



Department
for Transport

Capturing housing impacts in transport appraisal

Case studies

Moving Britain Ahead

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1. Overview of case studies

Introduction

- 1.1 Transport schemes can facilitate or 'unlock' new housing developments, either by expanding the capacity of the network to accommodate increased trips from the development or by providing access from the housing site to existing networks. Housing which is unlocked by transport in this way is termed 'dependent development'.
- 1.2 Decisions on funding for transport schemes are made on the basis of business cases developed in line with HM Treasury's five case model¹. The economic case presents the appraisal of the costs and benefits of a transport scheme and sets out the basis for the value for money (VfM) assessment of the scheme.
- 1.3 The benefits of unlocking new housing can be accounted for in the appraisal of transport schemes undertaken to support the economic case and hence inform decision making. The Department for Transport (DfT) sets out guidance in WebTAG on how to appraise induced investments²: changes in the level or location of private sector investment as a result of a transport investment. This guidance provides practitioners with a methodology to assess the impacts of dependent development and the value for money of both the transport scheme and the housing development in combination.
- 1.4 DfT has developed three case studies which demonstrate how the dependent development guidance has been applied in the analysis of three proposed transport schemes. The case studies are intended to give examples of how to apply the guidance in practice, and, where possible, reflect the flexibilities which exist in the guidance. They should not be interpreted as the only correct way to apply the guidance: they are not 'model answers', and we have highlighted areas where the analysis could have been developed even further to better capture the impacts.
- 1.5 The three case studies cover different types of transport scheme in different areas of the country. They are:
 - Kirkstall Forge rail station (Leeds)
 - Camborne-Redruth-Pool transport package (Cornwall)

¹ Transport Business Case; https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/85930/dft-transport-business-case.pdf

² WebTAG: Tag Unit A2-2 Induced Investment, May 2018, <https://www.gov.uk/government/publications/webtag-tag-unit-a2-2-induced-investment-may-2018>

Dependent Development Guidance

- 1.6 DfT's dependent development guidance is designed to determine the value for money of transport schemes that enable a residential or non-residential development to proceed. While the guidance provides some flexibility around the methodologies for assessing these schemes, there are some core requirements for scheme promoters to demonstrate. These include showing that the new housing is dependent on the transport investment, as well as considering the scheme's effectiveness in unlocking that housing.
- 1.7 DfT's Value for Money Framework³ sets out how different impacts should be taken account of in the value for money assessment of a scheme. The Department distinguishes between different types of monetised impacts (established, evolving and indicative) which are treated differently in the VfM assessment of a scheme. In addition non-monetised impacts can also be taken into account in the VfM assessment. Dependent development impacts are classed as indicative monetised impacts and are not included in the initial or adjusted benefit cost ratio (BCR) for the scheme. However, they inform the final VfM category of the scheme.
- 1.8 The case studies show how a number of schemes have implemented the dependent development guidance to capture the benefits of unlocked housing in their business case. They also show how the housing impacts were taken account of in the VfM assessment of the scheme. The schemes in the case studies all followed several steps: a full assessment of the impact of additional trips produced by the housing site on existing users of the transport network, the determination of the best intervention to alleviate the pressure on the network, and an assessment of the benefits of both the scheme and the enabled housing compared to the costs. The following provides a summary of how the dependent development guidance is typically applied, with reference to key features of the case studies which are set out individually further on.

Identification of the problem

- 1.9 For many dependent development schemes, the problem which needs addressing is obvious: increased congestion as new households in an area generate more trips. However, as these case studies show, transport schemes can address several issues at once. A good business case will include a strong rationale for the scheme, both as a means to facilitate housing and contribute to wider strategic objectives. For example, as well as unlocking housing developments, the objectives of the East Reading Mass Rapid Transit were to alleviate existing congestion on the A4, help to rejuvenate Reading town centre and be part of a broader strategy to promote sustainable transport.

³ DfT's Value for Money Framework can be accessed here: <https://www.gov.uk/government/publications/dft-value-for-money-framework>

1.10 A key step is establishing the dependence of a particular housing development. If the increase in traffic associated with the new housing can be adequately absorbed by the existing network then the housing is not dependent on the transport investment and should not be considered when assessing the impacts of the scheme. The development is dependent on the scheme if in its absence the transport network could no longer provide a '**reasonable level of service**' with the extra trips generated by the additional housing. The guidance gives no specific definition of what is 'reasonable' as it will vary by location and mode of transport. Dependence is generally determined through a transport assessment, in which the trips generated by the development are modelled on the existing network and assessed against a baseline scenario in which there is no development. If the additional trips put excessive pressure on the existing network then the scheme can be considered dependent. In many cases, such as Kirkstall Forge, local authorities will draw on the results of the transport assessment when deciding to grant planning permission conditional on mitigation of the impacts of the site. This provides further confidence that the transport scheme is indeed required to deliver the housing.

Identification of the preferred option

1.11 Many options are judged on a range of criteria, not solely cost or the extent to which they mitigate the direct impacts of the development on the network. The Camborne Pool Redruth transport package assessed options against five criteria including environmental impacts and whether the scheme enabled public transport. When determining how best to mitigate the pressure on the network the solution is not always to expand capacity at pinch points on the road network. Schemes such as Kirkstall Forge and East Reading Mass Rapid Transport sought to encourage mode shift, and in doing so release capacity on the road network.

Proportion of dependent housing

1.12 In many cases the existing network can support some proportion of the proposed housing development. Typically, once the additional trips from the entire development have been demonstrated to adversely affect the network, the model is re-run with incremental reductions in the number of dwellings in the development until the network operates at a tolerable level. Only the proportion of housing that reduces capacity on the network to an unsatisfactory level is considered dependent and so enters into the VfM assessment. Camborne Pool Redruth identified dependent housing by modelling the impact of dwellings planned on a number of sites as they were forecast to be built, identifying the year, 2015, when key junctions reached capacity. Those houses built after 2015 and closest to the affected junction were considered dependent.

Valuing dependent housing

- 1.13 New housing development is valued using land value uplift. This is the difference between the value of the land in its new and former uses and provides a convenient way of estimating the economic value of a development. This approach is consistent with the methodology set out in the Ministry of Housing, Communities and Local Government (MHCLG) appraisal guide⁴. The case studies presented here all valued land using Valuation Office Agency Property Market reports for the region (now discontinued) which provided benchmark land price data. While using VOA land value estimates is likely to be sufficient for most business cases to DfT, site-specific land values are likely to be more accurate and preferred where available, as noted in the MHCLG appraisal guide.

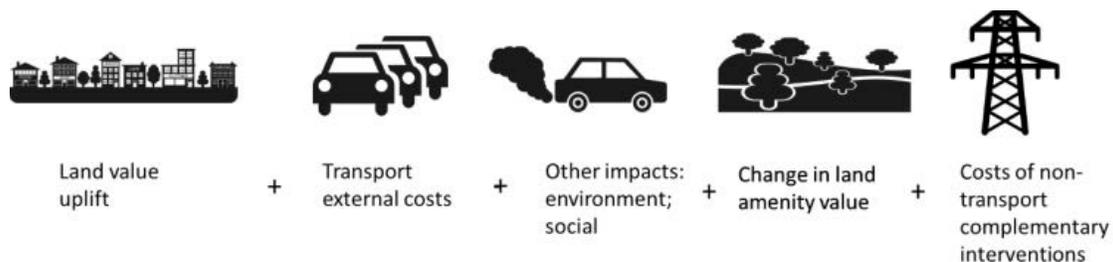
Assessment of costs associated with new housing

- 1.14 Transport external costs are the costs imposed on existing transport users by new users of the network, such as increased levels of congestion or over-crowding. The inclusion of these costs ensures that we consider both the economic benefits and costs of the new housing. Transport external costs can be estimated by modelling two scenarios, both with the new transport scheme but one with the dependent development and one without. In addition, other impacts such as environmental or social costs should be estimated: further detail is available both in WebTAG and the MHCLG appraisal guide.

Net impact of the new housing

- 1.15 The value of the dependent development is calculated according to the following formula:

Net impacts =



- 1.16 As well as the impacts already described, this calculation takes account of changes in land amenity value and costs of non-transport complementary interventions. Land amenity value is the level of pleasantness of the area, and is the difference in amenity value before and after the development. Values for

⁴ MHCLG Appraisal Guide, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/576427/161129_Appraisal_Guidance.pdf

different land types are typically taken from WebTAG's databook 'Valuing Housing Impacts Workbook'⁵. Non-transport complementary interventions are the costs of other infrastructure such as schools and other utilities that are also required to deliver the housing.

- 1.17 In assessing the three schemes described in the following case studies, DfT used the valuation of housing impacts to understand how the value for money assessment of each scheme would move under different assumptions. The Value for Money Framework proposes that an assessment is made as to whether the benefits of the housing are equal to or greater than a '**switching value**', defined as the additional benefit required to move the scheme to a more favourable VfM category. VfM guidance also suggests that the sensitivity of key assumptions is assessed, such as the extent to which new housing is additional (how much of the benefit is attributable to the transport scheme), and occupancy rates for new housing. For all the schemes, inclusion of housing impacts led to a higher VfM category being agreed than implied by the adjusted BCR alone.
- 1.18 The case studies presented have all followed the stages described above, and are good examples of how DfT's dependent development guidance allows scheme promoters to assess the impacts of both a transport scheme and the new housing it helps to support. The case studies also highlight aspects of each business case that DfT analysts felt particularly strengthened the case for investing public money in the scheme; and identify additional analysis that could have further strengthened the case and that would normally be expected in such business cases.

⁵ The workbook can be accessed here: <https://www.gov.uk/government/publications/webtag-economic-impacts-worksheets>

Table 1: Summary of Case Studies

	Problem & Options	Housing	Dependency Test	Value of dependent housing	Total value	Value for Money
Kirkstall Forge	<p>To encourage mode shift from car to rail and facilitate housing developments at new railway stations.</p> <p>Kirkstall Forge chosen (of more than 30) as most technically feasible with good vehicle and pedestrian access.</p>	<p>Leeds City Council's Urban Housing Capacity Study identified Kirkstall Forge as potential site to meet Yorkshire and Humber's Regional Spatial Strategy</p>	<p>Planning permission dependent on provision of station following transport assessment.</p> <p>Transport modelling demonstrated that without the station the surrounding roads network would be at capacity.</p>	<p>Land value uplift calculated based on land values taken from Valuation Office Agency Property Market reports. The scheme did not consider transport external costs or other impacts.</p>	<p>Adjusted BCR of Transport Scheme = 1</p> <p>Housing (£30m) + Operator Revenues (£17m) = £47m.</p>	<p>£14m housing and operator revenues required to achieve 'high' VfM. Judged that sufficient additional benefits for VfM category to be at least high.</p>
Camborne Pool Redruth	<p>To increase network capacity to absorb traffic from proposed housing developments of up to 9,300 homes.</p> <p>Options assessed against a series of criteria including</p>	<p>Housing required to accommodate Cornish economic and population growth forecast between 2011 and 2030, included in South West Regional Assembly's Draft Regional Spatial Strategy in 2006.</p>	<p>Additional traffic from new developments modelled on CPR network every year until 2030. Determined that capacity would become 'unacceptable' (increased delay agreed with DfT) on one junction after 2015.</p>	<p>Land value uplift calculated based on land values taken from Valuation Office Agency Property Market reports for SW Region. Costs of new traffic on networks from green field land and new commercial sites subtracted from land value.</p>	<p>Adjusted BCR of Transport Scheme = 1.9</p> <p>Housing (£39.5m) - Transport External Costs (£20.9m) = £18.6m</p> <p>Additional employment benefits (£6.6m)</p>	<p>£1.2m housing benefits (5% of calculated housing value) required to achieve 'high' VfM category (equivalent to BCR of 2). Sensitivity tests confirmed that VfM likely to be high.</p>

	employment and housing, public transport benefits and impacts on the network.		5,300 houses on sites scheduled after 2015 closest to junction (where delays greatest) deemed to be dependent.			
East Reading Mass Rapid Transit	Options assessed against a series of criteria including mode shift.	Housing required to accommodate forecast population growth.	Additional traffic modelled on network, and dependent housing identified. 168 dwellings identified to be directly dependent on scheme.	Land value uplift calculated based on land values taken from Valuation Office Agency Property Market reports and DfT's 'Valuing Housing Impacts' workbook for undeveloped land. Did not calculate transport external costs of housing on the network.	Adjusted BCR of Transport Scheme = 1.8 Three scenarios: Low (£6.4m), Core (£12m) and High (£21.4m)	£4.7m housing benefits required to achieve 'high' VfM. As achievable in low scenario, VfM category considered at least high.

2. Case study 1: Kirkstall Forge, Leeds Rail Growth Package

A rail scheme (a new station - part of a package to increase rail use)

Table 2: Summary of scheme

Scheme Cost	<i>£16.9 million, of which £10.3 million funded by DfT</i>
Techniques for demonstrating dependency	<i>Planning permission conditional on transport improvement</i>
Number of dependent houses	<i>1,085 housing units Also 300,000 square feet of commercial developments</i>
Value of dependent houses	<i>£30 million (not including transport external costs)</i>
Impact of housing on Value for Money category	<i>Change from Low to High</i>

Background on transport strategy and problem

- 2.1 Kirkstall is a north-western suburb of Leeds, West Yorkshire. It is approximately two miles from Leeds City Centre and has a population around 21,709, based on 2011 census data. It is surrounded by Headingley, Hawksworth, West Park, Bramley and Burley.
- 2.2 Metro ⁶ set out the aspirations, options and strategy for continued development of the rail network serving West Yorkshire in Railplan 5 (2000) and Railplan 6 (2006), with time horizons of 2020 and 2030 respectively. The rail plans supported the delivery of the third West Yorkshire Local Transport Plan (LTP3, formally adopted in 2011 and spanning 2011-2026) objectives and outcomes in the region.
- 2.3 In 2003 Leeds City Council produced the Urban Housing Capacity Study (UHCS). The UHCS identified Kirkstall Forge as a site acceptable for new housing, where the residential and commercial developments could not be fully delivered without an improvement in the public transport network.
- 2.4 Congestion from high volumes of car journeys existed on the approach into Leeds and on the A65 Leeds to Bradford corridor with car use in the morning peak at 100% of capacity. Metro had aspirations to achieve modal shift from car to rail so as to improve accessibility to the local rail network, thereby improving access to Leeds and

⁶ Metro is a public transport brand of the West Yorkshire Combined Authority (WYCA), replacing the West Yorkshire Passenger Transport Executive (WYTPE) in 2014.

Bradford. Previous Local Transport Plans also identified increasing rail capacity as the solution to tackling road congestion.

- 2.5 Priority sites for new stations were identified at Kirkstall Forge and Apperley Bridge. In 2009, the Leeds Rail Growth Package included the development of Kirkstall Forge station amongst other measures to support modal shift on to rail in the area. The station was officially completed and opened in 2016.

Objectives

- 2.6 Encourage modal shift away from the car through improving access to the rail network in a manner which improves access to Leeds and Bradford:
- To improve accessibility to the City Region’s rail network;
 - To increase the attractiveness of rail for all journeys, in particular commuting and business journeys;
 - To tackle congestion in the major centre and main corridors by providing a real alternative to car travel; and
 - To cater for future growth on the City Region rail network.

Options development

- 2.7 More than 30 sites which could accommodate a new rail station were identified in a 1999 strategic study commissioned by Metro, with five locations including Kirkstall Forge and Apperley Bridge prioritised for early implementation based on the assessment criteria of: improved train services, better integration of public transport modes, increased accessibility between Leeds and Bradford, improved safety, supporting economic growth, relieve operating constraints and minimising environmental impacts.
- 2.8 Of the five priority locations, further studies identified potential locations for the rail stations based on technical feasibilities and the availability of vehicular and pedestrian access.
- 2.9 Kirkstall Forge and Apperley Bridge were subsequently identified as the preferred options for the Leeds Rail Growth package. It was recognised that Kirkstall Forge station would facilitate residential and commercial developments at the Kirkstall Forge site, and so the developments became a key local objective of the scheme.
- 2.10 In December 2011 the Department of Transport (DfT) approved a maximum funding contribution of £10.3 million towards the estimated total scheme cost of £16.6 million.

Kirkstall Forge Station scheme

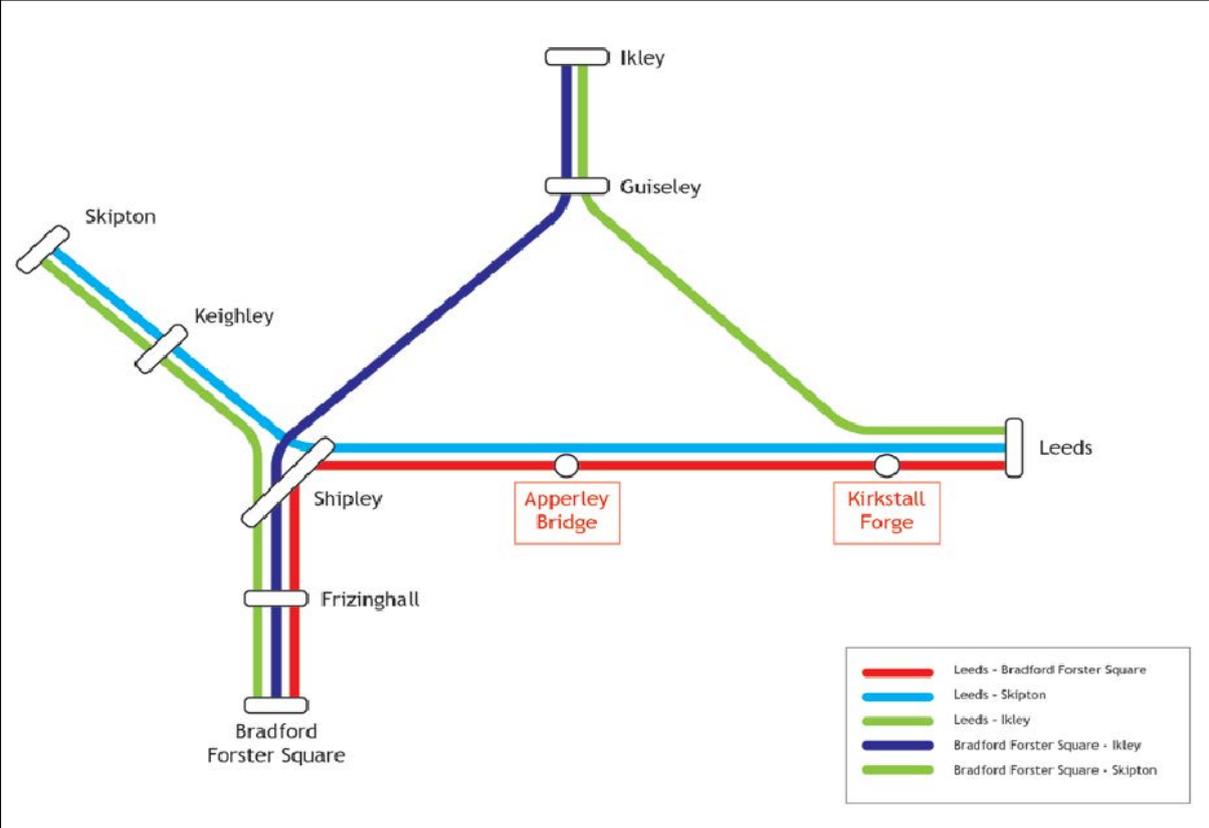
- 2.11 The proposed residential and commercial developments at Kirkstall Forge were granted outline planning permission in July 2007 and included a Section 106 (S106)⁷ agreement conditional on Kirkstall Forge station being implemented. The agreement

⁷ Planning obligations under Section 106 of the Town and Country Planning Act 1990 (s106 agreements), are used to make a development proposal acceptable in planning terms. They are focused on site specific mitigation of the impact of development. S106 agreements are often referred to as 'developer contributions' along with highway contributions and the Community Infrastructure Levy. <https://www.local.gov.uk/pas/pas-topics/infrastructure/s106-obligations-overview>

asked the developer to contribute £4 million, later revised upwards to £5.3 million, towards the new railway station.

2.12 The final approved package of Kirkstall Forge and Apperley Bridge stations each had two platforms served by two trains per hour between Leeds and Bradford. The appraisal of the core transport benefits from the two stations were assessed in the absence of the developments at the Kirkstall Forge site. The benefits of those developments were then assessed exclusively for Kirkstall Forge station: 1,085 housing units and 300,000 square feet of commercial developments, planned to be completed by 2021.

Figure 1: Proposed stations in Leeds Rail Growth Package



How was housing taken into account?

2.13 Dependency of the housing at Kirkstall Forge was demonstrated through having planning permission conditional on the station being built.

Conditional Planning Permission

2.14 DfT’s assessment of the business case noted that the whole Kirkstall Forge mixed residential and office development was granted full planning consent conditional on the delivery of Kirkstall Forge railway station and a £4 million (later £5.3 million) S106 contribution by the site developer towards the new station. It also noted that, at most, only a small proportion of the developments on the site could have gone ahead without the station.

2.15 The detailed traffic assessment underpinning the S106 agreement used local census information to consider the likely volume of traffic generated by the developments as well as the distribution of traffic through the local highway network. It also accounted for potential traffic generated from existing buildings on the site if they were brought back into operation.

2.16 The traffic assessment found the development site to be:

“...a major generator of peak hour traffic onto the surrounding road network and there is no disguising the fact that traffic congestion will significantly increase on the A65 corridor in peak times”

“The provision of the rail halt is key to this density of development being acceptable on this site in terms of its otherwise severely detrimental impact on the existing highway network. Although the benefits of the rail halt have not been modelled it is quite clear that the provision of stations at Kirkstall Forge and at Apperley Bridge have the potential to remove a significant number of trips from the A65 corridor.”

Valuing developments – External Costs - Certainty – Impacts on VfM

2.17 The modelling assumed that residential construction on the Kirkstall Forge site would begin in late 2015 and continue at a rate of around eighty-eight units per year for twelve years. There was an assumed one year lag between properties being put on sale and being occupied.

2.18 Using the land value uplift methodology the Kirkstall Forge residential and commercial developments, all of which were judged to be fully dependent on the scheme, were estimated to deliver £30 million of additional benefits. However, transport external costs were not accounted for in the calculation. There was no loss in amenity value as these developments were built on brownfield sites.

2.19 It was also estimated that, if built, the stations would generate up to £17m of operator revenue (which could be recouped by DfT and therefore appropriately subtracted from the costs).

Economic appraisal

2.20 The economic appraisal of the DfT contribution to the final scheme produced the following adjusted Benefit Cost Ratio (BCR) and corresponding Value for Money (VfM) category:

Table 3: Breakdown of adjusted BCR

Present Value Benefits	<i>£14.1 million</i>
Present Value Costs	<i>£14.0 million</i>
BCR	<i>1</i>
Value for Money Category	<i>Low</i>

2.21 Land value uplift and other monetised benefits not included in the BCR are listed below.

Table 4: Other monetised impacts

Land value uplift from development	£30 million
Operator revenues	£17 million
Total	£47 million

2.22 In the central case, it was shown that realising 18% of the land value uplift benefits would move the VfM category from low to high, while realising 40% of the benefits would move it to very high. In a key sensitivity test which considered additional costs associated with staffing, the proportion of the benefits that would be required to move the VfM category to high or very high was 25% and 70% respectively. It was therefore judged that there were likely to be sufficient additional benefits for the scheme to offer high value for money

Table 5: Benefits realisation required to change VfM category

% of benefits and revenues (not in BCR) to reach:	High VfM	Very High VfM
Central (no extra staff costs)	18%	40%
Additional staffing costs	25%	70%

There were a number of strong features of the analysis presented:

- Use of sensitivity analysis around increases in costs
- Conditional planning permission was based on detailed traffic assessment looking at the traffic flows through the existing network

The analysis could have been strengthened further by:

- Further sensitivity testing for high and low economic growth assumptions
- Accounting for transport external costs in the dependent development analysis.

3. Case study 2: Camborne Pool Redruth Transport Package

A road scheme (2 new roads, together with improved cycling and walking infrastructure)

Table 6: Summary of scheme

Scheme Cost	<i>£26.8 million, of which £16.1 million funded by DfT</i>
Techniques for demonstrating dependency	<i>Traffic modelling and spatial analysis</i>
Number of dependent houses	<i>5,300</i>
Value of dependent houses	<i>£18.6 million (net of transport external costs)</i>
Impact of housing on Value for Money category	<i>Change from Medium to High</i>

Background on transport strategy and problem

- 3.1 The western Cornish mining towns of Camborne, Pool and Redruth (CPR) form a five-mile continuous corridor of urban development along the A3047, and are bounded by the A30 to the north, and the main London to Penzance railway to the south. The CPR area is the largest conurbation in Cornwall with a population of around 60,000 in 2010.
- 3.2 In 2001, the CPR Urban Framework Plan set out the strategic direction and the underlying principles required to create a high quality urban environment in the CPR area including improved transport.
- 3.3 A transport study was commissioned in 2003 to identify the transport infrastructure improvements required for the CPR area which would support emerging development plans and overcome the constraints imposed by a network of narrow industrial estate roads and Victorian street patterns that were unsuitable for use by large freight vehicles and which inhibited inward investment.

Objectives

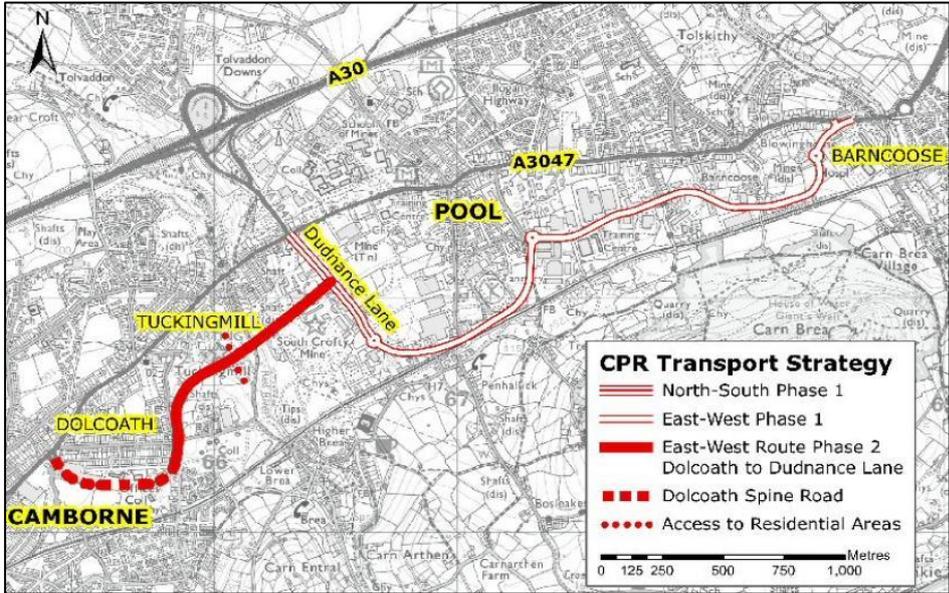
- 3.4 The study identified both making better use of the existing highway infrastructure and using new routes to provide new capacity, as potential options for supporting planned developments. A key constraint on development in the area was identified as the A3047 East Hill junction in Pool. Interim improvements were made to this junction in

2010 but traffic modelling highlighted that capacity at East Hill severely constrained further development in the area.

Options development

- 3.5 Detailed options appraisal was set out in the major scheme business case submitted to the Department of Transport (DfT) in 2006. Multiple route options for a highway scheme and a public transport option were considered. A qualitative methodology was used to compare the strengths and weaknesses of each potential option.
- 3.6 The key assessment criteria were:
 - unlocking the development of employment and housing land;
 - improvements to public transport;
 - highway network benefits;
 - environmental impacts; and,
 - engineering and costs.
- 3.7 The preferred route option choice for a new highway scored particularly highly on employment and housing; as well as highway network benefits and environmental impacts criteria.

Figure 2: Proposed scheme map



Camborne Pool Redruth Transport Package

- 3.8 DfT approved a maximum funding contribution of £16.1m towards the estimated total scheme cost of £26.8m in December 2011. The approved scheme had the following features:
 - A north-south 1.1km dual carriageway to provide quick access from the A30 to the main regeneration area in Pool;
 - An east-west 3.9km road link between Camborne and Pool to act as a distributor for planned new developments and as an alternative route to the congested A3047;
 - Improvements to cycling and walking infrastructure.

How was housing taken into account?

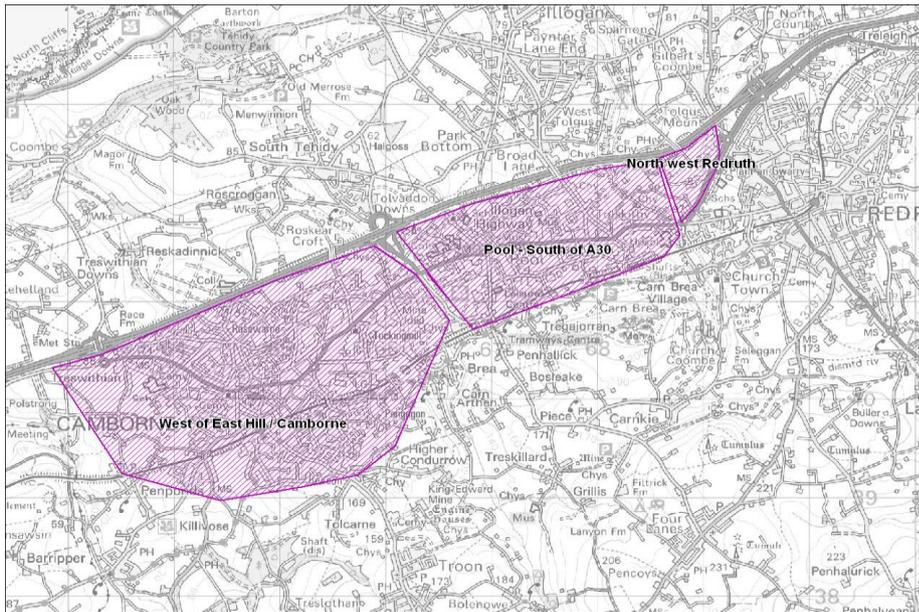
- 3.9 The South West Regional Assembly's 2006 Draft Regional Spatial Strategy identified 6,000 new houses would need to be built in the CPR area by 2026 to accommodate projected population growth and economic growth aspirations for the area. By 2011, Cornwall Council forecast 9,300 new housing units would be completed between 2011 and 2030 in the CPR area, based on proposed developments on identified sites. However, not all of these housing units were judged as dependent on the transport scheme.

Dependency Test

- 3.10 A method of identifying local development was agreed with DfT at Programme Entry⁸. This included identifying local development aspirations (housing and employment) for each year up to 2030 and using these to establish from which year service levels at East Hill junction would be 'unacceptable'.
- 3.11 Traffic modelling was used to understand expected increases in delays over time on the current network given these plans. The promoters first presented modelling showing that by 2013 there would be average AM peak delays of 4 minutes per vehicle on the East Hill approach, PM peak delays of 3 minutes per vehicle; and average PM delays of 1.5 minutes per vehicle on Dudnace Lane. They claimed this represented a 'unreasonable level of service' and that any developments after 2013 should be deemed scheme dependent. However, the Department's assessment disagreed and asked for the modelling to be re-run with different timeframes.
- 3.12 Additional modelling showed that by 2015 the average AM peak delays were 7 minutes per vehicle at the East Hill approach, with PM peak delays of 6 minutes per vehicle and that Dudnace Lane would experience 2 minutes per vehicle PM peak delays. Following more discussions with the Department it was judged that these represented the uppermost delays on the road network for it to still provide a 'reasonable level of service' and that due to the increased delays created by developments after 2015 an improvement to the transport network would be needed to maintain a 'reasonable level of service'.
- 3.13 The developments scheduled after 2015 were then assessed based on their locations relative to the scheme. Proposed developments judged to be dependent were all areas west of the East Hill junction where delays would be greatest, and the immediate areas east of East Hill junction where development would increase congestion at East Hill. However, proposed developments north of the A30 were not assumed dependent as access to the A30 from the north would not be affected by any congestion or by the new East-West Link Road.

⁸ When DfT would expect to fund a scheme subject to certain conditions.

Figure 3: Areas of dependent development



3.14 Assuming a housing density of one house per 85sqm (provided by the CPR Urban Regeneration Company⁹) it was estimated that about 45 hectares of dependent land could be developed for housing provision out to 2030, representing 5,300 houses.

Valuing housing - External costs – Certainty - Impacts on Vfm

3.15 The change in land value was calculated as the difference between the residential land value of the land to be developed with housing and the existing land value (including any amenity value), minus development costs, fees and profits.

3.16 Residential, industrial, office and agricultural land values were taken from the Valuation Office Agency Property Market Reports for the South West region¹⁰. The existing value of the land was assumed to be based on industrial or agricultural land prices depending on whether the land had been previously developed or not. For previously developed land the external impact of development was assumed to be zero. For previously undeveloped land the amenity value for urban fringe and agricultural land was taken from DfT's 'Valuing Housing Impacts' workbook.

3.17 The land value uplift associated with building these 5,300 houses was estimated to be £39.5 million.

3.18 Similar analysis was undertaken for the commercial sites to identify jobs dependent on the scheme. The Urban Regeneration Company provided the gross floorspace size and locations of commercial developments, valued using the VOA's Property Market Reports for the South West Region. This method was used because of the unavailability of a model to estimate employment impacts.

3.19 The total employment benefits were estimated to be £6.6 million, achieved by assessing the expected value of the proposed employment land and subtracting the existing value of employment land and other additional congestion costs from the new developments (transport external costs - estimated to be £20.9m).

⁹ The CPR Urban Regeneration Company was set up to help redevelop the CPR area. From 2002 to 2012 it worked with private and public sector organisations to undertake range of physical and business related work.

¹⁰ These reports have now been discontinued and replaced by the MHCLG's Land Value Estimates for Policy Appraisal published in 2017.

Economic appraisal

3.20 The economic appraisal of the DfT contribution to the final scheme produced the following adjusted Benefit Cost Ratio (BCR) and corresponding Value for Money (VfM) category.

Table 7: Breakdown of adjusted BCR

Present Value Benefits	<i>£31.6 million</i>
Present Value Costs	<i>£16.4 million</i>
BCR	<i>1.9</i>
Value for Money Category	<i>Medium</i>

3.21 Total estimates of dependent developments were as follows (2016-30):

Table 8: Value of dependent developments

Housing Gross	<i>+ £39.5 million</i>
Transport External Costs	<i>- £20.9 million</i>
Housing Net	<i>+ £18.6 million</i>
Employment	<i>+ £6.6 million</i>
Total	<i>£25.2 million</i>

3.22 To move the VfM category from medium to high (equivalent to BCR of 2), an additional £1.2m of benefits would be required from the dependent development, equating to around 5% of the benefits from the development. Given that this switch in VfM categories only required a small proportion of the planned housing to be delivered, 'high' was judged to be the most likely VfM category.

3.23 The business case also included a series of sensitivity tests to examine the impact of changes to forecast growth and variable demand modelling parameter assumptions.

There were a number of strong features of the analysis presented:

- Used traffic modelling to split the impacts by existing and new potential road users; and demonstrate when developments cause unacceptable service levels on the existing network;
- Determined future dependency based on the spatial distribution of planned developments;
- Used WebTAG recommended land amenity and transport external cost valuation methods;
- Considered uncertainty around delivery of planned investments up to 2015;
- Carried out sensitivity analysis around the core numbers.

The analysis could have been strengthened by:

- More analysis of the dependency of developments on other non-transport complementary investment such as the provision of school places or utilities;
- Using site specific rather than regional residential land values.

4. Case Study 3: East Reading Mass Rapid Transit

A mass rapid transit scheme to the east of Reading

Table 9: Summary of scheme

Scheme Cost	<i>£24 million, of which £19.1 million Local Growth Fund /Local Enterprise Partnership money</i>
Techniques for demonstrating dependency	<i>Traffic modelling and spatial analysis</i>
Number of dependent houses	<i>168</i>
Value of dependent houses	<i>£12m (not including transport external costs)</i>
Impact of housing on Value for Money category	<i>Change from Medium to High</i>

Background on transport strategy and problem

- 4.1 At present the A4 London Road is heavily constrained comprising two narrow lanes for traffic travelling towards central Reading and a single narrow lane exiting towards the A3290, and onto the M4 motorway which stretches east to west from London to Bristol.
- 4.2 In 2015, the Thames Valley Berkshire Local Enterprise Partnership (LEP) set out their vision for the area in their strategic economic plan. A key objective of the plan is to enhance urban connectivity. This project has been identified as key to enhancing urban connectivity, unlocking housing development and encouraging vibrant town centres.

Objectives

- 4.3 The scheme is intended to improve accessibility to and from eastern Reading, alleviating congestion along the A4 corridor which is host to a number of large employers and several educational establishments.
- 4.4 The extra capacity provided by the scheme will support additional journeys on the transport network and reduce overall journey times. The scheme will not only generate business and commuter related benefits but aims to unlock housing development, encourage further rejuvenation of Reading town centre and improve the attractiveness of travelling more sustainably. The scheme is designed to reduce private car trips, easing congestion and air quality issues along the existing highway network, particularly along the A4 corridor. The extra capacity will help planned

developments along the A4 corridor to come forward without placing a burden on the existing transport infrastructure

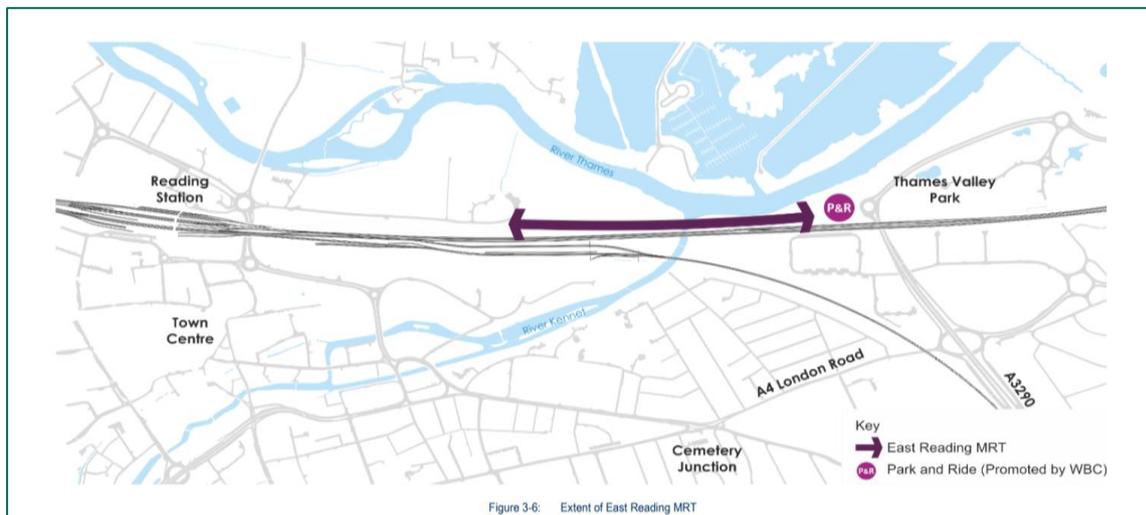
Options appraisal

- 4.5 In order to understand which options would generate the greatest economic benefits, maximise the gains from investment and help achieve the strategic goals for the area, the scheme promoters undertook a thorough review of possible routes and the use of various modes of transport, setting out options in an options assessment report (OAR)¹¹.
- 4.6 This concluded that a segregated bus route in the proposed location would provide clear benefits over options such as the park & rail and park & ferry area facilities, in terms of shorter journey times, shorter waiting times, passenger capacity and catchment. This, in turn, could help maximise the economic potential of Reading and the Thames Valley area by accommodating the forecast population, employment and housing growth in the area.
- 4.7 Other options under consideration were deemed to be unaffordable or less effective in meeting scheme objectives.

East Reading Mass Rapid Transit

- 4.8 The East Reading Mass Rapid Transit (ERMRT) is a public transport link between central Reading, the Thames Valley business park, a proposed park & ride facility and the A3290. The ERMRT will operate in parallel to the Great Western mainline, improving connectivity to and from Reading station.

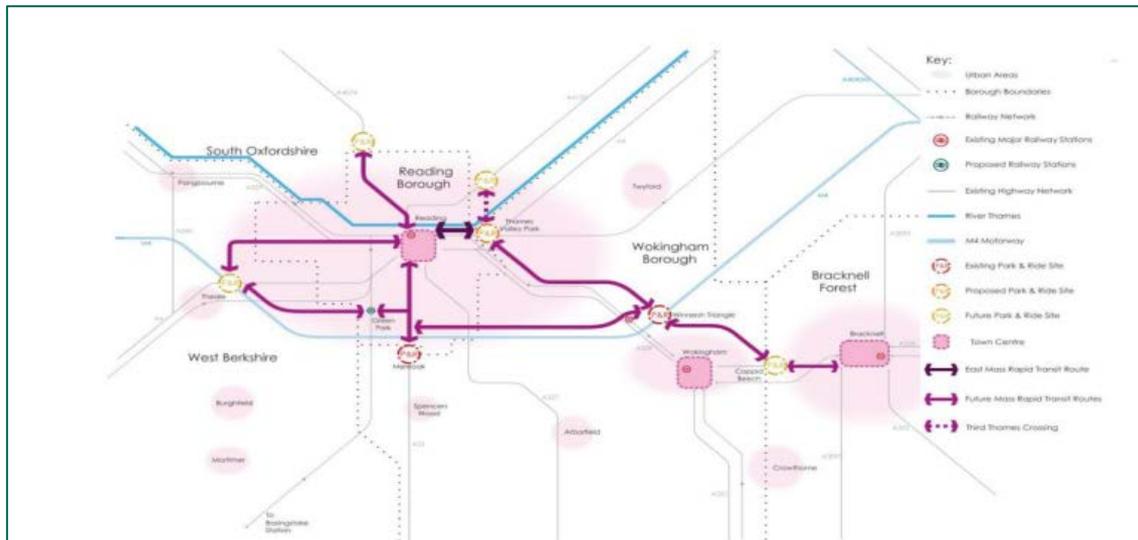
Figure 4: East Reading Mass Rapid Transit route plan



- 4.9 This project is set to be part of a bigger programme of infrastructure upgrades in the Thames Valley and Wokingham area and will form part of a bigger Mass Rapid Transit network for the region as shown in figure 5.

¹¹ http://www.reading.gov.uk/media/7923/East-Reading-Mass-Rapid-Transit---Economic-Assessment-Report/pdf/East_Reading_Mass_Rapid_Transit_-_Economic_Assessment_Report.pdf

Figure 5: Future Mass Rapid Transit Plan



How was housing taken into account?

- 4.10 By avoiding congestion on the A4 London Road the new transport infrastructure would provide considerable capacity increases to support planned growth and to deliver significant benefits for a number of public transport services including the Thames Valley Park commuter shuttle (approx. 1 million trips per annum), Rail-Air coach services to Heathrow and proposed East Reading park & ride services. However, not all the housing units identified in local plans were considered to be dependent on the transport scheme.
- 4.11 Traffic modelling for the corridor from the eastern edges of Reading into the centre found that with new developments set out in the Local Plan and the associated trips, the network would be unable to provide a reasonable level of service. Therefore, further developments were judged to be constrained unless there were improvements to the transport network.
- 4.12 On this basis the scheme was judged to unlock some dependent housing. The core scenario assumes that the number of dependent dwellings that can be directly associated with the transport scheme is 168, though sensitivity tests around this figure were also conducted.

Value of Housing

- 4.13 The value of housing was calculated under a number of different scenarios. The change in land value was calculated as the difference between the residential land with housing and the value of land in its current agricultural state. Residential and agricultural land values were taken from the Valuation Office Agency Property Market Reports for the region¹². For previously undeveloped land the average perpetuity value for urban fringe and agricultural land taken from DfT's 'Valuing Housing Impacts' workbook was used.

¹² These reports have now been discontinued and replaced by the MHCLG's Land Value Estimates for Policy Appraisal published in 2017.

Table 10: Dependent Development benefits

Dependent Housing Numbers	Value of housing
168	£12.0 million
300	£21.4 million
210	£15 million
120	£8.6 million
90	£6.4 million

Economic appraisal

4.14 The economic appraisal of the DfT contribution to the final scheme produced the following adjusted Benefit Cost Ratio (BCR) and corresponding Value for Money (VfM) category.

4.15 Table 11: Breakdown of adjusted BCR

Present Value Benefits	<i>£44.2 million</i>
Present Value Costs	<i>£24.5 million</i>
BCR	<i>1.8</i>
Value for Money Category	<i>Medium</i>

4.16 Benefits included in the BCR for the ERMRT scheme are assumed to include: non-user benefits or costs arising from a reduction in highway trips, which are likely to be relatively small in the case of this scheme. These include a reduction in accidents and improvements in noise and air quality. A number of potential benefits (agglomeration and improved accessibility to Reading station) have not been monetised.

4.17 The benefits from dependent development have been calculated at £12m in the core scenario, with the lowest level of dependent development showing a benefit of £6.4m and an upper value of £21.4m (See Table 10). The adjusted BCR for the scheme was 1.8 (medium VfM). Based on benefits of £44.2m and costs of £24.5m, additional benefits from the dependent development would need to be £4.7m to shift the VfM category to 2 (high value for money). This is the switching value. Even at the lowest level (90 dependent houses), the estimated benefit from the dependent development would exceed the benefit needed to raise the VfM assessment of the scheme. Given this, it was judged that the scheme should be assigned to the high VfM category.

There were a number of strong features of the analysis presented:

- Traffic modelling was used to demonstrate dependency.
- The proportion of the developments dependent on the scheme have been determined.
- Additionally, the business case undertakes a sensitivity analysis on the level of housing coming forward. At all levels it appears as if the housing would move the scheme into a high value for money (VfM) category.

- The appraisal of fundamental transport benefits was done well, utilising transport models to identify future traffic flows.

The analysis could have been strengthened by:

- The external costs of the dependent housing on the transport network were not accounted for (i.e. the impact of the dependent housing on the transport network which would typically be netted off from the land value uplift figures in table 1). Therefore, the approach for the MRT is very likely to have overstated some of the housing benefits.