potential growth in housing and development near to Cambridge, including to lower cost housing areas;
- Establish an Intercity Coach Station at a new Park & Ride at the M11 Hauxton, which would enable tourists to travel into Cambridge from the periphery without congestion and reduce the need for large coaches to travel into the city centre;
- Encourage walking / cycling from nearby residential areas and employment centres to strategically located stops on the public transport network;
- Foster a more sustainable city, protecting its rich heritage and environmental values, with electric light rail also better for air quality.



5. Demand

Cambridge Connect has estimated Cambridge peak hour commuter demand in 2031. Projections are based on Cambridge City and regional population projections and commuter numbers through to 2031. These data indicate that peak demand from commuters on a light rail line would be around 7,859 passengers per hour assuming 15% of commuters used the line (Table 2).

Table 2. Commuter demand for public transport on light rail at peak in Cambridge 2031

Year	Commuter journeys peak (000/h ¹)	% by light rail	Pax /h
2031	52	15	7859

1. Commuter journeys per hr at peak, excluding non-commuter and tourist journeys. Assumes travel in 2.5 h peak window. See data on passenger numbers in Revenue section below.

Light rail is considered an ideal mode of public transport for demand in the region of “3000-11,000 pax per hour” per direction (International Union for Public Transport (UITP)). With one light rail line and almost 8000 pax/hr at peak, this equates to almost ~4000 pax per/hr per direction at peak, assuming 15% of commuter journeys undertaken by light rail. Thus, demand on the ‘Isaac Newton Line’ is projected to meet the criteria for “ideal” level of demand set out by the UITP. Many European cities with light rail (e.g. Lausanne, Freiberg) achieve a much higher usage of public transport.

Tourist demand is not included in Table 2, yet with ~5 m visitors to Cambridge per year we can be confident that tourists would be an important demand segment for the ‘Isaac Newton Line’. This is particularly the case because the line would extend from the central rail station, from a proposed intercity / tourist coach station at the M11, and from Park & Ride facilities, into the heart of the city centre.

The above calculations also exclude non-commuters (people travelling for reasons other than work), which comprises the majority of journeys undertaken per day. The actual level of total demand is therefore anticipated to be much greater than indicated by commuters.

Currently Cambridge Rail Station has a footfall of ~11 m passengers per year, and we can anticipate this will also grow substantially by 2031.



6. 'Isaac Newton Line' cost

A preliminary estimate of the cost of the 'Isaac Newton Line' is £753 m. This estimate is based on an approximate cost of £25 m / km for light rail line development, with a similar per km allocation for tunnel construction. We understand that tunnel construction in the Cambridge geology would be approximately £20 m / km for a 3.5 m diameter tunnel, and we have allowed an additional 25% as contingency. We recognize more detailed work is required on these general costings.

Station costs will vary widely, depending on location, type and whether the station is underground. Many stations could comprise structures as simple as large bus shelters, and their costs would be insubstantial. Full underground platforms, however, would be much more expensive, and our estimate for underground stations is given separately. Table 1 summarises the estimated costs for the light rail line, tunnelling and stations.

Table 1. Estimated cost of 'Isaac Newton Line'

Component	No.	Unit Cost £M	Total £M
Light rail line (km)	22	25	550
Tunnelling (km)	3.3	25	75
Stations (underground)	4	25	100
Stations (above ground)	14	2	28
Total			753

By comparison, the cost of the light rail network established in Nottingham was ~£850 m, while the upgrade to the A14 highway is projected to cost at least £1500 m (Highways England 2016).



7. Revenue

Cambridge Connect has estimated minimum revenue of approximately ~£17 million per year in 2031 from the 'Isaac Newton Line' based on the commuter and population data and assuming an average fare of £1.20.

Numbers of journeys

Commuters (per day)

Year	Cambridge Working Residents	Commuting WITHIN Cambridge /d	Commuting OUT OF Cambridge /d	Commuting INTO Cambridge /d	Total INTO / OUT & WITHIN /d	Commuter journeys To-From = x2 /d
2011	60 000	44 000	16 000	51 000	111 000	222 000
2031	70 800	51 920	18 880	60 180	130 980	261 960

All commuter journeys and revenue (per year)

Year	Per day		Per Year		Revenue per year £ (15% of commuter journeys by Light Rail, avg fare £1.20)
	Total journeys commuters /d		Total /y	By Light Rail 15%	
2011	222 000		81 030 000	10 402 500	14 585 400
2031	261 960		95 615 400	12 274 950	17 210 772

This projection **excludes tourists and excludes non-commuter journeys**. In practice, commuters comprise only a small percentage of journeys per day: the Cambridge Access Study showed commuting comprised only 23% of all journeys made. The projections therefore represent a substantial underestimate of actual demand. Cambridge Connect supports further and more comprehensive research to be undertaken into demand from all potential users of a light rail network in Cambridge.

8. Long term development and extensions

It is recognised that the 'Isaac Newton Line' does not meet demand in all parts of Cambridge or its surrounding region, and there remain needs for public transport improvements in other parts of the city and region. The 'Isaac Newton Line' is viewed a 'backbone' of public transport that could be extended as demand and finance allows. Cambridge Connect recognises these longer term needs and has developed a model of extensions that may warrant consideration in the future (Figure 2). It is important to be aware of potential extensions when creating a long-term vision for the regional transport network.

Extension A (Figure 2) would serve business in the Mill Road / Coldhams Lane / Newmarket Road areas, connect with Cambridge North rail station and the Science Park / Milton Park & Ride, and include a spur on the old rail alignment to Fen Ditton and Wing development. Extension B would serve Capital Park (ARM etc) and Fulbourn, while Extension C would serve commuters from population centres to the north of the city and create a 'circle line'.



Further extensions can be envisaged to residential towns and centres of employment such as Cambourne and Haverhill, which are not presently served by rail links. Waterbeach is served by a heavy rail station, although with the projected increase in housing development in this area a light rail extension may be warranted in the future. An extension to Cambourne would integrate with and strengthen the Cambridge – Milton Keynes – Oxford strategic corridor.

Long term, such extensions and connections will help to create a more integrated and sustainable economy in the region, and enhance the economic strength of the United Kingdom. Cambridge Connect believes this to be strategically important for the country.

9. National Infrastructure Questions

The National Infrastructure Commission expressed interest in answers to a number of questions and our responses on these are offered below.

Question 1

Many places across the Cambridge – Milton Keynes – Oxford corridor have very successful local economies and are perceived as highly desirable places to live. What have been the key drivers of that success?

1. The University of Cambridge lies at the foundation of many of the dramatic economic, scientific and technological successes in the Cambridge region.
2. A vision that sought to build on the innovation and expertise within the University to develop business and economic opportunities has been a key driver.
3. The success has been facilitated by proximity and good transport links to London. The link to London is important not only academically, but also to join the expertise in financial services and business with the technological and scientific innovation in the University.
4. Protection of the environmental quality of the region has been key to maintaining the centre as an attractive place to live, and this helps to attract a highly-skilled and in-demand workforce.
5. A critical mass developed which in itself has attracted more and similar businesses, in particular those with strength in research and development in the sciences. Co-location facilitates collaboration, knowledge transfer and partnerships – all of which are important to the economic development.

What is holding back further growth and greater productivity?

1. Just as collaboration, knowledge transfer and partnerships are important to economic development, constraints in connectivity kill productivity.
2. Poor quality transport infrastructure in Cambridge is now imposing that constraint, and is weakening business productivity. Time is wasted in congestion.
3. In particular need of improvement is the Girton Interchange, which lies at a key strategic connection point on the road network, linking the nationally and regionally important highways of the M11, A14 and A428. Full connectivity is badly needed here.
4. Growth is hindered by high land / housing costs. Transport infrastructure, if planned properly, can help address this problem by enabling more reliable and faster links to lower cost housing areas, and to areas where more businesses can afford to locate.



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In particular, what planned or new infrastructure improvements would best support sustainable growth and promote innovation over the long-term?

1. Cambridge Light Rail, as proposed by Cambridge Connect in partnership with Railfuture, would make a dramatic improvement to the sustainable growth of Cambridge, would help support business and residential developments in the region, and support projected growth at the same time as sustaining environmental, heritage and community values.
2. The proposed East-West Rail link would help support and strengthen growth in the Oxford to Cambridge corridor.
3. The proposed A428 Expressway will further strengthen these linkages. We need to recognise that the road network is and will remain vital to the economy.
4. Improvements to the Girton Interchange on the A428 Expressway is a high priority, and would enable full and proper connections with the M11 and A14. The link with Cambridge Light Rail at this location would ensure this strategic junction is well-integrated by transport into the city centre and to key employment centres.

Does the corridor require better connectivity to other major centres of growth?

1. Such connectivity can only be beneficial. However, Cambridge Connect has not investigated such links, and is not in a position to comment on specific centres.

Question 2

Does the Cambridge – Milton Keynes – Oxford area, including Northampton, form a recognizable economic corridor?

1. Cambridge Connect has not evaluated the evidence for an economic ‘corridor’ as indicated by the question. However, we believe that the general business, technology, science and educational activity throughout this corridor would lend support to the idea that it works to some extent as a ‘corridor’ where the economy is boosted and strengthened by proximity.
2. Transport linkages are often linear, and thus help strengthen activity along ‘corridors’. There would seem many examples where transport corridors have served to stimulate the economy along those lines. Many examples are evident in London, for example, prominent amongst which is the Docklands Light Railway and east London developments.

If so: What factors unite the area?

1. Education, science, technology and finance, all fostered by an environment in which innovation and collaboration is allowed to flourish.
2. An environment that has protected important green space and heritage values.

Would greater emphasis on corridor-wide planning and decision making benefit local communities and local economies?

1. Corridor planning and transport planning need to be joined at the hip. It is transport that makes the connections within the corridors practical and workable, which in turn makes them viable and economically strong.
2. Without planning the two in concert, local communities will not benefit and local economies will find it more difficult to thrive.

Would that same emphasis on coordinated planning and decision making provide wider benefits for the UK economy?

1. This would seem logical, although Cambridge Connect has not studied the wider UK economy.



Should adjacent towns and cities be incorporated into the corridor in terms of growth and infrastructure planning?

1. In principle there is a good argument to undertake integrated infrastructure planning within a region extending up to about 15 miles from Cambridge City, which is a reasonable commuting distance.
2. The adjacent areas identified by Cambridge Connect that would benefit from this type of integrated infrastructure planning are particularly Cambourne, Haverhill, Fulbourn, Newmarket, Waterbeach, Ely, Royston, etc.
3. No doubt other nearby towns could be identified, although Cambridge Connect has not yet undertaken sufficient research on this aspect.

Question 3

Describe your vision to maximise growth, maintain a high quality environment, and deliver more jobs and homes across the corridor over the next 30 years.

1. The Cambridge Connect vision is outlined in the preceding sections and in the maps.
2. National-level support is needed to achieve this vision, which would be repaid by national-level benefits.

Question 4

Are there lessons to be learnt from previous initiatives to maximise the potential of the corridor?

1. The establishment of Cambourne is perhaps an example where more consideration could have been given to the means of integration of this town with key employment centres, and more consideration of transport provision and the economic drivers behind resident decisions.

Question 5

Are you aware of any examples of UK or international good practice, for example in respect of new technology, local frameworks or the built environment, that are relevant to this review?

1. Yes, the cities of Freiberg, Lausanne, Avignon, Helsinki, Grenoble, Amsterdam and many others all demonstrate very well the benefit of long-term investments in public transport infrastructure, in particular exploiting the benefits of light rail and integration on a multi-modal basis with other forms of transport including heavy rail, buses, private vehicles, cycling and walking. These examples should all be studied closely for the lessons they offer.

10. Selected sources

MacKay, David J.C. 2009. Sustainable energy – without the hot air. UIT Cambridge Ltd, Cambridge.

Mott MacDonald. 2015. Cambridge Access Study.

2011 Census / Office of National Statistics

Transport Strategy for Cambridge and South Cambridgeshire 2014

WSP Parsons Brinkerhoff 2015. Milton Road & Histon Road corridors draft options report. Report No 70012012-002

Greater Cambridge City Deal (2016) data showing number of houses and jobs by region.



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