# East West Rail - Central Section Conditional Outputs Statement

East West Rail Consortium

## **Final Report**

8 August 2014

Plan Design Enable

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This document has 130 pages including the cover.

## **Document history**

Job number: 5123752		Document ref: ITT 28744			
Purpose description	Originated	Checked	Reviewed	Authorised	Date
Final Report for Client Review	РВ	РВ	AJC	AJC	17/4/14
Final Report for Issue	PB	PB	AJC	AJC	14/5/14
Minor amendments	PB	PB	AJC	AJC	20/5/14
Revised GVA Calculations	PB	PB	AJC	AJC	8/8/14
	Purpose description Final Report for Client Review Final Report for Issue Minor amendments	Purpose descriptionOriginatedFinal Report for Client ReviewPBFinal Report for IssuePBMinor amendmentsPB	Purpose descriptionOriginatedCheckedFinal Report for Client ReviewPBPBFinal Report for IssuePBPBMinor amendmentsPBPB	Purpose descriptionOriginatedCheckedReviewedFinal Report for Client ReviewPBPBAJCFinal Report for IssuePBPBAJCMinor amendmentsPBPBAJC	Purpose descriptionOriginatedCheckedReviewedAuthorisedFinal Report for Client ReviewPBPBAJCAJCFinal Report for IssuePBPBAJCAJCMinor amendmentsPBPBAJCAJC

## **Client signoff**

Client	East West Rail Consortium
Project	East West Rail - Central Section
Document title	EWR Central Section COS
Job no.	5123752
Copy no.	
Document reference	ITT 28744

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# **Executive summary**

## Introduction

This report sets out the Conditional Outputs for the EWR Central Section (EWR-CS). The conditional outputs provide a set of target service outcomes without consideration being given to feasibility, deliverability or the adoption of specific routes for new infrastructure that may need to be provided. The focus has been on identifying service performance outcomes that have the prospect of delivering significant economic benefits and supporting economic growth that subsequent phases of the study can consider the design, operational feasibility of cost implications of achieving.

The study area for the EWR-CS conditional outputs is geographically large; it needs to take into account the extent of the existing Eastern Section of the EWR route, as well as the planned Western Section and the potential benefits and opportunities that it provides.

Figure 1 shows the study area and highlights the stations which will be included in the technical analysis.



## Figure 1. EWR-CS Study Area

## **Strategic Objectives**

The East West Rail Consortium (EWRC) have developed the following strategic objectives for the East West Rail scheme, these are:

- Improve east west public transport connectivity;
- Increase economic growth, prosperity and employment within the South-East of England through improvements to east west rail links;
- Provide faster, more reliable and additional rail links from the west to Cambridge, Norwich and Ipswich;
- Improve journey times and reliability of inter-regional and commuter journeys;
- Increase capacity for inter-regional and commuter journeys;
- Maintain and enhance capacity for rail freight; and
- Contribute to tackling climate change.

These objectives will guide the creation of the Conditional Outputs for the EWR Central Section (EWR-CS) based upon a detailed analysis of future housing and employment developments, population growth and journey patterns.

## **Study Process**

We have developed a detailed process for examining the potential for EWR-Central Section services in three broad stages as shown in Figure 2.



### Figure 2. Approach to delivering a Conditional Outputs Statement for the EWR Central Section

The stages to our study process are:

- Examining the evidence base to understand the current and future situations in terms of transport and development;
- Analysing the potential for EWR-CS to deliver business case outputs; and
- Defining the conditional outputs.

## **Evidence Base Conclusions**

Following our review of the evidence base in terms of the economic and transport situations we can identify some key conclusions and drivers for a rail based intervention which will guide the development of the Conditional Outputs for the EWR-CS. These are as follows:

- There is very significant planned population and employment growth to 2031 within 'the 'golden triangle' of London-Oxford-Cambridge and the East Anglia to Reading 'Knowledge Arc' and across the wider study area:
  - In-scope settlement population forecast to grow by between 0.6m and 1.1m
  - In-scope settlement employment forecast to grow by between 0.2m and 0.4m
- There are a number of major business trip ends with a significant knowledge based employment offer which provides opportunities for business to business travel by rail ;
- There are a number of locations which have major development opportunities in very close proximity to
  rail stations where the enhancement of rail services might assist or encourage progress (however most
  of these locations are already well served by rail);
- Poor east-west orbital connectivity in apparent in long journey times by both rail and car and is also reflected in the very low demand at present between locations on this arc;
- There appears to be some genuine scope for delivering competitive rail east-west journey times by implementing the EWR-CS.
- The reference case forecasts show that increasing numbers of east-west movements will be made via London in the future making use of Crossrail and the improved Great Western and Thameslink Services. We consider that this highlights the latent demand for these movements and demonstrates the potential for EWR-CS to unlock demand;
- The Socio-demographic and economic profiles within the study area also highlight the latent demand for enhanced labour market connectivity that could translate into travel demands;
- There is also a common issue of mismatch between employment growth opportunities and labour market supply identified in SEPs across the LEPs within the study area;
- The lack of orbital connectivity appears to be creating an over-reliance on London commuting, which in itself generates issues of crowding and congestion on radial routes
- Freight demands and pressures on available routes in context of parallel pressures from enhancements to passenger services significant Port expansion and plans for new rail accessible freight distribution centres
- Continued growth in Airport passenger demand to both Luton and Stansted Airports will generate additional surface access demands from both passengers and employees that rail could support

## The approach to identifying Passenger Service Conditional Outputs

Figure 3 provides an overall summary of the process through which the conditional outputs for the EWR-CS were derived.





### Initial location identification and sifting

The start of the process was the derivation of the 'long-list' of station locations which were potentially 'inscope' for the central section. This was generated by the EWRC and was a key initial input into the overall process.

In parallel, a comprehensive evidence base was developed on current and future population, employment levels and economic development characteristics and transport characteristics. This information was then used to consider and place the 'long-list' of locations in context and to provide a basis for identifying locations that offered the greatest potential to generate service demand and support economic growth. This analysis identified 26 'very high' or 'high' ranking locations which should be the focus for conditional output consideration. These 26 locations provided the basis for a matrix of journey pairs for which the potential for an EWR-CS service should be examined.

### Deriving target EWR-CS service specifications to consider

For the next stage we then identified target journey times that might be delivered between the 26x26 journey pairs using an agreed set of assumptions on potential average train speeds and an agreed geographical basis for deriving indicative journey distances. These target journey times were then considered for competitiveness against existing rail service and car journey times. This comparison enabled the identification of a number of journey pairs with genuine potential to offer a competitive journey time and enabled identification of a set of indicative EWR-CS services between journey pairs to investigate the benefits potential of. It is important to note that EWR-CS services are assumed to operate at a 2 tph service frequency (per direction).

### Deriving an indicative view on the potential for EWR-CS services to deliver benefits

Journey pairs were tested using our MOIRA/Gravity Model against a reference case which included the EWR Western Section (EWR-WS). Two versions of the model were created. One reflecting the DfT's TEMPRO trend based forecasts for growth, the other reflecting the development plans of the local authorities in the study area. This provided an indication of the potential for an EWR-CS service between each journey pair to increase rail demand, generate a reduction in generalised journey time and generate an increase in passenger miles (indicating the potential to generate rail revenue).

This information was then utilised to enable the calculation of indicative annual benefits by journey pair:

- Transport user benefits reflecting journey time savings
- GVA benefits associated with improved business to business connectivity
- GVA benefits associated with improved labour market connectivity

Transport user benefits were calculated in a fashion consistent with WebTAG. GVA benefits were calculated using the approach used by Network Rail on the London and SE Market Study. **However, benefits values should be considered indicative and only suitable for comparing relative rather than absolute performance of EWR-CS service journey pairs at this stage**. In addition to the three benefit items above the level of highway demand forecast in the East of England model was also identified as providing an indicator of the potential to deliver mode shift from car. Benefits were calculated for both the TEMPRO and Local Plan growth scenarios, with the latter being a higher growth scenario with also an alternative distribution of growth to TEMPRO.

This data was collated for all journey pairs tested and analysis of this underpinned the identification and prioritisation of journey pairs recommended as conditional outputs.

## **Journey Pair Benefits Analysis**

### Process for identification priority journey pairs

Having established the indicative benefits performance of each journey pair the relative performance of pairs was assessed.

The number of journey pairs tested was very significant and for analysis purposes the pairs were identified with one of four target EWR journey time categories:

- 0 15 minutes;
- 15 30 minutes;
- 30 60 minutes; and
- 60+ minutes

The range of impact and benefit that the journey pairs generated was examined, and on the basis of this, thresholds were identified for journey pairs to meet for recommendation as a conditional output. The choice of thresholds was set using the two-way benefits performance of the Oxford-Cambridge EWR-CS service as a minimal level to be met. The thresholds adopted were:

- Change in rail passenger miles: 2.8m in 2031
- Indicative transport user benefit: £1m in 2031
- Indicative GVA business to business connectivity benefit: £28,000 p.a. in 2031
- Indicative GVA labour market connectivity benefit: £17,000 p.a. in 2031

Journey pairs were then categorised depending on how they met criteria:

- Very High Priority: meets or exceeds all thresholds with transport user benefits in excess of £5m in 2031;
- High Priority: meets or exceeds change in rail passenger miles threshold and two or the other three thresholds (including having a minimum value of transport user benefits of £0.5m in 2031); or
- Excluded from Conditional Outputs.

This analysis was undertaken for against both the NTEM/Tempro and Local Plan scenarios, with the thresholds used remaining unchanged for each.

## **Passenger Service Prioritisation results**

It is clear that journey pairs identified as meeting the prioritisation thresholds set reduce significantly as journey time increases. This reflects the impact of journey time on the potential to deliver economic benefits, reflecting the combination of significant enhancement in connectivity combined with greatest opportunities for service demand that short distance journeys represent. The study area offers a large number of opportunities for such benefits to be realised, most notably between locations in Luton/Bedfordshire and Hertfordshire towns, where currently no direct rail service is available. The relatively short geographical distance between these locations means that journey times of less than 30 minutes and often below 15 minutes should be targeted.

For longer distance journeys that exhibit commensurately longer journey times of greater than 30 minutes or 60 minutes, the scale of business activity or labour market needs to be very sizeable to generate sufficient demand for service to offset the impact of time on the propensity to travel, noting that businesses and workers will often have alternatives within more attractive journey time bands available to them. Consequently, a more limited set of journey pairs are identified as conditional outputs falling within the 30-60 minute and >60 minutes journey categories.

What must be stressed is that this does not preclude the potential for EWR-CS to provide a service between locations with longer journey times, rather that these longer journey time pairs in themselves are unlikely to generate sufficient demand and economic benefit to drive the case for EWR-CS. Delivering an attractive and competitive combination of multiple passenger service opportunities between sizeable business activity and labour market locations is likely to maximise the economic growth potential the scheme can offer, and if a number of these can fall below 30 minutes the value of economic benefits is likely to be enhanced.

What clearly has not been considered at this stage, and which may prove challenging, is the feasibility and deliverability of achieving the target level of connectivity underpinning the analysis presented.

## **Passenger Service Conditional Outputs**

The Passenger Service Conditional Outputs provide a set of journey opportunities that should be the primary focus for further examination and development of EWR Central Section proposals. It is recognised that not all journey opportunities will be realisable together, and in practice choices will need to be made as to the combination of pairs to incorporate in a service timetable. They present a range of journey opportunities one would explore the feasibility of enabling by new EWR Central Section infrastructure as yet to be defined. Operational, feasibility and cost considerations, as well as the potential to deliver services within target journey parameters and at a level of service to deliver benefits, will all have a bearing on ultimate choice of journey pairs for inclusion in proposed EWR-CS service timetable.

All of the journey pairs highlighted in our conditional output table are conditional upon suitable infrastructure being provided to enable the target journey times, or times close to these, to be achieved. Our conditions also include a minimum 2 train per hour level of service.

Tables 1 to 7 present the EWR-CS Passenger Service Conditional Outputs by journey time category, while Figures 4 and 5 present diagrams showing all Very High and High priority conditional outputs respectively.

# Table 1Passenger Service Conditional Outputs for journeys of up to 15 minutes duration<br/>(NTEM/Tempro Growth to 2031)

Very High and High Priority Journey Pairs using NTEM/Tempro Growth to 2031	Notes:
VERY HIGH PRIORITY JOURNEY PAIRS	
Luton - Stevenage	(3)
Luton - Welwyn Garden City	(3)
Luton Airport Parkway - Stevenage	(3)
Luton Airport Parkway - Welwyn Garden City	(3)
HIGH PRIORITY JOURNEY PAIRS	
Bedford Midland - Hitchin	(3)
Bedford Midland - Letchworth	(3)
Harlow Town - Stevenage	(3)
Harlow Town - Welwyn Garden City	(3)
Hatfield - Luton	(3)
Hertford North - Luton	(3)
Hitchin - Luton	(3)
Hitchin - Luton Airport Parkway	(3)
Letchworth - Luton	(3)
Letchworth - Luton Airport Parkway	(3)
St.Albans City - Stevenage	(3)
St.Albans City - Welwyn Garden City	(3)

Table 2

Passenger Service Conditional Outputs for journeys of <u>up to 15 minutes duration</u> (Local Plan Growth to 2031)

Very High and High Priority Journey Pairs using Local Plan Growth to 2031	Notes:
VERY HIGH PRIORITY JOURNEY PAIRS	
Luton - Stevenage	(3)
Luton - Welwyn Garden City	(3)
Luton Airport Parkway - Stevenage	(3)
Luton Airport Parkway - Welwyn Garden City	(3)
HIGH PRIORITY JOURNEY PAIRS	
Bedford Midland - Hitchin	(3)
Harlow Town - Stevenage	(3)
Harlow Town - Welwyn Garden City	(3)
Hatfield - Luton	(3)
Hatfield - Luton Airport Parkway	(3)
Hertford North - Luton	(3)
Hertford North - Luton Airport Parkway	(3)
Hitchin - Luton	(3)
Hitchin - Luton Airport Parkway	(3)
Hitchin - St.Albans City	(3)
Letchworth - Luton	(3)
Letchworth - Luton Airport Parkway	(3)
St.Albans City - Stevenage	(3)
St.Albans City - Welwyn Garden City	(3)

Notes:

(1) Very Strong for Business 2 Business Trips

- (2) Strong for Business 2 Business Trips
- (3) Predominantly Commuting Trips

# Table 3Passenger Service Conditional Outputs for journeys of 15 to 30 minutes duration<br/>(NTEM/Tempro Growth to 2031)

Very High and High Priority Journey Pairs using NTEM/Tempro Growth to 2031	Notes:
VERY HIGH PRIORITY JOURNEY PAIRS	
Bedford Midland - Cambridge	(3)
Bedford Midland - Stevenage	(3)
Cambridge - Luton	(2)
Cambridge - Luton Airport Parkway	(2)
HIGH PRIORITY JOURNEY PAIRS	
Bedford Midland - Northampton	(3)
Bedford Midland - Welwyn Garden City	(3)
Harlow Town - Luton	(3)
Harlow Town - Luton Airport Parkway	(3)

## Table 4Passenger Service Conditional Outputs for journeys of 15 to 30 minutes duration<br/>(Local Plan Growth to 2031)

Very High and High Priority Journey Pairs using Local Plan Growth to 2031	Notes:
VERY HIGH PRIORITY JOURNEY PAIRS	
Bedford Midland - Cambridge	(3)
Bedford Midland - Stevenage	(3)
Cambridge - Luton	(2)
Cambridge - Luton Airport Parkway	(2)
Harlow Town - Luton	(3)
HIGH PRIORITY JOURNEY PAIRS	
Bedford Midland - Northampton	(3)
Bedford Midland - Welwyn Garden City	(3)
Harlow Town - Luton Airport Parkway	(3)
Harlow Town - St.Albans City	(3)

# Table 5Passenger Service Conditional Outputs for journeys of <u>30 to 60 minutes duration</u><br/>(NTEM/Tempro Growth to 2031)

Very High and High Priority Journey Pairs using NTEM/Tempro Growth to 2031	Notes:	
VERY HIGH PRIORITY JOURNEY PAIRS		
Cambridge - Northampton	(1)	
Cambridge - St.Albans City	(2)	
HIGH PRIORITY JOURNEY PAIRS		
Bedford Midland - Peterborough	(3)	
Bletchley - Cambridge	(3)	
Cambridge - Oxford	(1)	
Luton - Northampton	(2)	
Northampton - Stevenage	(3)	
Northampton - Welwyn Garden City	(3)	

Notes:

(1) Very Strong for Business 2 Business Trips

- (2) Strong for Business 2 Business Trips
- (3) Predominantly Commuting Trips

# Table 6Passenger Service Conditional Outputs for journeys of <u>30 to 60 minutes duration</u><br/>(Local Plan Growth to 2031)

Very High and High Priority Journey Pairs using Local Plan Growth to 2031	Notes:
VERY HIGH PRIORITY JOURNEY PAIRS	
Cambridge - Northampton	(1)
Cambridge - St.Albans City	(2)
HIGH PRIORITY JOURNEY PAIRS	
Bedford Midland - Harlow Town	(3)
Bedford Midland - Peterborough	(3)
Cambridge - Oxford	(1)
Luton - Northampton	(2)
Luton Airport Parkway - Northampton	(2)
Northampton - Welwyn Garden City	(3)

# Table 7Passenger Service Conditional Outputs for journeys longer than 60 minutes duration<br/>(NTEM/Tempro Growth to 2031)

Very High and High Priority Journey Pairs using Local Plan Growth to 2031	Notes:
HIGH PRIORITY JOURNEY PAIRS	
Cambridge - Reading	(1)
Notes	

Notes:

- (1) Very Strong for Business 2 Business Trips
- (2) Strong for Business 2 Business Trips
- (3) Predominantly Commuting Trips

The journey patterns indicated by the conditional outputs are shown in Figure 4 and 5 for the Very High Priority services and High Priority Services respectively.









### Interpreting the Passenger Service Conditional Outputs

The EWR-CS Passenger COS outputs present a set of key station to station passenger journey opportunities that have been assessed to offer the greatest potential to deliver economic benefits, and generate new rail demand and revenue. It is anticipated that a selection of these key journey pairs in combination will form the core service specification within an EWR-CS enabled timetable.

Target performance for the journey pairs identified should be considered to be the delivery of a service journey time below the upper threshold for the journey time category they have been identified with, at a service frequency of 2 tph. This is a target to aim for in considering design options but this does not mean that if this target were not met the journey pair would not be worthy of inclusion as part of an EWR-CS service specification or timetable. That would be determined by more detailed consideration of the value a service would provide to an overall EWR-CS business case to be developed in due course.

It should also be stressed that the identification of the conditional output journey pairs does not preclude the inclusion of other journey pairs as part of an ultimate EWR-CS service timetable. The COS identifies the key pairs to focus examination of deliverability on. In developing a business case for an EWR-CS scheme in the future it would be expected that the additional value that can be realised from enabling other journey pairs to the core ones will be explored as part of the process of business case optimisation. Consequently, other pairs not identified as conditional outputs, particularly where they generate significantly more benefit and revenue relative to the incremental cost of enabling them, could form part of the ultimate EWR-CS scheme specification for which a business case is presented.

We have given some initial consideration of the scale of economic benefits and the potential to deliver new rail demand and revenue associated with the passenger service conditional outputs, and the likelihood of this being sufficient to support significant rail investment costs. This indicates that the delivery of a selection of conditional outputs has genuine potential to deliver significant transport user economic benefits, sufficient to support a viable value for money case. Transport user benefits alone over a 60 year appraisal period are likely to support a capital investment of over £400 million (in 2010 discounted prices) while still meeting the DfT's economic cost benefit threshold criteria.

This initial consideration suggests that an EWR-CS scheme that delivered a service specification consistent with the conditional outputs, has genuine potential to generate sufficient benefits to justify the capital investment that may be associated with the scheme.

## **Freight Service Conditional Outputs**

EWR-CS has the potential to provide vital additional capacity to the Strategic Freight Network to cater for the forecast increases in intermodal and bulk rail freight. Felixstowe and the Thames Gateway ports on the East Coast are expected to generate a significant increase in intermodal traffic.

If the EWR-CS was implemented, it would offer potential through running from East Anglia to the western side of the UK (south of the West Midlands). It could also provide links to the ECML, MML and WCML. This would facilitate new freight flows plus diversion of some existing traffic flows.

The route could provide relief for capacity on the existing heavily congested North London Line and / or the present West Midlands / Felixstowe route via Nuneaton, Leicester, Peterborough and Ely. There was a scheme in BR days in the 1950s to route existing cross London freight traffic over this line – hence the building of the Bletchley flyover.

Given the proposal to develop electric haulage over the route from Bedford to the west, the proposal to reopen the eastern end of the route to Cambridge, adding it to the national rail network, would give major benefits both in speeding up existing journey times, developing new freight flows and relieving capacity / pressure on existing routes.

In addition to this, two new proposed rail freight terminals could to a large extent depend upon the opening of EWR-CS to access to and from key parts of the county, such as the Haven Ports and London Gateway. Proposals for freight terminals have been suggested for:

- M1 Junction 13, though this does not have support of the local planning authority; and
- MOD Bicester.

With further potential terminals/railheads at:

- Sundon, in Central Bedfordshire (accessed from the MML); and
- Rookery South, near to Stewartby (accessed from the Marston Vale Line).

Based upon this Table 8 shows the Conditional Outputs for Rail Freight.

Table 8. Rail Freight Conditional Output	ıts
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Conditional Output	Description
Freight CO 1	Provide sufficient freight paths/capacity to enable the planned growth of the Haven and Thames Ports whilst providing an alternative route to the Midlands and West of England avoiding the North London Line.
Freight CO 2	Provide sufficient freight paths/capacity to support potential development of a rail freight terminal in proximity to the M1. Capacity would need to be compatible with that planned for the Western Section of EWR.
Freight CO 3	Provide sufficient freight paths/capacity to enable the planned development of a rail freight terminal at MOD Bicester. Capacity would need to be compatible with that planned for the Western Section of EWR.

## **The Next Steps**

In terms of further activity, we recommend that the following next steps be considered:

- Review the conditional outputs journey pairs and develop a set of logical journey pair combinations as EWR-CS Service Scenarios (EWR-CS SS) to consider, focussed on the conditional outputs but also considering in-scope and logical additional non-conditional output pairs.
- Identify potential routes in concept that could enable each EWR-CS SS to be realised this would draw on the extensive body of previous work and studies plus desktop research and consultation with EWRC, DfT and NR.
- Undertake an initial high level operational and planning constraints analysis and deliverability appraisal
  of each EWR-CS SS as basis for sifting down to a limited set EWR-CS SS (2 or 3 scenarios) that will
  provide a more manageable scope and focus for more detailed engineering feasibility consideration and
  outline business case analysis.
- Progress with more detailed operational and early engineering feasibility design study to develop key operational and design outputs (alignments, realisable service performance parameters, indicative timetables, high level cost estimates etc) to support production of an Outline Business Case.
- Undertake the various technical analyses and assessments on feasibility designs necessary, including updated modelling and forecasting, environmental scoping level assessment and economic analysis and appraisal to support preparation of an Outline Business Case – would include consideration of business case optimising EWR-CS SS inclusive of in-scope non-conditional output journey pairs.
- Prepare and present the EWR-CS Outline Business Case in line with the DfT's Five Cases Model template.

# 1. Introduction

## 1.1. Background to Study

The original 'Varsity Line' linking Oxford and Cambridge was closed to through trips in 1967. Some sections of the line have remained in use, but others have been mothballed or ripped up and re-developed. The East West Rail Consortium has been promoting a scheme to reopen the link between Oxford and Cambridge. The complete EWR link will act as a strategic rail route that will link:

- Ipswich, Norwich and Cambridge, with Bedford/Luton, Milton Keynes, Bicester and Oxford, allowing connections to the South Coast, South West England and South Wales;
- Eastern Section (Cambridge to Norwich/Ipswich) Already in Place;
- Western Section (Oxford to Bedford/Aylesbury to Milton Keynes) Scheduled to be open in 2017
- Central Section (Bedford to Cambridge) subject of this study

East West Rail is being planned in three distinct phases, namely, the eastern section between Ipswich and Norwich to Cambridge, the central section between Cambridge and the Midland Main Line (MML) between Bedford/Luton and the western section between the MML and Oxford. The eastern section is already in place. The central section, which would connect the east and western sections, is at an earlier stage of development. The first EWR project objective is to deliver the western section by 2017 after which emphasis will be switched to the delivery of the central section.

This report sets out the Conditional Outputs for the EWR Central Section (EWR-CS). The conditional outputs provide a set of target service outcomes without consideration being given to feasibility, deliverability or the adoption of specific routes for new infrastructure that may need to be provided. The focus has been on identifying service performance outcomes that have the prospect of delivering significant economic benefits and supporting economic growth that subsequent phases of the study can consider the design, operational feasibility of cost implications of achieving.

## 1.2. Strategic Objectives

The East West Rail Consortium (EWRC) have developed the following strategic objectives for the East West Rail scheme, these are:

- Improve east west public transport connectivity;
- Increase economic growth, prosperity and employment within the South-East of England through improvements to east west rail links;
- Provide faster, more reliable and additional rail links from the west to Cambridge, Norwich and Ipswich;
- Improve journey times and reliability of inter-regional and commuter journeys;
- Increase capacity for inter-regional and commuter journeys;
- Maintain and enhance capacity for rail freight; and
- Contribute to tackling climate change.

These objectives will guide the creation of the Conditional Outputs for the EWR Central Section (EWR-CS) based upon a detailed analysis of future housing and employment developments, population growth and journey patterns.

## 1.3. The Study Area

The study area for the EWR-CS conditional outputs is geographically large; it needs to take into account the extent of the existing Eastern Section of the EWR route, as well as the planned Western Section and the potential benefits and opportunities that it provides.

Figure 1-1 shows the study area and highlights the stations which will be included in the technical analysis.

## Figure 1-1 EWR-CS Study Area



## 1.4. Strategic Objectives

The East West Rail Consortium (EWRC) have developed the following strategic objectives for the East West Rail scheme, these are:

- Improve east west public transport connectivity;
- Increase economic growth, prosperity and employment within the South-East of England through improvements to east west rail links;
- Provide faster, more reliable and additional rail links from the west to Cambridge, Norwich and Ipswich;
- Improve journey times and reliability of inter-regional and commuter journeys;
- Increase capacity for inter-regional and commuter journeys;
- Maintain and enhance capacity for rail freight; and
- Contribute to tackling climate change.

These objectives will guide the creation of the Conditional Outputs for the EWR Central Section (EWR-CS) based upon a detailed analysis of future housing and employment developments, population growth and journey patterns.

## 1.5. Our Approach

The Conditional Outputs Statement (COS) sets out what the EWR-CS should deliver in terms of services and the associated benefits. As such it establishes the rationale for progressing the scheme and defines its strategic scope based on a sound evidence base on the drivers and context for intervention.

The COS captures and presents the evidence on drivers for change and intervention with respect to:

- Economic activity and growth;
- Transport network efficiency and performance;
- Passenger travel demand; and
- Freight demand.

These are all themes reflected in the current EWRC Strategic Objectives.

The COS also indicates the scope and potential for key business case outputs to be realised should an EWR-CS scheme be delivered – this should be considered as a precursor to any future feasibility studies or business cases being developed.

Figure 1-2 below presents our approach to the development of the EWR CS COS:





Key elements of the approach are elaborated on below.

#### **Evidence Base Analysis**

We have undertaken a comprehensive review and analysis of the available evidence base to develop the COS for EWR-CS. This has included the analysis of travel patterns from census data, the East of England Regional Highway Model, the PLANET rail model, local development plans and the Strategic Economic Plans of the Local Economic Partnerships. From this we have identified key locations in terms of population and economic growth and areas which will act as key attractors of new trips.

#### Analysis of EWR-CS potential for delivering Business Case Outputs

Taking into account the evidence base we have developed an updated version of the EWR Gravity Model to forecast the likely trip making passenger demand between key origins and destinations within the study area based upon the ability of the EWR-CS to enable faster journey times than would be possible in the future using the road or rail networks. We have used these potential changes in journey times to produce estimates of the likely conventional transport user benefits in terms of journey time savings. In addition we have used the methodology (as recommended by Network Rail) from the Rail Market Studies to estimate further economic benefits in terms of the impact of the scheme on the labour market (in terms of GVA) and also the potential to generate increased business to business travel and hence economic activity (also in terms of GVA).

#### **Defining Conditional Outputs**

We analysed the transport demand, user benefits, and economic benefits of the scheme in terms of short, medium and long duration passenger journeys to identify key Origin to Destination (O-D) movements. We have identified the best performing O-D pairs in each of these journey time categories and these form the basis of the passenger service COS.

In terms of freight, we have utilised the rail industry rail freight forecasts, and taken into account specific proposals for new rail freight terminals to determine a series of conditional outputs specifically for freight services.

# 2. Economic Analysis Evidence Base

## 2.1. National Context

### Introduction

This section reviews the strategic role of East West Rail in terms of its ability to contribute to the UK's growth objectives. It focuses on the importance of delivering growth within the Greater South East, as well as the role improved connectivity can play in facilitating development.

This section should be read in association with the data analysis set out in Appendix A

### Importance of Greater South East to the National Economy

The Greater South East<sup>1</sup> is the engine of the UK's high value innovation driven economy, having developed into an internationally focussed highly inter-dependent region defined by flows of people, goods, money and ideas. The increasing agglomeration of high-wage financial, business and professional services in Greater London and neighbouring parts of the South East undoubtedly confers major benefits – both nationally and regionally – as a result of highly productive, internationally competitive and vital export earning activities.

In 2010 Centre for Cities published a report, *Private Sector Cities*, which looked at private sector jobs growth in cities between 1998 and 2008 and ranked cities as buoyant, stable or struggling based on their performance. It concluded that, while private sector jobs grew in cities across the country, the largest grouping of buoyant cities over that period, with growing economies and new private sector employment was in the Greater South East (GSE). The Greater South East cities created approximately 338,000 private sector jobs in the 10 years prior to the recession, percent of England's total private sector jobs growth. This suggests that the future performance of GSE cities will be fundamental to the UK's future growth prospects.

As a result, the share of the Greater South East's contribution to national economic output has risen from 50.5% to 53.5% in the past 15 years. Population growth to serve the expanding economy has also been strong.

### **Constraints to Growth**

However, despite continuing to outperform the rest of the UK, the South East economy is starting to show signs of underperformance. Our analysis shows that, despite strong growth in the period 1990-1998, growth over the last ten years has been significantly lower, with London now performing more strongly than the rest of the Greater South East.

The reasons for this relative dip in performance are complex. However, they partly relate to the fact that businesses are now increasingly looking to be located closer to other businesses, rather than being driven primarily by cost factors. The London Office Policy Review<sup>2</sup> sets out a number of reasons why office employment has declined in suburban office locations since the late-1980s:

- Changes to property cost differential A steep rental gradient from Central London in the past persuaded businesses to relocate to the Greater South East to reduce costs. This role of the GSE has been usurped by the emergence of campus-style schemes around the periphery of Central London, including Broadgate, London Bridge City, More London and Paddington: a new generation of high quality environments with better connectivity to the West End and City;
- Changes to salary cost differential In this too, the historic advantage of the suburbs has been upstaged. The Central London salary weighting has all but disappeared and back office functions are now more likely to be relocated to Bangalore or Glasgow than the GSE as advances in technology have eroded the need of physical proximity;
- **Changing work styles** Work styles have changed dramatically in response to technology and business priorities. One symptom of this is the virtual disappearance of the typing pool and large clerical, back office functions, staples of the suburban office market. Many such jobs have simply disappeared.

<sup>&</sup>lt;sup>1</sup> Defined as the East, South East and London regions

<sup>&</sup>lt;sup>2</sup> London Office Policy Review 2012: Ramidus Consulting Ltd for GLA

• **Outmoded physical environment** The environmental quality of some locations is tired and poorly maintained, with office accommodation and other employment premises ill-suited to modern business needs, often due to being provided as lip service to planning requirements.

These structural changes can be illustrated by the fact that, where as 20 years ago Microsoft decided to base themselves in the Thames Valley, Google have now decided to locate their UK HQ at Kings Cross. In short, connectivity is a hugely significant factor in locational decisions made by high value growth sectors (explored further below).

A further potential constraint to growth is the lack of housing supply, with a shortage of sites for new housing pushing prices up and workers out, as well as preventing workers from moving to the GSE from other parts of the country. House prices have continued to rise during the past 15 years, with levels of affordability across the South East now at record lows in some areas.

Recent research<sup>3</sup> has suggested that local authorities may underprovide by as many as 160,000 homes across London, East of England, the South East and South West over the next five years against calculations for housing need provided by the Town and Country Planning Association. This is expected to continue to push up prices, creating further problems for labour market mobility.

#### Importance of Connectivity to Growth

Transport matters for the Greater South East region. More people commute to work, and travel further to do so, than anywhere else in the UK. The region therefore has a particularly high dependence on efficient road and rail connections, and any problems with transport infrastructure often have multiplied economic costs for the UK as a whole<sup>4</sup>.

Knowledge driven economies operate with numerous systems including those of innovation, venture capital provision and the development of highly qualified labour. Connectivity both within and between these systems is therefore critically important to system functioning. Connectivity takes many forms including physical road, rail and air connections, electronic telecommunications, and business networks. Further analysis of the academic literature on the relationship between connectivity and development is set out below.

#### **Commercial and retail development**

Public transport use tends to lead to a concentration of economic activity in core areas served by its stops or stations<sup>5</sup>. This concentration of economic activity has been demonstrated as a key driver of economic development and innovation in economic cluster theory. Concentrated economic activity (in its widest sense) also brings a degree of 'buzz' to an area, enhancing its image and leading to further investment, so starting a virtuous circle.

However, this concentration of development is not facilitated by public transport alone. Hall and Marshall<sup>6</sup> noted two particularly important contextual items regarding the impact of transport investment on development in general: the general economic situation and the regulatory context. It has been found that infrastructure investment has led to land use development in buoyant economic contexts, and that public transport-led development in particular had tended to flourish where planning policy favoured public transport orientated development and restricted car orientated development.

Walmsley and Perrett<sup>7</sup> state that public transport systems had the greatest effect on development where there was a long process of urban planning in conjunction with the rail system. There is a risk that developers will not make the most of the increased accessibility unless they are given a planning framework to work within and incentives to do so.

<sup>&</sup>lt;sup>3</sup> Planning: Countdown to the Election - Savills

<sup>&</sup>lt;sup>4</sup> East-West Rail: The Economic Case for Investment – Oxford Economics

<sup>&</sup>lt;sup>5</sup> Siraut, J: Economic and regeneration impacts of Croydon Tramlink in Urban Transport X

<sup>&</sup>lt;sup>6</sup> Hall, P & Marshall S (2000): Report on Transport and Land Use/Development for Independent Transport Commission, cited in RICS: Land Value and Public Transport: Stage 1 Report

<sup>&</sup>lt;sup>7</sup> Walmsley, D & Perrett, K: The Effects of Rapid Transit on Public Transport and Urban Development, cited in RICS: Land Value and Public Transport: Stage 1 Report

Of course, the accessibility improvements facilitated by transport investment are a critical factor in the eventual impact on development. Ryan<sup>8</sup> notes that it is where time savings are noted that increases in property values are likely to accrue. In other words, if the change in accessibility is sufficiently large (e.g. new metro in poor public transport area) then palpable time savings will be made (by at least some sectors of the population who would use the system). Whereas a public transport investment that hardly changed travel times to any significant degree would not expect to see so much impact.

A study into the potential property impacts of Crossrail<sup>9</sup> estimated that, over the next 10 years:

- Commercial office values around Crossrail stations in central London will increase due to Crossrail over the next decade, with an uplift of 10 per cent in capital value above a rising baseline projection.
- Urban realm improvements and the development of new schemes above Crossrail stations will act as a highly visible and beneficial driver for further development activity, the intensification of use and in several areas. Crossrail will have a transformative effect on the property market and development activity over time.

#### **Residential development**

Siraut<sup>10</sup> notes that land accumulation for private residential redevelopment is difficult and this tends to limit such development along the route of new transit systems especially where the system is a conversion of an existing heavy rail route serving well established localities, for example, Tyne & Wear Metro and the first section of the Manchester Metrolink. Where there is space available for development, for example, Don Valley in Sheffield, Beckton on the Docklands Light Railway and Salford Quays on Manchester Metrolink extensions, new residential development has been facilitated. In North America, where land tends to be more readily available there have been numerous examples of high density residential development being attracted to transit served locations.

A Study by RICS<sup>11</sup> notes that there are many factors that influence property prices of which transport is just one. Access to open space and the quality of local schools can impact house prices by as much as local transport accessibility.

#### The role of East West Rail

Drawing upon the above, we estimate that East West Rail will contribute to the following at a national level:

- It will help to unlock higher levels of housing growth that is urgently required in the South East. It will do this by making town centre locations (and other areas with new stations, if developed) more attractive to residential development as a result of their improved connectivity. The impact is likely to be variable at each station location depending on the change in connectivity expected;
- It will help to alleviate labour market constraints in the South East by expanding the size of the potential labour force within an acceptable commuting period. This may have the effect of making some locations more attractive for commercial development, bringing forward additional jobs at some locations;
- It will help to drive agglomeration benefits at key high value clusters by bring businesses closer to each other, thereby increasing business growth in key sectors vital for the UK
- It will reinforce the image of the 'Golden Triangle' as being a coherent economic entity and could attract further inward investment to key locations along the route
- It will help to rebalance some of the growth away from the London economy, which is subject to its own labour market and congestion constraints, towards a series of locations in the South East where there is space to grow;

<sup>&</sup>lt;sup>8</sup> Ryan, S. Property Values and Transport Facilities: Finding the Transportation-Land Use Connection, cited in RICS: Land Value and Public Transport: Stage 1 Report

<sup>&</sup>lt;sup>9</sup> Crossrail Property Impact Study 2012, GVA Grimley

<sup>&</sup>lt;sup>10</sup> Siraut, J: Economic and regeneration impacts of Croydon Tramlink in Urban Transport

<sup>&</sup>lt;sup>11</sup> RICS Policy Unit: Land value and public transport: Stage two – summary of findings

## 2.2. Sub-Regional Context

#### Introduction

This section reviews the growth aspirations along the East West Rail route and provides an assessment of how improved rail links might help to contribute to these. The analysis has been undertaken at the LEP level given their role as facilitators for inward investment and co-ordinators of sub-regional growth.

This section should be read in conjunction with Table 9 at the end of this chapter which provides key metrics to support the analysis.

#### **Hertfordshire LEP**

On most national benchmarks, Hertfordshire's economy is positive. In terms of overall economic well-being, it is ranked fourth among LEP areas: employment rates are relatively high; unemployment is generally low; and on qualification based metrics, Hertfordshire's skills base is significantly above the national average.

The county is home to leading edge knowledge-based businesses. More generally, over 50% of Hertfordshire's businesses are knowledge intensive – a figure that is ten percentage points higher than the UK average.

It also has a key location at the geographical heart of the UK's Golden Triangle. Inside this geography is a high proportion of the UK's current – and prospective future – knowledge-based intellectual assets and horsepower. Hertfordshire is at its geographical core. The Hertfordshire LEP's vision is that by 2030 Hertfordshire will be the leading economy at the heart of the UK's Golden Triangle.

Hertfordshire's close proximity to London and other key locations (e.g. Cambridge) is a particular strength that contributes to all the growth sectors identified by the LEP. This has advantages for businesses located in Hertfordshire because it creates proximity to clients, technology, skilled staff, trade bodies, research and funding organisations, whilst at the same time allowing businesses to benefit from the reduced costs and overheads when compared to London itself. High quality connectivity to other parts of the Golden Triangle, via East West Rail, is key to realising this objective.

However, analysis suggests that Hertfordshire has not performed to its potential over recent years:

- Hertfordshire's growth performance in terms of economic output since 2001 has been overshadowed by that of its neighbours, particularly London and Cambridgeshire; and
- Jobs growth in Hertfordshire has been modest in recent years: even before the recession, some districts saw an overall decline in private sector employment;

The consequence has been that in relative terms, Hertfordshire has slipped. Hertfordshire has seen only modest growth of GVA per head since the late 1990s. On this metric, its rate of growth has been similar to that of the Tees Valley and York and North Yorkshire LEP areas; it has been well below that of its near neighbours (London, Greater Cambridge Greater Peterborough, Buckinghamshire Thames Valley, etc.).

The County looks like it has lost competitiveness. Not only does Hertfordshire appear to have lost out to other parts of the UK in terms of standard economic measures, it would also appear to have lost some of its attraction both as a place of employment and of residence. The indications are that net-commuting from the County increased in the last decade, suggesting that Hertfordshire-based employers were unable or unwilling to offer the salaries that would encourage fewer Hertfordshire residents to commute to London and residents from other areas to continue to work in the County. Over the same period the differential in house prices between London and Hertfordshire has increased from 15% to 27%.

There are a number of interrelated reasons for the relative decline in competitiveness. One key factor is that transport related infrastructure is seen as a major barrier to economic competitiveness within the County and requires the largest level of investment. The existing deficit mainly concerns North-South routes but East-West routes are also a problem, particularly with regard to public transport. The introduction of East West Rail can help to address these existing deficits, providing direct links to major employment centres both within and outside the LEP area.

Hertfordshire also faces a significant challenge in providing the housing that population projections suggest is necessary. Official population and household projections and economic forecasts all imply that large numbers of houses need to be built in the County to accommodate an increase in the number of households in the order of 100,000 over the next 20 years. This is significantly greater than the rate of house building prescribed for 2001-2021 in the East of England Plan. Analysis completed through the refresh of the Hertfordshire Infrastructure Investment Strategy (2012) concluded that there could be 22,000 fewer dwellings coming forward over the period 2001-2031 than previously planned.

East West Rail can play a role in making town centre sites more attractive for development and bringing forward housing delivery. Table 2-1 shows that most potential station locations in Hertfordshire have considerable opportunities for development already identified in Local Plans which East West Rail could help to facilitate.

The urban fabric is also in urgent need of regeneration, particularly with regard to the Phase 1 New Towns (Hatfield, Hemel Hempstead, and Stevenage). Yet most have mainline railway stations and they ought to be regarded as a substantial opportunity. Again, the improved connectivity offered by East West Rail should have a positive effect on the attractiveness of sites within town centres and can help to deliver town centre regeneration.

Table 2-1	Development opportunities within close proximity to potential EWR Stations –
	Hertfordshire LEP

Station	Residential Units	Office floorspace (sq.m)	Retail floorspace (sq.m)
Hitchin	374	Unknown	Unknown
Letchworth Garden City	170	Unknown	Unknown
Stevenage	Unknown	Unknown	Unknown
Welwyn Garden City	50	Unknown	11,229
Hatfield	251	Unknown	12,747
Hemel Hempstead	1,800	Unknown	Unknown
St Albans	201	Unknown	Unknown
Watford	1,500	Unknown	Unknown
Hertford	875	3,000	Unknown

Source: Atkins own review of local planning strategies

#### New Anglia LEP

The New Anglia LEP has an ambition to establish the New Anglia economy as a centre for global talent and business excellence. The LEP is targeting the following by 2026:

- 95,000 more jobs which is 50 per cent higher than forecast;
- 10,000 new businesses which is more than double previous trends;
- 117,000 new homes which is 30 per cent higher than previous delivery.

The LEP has a relatively strong and diverse business base and is home to major national and international businesses. The employment base has shown resilience during the recession, with a drop from 2008 to 2012 of just 0.4%, compared with other comparable areas such as the Lincolnshire LEP (drop of 4.1%) and Northamptonshire (drop of 2.5%).

However, on many economic measures of performance, the New Anglia area is a middle-ranking economy. The total size of the economy was around £27.5bn in 2011 – the 14th largest LEP area economy. The rate of economic growth across the area during the period 2001 to 2011 was 3.5% per annum, the average for England, and the 14th highest growth rate of the 39 LEP areas.

The LEP recognises that rail is the key to job creation and a new economy, driven by innovation and technology hubs across the region. The burden on the region's road network, lacking a major motorway artery, will be eased by improved rail capacity and connections, such as East West Rail. The LEP notes that

the rail network provides vital employment opportunities for commuters and improvements will attract inward investment into the region, which East West Rail can only improve.

Although the most significant journey time improvements and estimated economic impacts are expected to be felt outside of the New Anglia LEP, there is still potential for it to play a minor role in facilitating growth in the major centres of Norwich and Ipswich.

Table 2-2 shows that there are development opportunities in close proximity to potential East West Rail stations, as identified in local authority planning strategies, in Bury St Edmunds, Stowmarket and Norwich, which the introduction of improved connectivity associated with East West Rail, could help to facilitate. Other locations, such as Ipswich, are also expected to see significant development close to the station, although the scale of this growth is not clearly identified in current planning strategies.

Table 2-2	Development opportunities within close proximity to potential EWR Stations – New
	Anglia LEP

Station	Residential Units	Office floorspace (sq.m)	Retail floorspace (sq.m)
Bury St Edmunds	Unknown	Unknown	25,000
Stowmarket	110	1,800	6,650
Newmarket	Unknown	Unknown	Unknown
Ipswich	Unknown	Unknown	Unknown
Thetford	Unknown	Unknown	Unknown
Norwich	224	Unknown	Unknown

Source: Atkins own review of local planning strategies

#### Greater Cambridge and Peterborough LEP

The Greater Cambridge and Peterborough LEP describes itself as an economic geography of scale and national significance: It boasts some of the country's most globally competitive clusters which, if fostered, can help to lead the UK's economic recovery over the coming years.

It has a diverse economy with national and international strengths in ICT, creative industries, bio-medical, low carbon and environmental goods, high value engineering and manufacturing sectors – all sectors with significant export potential which have driven our economy to be one of the few net contributors to national wealth.

In addition, Cambridgeshire is one of the top four regions in Europe in terms of total institutional investment into innovative start-ups. The result is higher employment, higher Gross Value Added and one of the highest levels of population growth in the UK.

However, the LEP's ability to grow has been constrained by under-investment in transport infrastructure, skills disparities and shortages and a chronic shortage of affordable homes. Future economic growth potential is constrained by an increasingly tight labour market, itself a function of the shortage of good quality and affordable housing and supporting infrastructure. Addressing the housing and transport deficits is critical to the region achieving its economic potential. East West Rail is a key factor in increasing the size of the potential labour catchment and addressing some of these labour market issues.

The LEP recognises that one of the key components of success in the region is the ease with which individuals, businesses and organisations are able to interact with one another. Transport has been and will continue to be critical to this, and rail, including East West Rail, is particularly important - it attracts businesses and productive individuals because it is fast, reliable and allows people to work while travelling. Moreover, it signals to businesses that a region is suitable for investment and growth.

Trains services to the East also have the potential to spread the area's high tech industries across a broader area. Improved links between Norwich, Cambridge and Ipswich would create a life sciences triangle, which would cement the region as world leaders in high tech growth.

Alconbury Weald now has Enterprise Zone status and is expected to accommodate 8,000 new jobs and 5,000 new homes and could be delivered more quickly if served by East West Rail. In addition to this, Table 2-3 shows that all four station locations in the LEP area considered as part of this work have considerable opportunities for development already identified in local planning strategies within close proximity to each station, which East West Rail could help to facilitate.

# Table 2-3Development opportunities within close proximity to potential EWR Stations – Greater<br/>Cambridge & Peterborough LEP

Station	Residential Units	Office floorspace (sq.m)	Retail floorspace (sq.m)
Cambridge	2,000	Unknown	Unknown
Ely	628	20,954	1,078
St. Neots	429	6,952	23,550
Peterborough	3,117	70,000	Unknown

Source: Atkins own review of local planning strategies

#### **Buckinghamshire & Thames Valley LEP**

The Greater Thames Valley (GTV6) is the most prosperous, productive and entrepreneurial part of the UK. The economy is worth £161.7 billion per annum, with 334,915 businesses providing 3.1 million jobs. It has GVA per capita which is 13.8% above the national level as well very high educational attainment.

The LEP plans to deliver almost 11,000 homes and 31,000 jobs between 2015 and 2020 subject to securing government investment for growth.

Last year, Buckinghamshire Thames Valley LEP ranked 2nd among LEPs for housing completions. This, combined with the fact that Buckinghamshire is the 2nd most porous LEP in the country (with only 62.3% of residents working in the LEP area and 92,000 people out commuting) means congestion is becoming a significant constraint. These statistics, together with some of the empirical evidence he LEP has identified from the increasing number of businesses that are complaining about road congestion, supports the business case for the need to improve our transport infrastructure.

The LEP has commissioned a number of transport studies that have outlined that identified the following connectivity issues:

- Poor connectivity to neighbouring centres and employment areas;
- Poor north-south highway connections, in terms of journey times, speeds and reliability;
- High dependence on the private car for many in Buckinghamshire, public transport is currently not a viable, realistic alternative, as the point to-point journey times are typically between two to two-and-a-half times longer than by car;
- The road and rail radials from London are heavily congested;
- Aylesbury has poor connectivity with neighbouring urban centres, with the fastest options involving journeys in excess of one hour;
- Poor and congested east-west connections between Bedford, Milton Keynes, Aylesbury and Oxford;

When combined with the fact that cross border growth is expected to increase travel demand, transport is likely to remain a significant constraint to growth under a business as usual scenario. East West Rail can help to help to alleviate some of these congestion issues, improving the image of the LEP for further inward investment and job creation.

Transport, particularly how it is integrated into land use planning, also has a crucial role to play in the successful delivery of town centre regeneration. Aylesbury and High Wycombe face intense competition from rival centres such as Milton Keynes, Watford, Slough, Reading, and Oxford. The regeneration of towns is required to attract private sector investment to avoid the town centres stagnating, and to support a mixed and vibrant town centre economy. Growth in and around both towns, necessitates that the town centres develop and grow to be able to support the varied needs of the population. Failure to do so will result in the towns becoming increasingly dormitory, and encourage people to travel further to more distant centres, thereby worsening congestion and carbon emission levels. The East West rail link to Aylesbury will play a

key role in supporting growth at the town, with Table 2-4 illustrating that the town could deliver 885 new residential units and a considerable amount of commercial floorspace, which could be supported by the improved connectivity facilitated by the railway.

## Table 2-4 Development opportunities within close proximity to potential EWR Stations – Buckinghamshire & Thames Valley LEP

Station	Residential	Office floorspace	Retail floorspace
	Units	(sq.m)	(sq.m)
Aylesbury	885	114,900	45,001

Source: Atkins own review of local planning strategies

The LEP has also identified a number of potential schemes which will help unlock a number of key local employment sites. Particular schemes of note under this priority include the Winslow Station and Employment Site Developments (Furze Lane & Access onto A413) - This scheme will deliver a road on the edge of Winslow in order to support housing growth on the edge of the town, linked to the East West Rail developments.

### **Thames Valley Berkshire LEP**

The Thames Valley Berkshire (TVB) LEP is home to over 870,000 people and 42,000 businesses. Together these generate economic output of around £30bn. This is equivalent to around 15% of the total for the South East region or just over 2% of the UK-wide figure. On a national stage, TVB performs strongly on most key metrics. In 2012/13, the LEP secured more inward investment projects than any other LEP area apart from London. The 2014 *UK Competitiveness Index 2013* concluded that TVB is by far the most competitive LEP area in England.

However, there are some key constraints to growth. The LEP has identified that the biggest single risk to the future economic contribution of TVB concerns the transport and communications infrastructure.

Within TVB, there are world class businesses, but many of these – particularly those in tech-based sectors – are struggling to recruit and retain the staff that they need. The LEP recognises that if its ambitions for economic growth are not to be stifled, it must grow our overall labour supply. Where particular skills are in very short supply, businesses need to be able to find solutions. East West Rail has a key role to play in increasing the size of the potential labour market to facilitate growth in the LEP.

The LEP also recognises that it is imperative that the planned housing provision is delivered. The forecasts created for the now-revoked South East Plan (which are largely reflected in the adopted Local Plans) are fast becoming out of date. Existing housing targets may have to be adjusted where there is evidence that housing affordability is significantly worse than in adjoining areas (defined in relation to Local Plans); this is a particular concern in TVB. Again, East West Rail might be able to help deliver housing and commercial floorspace within Reading town centre, as identified in Table 2-5, although its impact is likely to be relatively marginal.

# Table 2-5 Development opportunities within close proximity to potential EWR Stations – Thames Valley Berkshire LEP

Station	Residential Units	Office floorspace (sq.m)	Retail floorspace (sq.m)
Reading	4,528	1,500	70,000

Source: Atkins own review of local planning strategies

### Oxfordshire LEP

Oxford is a global brand, known the world over for its academic excellence and historical significance. The area is amongst the top five Technology Innovation Ecosystems in the world, home to a significant knowledge-intensive cluster, with 1,500 high tech firms employing around 43,000 people. The close proximity of these economic assets provides major opportunities to expand university and business interaction.

Yet to date the Oxford City Region has underperformed compared with other high-tech areas. Oxfordshire's GVA per capita has followed the UK average (1980-2006), while Cambridgeshire grew at 2.5 times the national rate. Oxfordshire's hi-tech sector is similar in scale, but more broadly based, with greater spin-out activity, a 90% survival rate and in a better strategic location. But Cambridgeshire's hi-tech sector is focused in two major locations. Oxfordshire's research centres are scattered (Oxford/Culham/Harwell), and its high tech clusters widely dispersed, without the essential infrastructure and employment sites.

The LEP's diagnosis of the recent underperformance is that the LEP lacks connectivity, networks and critical mass to support growth, services and investment; without these it is much more difficult to grow and retain firms and attract Foreign Direct Investment.

The LEP's knowledge economy currently relies on fragmented and informal collaborative networks and there is limited access to resilient and fast Broadband across the county. The information and exchange networks and hubs need greater focus, connectivity, scale and reach across the region. The current road and rail connections are poor across the key areas of Bicester, Oxford and the Enterprise Zone Science Vale and this is reducing the physical connections between and across these investment locations. These connectivity issues are further constrained through capacity constraints exacerbated by high levels of incommuting.

Improved linkages provided by East West Rail may have the effect of helping to concentrate some of these high tech activities in accessible locations, providing a critical mass for growth.

Oxfordshire's business base is static and is listed in the lowest quarter for new business formations when compared to other LEP areas. Employers report that empty job vacancies are impacting on their business due to a lack of applicants with the required skills, qualifications or experience particularly in the advanced manufacturing/motorsport industries. Lack of space is a major limitation to the Oxfordshire economy, particularly for expanding businesses and start-ups. It also restricts housing supply, particularly in Oxford, which drives up house prices and limits the attractiveness and diversity of labour supply in the county. Despite the 85,000 new homes planned in Oxfordshire over the next 15 years, local housing is at the limit of affordability for many who live and work here. East West Rail could be a key factor in increasing the size of the potential labour catchment and addressing some of these labour market issues.

Table 2-6 shows that there are development opportunities in close proximity to potential East West Rail stations, as identified in local authority planning strategies, in all three station locations considered as part of this work, which the introduction of improved connectivity associated with East West Rail, could help to facilitate.

Table 2-6	Development opportunities within close proximity to potential EWR Stations –
	Oxfordshire LEP

Station	Residential Units	Office floorspace (sq.m)	Retail floorspace (sq.m)
Didcot	450	Unknown	32,000
Oxford	800	35,000	37,000
Bicester	2,300	178,200	Unknown

Source: Atkins own review of local planning strategies

#### South East Midlands LEP

The South East Midlands is a functional economic area and a significant 'growth diamond' with the potential to be a powerhouse for the business-led recovery of the national economy. The LEP covers a population of over 1.8 million people and 75,600 businesses and accounts for 3.7% of the national economy.

The LEP notes that the area's place on the Golden Triangle formed by the university centres of Oxford, Cambridge and London is valuable. An identifiable knowledge intensive corridor, containing important educational institutions and companies, is strengthened by routes such as the A421.

This area's public transport and highway connectivity to London, the South East and to the Midlands and beyond makes it a key contributor to the labour markets of these economies. It is also a dominant business

location in its own right with Milton Keynes, Aylesbury Vale and Luton all featuring in the top ten UK areas for predicted output and employment growth over 2013-17, according to a recent analysis by Experian.

The area's strategic road network and rail network were the top two aspects of what is good about the area as rated by businesses. However, the LEP notes that more investment is needed to ensure that the planned growth does not lead to congestion and reduced reliability on the road network. East West Rail therefore has a key role to play in providing links both within and outside of key settlements in the LEP.

35% of businesses reported finding it difficult to obtain key skills when recruiting new staff (skills shortages are defined as where skills are difficult to obtain from outside the organisation/from new recruits). East West Rail could be a key factor in increasing the size of the potential labour catchment and addressing some of these labour market issues.

The delivery of an adequate supply of homes to meet a range of needs is perhaps the biggest challenge in the SEMLEP area, given the historic levels of employment growth and aspirations for future expansion. Local Plans across the SEMLEP area that are either already in place or currently emerging contain ambitious levels of future residential development. Current plans generally seek to continue this trend. In the current economic climate delivery of new homes has been frustrated by issues of economic viability, the availability of mortgage finance and the need for associated infrastructure.

The challenge for the area is to accelerate the number of housing completions in order to meet existing development plan targets for the provision of 127,000 new dwellings by 2026 (with 86,700 by 2021) at a higher rate than is currently being achieved. As described under section 2.2, unlocking major transport infrastructure across key locations in South East Midlands is a required precursor to open up development opportunities to build more homes and support a growing population. Achieving higher rates of delivery will therefore require further levels of investment in enabling infrastructure. East West Rail could help to bring forward some of these new homes in key locations where a step change in connectivity is realised.

Table 2-7 shows that there are development opportunities in close proximity to potential East West Rail stations, as identified in local authority planning strategies, in most station locations considered as part of this work, which the introduction of improved connectivity associated with East West Rail, could help to facilitate. There is also potential for it to help unlock a whole new residential community at Wixams, south of Bedford.

#### Table 2-7 Development opportunities within close proximity to potential EWR Stations – South East Midlands LEP

Station	Residential Units	Office floorspace (sq.m)	Retail floorspace (sq.m)	
Milton Keynes	5,000	240,000	89,748	
Bletchley	800	Unknown	Unknown	
Bedford	1,205	Unknown	48,800	
Arlesey	1,000	Unknown	Unknown	
Biggleswade	2,213	110,000	7,000	
Flitwick	1,035	90,000	Unknown	
Luton Central	2,735	75,000	56,765	
Luton Airport Parkway)	Unknown	141,482	Unknown	
Sandy	Unknown	Unknown	Unknown	
Northampton	3,965	79,500	63,750	
Wellingborough	5,700	Unknown	Unknown	
Wixams (new town – no existing station)	6,000	Unknown	Unknown	

Source: Atkins own review of local planning strategies

SEMLEP also has an active Enterprise Zone, in the Waterside area of Northampton. This is composed of more than 20 potential brownfield investment sites along the River Nene and stretching across the town centre. The University of Northampton will build its new £330m campuses on the Enterprise Zone.

## Table 2-8 Key Economic Metrics at LEP level

	Buckinghams hire Thames Valley	Greater Cambridge and Peterborough	Hertfordshire	New Anglia	Oxfordshire	South East Midlands	Thames Valley Berkshire	England
Private and other services employment: share of total 2010	58.4%	51.0%	62.9%	51.5%	51.8%	57.4%	64.8%	54.8%
Manufacturing employment: share of total 2010	7.6%	10.7%	6.9%	10.8%	7.9%	9.5%	6.4%	8.9%
Share of employment in public sector 2010	15.4%	18.1%	17.1%	20.4%	18.0%	18.2%	14.9%	20.8%
GVA per head 1998	15,300	14,300	16,300	11,400	14,700	14,000	20,500	12,700
GVA per head rank 1998	5	11	4	24	9	12	2	
GVA per head 2009	22,100	21,700	22,800	16,100	21,900	20,100	30,700	20,700
GVA per head rank 2009	6	9	4	23	8	12	2	
Ratio of unemployment claimants to jobcentre vacancies 2011	2.5	2.4	3.1	4.1	1.4	2.7	2.9	4.6
Total change in adult population 2000 - 2010	1.5%	9.2%	7.2%	7.9%	6.1%	9.4%	8.0%	7.6%
Employment rate 2011	75.9%	73.8%	74.6%	73.3%	76.9%	75.1%	75.8%	70.4%
Patents per 100,000 residents 2007	16.3	43.1	12.6	9.6	33.4	7.8	24.6	10.6
Share of employment in Knowledge Economy and High and Medium Tech Man. 2010	24.7%	23.0%	21.7%	16.0%	30.3%	20.2%	29.5%	22.2%
Share of employees that are highly skilled	55.6%	47.7%	53.4%	40.3%	57.3%	46.4%	52.3%	45.2%
No. Of enterprises per 1,000 pop 2010	52	39	42	35	42	37	40	34
### 2.3. Basis for the Economic Analysis

The economic analysis for the EWR-CS draws upon existing Local Economic Assessments, Employment Land Reviews and Economic Development Strategies, as well as analysis of latest socio-economic datasets. The purpose of the analysis is to identify opportunities for EWR to facilitate economic growth through enhanced connectivity.

The analysis has focused on catchments around the 64 station locations that were identified by EWR Consortium members. The current population and employment levels have been identified for all locations with the potential to be served by rail using information derived from the 2011 Census and the Business Register and Employment Survey.

#### **Forecasting Population and Employment Growth**

Our forecasts of population and employment growth have been based upon two alternative data sources identifiable, these being:

- A detailed review of growth "plans" as set out in local planning documents, as well as emerging and unpublished information for some authorities (e.g. emerging Strategic Economic Plans) based on actual or proposed allocations of land for housing or employment uses; or
- NTEM<sup>12</sup>/Tempro<sup>13</sup> (DfT) trend-based growth forecasts These forecasts include population, employment, households by car ownership, trip ends and simple traffic growth factors based on data from the National Transport Model (NTM) and provide a nationally consistent set of forecasts for use in DfT investment appraisal controlled by thresholds for overall growth across the UK. The two forecasts differ significantly for some locations within the EWR-CS study area.

Whilst we have used the latest published forecasts of population and job growth using local and national data, it is accepted that these are in different stages of review and subject to change. In particular there is currently some uncertainty on how housing growth levels and locations will be agreed across Local Planning Authorities and what level of job growth will result as Local Enterprise Partnerships implement their Strategic Economic Plans. As the East West Rail project is progressed it will be necessary to review the planning forecasts used, but it is not believed this uncertainty affects the robustness of the conclusions reached in this piece of work.

Overall there is significant growth in population and employment forecast for the EWR-CS Study Area in relation to the 64 locations identified. Table 2-9 highlights the forecast growth in employment and population within 5km of the 64 stations. Local Plan based forecasts for growth are significantly higher than NTEM based forecasts. As there will be competition between locations across the study area (and beyond) it is likely that not all areas grow as "planned", this should therefore be seen as a 'High Growth' scenario.

Therefore the growth in population and employment should best be considered as falling within the range between NTEM/Tempro and the Local Authority plans. However it is important to note that private sector investment decisions and market perspective will also play a major role in determining the outturn levels of growth in terms of housing and employment.

		Existing	Forecast to 2031	Growth	Growth (%)
Local Plans	Population	3,761,869	4,876,754	1,114,885	30%
based Forecast	Employment	1,984,260	2,391,662	407,402	21%
	Population	3,761,869	4,331,216	569,347	15%
NTEM/Tempro	Employment	1,984,260	2,157,759	173,499	9%

#### Table 2-9 Comparison of Local Plan and NTEM based Growth Forecasts in EWR-CS Study Area

<sup>12</sup> National Trip End Model

<sup>&</sup>lt;sup>13</sup> Trip End Model Presentation Program

Table 2-10 and Table 2-11 show the differences between the local and NTEM based growth forecasts of population and employment at a sample of locations within the study area. This illustrates clearly the some of the significant differences in forecast which exist at the local level. These differences will have an impact upon the level for rail passenger demand which is forecast for these locations in the forecasting stage of the study.

Station Name	Local Plan Pop	Tempro Pop	Difference
Peterborough	254,246	164,409	89,837
Norwich	284,330	196,146	88,185
Bletchley	225,320	145,424	79,896
Hemel Hempstead	238,127	184,683	53,444
Harlow Town	254,246	202,322	51,924
Cambridge	135,969	102,059	33,910
Bedford	219,173	191,371	27,801
Leicester	219,480	197,916	21,564
Watford Junction	66,798	52,269	14,529
Milton Keynes	164,048	150,210	13,838
Hertford North	186,224	174,548	11,676
Reading	119,157	107,955	11,203
Northampton	184,402	176,346	8,057
Wixams	106,048	98,693	7,355
Aylesbury	91,645	84,337	7,307
Luton	155,054	148,919	6,135
Welwyn Garden Cit	405,821	399,759	6,062
Oxford	85,087	81,377	3,710
Stansted Airport	88,636	86,059	2,577
Hatfield	66,708	64,363	2,345
Stevenage	98,680	99,881	- 1,202
Luton Airport	218,196	220,207	- 2,012
St Albans	14,310	16,469	- 2,159
lpswich	106,961	112,973	- 6,012
Hitchin	175,348	183,159	- 7,811
Letchworth	86,438	101,440	- 15,002

#### Table 2-10 Local Plan and NTEM/Tempro Population Forecasts to 2031

Table 2-11 Local Plan and NTEM/Tempro Employment Forecasts to 2031

Station Name	Local Plan Emp	Tempro Emp	Difference
Norwich	170,189	112,098	58,091
Northampton	128,983	106,679	22,304
Harlow Town	110,119	90,270	19,849
Bedford	110,764	90,997	19,767
Hemel Hempstead	122,456	104,934	17,522
Peterborough	96,392	79,197	17,195
Wixams	67,829	51,803	16,026
Hertford North	90,973	75,431	15,542
Luton	67,939	59,508	8,431
Milton Keynes	109,645	103,121	6,524
St Albans	17,475	11,422	6,053
Hatfield	29,566	26,888	2,678
Reading	54,439	52,165	2,274
Cambridge	49,290	47,050	2,240
Watford Junction	29,894	27,695	2,199
Oxford	33,872	32,453	1,418
Stansted Airport	60,966	60,618	348
Stevenage	40,542	40,426	116
Aylesbury	63,626	63,873	- 247
Leicester	120,788	121,766	- 978
Hitchin	100,061	101,045	- 984
Letchworth	33,627	35,067	- 1,440
lpswich	49,922	53,135	- 3,213
Luton Airport	126,073	130,274	- 4,201
Bletchley	76,023	80,843	- 4,821
Welwyn Garden Cit	152,500	167,458	- 14,958

#### **Identifying Priority Locations**

The 64 locations which were identified by the EWR consortium was too great a number to consider for undertaking detailed analysis. However, data on population, employment and development proximity to stations collated for all 64 locations.

#### **Population Forecasts**

Based on the population forecast data, the most sizeable locations that have genuine potential to drive demand and delivery of economic value from EWR-CS services were identified. The ranking was based upon their current size and absolute levels of growth forecast under the Local Plan and NTEM based forecasts. From this analysis 3-tiers of location were identified, these were:

- Very High Potential 14 locations
- High Potential 10 locations
- 2 additional locations added as unique locations: Wixams as a prospective new town and Stansted as an Airport/international gateway.

These locations are shown in Table 2-12

		Local Plan Forecasts		NTEM/Tempro	Forecast	
Station	Current Population	growth to 2031	2031 pop'n	growth to 2031	2031 pop'n	Ranking
Leicester	346,502	59,319	405,821	53,257	399,759	Very High
Milton Keynes	160,775	123,555	284,330	35,371	196,146	Very High
Luton (Luton Central)	187,006	67,240	254,246	15,316	202,322	Very High
Luton Airport (Luton Parkway)	151,963	102,283	254,246	12,446	164,409	Very High
Norwich	159,705	78,422	238,127	24,978	184,683	Very High
Bletchley	119,200	106,120	225,320	26,224	145,424	Very High
Northampton	171,267	48,213	219,480	26,649	197,916	Very High
Peterborough	150,260	68,913	219,173	41,111	191,371	Very High
Reading	191,668	26,528	218,196	28,539	220,207	Very High
Ipswich	146,163	40,061	186,224	28,385	174,548	Very High
Cambridge	136,787	47,615	184,402	39,559	176,346	Very High
Watford	167,024	8,324	175,348	16,135	183,159	Very High
Oxford	136,307	27,741	164,048	13,903	150,210	Very High
Bedford	124,869	30,185	155,054	24,050	148,919	Very High
Harlow (Harlow Town and/or Harlow Mill)	91,689	44,280	135,969	10,370	102,059	High
Hemel Hempstead	100,255	18,902	119,157	7,700	107,955	High
Stevenage	97,357	9,604	106,961	15,616	112,973	High
St. Albans	93,530	12,518	106,048	5,163	98,693	High
Aylesbury	81,363	17,317	98,680	18,518	99,881	High
Welwyn Garden City	76,538	15,107	91,645	7,799	84,337	High
Hatfield	78,101	10,535	88,636	7,958	86,059	High
Letchworth Garden City	85,886	552	86,438	15,554	101,440	High
Hitchin	68,899	16,188	85,087	12,478	81,377	High
Hertford (Hertford North and/or Hertford East)	47,980	18,818	66,798	4,289	52,269	High
Wixams (new town – no existing station)	57,554	9,154	66,708	6,809	64,363	Additional
Stansted Airport	14,463	-153	14,310	2,006	16,469	Additional

#### Table 2-12 Population Ranking (within 5km catchments)

Appendix A also contains further figures highlighting the forecast 2031 populations and the forecast growth to 2031.

The analysis of the population data and forecasts has identified the existing population levels identified for 5km catchment areas around the identified station locations. Our analysis has shown that urban extensions to existing major settlements make up a substantial proportion of the forecast growth within the study area.

The forecast Local Plan growth reflects housing allocations proposed by the local authorities. Therefore it is important to note that the outturn population increases are highly dependent upon build rates that actually materialise.

#### **Employment Forecasts**

For the employment forecasts the existing employment levels were identified for a 5km catchment area around each of the identified station locations. In addition, a number of high level economic characteristics were also reviewed to provide a comprehensive view of the employment profiles in each of the locations, this identified that:

- There is significant employment growth led by private sector in some locations, especially in areas with high degree of knowledge based jobs;
- There are lower levels of job creation in areas with lower value sectoral profile;
- There is labour market tightening in some areas (e.g. Cambridge) this is a concern for future growth
  prospects as the lack of a suitable labour force could act as a real constraint to the level of growth which
  is achieved; and
- There is evidence of a greater demand for city centre employment growth in successful economies (e.g. Cambridge and Milton Keynes).

To a large extent the forecast growth contained in Local Plans reflects both local and national policy as much as economic potential. The plans recognise the strengths of locations with respect to the existing employment sectoral profile, connectivity and characteristics of the local labour market. In addition, a common theme in the recently published SEPs is securing higher value jobs and drawing on the potential to create jobs that "Golden Triangle" of Oxford-Cambridge and London offers. However, it is important to remember that the proximity to London, for many of the locations in the study area. This means that high value jobs will continue to be in reasonable commuting distance to London.

Table 2-13 shows the Employment Ranking of locations within the study area.

		Local Plan Forecasts		NTEM/Te	mpro	
Station	Current Employment	growth to 2031	2031	growth to 2031	2031	Ranking
Milton Keynes	100,329	69,860	170,189	11,769	112,098	Very High
Leicester	160,600	-8,100	152,500	6,858	167,458	Very High
Cambridge	95,883	33,100	128,983	10,796	106,679	Very High
Reading	118,173	7,900	126,073	12,101	130,274	Very High
Norwich	95,568	26,888	122,456	9,366	104,934	Very High
Northampton	112,788	8,000	120,788	8,978	121,766	Very High
Luton (Luton Central)	81,249	30,309	111,558	9,021	90,270	Very High
Peterborough	80,764	30,000	110,764	10,233	90,997	Very High
Oxford	97,055	12,590	109,645	6,066	103,121	Very High
Luton Airport (Luton Parkway)	67,522	33,893	101,415	11,675	79,197	Very High
Watford	94,461	5,600	100,061	6,584	101,045	Very High
Ipswich	69,573	21,400	90,973	5,858	75,431	Very High
Bletchley	72,356	3,667	76,023	8,487	80,843	Very High
Bedford	56,129	11,810	67,939	3,379	59,508	Very High
St. Albans	45,629	22,200	67,829	6,174	51,803	High
Welwyn Garden City	57,512	6,114	63,626	6,361	63,873	High
Hatfield	54,581	6,385	60,966	6,037	60,618	High
Hemel Hempstead	46,439	8,000	54,439	5,726	52,165	High
Stevenage	47,362	2,560	49,922	5,773	53,135	High
Harlow (Harlow Town and/or Harlow Mill)	41,290	8,000	49,290	5,760	47,050	High
Aylesbury	36,542	4,000	40,542	3,884	40,426	High
Hitchin	30,599	3,273	33,872	1,854	32,453	High
Letchworth Garden City	33,063	564	33,627	2,004	35,067	High
Bicester	16,294	13,813	30,107	1,082	17,376	High
Hertford (Hertford North and/or Hertford East)	27,001	2,893	29,894	694	27,695	High
Wixams (new town – no existing station)	25,333	4,233	29,566	1,555	26,888	Additional
Stansted Airport	10,475	7,000	17,475	947	11,422	Additional

Table 2-13	Employment Ranking (based upon 5km catchment areas)
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Appendix A also contains further figures highlighting the forecast 2031 employment levels and the forecast growth to 2031.

In addition to the current and forecast levels of employment our analysis has identified the likelihood for some locations to be a business to business journey trip end that will reflect higher value "knowledge based" employment characteristics. These locations have been identified in two tiers:

- Locations with existing knowledge based employment >15,000:
  - Reading
  - Oxford
  - Milton Keynes
  - Cambridge
  - Norwich
  - Peterborough
  - Northampton
  - Leicester
- Locations with existing knowledge based employment between 10,000 and 15,000
  - Luton
  - Ipswich
  - Watford
  - St Albans
  - Aylesbury

All of these locations have the potential to generate increased business travel in addition to commuter type trips. In addition to these locations, we have identified a number of potential development and regeneration opportunities close to station locations. A summary of these locations is shown in Table 2-14.

Station	<b>Residential Units</b>	Office floorspace (sq.m)	Retail floorspace (sq.m)
Wixams	6,000	No specific information	No specific information
Milton Keynes	5,000	240,000	89,748
Reading	4,528	1,500	70,000
Northampton	3,965	79,500	63,750
Peterborough	3,117	70,000	No specific information
Luton	2,735	75,000	56,765
Bicester	2,300	178,200	No specific information
Biggleswade	2,213	110,000	7,000
Cambridge	2,000	No specific information	No specific information
Hemel Hempstead	1,800	No specific information	No specific information
Watford	1,500	No specific information	No specific information
Bedford	1,205	No specific information	48,800
Luton Airport	No specific information	141,482	No specific information
Flitwick	1,035	90,000	No specific information

#### Table 2-14 Summary of potential development opportunities within 500m of station locations

However, it is important to note that all locations with exception of Wixams are well served to varying degrees by existing rail services so the scope for EWR-CS to significantly impact on development progress at these locations may not be significant.

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# 3. Transport Networks Evidence Base

## 3.1. Highway Networks

The highway networks within the study area reflect the rail network to a large extent in that the strategic routes (Motorways and Trunk Roads) are mostly radial routes leading to/from London. There are very few strategic east-west highway routes across the study area. Anyone wanting to make an east-west journey would mostly have to do so using numerous 'A' class roads. This is reflected in the relatively long journey times for east west movements. For example, at present a car journey between Oxford and Cambridge could typically take over 2 hours.

The EWR-CS will not only assist in making current east-west rail journeys quicker and more convenient, it will also potentially be highly competitive with the car. Therefore we need to have an understanding of the current car journey times between priority locations (so that we can ascertain those movements for which a rail alternative will be truly competitive) and also the current level of highway demand (so that we can understand the size of the potential market which could be attracted to use a competitive EWR-CS service).

We have used several different sources of data to identify:

- Current journey times (using the DfT's Transport Direct website) between all of the priority locations identified in the Economic Analysis evidence base; and
- Current and future highway traffic demand and journey patterns across most of the study area were obtained from the Highways Agency's East of England Regional Highway Model.

We will discuss the findings of each of these analyses over the following sections.

#### **Highway Journey Times**

Table 3-1 shows the journey times (in minutes) between priority locations.

	Reading	Oxford	Bletchley	Milton Keynes	Bedford	Luton Railway	Luton Parkway	Cambridge	Ipswich	Hitchin	Stevenage	Norwich	Harlow	Stansted Airport	Peterborough	Northampton	Leicester	Watford	Wixams	St.Albans city	Welwyn Garden	Hemel Hempstead	Hatfield	Aylesbury	Hertford	Letchworth
Reading		51	104	100	105	83	79	128	156	94	85	197	97	108	143	103	137	68	103	71	80	67	77	72	83	95
Oxford			66	64	91	82	78	128	156	94	84	196	96	108	125	58	93	68	89	71	80	67	77	54	83	95
Bletchley				13	34	40	43	78	137	58	62	152	84	98	76	38	72	63	32	55	66	46	64	40	70	63
Milton Keynes					34	37	41	78	136	56	62	152	81	96	76	33	67	60	32	52	64	47	61	41	67	63
Bedford						40	44	61	119	40	42	135	73	80	55	45	80	64	12	56	61	55	60	64	60	42
Luton Central							6	68	120	22	28	140	55	70	81	48	82	34	37	26	37	25	34	53	41	30
Luton Parkway								66	117	20	26	138	52	68	82	48	82	32	38	23	34	22	31	53	38	28
Cambridge									75	50	48	91	51	39	55	86	104	88	63	75	68	83	66	111	62	48
lpswich										106	104	76	88	72	114	139	161	128	115	120	112	127	108	156	99	105
Hitchin											14	123	45	57	72	64	98	47	40	39	32	38	31	69	32	10
Stevenage												120	31	48	69	69	102	40	41	26	20	34	18	65	18	15
Norwich													119	107	116	156	178	154	132	142	135	149	133	178	130	122
Harlow														26	84	87	120	50	72	36	28	44	24	75	15	45
Stansted Airport															80	107	128	76	86	63	55	71	51	102	42	60
Peterborough																77	76	107	63	100	93	98	91	111	93	76
Northampton																	50	74	47	66	78	64	75	69	81	77
Leicester																		110	86	104	114	102	111	108	117	116
Watford																			54	24	33	23	30	51	36	48
Wixams																				54	64	53	62	62	62	45
St.Albans city																					19	18	16	49	22	33
Welwyn Garden																						26	8	56	15	28
Hemel Hempstead																							23	30	29	41
Hatfield																								55	11	26
Aylesbury																									58	70
Hertford																										31
Letchworth																										

#### Table 3-1 2014 Weekday Peak Highway Journey Times (minutes) – Source: Transport Direct

Table 3-1 highlights the long journey times between priority locations within the study area, e.g.

- Oxford to Cambridge 2 Hours 8 Minutes, (Average Speed = 41 mph);
- Bedford to Cambridge 1 Hour 1 Minute, (Average Speed = 35 mph);
- Bedford to Norwich 2 Hours 15 Minutes, (Average Speed = 45 mph); and
- Milton Keynes to Norwich 2 Hours 32 Minutes, (Average Speed = 45 mph).

These journey times equate to average journey speeds of between 35 and 45 mph which is significantly slower than what could be achieved when travelling on a radial motorway route or competing radial railway service. This is indicative that rail could potentially be very competitive in terms of attracting car users to rail for east west rail journeys across the study area.

#### **Highway Demand**

We have utilised the Highways Agency's East of England Regional Model (EERM) to understand the current and future demand for highway trips across the study area. Details of the Demand Outputs from the EERM can be found in Appendix B1.

The EERM has been developed and operated for the Highways Agency by the consultant Aecom. Aecom's latest modelling report describes the model as follows:

The EERM has been reviewed by DfT and is considered a fully WebTAG compliant model. It has been used to inform regional reviews as well as numerous Local Development Frameworks, helping to provide guidance on the impacts of development and associated network stress through varying planning and infrastructure assumptions. It has provided an evidence base to assess the impacts of planning policy and schemes and to inform prioritisation of interventions.

The EERM study area includes Bedfordshire, Cambridgeshire, Essex, Hertfordshire, Norfolk, Suffolk and Peterborough, as well as coverage within other areas such as London, the South East and the East Midlands.

The DfT Regional and Local Strategic Modelling and Appraisal Capability (September 2009) confirmed EERM as "highly compliant with current WebTAG and DMRB guidance" and "EERM is suitable for strategic analysis of road interventions" and "large-scale or widespread public transport interventions".

#### Potential for EWR-CS to capture highway demand

Origin-Destination (OD) pairs which currently have large highway demand (as shown in Appendix B1, Table B.1) offer potential for a mode shift to rail if they are not currently well served by rail links, subject to the rail service being time and cost competitive.

Example journeys include:

- Hertford Welwyn Garden City
- Luton Milton Keynes and Hitchin
- Milton Keynes Bedford and Luton
- St Albans Welwyn, Hemel Hempstead and Hatfield;
- Stevenage Hitchin, Welwyn and Letchworth
- Watford St Albans

In addition to the existing and forecast levels of travel demand, changes to the highway networks, in terms of increasing levels of congestion, or alternatively, the opening of major highway improvement schemes are

likely to have an impact upon the overall levels of highway travel demand. The EERM model is was last updated in 2010. The model therefore does not include the significant amount of highway infrastructure improvement schemes which have been included in the National Infrastructure Plan (NIP) over the intervening years. In addition a large number of Highways Agency and Local Authority Pinch Point Schemes have also been either improved or implemented over the period since the model was last updated.

The EERM forecasts which we have used, (based upon the highway improvements that had been planned or announced prior to 2010) indicates a significant increase in demand to 2031 (as shown in Appendix B1, Tables B1.2 and B1.3) resulting in worsening of highway congestion across the study area.

Our view is that major new east west highway schemes (such as A5 M1 Link Road, A14 Huntingdon to Cambridge and M25 Managed Motorway) as well as improvements to key radials such as the M1, A1 and A1(M), together with a large number of pinch point schemes and local authority majors is likely to provide a significant overall increase in network capacity. In view of this, we do not consider that increasing future congestion levels are likely to be a significant factor in driving future demand for east-west rail services. Further detail of the HA and Local Authority Highway Schemes which are in the NIP or draft SEPs can be found in Appendix B2 and B3.

Taking into account the above, there is the potential for high growth areas with existing significant highway demand to be well served by EWR CS services, e.g. Milton Keynes – Luton. However, ODs without significant car demand may still generate demand if journey times and the basis for travel become attractive through journey times which are significantly faster than that possible by car, as well as growth in employment or population/housing at either or both ends of the trip.

### 3.2. Rail Network

### 3.2.1. Level of Service

The rail network across the study area is mostly radial in nature, with limited east west links. The West Coast, Midland and East Coast Main Lines all pass through the study area on a broadly north-south basis. All of the main line routes are capable of 125 mph through the study area. There are significant numbers of passenger services on these routes which is indicative of the passenger demand to travel to and from London, which is a key focus of most journeys on these routes.

Table 3-2 provides an indication of the number of southbound services passing key stations in the study area during the morning peak period (07:00 - 09:59).

Main Line	Station	Total Southbound Passenger Trains per hour (Stopping & Passing)
	Milton Keynes	15
West Coast Main Line	Tring	17
	Watford	21
	-	
	Bedford	12
Midland Main Line	Luton	15
	St Albans	18
	-	
	Peterborough	8
East Coast Main Line	Cambridge	6
East Coast Main Line	Hitchin	15
	Welwyn	19

#### Table 3-2 Current level of Main Line Utilisation (2014 AM Peak period 0700 – 0959)

Table 3-2 shows that the number of services operating on the main lines increases as they get nearer to London. This reflects the amount of services required to serve the London commuter market increases as the distance to London decreases which corresponds with an increase in passenger demand.

Significant enhancements to the rail network are underway and planned for delivery in Control Period 5 (CP5) and 6 (CP6), this corresponds to calendar year periods of 2014-19 and 2019-24 respectively.

Table 3-3 highlights the rail schemes scheduled for delivery in CP5, whilst Table 3-7 highlights the schemes being led promoted by local authorities and developers for delivery over a similar timeframe.

Table 3-3Network Rail schemes confirmed for CP5/CP6	Table 3-3	<b>Network Rail</b>	schemes	confirmed	for	CP5/CP6
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Scheme Type	Scheme Name	Anticipated Completion
Freight	Felixstowe to Nuneaton route enhancements (Phase 2)	Being developed for CP5 delivery
Freight	Access to Felixstowe and Immingham Ports	Being developed for CP5 delivery
Control	ERTMS - Kings X to Peterborough (ECML)	February 2020
Major	Midland Mainline Electrification (Bedford to Sheffield)	December 2020
Major	East West Rail (Western Section)	March 2019
Major	Thameslink Programme	December 2018
Major	Crossrail	December 2019
Major	Intercity Express Programme	August 2017
Major	Electric Spine	Being developed for CP5 delivery
Enhancement	Ely North Junction	June 2016
Enhancement	Stevenage and Gordon Hill turnbacks	September 2018
Enhancement	MML long distance high speed services train lengthening	January 2019
Enhancement	East Coast Connectivity (Peterborough Enhancements)	Being developed for CP5 delivery

Scheme Type	Scheme Name	Anticipated Completion
Major	Croxley Rail Link	2017
New Station	Cambridge Science Park Station	2016
New Station	Wixams Station	2015

#### Table 3-4 Local Authority & Developer schemes confirmed for CP5/CP6

The net impact of all of these rail schemes will be a significant increase in the capability and capacity of the rail network in the study area. This also includes the Western Section of EWR, which will by itself generate many new journey opportunities and demands within the study area. Table 3-5 highlights the changes in the number of trains operating on the main lines out of London.

#### Table 3-5Current level of Main Line Utilisation (2026 AM Peak period 0700 – 0959)

Main Line	Station	Total Southbound Passenger Trains per hour (Stopping & Passing)	Change in service numbers
	Milton Keynes	19	+4
West Coast Main Line	Tring	21	+4
	Watford	25	+4
	Bedford	14	+2
Midland Main Line	Luton	18	+3
	St Albans	22	+4
	Peterborough	9	+1
East Coast Main Line	Cambridge	5	-1
East Coast Main Line	Hitchin	16	+1
	Welwyn	20	+1

Table 3-5 shows that there are significant increases in the number of train services operating on the WCML and MML. The change on the ECML is more modest (reflecting the capacity constraints along this route). However, the introduction of the IEP trains will deliver a significant increase in passenger capacity along the ECML.

It should be noted that the results highlighted in Table 3-8 do not take into account any potential changes which would be introduced by HS2.

#### Forecast Rail Journey Times – 2026

Our analysis has highlighted that the Western Section of EWR will significantly improve rail journey times and opportunities between Reading/Oxford and Milton Keynes and Bedford. In addition journey times will improve as do service frequencies on Thameslink, Southern and Great Northern franchise (Thameslink Programme) routes as do cross-London connections (Crossrail). Our analysis shows that the shortest journey times in the study area are along EWR-WS and along radial routes to/from London. Conversely the longest journey times are to/from East Anglia, and from western end of the corridor to places not connected via EWR-WS (e.g. Oxford – Cambridge = 2h15mins).

#### **Rail Demand**

Currently there is little or no demand between locations on different orbital routes. The existing demand is therefore focused on the radial routes in to and out of London reflecting the current level of service provision. The heavy demands on radial routes have rail crowding / passenger capacity implications both now and into the future.

There are virtually zero rail journeys between geographically close locations on different radial rail routes e.g. Luton (MML) to Hitchin (ECML). Highway based modes are currently the only practical option for travelling between these locations

In the future, overall rail demand is forecast to increase between 2013 and 2031. EWR-WS will have a significant impact upon future demand levels where new direct rail journey opportunities are created as a consequence of reopening this route.

In addition, the increased frequency, capacity and configuration of Thameslink services, combined with Crossrail will also lead to an increase in demand for East-West movements, albeit they can only be met through travelling via London. This is indicative of the current unmet demand for direct east-west rail services across the study area.

Details of the current levels of rail demand across the study area can be found in Appendix C1.

#### **Rail Freight**

EWR-CS has the potential to provide vital additional capacity to the Strategic Rail Freight Network to cater for the forecast increases in intermodal and bulk rail freight.

Felixstowe and the Thames Gateway ports on the East Coast are expected to generate a significant increase in intermodal traffic. However, the routes around London are heavily congested and may act as a constraint on freight throughput. The recently completed Ipswich North Chord and improvements on the Felixstowe to Nuneaton route will allow more freight to avoid London to reach the Midlands and South Yorkshire.

EWR-CS – whilst being a longer route – would provide significant additional capacity to reach the Midlands and South Yorkshire avoiding London, providing significant capacity benefits on the North London Line.

Appendix C2 contains further information on the forecast increase in freight traffic flows as well as the locations of major existing and proposed rail freight terminals in and around the study area.

#### **Airport Surface Access Opportunities**

The Airport Commissions Interim Report forecasts that London Luton Airport to be running at capacity by 2030 and for Stansted to be operating at capacity by 2040. London Stansted currently handling approximately 17.5 mppa with Luton handling approximately 11.5 mppa.

The Airport Commissions Interim Report found against providing major airport expansion (new runways) at Stansted or Luton, but recommended:

- Improvements in rail access to Stansted
- Improvements in motorway access to Luton from the M1

Luton Airport currently has a planning application in the process of being determined which could significantly increase the passenger capacity of the airport from 12mppa to 18mppa. The council approved the application on 20th December 2013; however the Secretary of State for Communities is now reviewing that decision and may issue a 'call in' direction.

# 4. Evidence Base Conclusions

Following our review of the evidence base in terms of the economic and transport situations we can identify some key conclusions and drivers for a rail based intervention which will guide the development of the Conditional Outputs for the EWR-CS. These are as follows:

- There is very significant planned population and employment growth to 2031 within 'the 'golden triangle' of London-Oxford-Cambridge and the East Anglia to Reading 'Knowledge Arc' and across the wider study area:
  - In-scope settlement population forecast to grow by between 0.6m and 1.1m
  - In-scope settlement employment forecast to grow by between 0.2m and 0.4m
- There are a number of major business trip ends with a significant knowledge based employment offer which provides opportunities for business to business travel by rail ;
- There are a number of locations which have major development opportunities in very close proximity to
  rail stations where the enhancement of rail services might assist or encourage progress (however most
  of these locations are already well served by rail);
- Poor east-west orbital connectivity in apparent in long journey times by both rail and car and is also reflected in the very low demand at present between locations on this arc;
- There appears to be some genuine scope for delivering competitive rail east-west journey times by implementing the EWR-CS.
- The reference case forecasts show increases in east-west rail movements be made via London in the future. We consider that this highlights the latent demand for these movements and demonstrates the potential for EWR-CS to unlock demand;
- The Socio-demographic and economic profiles within the study area also highlight the latent demand for enhanced labour market connectivity that could translate into travel demands;
- There is also a common issue of mismatch between employment growth opportunities and labour market supply identified in SEPs across the LEPs within the study area;
- The lack of orbital connectivity appears to be creating an over-reliance on London commuting, which in itself generates issues of crowding and congestion on radial routes
- Freight demands and pressures on available routes in context of parallel pressures from enhancements to passenger services – significant Port expansion and plans for new rail accessible freight distribution centres
- Continued growth in Airport passenger demand to both Luton and Stansted Airports will generate additional surface access demands from both passengers and employees that rail could support

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# 5. The approach to identifying Passenger Service Conditional Outputs

## 5.1. Summary of Process

Figure 5-1 provides an overall summary of the process through which the conditional outputs for the EWR-CS were derived.



#### Figure 5-1 Summary of process to develop Passenger Service Conditional Outputs for EWR-CS

## 5.2. Factors that will influence EWR-CS service viability

There are a number of factors that will have an influence on the potential use of future rail services which make use of the EWR-CS. These include:

- Size and type of the potential travel market being served
- Journey distance involved
- Extent to which the service will be competitive against car
- Extent to which the service enhances journey time and convenience relative to what rail already offers

These factors need to be considered in identifying the overall conditional outputs in terms of the station to station journeys to be enabled and the service performance level (in terms of journey time and service frequency) to be delivered.

All of these factors are intrinsic within the analytical processes we have adopted to determine the conditional outputs.

## 5.3. Initial location identification and sifting

The start of the process was the derivation of the 'long-list' of station locations which were potentially 'inscope' for the central section. This was generated by the EWRC and was a key initial input into the overall process.

In parallel, a comprehensive evidence base (See Chapter 2 and Appendix A) was developed on current and future population, employment levels and economic development characteristics and transport characteristics. This information was then used to consider and place the 'long-list' of locations in context and to provide a basis for identifying locations that offered the greatest potential to generate service demand and support economic growth. This analysis identified 26 'very high' or 'high' ranking locations which should be the focus for conditional output consideration. These 26 locations provided the basis for a matrix of journey pairs for which the potential for an EWR-CS service should be examined. A summary of the process can be found in Appendix D1.

### 5.4. Deriving target EWR-CS service specifications

For the next stage we then identified target journey times that might be delivered between the 26x26 journey pairs using an agreed set of assumptions on potential average train speeds and an agreed geographical basis for deriving indicative journey distances.

The journey times were derived on the following basis:

- (i) We should not assume any particular route for EWR-CS;
- (ii) Taking into account the distance between key locations for rail services the length of the EWR-CS component of the overall journey should be assumed to be the crow fly distance multiplied by 1.2, to take into account that a straight line route is likely to be unfeasible between most points and hence make an allowance for diversions and necessary curvature to enable points to be linked. For portions of journey made on the existing rail network, the existing rail distance was utilised;
- (iii) We should assume that the average journey speed by rail is 80mph. This reflects that any new route would be built to a high standard and would be operated by modern diesel or electric traction which would be capable of 125mph, rapid acceleration and deceleration. (We have used the performance specification of the new Intercity Express train IEP, as the benchmark in this respect).

From this process we can work out the journey distance between all priority OD pairs. As we are also assuming an average speed of 80mph we can also calculate the target individual journey times for each OD movement. Appendix D2 provides a detailed set of the calculated journey times.

Examples of the calculated journey times using EWR-CS include:

- Oxford to Cambridge 60 minutes;
- Bedford to Cambridge 24 minutes;
- Luton to Cambridge 29 minutes; and
- Stevenage to St Albans 10 minutes.

A further consideration is the frequency of service. It is important to note that EWR-CS services are assumed to operate at a 2 tph service frequency (per direction). This is therefore a key service specification assumption which is intrinsic to the derivation of the potential benefits of the scheme.

#### 5.4.1. The impact of journey time on passenger demand

We have undertaken an analysis in the PLANET rail model of the relationship between journey times and passenger demand. The results of this analysis are shown in Figure 5-2.

Figure 5-2 shows AM Peak weekday passenger demand against journey time obtained from the PLANET model. This analysis suggests that there is little or no passenger demand for journeys of more than 50 minutes in the EWR study area.



#### Figure 5-2 Graph showing Passenger Demand vs Journey Time (from PLANET model)

However, Figure 5-2 does highlight demand between Norwich and Cambridge as a notable exception to this general trend. This highlights potential for rail travel that EWR CS might unlock by providing for more efficient transport links across the study area as well as reflecting the particularly limited and poor alternative mode choice available between these two locations.

This means that when considering journey time competitiveness, we do not only have to consider if the journey is quicker than the equivalent car journey, but also if the EWR-CS journey is possible within a 60 minute travelling time.

This has therefore influenced the criteria that we have used to ascertain the competitiveness of business to business and commuting journeys using EWR-CS.

These journey times were then considered for competitiveness against existing rail service and car journey times. This comparison enabled the identification of a number of journey pairs with genuine potential to offer a competitive journey time and enabled identification of a set of indicative EWR-CS services between journey pairs to investigate the benefits potential of. EWR-CS services are assumed to operate at a 2 train per hour service frequency. Details of these journey time can be found in Appendix D2. Appendix D3 provides a breakdown into journey types, either Business to Business or commuting.

This is discussed further in the following sections.

#### Journey Time Competitiveness: Business to Business

For each station pair, the level of rail journey time competitiveness with highway was assessed comparing the indicative EWR-CS times to car times using the following set of criteria:

- Very strong: rail journey time is at least 40% quicker than highway and less than 60 minutes;
- Strong: rail journey time is at least 20% quicker than highway and less than 120 minutes;
- Moderate: rail journey time is quicker than highway (with no interchanges) and/or has a journey time greater than 120 minutes ; and
- Weak: rail journey time is longer than highway or under 20% quicker but has at least one interchange.

These criteria recognise the need to account for access/egress and wait components to rail journeys versus car, whilst also recognising the propensity to travel longer journey times and distances for business to business purpose. The Results of this analysis are shown in Appendix D4.

#### Journey Time Competitiveness: Commuting

The observed reduced willingness to commute for longer periods is reflected in the criteria which we have adopted:

- Very strong: rail journey time is at least 40% quicker than highway and less than 30 minutes;
- Strong: rail journey time is at least 20% quicker than highway and less than 60 minutes;
- **Moderate**: rail journey time is quicker than highway (with no interchanges) and/or has a journey time greater than 60 minutes ; and
- Weak: rail journey time is longer than highway or under 20% quicker but has at least one interchange

It is important to note that commuting in-vehicle times by rail to London from within the study area are often less than 60 minutes. The Results of this analysis are shown in Appendix D4.

#### **Potential for Rail Journey Enhancement**

The potential for EWR central section to enhance journeys between station pairs vs a 2026 reference case with EWR-WS was assessed:

- Very strong: No direct journey available
- Strong: Direct journey but low level of service frequency (<1tph)</li>
- Moderate: Direct journey and reasonable level of service frequency (1-2 tph)
- Weak: Direct journey and good level of service frequency (>2tph)

The Results of this analysis are shown in Appendix D5.

#### **Overall assessment**

Criteria were then combined to give an overall level of priority for each station pair according to the following criteria:

- High priority: Very strong/strong journey time competitiveness and very strong/strong potential for journey enhancement
- Moderate priority: Moderate journey time competitiveness and very strong/strong potential for journey enhancement
- Low priority: Weak journey time competitiveness or moderate/weak potential for journey enhancement
- **Already a committed scheme**: Includes station pairs served by EWR western section

Journey pairs identified as High and Moderate priority will be used to derive an indicative EWR-CS service specification to "test" and derive preliminary view on potential journey pair performance with respect to demand and scope to deliver benefits. The Results of this analysis are shown in Appendix D6.

Further to the above, Appendix D7 shows the indicative In Vehicle Times for EWR-CS services, Appendix D8 highlights the change in GJT's from the introduction of EWR-CS services.

# 5.4.2. Deriving an indicative view on the potential for EWR-CS services to deliver benefits

High and moderate priority journey pairs were tested using our gravity model against a reference case which included the EWR Western Section (EWR-WS). Two versions of the model were created.

- One reflecting the DfT's NTEM/Tempro trend based forecasts for growth; and
- Another reflecting the development plans of the local authorities in the study area.

These two versions of the model represent a central case and high growth scenario respectively.

This provided an indication of the potential for an EWR-CS service between each journey pair to increase rail demand, generate a reduction in generalised journey time and generate an increase in passenger miles (indicating the potential to generate rail revenue).

The model produces demand forecasts for each station to station OD pair identified. For each OD pair contained in the model, there are two sets of demand forecast subject to the change in Generalised Journey Time (GJT). When the GJT change is less than 30% compared to the Do Nothing (present day) scenario, the elasticity approach is adopted; otherwise the higher number between the gravity model forecast and the elasticity forecast is selected. This demand is then grown to future years (2016, 2021, 2026, and 2031) by the exogenous demand factors. Amongst the exogenous growth factors, we have taken the NTEM/Tempro growth factors for population and employment as the central case and used the growth factors derived from the Local Plan projections as a 'high growth' sensitivity test.

Appendix D9 to D16 show the forecasts of demand growth for all growth scenarios as well as the changes in passenger miles. This information was then utilised to enable the calculation of indicative annual benefits by journey pair:

Appendix E provides further details on the gravity modelling undertaken for this study.

- Transport user benefits reflecting journey time savings;
- GVA benefits associated with improved business to business connectivity; and
- GVA benefits associated with improved labour market connectivity.

The assessment of these benefits will inform the specification of the conditional outputs as evidenced by the indicative value of the benefits.

### 5.5. Journey Time Impacts of EWR-CS

The indicative journey times that we have calculated for EWR-CS services, in most cases, represent a significant improvement on the current and forecast road and rail journey times in the study area. Notably, many longer distance journeys now fall within plausible B2B time thresholds e.g.:

- Oxford Cambridge
- Milton Keynes Leicester
- Luton Oxford
- Reading Northampton

In addition, some geographically relatively short distance journey pairs now exhibit commensurately short rail journey times, e.g.:

- Luton Stevenage
- St Albans Hatfield

The improved journey times, plus the improved service frequencies result in large reductions in generalised journey times - GJT (weighted time accounting for access/egress, wait time and any interchange penalty) across the study area. This suggests that significant transport user benefits and subsequent wider economic (GVA) benefits could be delivered, subject to levels of demand generated

## 5.6. Transport User Benefits

Transport user benefits were calculated in a fashion consistent with WebTAG with the main driver for these benefits being changes in journey times. In addition to the three benefit items above the level of highway demand forecast in the East of England model was also identified as providing an indicator of the potential to deliver mode shift from car. Benefits were calculated for both the NTEM/Tempro and Local Plan growth scenarios, with the latter being a higher growth scenario with also an alternative distribution of growth to that assumed in NTEM/Tempro.

The economic assessment used to identify movements on which the greatest benefit will be derived has been based on a two stage modelling process using MOIRA to forecast changes in demand and a gravity model to more accurately forecast the impact of large changes in journey time. The demand modelling has used a split between season ticket and non-season ticket journeys in order to apply elasticities at a disaggregate level.

For the purposes of quantifying time benefits, demand has been further disaggregated into business, commute and leisure trips. User benefit has been restricted to changes in generalised journey times, taking into account the relevant perceived values of 'In Vehicle Time' (IVT), walking, waiting and interchanging time, while maintaining actual values of time for business users. This has been assessed on an origin station to destination station basis, considering forecast demand and journey time changes between 2016 and 2031.

User benefits have been calculated as present values (i.e. discounted to 2010) and in market prices in order to correctly capture the relative impacts on business and non-business users.

This data was collated for all journey pairs and tested. The analysis of the results of this underpinned the identification and prioritisation of journey pairs recommended as conditional outputs.

## However, benefits values should be considered indicative and only suitable for comparing relative rather than absolute performance of EWR-CS service journey pairs at this stage.

Further details on the modelling process used to calculate the passenger demand and user benefits are included in Appendix E.

## 5.7. Estimating GVA Impacts

#### **Overall Approach**

An econometric model has been developed, following discussions with Network Rail that utilises the Market Studies methods to assess the economic impact of achieving Conditional Outputs, this utilises:

- The Long Distance study approach to estimate B2B connectivity gains business travel
- The Urban Regional approach to measure labour market connectivity gains commuter travel

This can generate GVA impacts from service improvements implicit in Conditional Outputs. These impacts are additional to those inherent in conventional transport benefits.

Inputs to the process are:

- Generalised cost changes from the gravity model;
- Journey to work mode shares from 2011 census;
- Employment and labour force data within 2 km station catchments;
- Growth factors to 2031 consistent with the NTEM/Tempro and local aspiration scenarios; and
- Decay curves for business and commuting travel as generalised cost changes from NR analyses.

#### Outputs are:

- GVA impacts of moving from the reference case to the conditional output case; and
- These are *comparative* impacts since it may not be feasible to deliver improvements to all o-d pairs.

The results of this analysis provide a guide to the potential GVA impacts, in terms of supporting business to business travel and improvements in labour market connectivity. The results are based upon a new methodology which is being developed by Network Rail. Due to the experimental nature of these results it should be noted that the values of these GVA benefits should only be used to compare journey pairs and locations in a relative sense rather than using the absolute values presented in the following sections. These results, together with the Transport User benefits will provide a comprehensive set of data from which we can identify key journey pairs for inclusion in the overall conditional outputs.

#### 5.7.1. Business to Business Impacts

The impacts that we have calculated are summed by station. The key drivers are:

- size of local economies
- connectivity improvements via EWR
- threshold effects of business travel being brought within a 2 hour trip

All B2B benefits assumed to accrue symmetrically i.e. are the same irrespective of journey direction. Table 5-1 provides a summary of the B2B GVA impacts.

High Impact Locations	<i>Medium Impact Locations</i>	Smaller Impact Locations		
(>£0.5m pa GVA:	(£0.3-0.5m pa GVA :	(<£0.3m pa GVA :		
NTEM/Tempro 2031)	NTEM/Tempro 2031)	NTEM/Tempro 2031)		
<ul> <li>Cambridge</li> <li>Leicester</li> <li>Luton</li> <li>Luton Airport Parkway</li> <li>Northampton</li> <li>Oxford</li> <li>Reading</li> <li>Stevenage</li> <li>Welwyn Garden City</li> </ul>	<ul> <li>Aylesbury</li> <li>Bedford Midland</li> <li>Harlow Town</li> <li>Milton Keynes Central</li> <li>Peterborough</li> <li>St.Albans</li> <li>Watford Junction</li> </ul>	<ul> <li>Bletchley</li> <li>Hatfield</li> <li>Hemel Hempstead</li> <li>Hertford North</li> <li>Hitchin</li> <li>Ipswich</li> <li>Letchworth</li> <li>Norwich</li> <li>Stansted Airport</li> </ul>		

 Table 5-1
 Summary of Key B2B Impacts (assuming NTEM/Tempro Growth Forecasts)

#### **B2B Impacts – Interpreting results**

When considering the results of the B2B GVA analysis the following points need to be considered:

- The impacts are productivity gains for businesses at both trip end locations;
- Locations with many new connections gain the most benefits This indicates that locations which are connected to more than one rail route would gain more benefits; and
- The eastern end of the route obtains fewer benefits as the connectivity improvements provided by EWR-CS are not enough to encourage more business travel to larger economies at the western end of the EWR route. This is a direct result of adopting the decay curve that was defined by Network Rail for their market studies.

#### 5.7.2. Labour Market Impacts

The impacts are of this GVA measure is summed by the workers assumed origin station. The key drivers of this impact are:

- The size of the local labour force;
- The connectivity improvements via EWR especially new rail links to nearby towns; and
- The threshold effects of commuter travel being brought within a 1 hour trip length.

Table 5-2 provides a summary of the Labour Market GVA impacts.

Table 5-2	Summary of Key Labour Market Impacts (assuming NTEM/Tempro Growth Forecasts)	
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High Impact Worker Locations (>£0.3m pa GVA	<i>Medium Impact Worker Locations (£0.15m-£0.3m pa GVA)</i>	Smaller Impact Worker Locations (<£0.15m pa GVA)
<ul> <li>Hatfield</li> <li>Luton Airport Parkway</li> <li>Luton</li> <li>Northampton</li> </ul>	<ul> <li>Bedford Midland</li> <li>Hitchin</li> <li>Harlow Town</li> <li>Letchworth</li> <li>St.Albans City</li> <li>Stevenage</li> </ul>	<ul> <li>Aylesbury</li> <li>Bletchley</li> <li>Cambridge</li> <li>Hertford North</li> <li>Hemel Hempstead</li> <li>Ipswich</li> <li>Leicester</li> <li>Milton Keynes Central</li> <li>Norwich</li> <li>Oxford</li> <li>Peterborough</li> <li>Reading</li> <li>Stansted Airport</li> <li>Watford Junction</li> <li>Welwyn Garden City</li> </ul>

#### Labour Market Impacts – Interpreting Results

The total GVA impacts are around from Labour Market impacts are around half those of B2B activity. The impacts are more concentrated around short-distance movements that are now possible by rail – this is due to the rapid drop-off in propensity to commute by rail beyond 60 minutes GJT. The analysis highlights the potential benefits for the Hertfordshire-Bedfordshire sub-region.

# 6. Prioritisation results

## 6.1. Journey Pair Benefits Analysis

#### Process for identification priority journey pairs

Having established the indicative benefits performance of each journey pair (in terms of transport user benefits and GVA impacts) the relative performance of all journey pairs was assessed.

The number of journey pairs tested was very significant and for analysis purposes the pairs were identified with one of four target EWR journey time categories:

- 0 15 minutes;
- 15 30 minutes;
- 30 60 minutes; and
- 60+ minutes

The range of impact and benefit that the journey pairs generated was examined, and on the basis of this, thresholds were identified for journey pairs to meet for recommendation as a conditional output. The choice of thresholds was set using the two-way benefits performance of the Oxford-Cambridge EWR-CS service as a minimal level to be met. The thresholds adopted were:

- Change in rail passenger miles: 2.8m in 2031
- Indicative transport user benefit: £1m in 2031
- Indicative GVA business to business connectivity benefit: £28,000 in 2031
- Indicative GVA labour market connectivity benefit: £17,000 in 2031

Journey pairs were then categorised depending on how they met criteria:

- Very High Priority: meets or exceeds all thresholds with transport user benefits in excess of £5m in 2031;
- High Priority: meets or exceeds change in rail passenger miles threshold and two or the other three thresholds (including having a minimum value of transport user benefits of £0.5m in 2031); or
- Excluded from Conditional Outputs.

This analysis was undertaken for against both the NTEM/Tempro and Local Plan scenarios, with the thresholds used remaining unchanged for each.

Tables 6-1 to 6-7 present the benefits performance for each of the tested journey pairs, by each of the 4 respective journey time categories, against both growth scenarios.

The detailed results of the prioritisation exercise for all 26 O-D pairs can be found in Appendix F.

Table 6-1Priority Journey Pairs: < 7	15 minutes j	journey time	(2031 NTEM/Ten	npro Growth)
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Journey Pair	Journey Time	Indicative	Indicative	Indicative	Indicative	Indicative
	(minutes)	Change in	Change in	value of		value of GVA
	(minutes)	0	Ũ			
		Rail GJT	Passenger	transport	benefits	benefits
		(Full)	Miles (annual	user benefits	(B2B) (000's)	(Commuting)
			PaxMiles in	(£000 pa)		(000's)
			000's)	,		. ,
			,			
Luton - Stevenage	8	-97	7,167	6,213	154	131
Luton - Welwyn Garden City	10	-104	7,422	5,252	157	99
Luton Airport Parkway - Stevenage	7	-97	5,921	5,464	148	160
Luton Airport Parkway - Welwyn Garden City	9	-103	6,092	4,698	152	121
Bedford Midland - Hitchin	14	-124	3,124	1,968	24	43
Bedford Midland - Letchworth	14	-147	2,875	2,147	25	46
Harlow Town - Stevenage	14	-99	3,214	1,428	64	37
Harlow Town - Welwyn Garden City	12	-94	3,292	1,603	72	36
Hatfield - Luton	11	-100	3,000	1,911	55	131
Hertford North - Luton	13	-115	2,966	1,572	28	25
Hitchin - Luton	7	-102	3,620	4,114	63	106
Hitchin - Luton Airport Parkway	7	-101	3,075	3,534	59	110
Letchworth - Luton	9	-118	3,836	3,359	37	99
Letchworth - Luton Airport Parkway	9	-117	3,280	2,872	36	101
St.Albans City - Stevenage	10	-114	4,784	2,352	66	91
St. Albans City - Welwyn Garden City	6	-51	3,300	3,754	128	102

#### Table 6-2 Priority Journey Pairs: < 15 minutes journey time (2031 Local Plan Growth)</th>

Journey Pair	Journey Time	Indicative	Indicative	Indicative	Indicative	Indicative
	(minutes)	Change in	Change in	value of	value of GVA	value of GVA
		Rail GJT	Passenger	transport	benefits	benefits
		(Full)	Miles (annual	user benefits	(B2B) (000's)	(Commuting)
			PaxMiles in	(£000 pa)		(000's)
			000's)	· · /		· · · ·
			,			
Luton - Stevenage	8	-97	7,786	6,749	165	144
Luton - Welwyn Garden City	10	-104	8,647	6,119	179	117
Luton Airport Parkway - Stevenage	7	-97	6,281	5,797	159	176
Luton Airport Parkway - Welwyn Garden City	9	-103	6,997	5,396	174	143
Bedford Midland - Hitchin	14	-124	3,190	2,010	28	47
Harlow Town - Stevenage	14	-99	3,402	1,513	56	38
Harlow Town - Welwyn Garden City	12	-94	3,752	1,827	67	42
Hatfield - Luton	11	-100	3,396	2,165	63	156
Hatfield - Luton Airport Parkway	10	-91	2,876	1,782	63	160
Hertford North - Luton	13	-115	3,462	1,834	36	33
Hertford North - Luton Airport Parkway	13	-114	2,899	1,622	36	37
Hitchin - Luton	7	-102	4,106	4,667	79	132
Hitchin - Luton Airport Parkway	7	-101	3,440	3,952	74	137
Hitchin - St.Albans City	13	-121	2,916	1,238	36	62
Letchworth - Luton	9	-118	3,900	3,416	42	104
Letchworth - Luton Airport Parkway	9	-117	3,241	2,837	41	107
St.Albans City - Stevenage	10	-114	4,783	2,340	74	91
St.Albans City - Welwyn Garden City	6	-51	3,565	4,058	152	109

In the above tables, Very High Priority journey pairs are shown in **Bold** text, High priority pairs are shown in normal text, and journey pairs which do not meet the thresholds have been excluded.

The results of the prioritisation of journeys of less than 15 minutes journey time has highlighted some very strong results in terms of the change in passenger miles, indicating that the new services are leading to an overall increase in rail demand.

Both the NTEM/Tempro and Local Plan growth scenarios highlight that journeys between Luton (town & airport) and Welwyn Garden City are the top performers in the sub-15 minute journey time band. This can be explained by both the short journey times and the significant journey saving which could be made by an EWR-CS service which joined these locations.

Table 6-3	Priority Journey Pairs: 7	5 - 30 min's journey time (203	<b>31 NTEM/Tempro Growth)</b>
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Journey Pair	Journey Time	Indicative	Indicative	Indicative	Indicative	Indicative
	(minutes)	Change in	Change in	value of	value of GVA	value of GVA
		Rail GJT	Passenger	transport	benefits	benefits
		(Full)	Miles (annual	user benefits	(B2B) (000's)	(Commuting)
			PaxMiles in	(£000 pa)		(000's)
			000's)			
Bedford Midland - Cambridge	24	-155	8,160	2,648	93	63
Bedford Midland - Stevenage	18	-116	5,223	2,400	55	47
Cambridge - Luton	29	-115	9,636	2,801	143	70
Cambridge - Luton Airport Parkway	29	-114	8,218	2,385	134	77
Bedford Midland - Northampton	27	-51	7,004	625	79	68
Bedford Midland - Welwyn Garden City	23	-123	4,733	1,605	63	35
Harlow Town - Luton	21	-112	4,339	1,458	59	51
Harlow Town - Luton Airport Parkway	20	-112	3,700	1,272	55	57

#### Table 6-4 Priority Journey Pairs: 15 - 30 min's journey time (2031 Local Plan Growth)

Journey Pair	Journey Time	Indicative	Indicative	Indicative	Indicative	Indicative
	(minutes)	Change in	Change in	value of	value of GVA	value of GVA
		Rail GJT	Passenger	transport	benefits	benefits
		(Full)	Miles (annual	user benefits	(B2B) (000's)	(Commuting)
			PaxMiles in	(£000 pa)		(000's)
			000's)			
Bedford Midland - Cambridge	24	-155	8,200	2,661	118	71
Bedford Midland - Stevenage	18	-116	5,025	2,308	56	44
Cambridge - Luton	29	-115	10,735	3,119	193	91
Cambridge - Luton Airport Parkway	29	-114	9,000	2,611	180	101
Harlow Town - Luton	21	-112	5,426	1,824	68	68
Bedford Midland - Northampton	27	-51	7,229	645	87	76
Bedford Midland - Welwyn Garden City	23	-123	4,846	1,644	68	34
Harlow Town - Luton Airport Parkway	20	-112	4,611	1,585	64	75
Harlow Town - St.Albans City	16	-94	3,123	1,072	71	57

In Tables 6-3 and 6-4, Very High Priority journey pairs are shown in **Bold** text, High priority pairs are shown in normal text, and journey pairs which do not meet the thresholds have been excluded.

In both the NTEM/Tempro and Local Plan growth scenarios the Very High priority Journey pairs (i.e. those that meet all of the prioritisation criteria) are Cambridge to Bedford and Cambridge to Luton (town and airport). As with the sub-15 minute journey time category, journeys across Hertfordshire from Harlow to Luton (town and airport) are highlighted as being a priority.

As with the sub-15 minute journey time category, the journey time savings for each of the priority journey pairs is very significant highlighting the role that the EWR-CS could play in meeting transport demands across the study area.

Table 6-5	Priority Journey Pairs: 30	- 60 min's journey time (	(2031 NTEM/Tempro Growth)
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Journey Pair	Journey Time	Indicative	Indicative	Indicative	Indicative	Indicative
	(minutes)	Change in	Change in	value of	value of GVA	value of GVA
		Rail GJT	Passenger	transport	benefits	benefits
		(Full)	Miles (annual	user benefits	(B2B) (000's)	(Commuting)
			PaxMiles in	(£000 pa)		(000's)
			000's)			
Cambridge - Northampton	50	-194	6,464	1,381	28	64
Cambridge - St.Albans City	33	-101	5,130	1,139	110	42
Bedford Midland - Peterborough	40	-74	3,167	657	80	22
Bletchley - Cambridge	36	-185	3,770	1,059	8	23
Cambridge - Oxford	60	-194	2,838	1,081	28	17
Luton - Northampton	46	-97	5,327	566	124	78
Northampton - Stevenage	45	-155	4,068	919	31	43
Northampton - Welwyn Garden City	50	-132	3,597	553	117	36

#### Table 6-6 Priority Journey Pairs: 30 - 60 min's journey time (2031 Local Plan Growth)

Journey Pair	Journey Time	Indicative	Indicative	Indicative	Indicative	Indicative
	(minutes)	Change in	Change in	value of	value of GVA	value of GVA
		Rail GJT	Passenger	transport	benefits	benefits
		(Full)	Miles (annual	user benefits	(B2B) (000's)	(Commuting)
			PaxMiles in	(£000 pa)		(000's)
			000's)			
Cambridge - Northampton	50	-194	6,619	1,414	31	73
Cambridge - St.Albans City	33	-101	5,315	1,179	154	50
Bedford Midland - Harlow Town	31	-139	2,890	795	50	25
Bedford Midland - Peterborough	40	-74	3,338	692	105	26
Cambridge - Oxford	60	-194	2,916	1,102	33	18
Luton - Northampton	46	-97	6,249	664	144	97
Luton Airport Parkway - Northampton	47	-97	4,993	519	136	100
Northampton - Welwyn Garden City	50	-132	3,809	586	109	37

In Tables 6-5 and 6-6, Very High Priority journey pairs are shown in **Bold** text, High priority pairs are shown in normal text, and journey pairs which do not meet the thresholds have been excluded.

Cambridge – Oxford is identified as a priority pair in both the NTEM/Tempro and Local Plan growth scenarios. This journey pair is the main basis for the EWR project and has formed the key benchmark against which all other journey pairs have been assessed.

Cambridge – Northampton was identified as a priority pair for testing due to the potential for journey time competitiveness (compared to car travel) and enhancement (compared to existing rail). The prioritisation process has subsequently identified this journey pair as a very high priority in both the NTEM/Tempro and Local Plan growth scenarios.

Whilst the journey time saving of Cambridge – Oxford and Cambridge – Northampton are the same, the faster journey time possible between Cambridge and Northampton means that a higher level of transport user benefits and GVA commuting benefits are generated, meaning that Cambridge – Northampton emerges as a higher overall priority.

In the Local Plan Growth scenario journey pairs of Luton and Luton Airport with Northampton are identified as being high priority. The GVA impacts indicate that improving the labour market accessibility of both Luton and Northampton has the potential to generate significant GVA impacts.

Journey Pair	Journey Time	Indicative	Indicative	Indicative	Indicative	Indicative
	(minutes)	Change in	Change in	value of	value of GVA	value of GVA
		Rail GJT	Passenger	transport	benefits	benefits
		(Full)	Miles (annual	user benefits	(B2B) (000's)	(Commuting)
			PaxMiles in	(£000 pa)		(000's)
			000's)			
Cambridge - Reading	81	-108	2,908	503	108	23

#### Table 6-7 Priority Journey Pairs: > 60 min's journey time (2031 NTEM/Tempro Growth)

At journey times of over 60 minutes there were no high priority journey pairs identified in the Local Plan growth scenario. In the NTEM/Tempro growth scenario only one journey pair was identified as being a high priority, this being Cambridge – Reading, as shown in Table 6-7. For this journey pair the value of the user benefits is below the threshold value. However, the values for change in PaxMiles and GVA impacts are all above the threshold levels.

## 6.2. Conclusions

It is clear that journey pairs identified as meeting the prioritisation thresholds set reduce significantly as journey time increases. This reflects the impact of journey time on the potential to deliver economic benefits, reflecting the combination of significant enhancement in connectivity combined with greatest opportunities for service demand that short distance journeys represent. The study area offers a large number of opportunities for such benefits to be realised, most notably between locations in Luton/Bedfordshire and Hertfordshire towns, where currently no direct rail service is available. The relatively short geographical distance between these locations means that journey times of less than 30 minutes and often below 15 minutes should be targeted.

For longer distance journeys that exhibit commensurately longer journey times of greater than 30 minutes or 60 minutes, the scale of business activity or labour market needs to be very sizeable to generate sufficient demand for service to offset the impact of time on the propensity to travel, noting that businesses and workers will often have alternatives within more attractive journey time bands available to them. Consequently, a more limited set of journey pairs are identified as conditional outputs falling within the 30-60 minute and >60 minutes journey categories.

What must be stressed is that **this does not preclude the potential for EWR-CS to provide a service between locations with longer journey times**, rather that these longer journey time pairs in themselves are unlikely to generate sufficient demand and economic benefit to drive the case for EWR-CS. Delivering an attractive and competitive combination of multiple passenger service opportunities between sizeable business activity and labour market locations is likely to maximise the economic growth potential the scheme can offer, and if a number of these can fall below 30 minutes the value of economic benefits is likely to be enhanced. What clearly has not been considered at this stage, and which may prove challenging, is the feasibility and deliverability of achieving the target level of connectivity underpinning the analysis presented. This page is intentionally blank

# 7. Passenger Service Conditional Outputs

The Passenger Service Conditional Outputs provide a set of journey opportunities that should be the primary focus for further examination and development of EWR Central Section proposals. It is recognised that not all journey opportunities will be realisable together, and in practice choices will need to be made as to the combination of pairs to incorporate in a service timetable. They present a range of journey opportunities one would explore the feasibility of enabling by new EWR Central Section infrastructure as yet to be defined. Operational, feasibility and cost considerations, as well as the potential to deliver services within target journey parameters and at a level of service to deliver benefits, will all have a bearing on ultimate choice of journey pairs for inclusion in proposed EWR-CS service timetable.

All of the journey pairs highlighted in our conditional output table are conditional upon suitable infrastructure being provided to enable the target journey times, or times close to these, to be achieved. Our conditions also include a minimum 2 train per hour level of service.

Tables 7-1 to 7-7 present the EWR-CS Passenger Service Conditional Outputs by journey time category, while Figures 7-1 and 7-2 present diagrams showing all Very High and High priority conditional outputs respectively.

Table 7-1	Passenger Service Conditional Outputs for journeys of <u>up to 15 minutes duration</u>
	(NTEM/Tempro Growth to 2031)

Very High and High Priority Journey Pairs using NTEM/Tempro Growth to 2031	Notes:
VERY HIGH PRIORITY JOURNEY PAIRS	
Luton - Stevenage	(3)
Luton - Welwyn Garden City	(3)
Luton Airport Parkway - Stevenage	(3)
Luton Airport Parkway - Welwyn Garden City	(3)
HIGH PRIORITY JOURNEY PAIRS	
Bedford Midland - Hitchin	(3)
Bedford Midland - Letchworth	(3)
Harlow Town - Stevenage	(3)
Harlow Town - Welwyn Garden City	(3)
Hatfield - Luton	(3)
Hertford North - Luton	(3)
Hitchin - Luton	(3)
Hitchin - Luton Airport Parkway	(3)
Letchworth - Luton	(3)
Letchworth - Luton Airport Parkway	(3)
St.Albans City - Stevenage	(3)
St.Albans City - Welwyn Garden City	(3)

Notes:

(1) Very Strong for Business 2 Business Trips

(2) Strong for Business 2 Business Trips

(3) Predominantly Commuting Trips

## Table 7-2Passenger Service Conditional Outputs for journeys of up to 15 minutes duration<br/>(Local Plan Growth to 2031)

Very High and High Priority Journey Pairs using Local Plan Growth to 2031	Notes:
VERY HIGH PRIORITY JOURNEY PAIRS	
Luton - Stevenage	(3)
Luton - Welwyn Garden City	(3)
Luton Airport Parkway - Stevenage	(3)
Luton Airport Parkway - Welwyn Garden City	(3)
HIGH PRIORITY JOURNEY PAIRS	
Bedford Midland - Hitchin	(3)
Harlow Town - Stevenage	(3)
Harlow Town - Welwyn Garden City	(3)
Hatfield - Luton	(3)
Hatfield - Luton Airport Parkway	(3)
Hertford North - Luton	(3)
Hertford North - Luton Airport Parkway	(3)
Hitchin - Luton	(3)
Hitchin - Luton Airport Parkway	(3)
Hitchin - St.Albans City	(3)
Letchworth - Luton	(3)
Letchworth - Luton Airport Parkway	(3)
St.Albans City - Stevenage	(3)
St.Albans City - Welwyn Garden City	(3)

## Table 7-3Passenger Service Conditional Outputs for journeys of 15 to 30 minutes duration<br/>(NTEM/Tempro Growth to 2031)

Very High and High Priority Journey Pairs using NTEM/Tempro Growth to 2031	Notes:
VERY HIGH PRIORITY JOURNEY PAIRS	
Bedford Midland - Cambridge	(3)
Bedford Midland - Stevenage	(3)
Cambridge - Luton	(2)
Cambridge - Luton Airport Parkway	(2)
HIGH PRIORITY JOURNEY PAIRS	-
Bedford Midland - Northampton	(3)
Bedford Midland - Welwyn Garden City	(3)
Harlow Town - Luton	(3)
Harlow Town - Luton Airport Parkway	(3)

Notes:

- (1) Very Strong for Business 2 Business Trips
- (2) Strong for Business 2 Business Trips
- (3) Predominantly Commuting Trips

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## Table 7-4Passenger Service Conditional Outputs for journeys of 15 to 30 minutes duration<br/>(Local Plan Growth to 2031)

Very High and High Priority Journey Pairs using Local Plan Growth to 2031	Notes:
VERY HIGH PRIORITY JOURNEY PAIRS	
Bedford Midland - Cambridge	(3)
Bedford Midland - Stevenage	(3)
Cambridge - Luton	(2)
Cambridge - Luton Airport Parkway	(2)
Harlow Town - Luton	(3)
HIGH PRIORITY JOURNEY PAIRS	
Bedford Midland - Northampton	(3)
Bedford Midland - Welwyn Garden City	(3)
Harlow Town - Luton Airport Parkway	(3)
Harlow Town - St.Albans City	(3)

## Table 7-5Passenger Service Conditional Outputs for journeys of <u>30 to 60 minutes duration</u><br/>(NTEM/Tempro Growth to 2031)

Very High and High Priority Journey Pairs using NTEM/Tempro Growth to 2031	Notes:
VERY HIGH PRIORITY JOURNEY PAIRS	
Cambridge - Northampton	(1)
Cambridge - St.Albans City	(2)
HIGH PRIORITY JOURNEY PAIRS	
Bedford Midland - Peterborough	(3)
Bletchley - Cambridge	(3)
Cambridge - Oxford	(1)
Luton - Northampton	(2)
Northampton - Stevenage	(3)
Northampton - Welwyn Garden City	(3)

## Table 7-6Passenger Service Conditional Outputs for journeys of <u>30 to 60 minutes duration</u><br/>(Local Plan Growth to 2031)

Very High and High Priority Journey Pairs using Local Plan Growth to 2031	Notes:
VERY HIGH PRIORITY JOURNEY PAIRS	
Cambridge - Northampton	(1)
Cambridge - St.Albans City	(2)
HIGH PRIORITY JOURNEY PAIRS	
Bedford Midland - Harlow Town	(3)
Bedford Midland - Peterborough	(3)
Cambridge - Oxford	(1)
Luton - Northampton	(2)
Luton Airport Parkway - Northampton	(2)
Northampton - Welwyn Garden City	(3)

## Table 7-7Passenger Service Conditional Outputs for journeys longer than 60 minutes duration<br/>(NTEM/Tempro Growth to 2031)

	Very High and High Priority Journey Pairs using Local Plan Growth to 2031	Notes:
	HIGH PRIORITY JOURNEY PAIRS	
	Cambridge - Reading	(1)
Ν	lotes:	

(1) Very Strong for Business 2 Business Trips

(2) Strong for Business 2 Business Trips

(3) Predominantly Commuting Trips

The journey patterns indicated by the conditional outputs are shown in Figure 7-1 and 7-2 for the Very High Priority services and High Priority Services respectively.





#### Figure 7-2 High Priority journey pairs as identified in conditional outputs



### 7.1. Interpreting the Passenger Service Conditional Outputs

The EWR-CS Passenger Conditional Outputs present a set of key station to station passenger journey opportunities that have been assessed to offer the greatest potential to:

- Deliver economic benefits;
- Improve connectivity;
- Easing highways congestion;
- Supporting development; and
- Generate new rail demand and revenue.

It is anticipated that a selection of these key journey pairs in combination will form the core service specification within an EWR-CS enabled timetable.

Target performance for the journey pairs identified should be considered to be the delivery of a service journey time below the upper threshold for the journey time category (as defined in Section 6.1) they have been identified with, at a service frequency of 2 tph. This is a target to aim for in considering design options but this does not mean that if this target were not met the journey pair would not be worthy of inclusion as part of an EWR-CS service specification or timetable. That would be determined by more detailed consideration of the value a service would provide to an overall EWR-CS business case to be developed in due course.

It should also be stressed that the identification of the conditional output journey pairs does not preclude the inclusion of other journey pairs as part of an ultimate EWR-CS service timetable. The COS identifies the key pairs to focus examination of deliverability on. In developing a business case for an EWR-CS scheme in the future it would be expected that the additional value that can be realised from enabling other journey pairs to the core ones will be explored as part of the process of business case optimisation. Consequently, other pairs not identified as conditional outputs, particularly where they generate significantly more benefit and revenue relative to the incremental cost of enabling them, could form part of the ultimate EWR-CS scheme specification for which a business case is presented.

As part of the study we have given some initial consideration of the scale of economic benefits and the potential to deliver new rail demand and revenue associated with the pairs identified, and the likelihood of this being sufficient to support significant rail investment costs. This suggests that the delivery of a selection of the pairs within the relevant journey time target bands, at a service frequency of 2 tph has genuine potential to deliver sufficient benefit to support a viable value for money case over the standard 60 year appraisal period.

For example, we have calculated the potential indicative scale of benefits of the following EWR-CS service pattern reflecting one possible combination of conditional outputs:

• The total EWR network, including Reading; Oxford; Aylesbury; Bletchley; Milton Keynes; Bedford; Cambridge; Ipswich and Norwich (only considering the benefits of journeys between these locations).

For the calculation we used the Tempro Growth Scenario and summed the indicative discounted benefits over a 60 year appraisal period. The results of this indicate that the scheme could generate transport user benefits alone in the region £750 million PV (in 2010 prices discounted to 2010) – this does not account for wider economic (business to business and commuting) benefits.

If we were to include the benefits from all of the permutations of intermediate journeys the overall benefits would be considerably higher. Furthermore, if we were to consider alternative service patterns which took in more locations (Luton, Hitchin etc.) then the overall benefits would also be higher.

This initial analysis suggests that the benefits that might be generated by an EWR-CS scheme could justify a capital investment of over £400 million (2010 prices) while still meeting the DfT's economic cost benefit threshold criteria.

This initial consideration suggests that an EWR-CS scheme that delivered a service specification consistent with the conditional outputs, has genuine potential to generate sufficient benefits to justify the capital investment that may be associated with the scheme.
## 8. Freight Service Conditional Outputs

EWR-CS has the potential to provide vital additional capacity to the Strategic Freight Network to cater for the forecast increases in intermodal and bulk rail freight. Felixstowe and the Thames Gateway ports on the East Coast are expected to generate a significant increase in intermodal traffic.

However, the routes around London are heavily congested and may act as a constraint on freight throughput. Ipswich North Chord and improvements on the Felixstowe to Nuneaton route will allow more freight to avoid London to reach the Midlands and South Yorks. EWR-CS – whilst being a longer route – would provide significant additional capacity to reach the Midlands and South Yorkshire avoiding London, providing significant capacity benefits.

If the EWR-CS was implemented, it would offer potential through running from East Anglia to the western side of the UK (south of the West Midlands). It could also provide links to the ECML, MML and WCML. This would facilitate new freight flows plus diversion of some existing traffic flows.

The route could provide relief for capacity on the existing North London routes and / or the present West Midlands / Felixstowe route via Nuneaton, Leicester, Peterborough and Ely. There was a scheme in BR days in the 1950s to route existing cross London freight traffic over this line – hence the building of the Bletchley flyover.

Depending on the development of the UK energy policy, if more generating capacity is produced from biomass and imports of this commodity arrive at west facing ports including Avonmouth and those in South Wales, then this route with its strategic links to northern destination main lines could prove very useful.

Given the proposal to develop electric haulage over the route from Bedford to the west, the proposal to reopen the eastern end of the route to Cambridge, adding it to the national rail network, would give major benefits both in speeding up existing journey times, developing new freight flows and relieving capacity / pressure on existing routes.

In addition to this, two new proposed rail freight terminals could to a large extent depend upon the opening of EWR-CS to access to and from key parts of the county, such as the Haven Ports and London Gateway. Proposals for freight terminals have been suggested for:

- M1 Junction 13, though this does not have support of the local planning authority; and
- MOD Bicester.

With further potential terminals/railheads at:

- Sundon, in Central Bedfordshire (accessed from the MML); and
- Rookery South, near to Stewartby (accessed from the Marston Vale Line).

Figure 8-1 illustrates how the EWR-CS could form a key link in the Strategic Freight Network, enabling traffic from the Thames and Haven Ports to reach the Midlands, West of England and South Wales whilst avoiding London, in particularly the heavily congested North London Line.



#### Figure 8-1 Rail Freight Network & Terminals

Based upon our analysis, Table 8-1 shows the Conditional Outputs for Rail Freight.

Table 8-1	Rail Freight	Conditional	Outputs
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Conditional Output	Description
Freight CO 1	Provide sufficient freight paths/capacity to enable the planned growth of the Haven and Thames Ports whilst providing an alternative route to the Midlands and West of England avoiding the North London Line.
Freight CO 2	Provide sufficient freight paths/capacity to support potential development of a rail freight terminal in proximity to the M1. Capacity would need to be compatible with that planned for the Western Section of EWR.
Freight CO 3	Provide sufficient freight paths/capacity to enable the planned development of a rail freight terminal at MOD Bicester. Capacity would need to be compatible with that planned for the Western Section of EWR.

## 9. Next Steps

The Conditional Outputs provide a robust evidence-based starting point for further EWR-CS scheme development activities. The work demonstrates that there are clear and strong strategic economic and transport drivers for scheme development and that the potential scale of benefits that EWR-CS could generate makes presenting a viable and robust business case a realistic prospect.

In terms of further activity, we recommend that the following next steps be considered:

- Review the conditional outputs journey pairs and develop a set of logical journey pair combinations as EWR-CS Service Scenarios (EWR-CS SS) to consider, focussed on the Conditional Outputs but also considering in-scope and logical additional non-Conditional Output pairs.
- Identify potential routes in concept that could enable each EWR-CS SS to be realised this would draw on the extensive body of previous work and studies plus desktop research and consultation with EWRC, DfT and NR.
- Undertake an initial high level operational and planning constraints analysis and deliverability appraisal
  of each EWR-CS SS as basis for sifting down to a limited set EWR-CS SS (2 or 3 scenarios) that will
  provide a more manageable scope and focus for more detailed engineering feasibility consideration and
  outline business case analysis.
- Progress with more detailed operational and early engineering feasibility design study to develop key operational and design outputs (alignments, realisable service performance parameters, indicative timetables, high level cost estimates etc) to support production of an Outline Business Case.
- Undertake the various technical analyses and assessments on feasibility designs necessary, including updated modelling and forecasting, environmental scoping level assessment and economic analysis and appraisal to support preparation of an Outline Business Case – would include consideration of business case optimising EWR-CS SS inclusive of in-scope non-Conditional Output journey pairs.
- Prepare and present the EWR-CS Outline Business Case in line with the DfT's Five Cases Model template.

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# Appendices

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## Appendix A. Economic Analysis Evidence Base

### A.1. Supporting Analysis

#### Figure A-1 Annual Population Growth 1991-2011



#### Figure A-2 Total Annual Employment Growth 1991-2012







Figure A-4 Workplace based GVA – Annual Growth 1997-2012







Figure A-6 Annual Growth in House Prices 1998 - 2010





#### Figure A-7 Median House Price to Median Income Ratio

#### Table A-1 Commuting

	Work in same LA as residence	Work in same region as residence	Relative importance of commuting (GB = 1)
South East	58.5	87.8	1.18
London	38.5	93.2	1.5
East	58.6	86.1	1.22
South West	70.4	95.8	0.74
West Midlands	63.9	95	0.9
East Midlands	58.8	90	1.13
York's & Humber	75.2	95.8	0.64
North West	62.7	96.8	0.89
North East	59.3	96.5	0.97





Figure A-9 Average Distance Travelled to Work 2011







#### Figure A-11 Local Plans Population Growth, 2011-31







#### Figure A-13 Local Plan Employment Growth, 2011-31



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## Appendix B. Highway Networks Evidence Base

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## **B.2.** Highway Demand

 Table B-1
 Current Highway Demand – Weekday 16 hour - Source: East of England Highway Model)

	Reading	Oxford	Bletchley	Milton Keynes	Bedford	Luton Railway	Luton Parkway	Cambridge	Ipswich	Hitchin	Stevenage	Norwich	Harlow	Stansted Airport	Peterborough	Northampton	Leicester	Watford	Wixams	St.Albans city	Welwyn Garden City	Hemel Hempstead	Hatfield	Aylesbury	Hertford	Letchworth
Reading	-	737	4	105	13	126	0	20	8	3	3	5	6	0	1	22	81	152	0	28	4	73	42	169	5	3
Oxford	817	-	48	346	76	156	0	29	2	1	6	9	2	0	28	169	374	217	0	14	2	94	17	1,067	1	2
Bletchley	26	110	-	21,967	555	965	17	73	2	18	16	2	1	0	9	651	112	80	8	55	14	174	13	559	2	2
Milton Keynes	120	767	10,012	-	4,628	5,443	108	464	33	167	263	41	15	0	179	6,232	1,006	388	352	368	127	775	111	2,776	20	74
Bedford	8	73	310	4,842	-	1,570	75	240	3	262	366	19	8	0	121	873	2,831	105	597	108	174	81	287	114	19	613
Luton Central	48	404	372	4,708	1,343	-	2,207	250	49	3,229	1,108	25	76	0	20	852	264	1,939	79	3,428	1,887	2,674	1,170	1,101	198	574
Luton Parkway	0	0	19	118	82	2,481	-	0	0	99	16	0	0	0	0	28	0	32	21	43	35	61	26	30	41	32
Cambridge	11	93	49	604	426	228	0	-	137	130	219	461	1,149	0	227	84	223	97	1	42	132	47	57	53	33	329
lpswich	7	2	0	32	6	25	0	284	-	7	18	257	26	0	25	13	184	12	0	1	2	4	3	2	3	10
Hitchin	3	4	10	187	426	2,726	84	95	7	-	6,625	17	15	0	24	64	53	125	20	162	1,522	184	622	16	54	2,288
Stevenage	8	5	15	177	293	1,247	14	169	35	6,245	-	18	488	0	100	26	66	283	6	1,107	3,824	269	1,758	13	2,275	3,293
Norwich	1	0	0	121	10	16	0	407	441	17	5	-	86	0	14	1	111	4	0	9	0	1	2	3	1	2
Harlow	27	8	0	9	34	30	0	910	91	34	1,076	124	-	3	67	18	47	273	0	110	873	52	169	11	1,841	37
Stansted Airport	0	0	0	0	0	0	0	1	0	0	0	0	5	-	0	0	0	0	0	0	0	0	0	0	0	0
Peterborough	1	52	12	126	50	41	0	129	12	10	118	31	27	0	-	631	687	4	1	26	51	8	21	21	6	23
Northampton	40	277	413	5,862	1,091	623	26	143	27	23	45	21	17	0	1,615	-	1,816	90	12	133	36	129	22	147	6	17
Leicester	65	285	59	421	1,352	97	0	61	66	12	81	182	23	0	578	662	-	63	24	46	38	26	33	49	5	15
Watford	230	182	5	377	149	1,506	28	30	14	164	228	9	84	0	1	119	87	-	1	3,362	174	2,932	1,427	808	92	72
Wixams	0	2	18	574	1,584	162	19	6	0	23	31	0	0	0	2	63	40	4	-	11	34	2	6	7	1	77
St.Albans city	35	34	6	425	114	2,931	38	59	1	81	752	25	136	6	33	55	62	4,807	6	-	6,087	7,333	5,439	202	502	91
Welwyn Garden City	10	7	2	152	101	960	33	75	2	1,778	3,301	5	453	0	47	25	41	1,176	3	6,795	-	1,325	9,451	69	3,066	1,928
Hemel Hempstead	354	102	46	592	123	2,071	52	58	1	136	281	9	64	0	2	132	38	6,482	0	5,979	826	-	1,190	1,355	214	29
Hatfield	65	28	1	87	45	388	23	47	3	573	1,397	6	318	0	15	10	114	2,392	2	4,799	9,239	862	-	21	2,688	895
Aylesbury	183	978	123	1,722	128	508	28	41	2	3	8	3	5	0	9	269	80	333	0	103	11	806	21	-	4	1
Hertford	11	2	0	13	4	76	38	23	7	56	1,121	2	1,455	0	5	4	6	231	0	333	3,632	155	960	6	-	51
Letchworth	2	5	4	70	1,079	618	27	280	33	2,226	2,832	32	14	0	72	34	24	44	40	77	1,050	52	431	6	33	-

#### Table B-2 Future Highway Demand (2026) - Source: East of England Highway Model

	Reading	Oxford	Bletchley	Milton Keynes	Bedford	Luton Railway	Luton Parkway	Cambridge	lpswich	Hitchin	Stevenage	Norwich	Harlow	Stansted Airport	Peterborough	Northampton	Leicester	Watford	Wixams	St.Albans city	Welwyn Garden City	Hemel Hempstead	Hatfield	Aylesbury	Hertford	Letchworth
Reading	-	796	4	115	14	124	0	21	8	3	4	7	7	0	1	26	88	162	0	29	4	82	46	191	5	3
Oxford	889	-	53	377	82	175	0	34	2	1	7	11	2	0	30	188	399	250	0	14	2	105	20	1,176	1	2
Bletchley	30	123	-	26,086	770	1198	24	100	2	20	18	2	1	0	12	736	127	97	13	65	17	212	16	654	3	3
Milton Keynes	134	835	12,096	-	5,879	6,357	140	606	39	189	325	57	20	0	241	7,069	1,168	448	622	408	144	909	131	3,064	22	81
Bedford	8	80	437	6,089	-	1,645	88	259	3	260	417	22	9	0	133	945	3,081	119	803	113	191	91	317	129	20	645
Luton Central	49	443	419	5,260	1,375	-	2,375	280	54	3,432	1,259	31	83	0	23	909	284	1,968	127	3,473	2,055	2,876	1,261	1,182	208	580
Luton Parkway	0	0	25	145	92	2,605	-	0	0	105	18	0	0	0	0	34	0	36	40	48	36	68	28	36	41	33
Cambridge	13	108	65	765	440	262	0	-	159	134	269	606	1,343	0	263	96	247	106	2	46	142	56	66	61	38	360
lpswich	7	3	0	41	6	29	0	325	-	7	23	300	28	0	31	14	202	14	0	1	2	5	4	2	3	12
Hitchin	3	4	10	206	428	2,815	83	103	7	-	7,152	20	17	0	28	75	59	114	31	152	1,472	171	610	16	49	2,155
Stevenage	9	5	18	208	302	1,285	15	201	40	6,056	-	23	566	0	116	29	73	305	9	1,179	4,153	309	2,014	15	2,441	3,492
Norwich	1	0	0	170	12	20	1	534	484	23	7	-	106	0	16	1	126	5	0	10	0	2	2	4	1	2
Harlow	32	9	0	12	35	33	0	1136	97	40	1,295	162	-	3	79	20	50	356	0	105	958	71	192	15	2,057	43
Stansted Airport	0	0	0	0	0	0	0	1	0	0	0	0	5	-	0	0	0	0	0	0	0	0	0	0	0	0
Peterborough	1	59	17	168	55	49	0	151	14	11	156	36	29	0	-	720	809	4	2	29	58	11	25	26	7	26
Northampton	45	307	462	6,541	1,205	711	33	161	29	27	55	25	20	0	1,825	-	2,021	104	19	140	38	147	25	170	6	20
Leicester	71	304	69	480	1,422	106	0	69	71	13	94	204	24	0	677	722	-	69	36	49	42	29	34	54	6	17
Watford	239	201	5	430	176	1,555	28	34	15	155	261	12	97	0	1	128	98	-	1	3,378	186	3,262	1,569	870	95	70
Wixams	0	3	33	1037	2,153	241	36	10	0	37	56	0	0	0	3	96	58	5	###	16	69	3	11	10	2	125
St.Albans city	35	35	7	464	118	3,070	44	63	1	79	840	28	150	6	38	60	65	4,832	10	-	6,222	7,709	5,778	207	498	90
Welwyn Garden City	11	8	2	171	126	1118	36	86	2	1,798	3,958	6	529	0	55	27	44	1,186	7	6,985	-	1,484	10,431	73	3,243	1,970
Hemel Hempstead	394	115	56	687	141	2,243	53	70	1	136	332	11	82	0	3	164	45	6,943	0	6,170	918	-	1,344	1,511	219	29
Hatfield	70	29	1	103	50	438	26	53	3	575	1,679	8	378	0	18	11	122	2,479	3	5,068	10,063	972	-	24	2,912	886
Aylesbury	208	1090	143	1,935	143	579	36	49	2	3	9	4	6	0	11	309	90	370	0	110	12	932	25	-	5	1
Hertford	11	2	0	14	4	75	39	28	8	49	1,238	2	1,631	0	6	3	6	226	0	322	3,701	162	1017	6	-	48
Letchworth	2	5	5	77	1,153	660	27	308	38	2,120	3,219	39	18	0	82	41	28	41	63	75	1,066	48	445	6	32	-

Table B-3	Change in highway demand (2026 – Current) - Source: East of England Highway Model

	Reading	Oxford	Bletchley	Milton Keynes	Bedford	Luton Railway	Luton Parkway	Cambridge	Ipswich	Hitchin	Stevenage	Norwich	Harlow	Stansted Airport	Peterborough	Northampton	Leicester	Watford	Wixams	St.Albans city	Welwyn Garden City	Hemel Hempstead	Hatfield	Aylesbury	Hertford	Letchworth
Reading	-	59	0	10	1	-2	0	1	0	0	1	2	1	0	0	4	7	10	0	1	0	9	4	22	0	0
Oxford	72	-	5	31	6	19	0	5	0	0	1	2	0	0	2	19	25	33	0	0	0	11	3	109	0	0
Bletchley	4	13	-	4119	215	233	7	27	0	2	2	0	0	0	3	85	15	17	5	10	3	38	3	95	1	1
Milton Keynes	14	68	2084	-	1251	914	32	142	6	22	62	16	5	0	62	837	162	60	270	40	17	134	20	288	2	7
Bedford	0	7	127	1247	-	75	13	19	0	-2	51	3	1	0	12	72	250	14	206	5	17	10	30	15	1	32
Luton Central	1	39	47	552	32	-	168	30	5	203	151	6	7	0	3	57	20	29	48	45	168	202	91	81	10	6
Luton Parkway	0	0	6	27	10	124	-	0	0	6	2	0	0	0	0	6	0	4	19	5	1	7	2	6	0	1
Cambridge	2	15	16	161	14	34	0	-	22	4	50	145	194	0	36	12	24	9	1	4	10	9	9	8	5	31
lpswich	0	1	0	9	0	4	0	41	-	0	5	43	2	0	6	1	18	2	0	0	0	1	1	0	0	2
Hitchin	0	0	0	19	2	89	-1	8	0	-	527	3	2	0	4	11	6	-11	11	-10	-50	-13	-12	0	-5	-133
Stevenage	1	0	3	31	9	38	1	32	5	-189	-	5	78	0	16	3	7	22	3	72	329	40	256	2	166	199
Norwich	0	0	0	49	2	4	1	127	43	6	2	-	20	0	2	0	15	1	0	1	0	1	0	1	0	0
Harlow	5	1	0	3	1	3	0	226	6	6	219	38	-	0	12	2	3	83	0	-5	85	19	23	4	216	6
Stansted Airport	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0	0	0	0	0	0	0	0	0
Peterborough	0	7	5	42	5	8	0	22	2	1	38	5	2	0	-	89	122	0	1	3	7	3	4	5	1	3
Northampton	5	30	49	679	114	88	7	18	2	4	10	4	3	0	210	-	205	14	7	7	2	18	3	23	0	3
Leicester	6	19	10	59	70	9	0	8	5	1	13	22	1	0	99	60	-	6	12	3	4	3	1	5	1	2
Watford	9	19	0	53	27	49	0	4	1	-9	33	3	13	0	0	9	11	-	0	16	12	330	142	62	3	-2
Wixams	0	1	15	463	569	79	17	4	0	14	25	0	0	0	1	33	18	1	-	5	35	1	5	3	1	48
St.Albans city	0	1	1	39	4	139	6	4	0	-2	88	3	14	0	5	5	3	25	4	-	135	376	339	5	-4	-1
Welwyn Garden City	1	1	0	19	25	158	3	11	0	20	657	1	76	0	8	2	3	10	4	190	-	159	980	4	177	42
Hemel Hempstead	40	13	10	95	18	172	1	12	0	0	51	2	18	0	1	32	7	461	0	191	92	-	154	156	5	0
Hatfield	5	1	0	16	5	50	3	6	0	2	282	2	60	0	3	1	8	87	1	269	824	110	-	3	224	-9
Aylesbury	25	112	20	213	15	71	8	8	0	0	1	1	1	0	2	40	10	37	0	7	1	126	4	-	1	0
Hertford	0	0	0	1	0	-1	1	5	1	-7	117	0	176	0	1	-1	0	-5	0	-11	69	7	57	0	-	-3
Letchworth	0	0	1	7	74	42	0	28	5	-106	387	7	4	0	10	7	4	-3	23	-2	16	-4	14	0	-1	

## **B.3.** Highways Agency Schemes

#### HA - Majors

	T	
Scheme Type	Scheme Name	Anticipated Completion
Trunk road improvement project	A14 Kettering Bypass	2016
Junction improvement project	M1 / M6 Junction 19 Improvement	2017
Bypass Project	A5-M1 Link Road	2016
Managed motorway project	M25 Junctions 23 to 27	2016
Trunk road improvement project	A14 Cambridge to Huntingdon	2020
Managed Motorway	M1 J13-19	After 2015

#### HA - Improvements

Scheme Type	Scheme Name	Anticipated Completion
Improvement Scheme	A1(M) Junction 6 Northbound Improvements, Welwyn	Summer 2014
Improvement Scheme	A1 Biggleswade	July 2014

#### HA - Pinchpoints

Scheme Type	Scheme Name	Anticipated Completion
Pinch Point	A1 BlackCatPartTimeSignals PPP	Autumn 2014
Pinch Point	A1/A47 Wansford Interim PPP	February 2014
Pinch Point	A14 J31-32 Eb&Wb LnGnLnDrp PPP	November 2014

## B.4. Local Authority/LEP Schemes

Scheme Type	Scheme Name
LTB Majors	Bedford Western Bypass
LTB Majors	Woodside Link
LTB Majors	Luton Airport surface access
LTB Majors	A421 dualling from Milton Keynes to J13 on M1
LTB Majors	A142 Ely Southern Bypass –£6m LTB funding,
LTB Majors	A120 Little Hadham Bypass
Single Local Growth Fund (SLGF)	Sundon Park Road (Luton)
Single Local Growth Fund (SLGF)	A428 Caxton Gibbet to Black Cat capacity improvements.

## **Appendix C. Rail Network Evidence Base**

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### C.1. Reference case rail demand forecasts for 2031.

 Table C-1
 Rail Demand - Reference Case (2031): NTEM/Tempro growth scenario

	Reading	Oxford	Bletchley	Milton Keynes Central	Bedford Midland	Luton	Luton Airport Parkway	Cambridge	lpswich	Hitchin	Stevenage	Norwich	Harlow Town	Stansted Airport	Peterbo rough	Northampton	Leicester	Watford Junction	Wixams	St.Albans City	Welwyn Garden City	Hemel Hempstead	Hatfield	Aylesbury	Hertford North	Letchworth
Reading	-	884	54	101	59	15	12	28	7	2	3	12	3	22	9	7	11	11	-	7	4	4	9	21	2	1
Oxford	739	-	87	106	79	23	21	20	3	1	1	7	1	4	3	34	14	35	-	10	1	8	2	27	1	0
Bletchley	89	188	-	114	245	36	36	0	0	0	0	0	1	0	0	51	1	152	-	0	0	25	0	151	0	0
Milton Keynes Central	125	172	86	-	127	1	26	1	3	0	1	3	1	4	1	340	12	254	-	1	1	57	3	112	1	0
Bedford Midland	84	150	203	146	-	513	181	0	1	0	0	1	0	1	16	9	56	58	-	181	0	17	2	42	0	0
Luton	8	34	24	1	305	-	115	2	1	7	0	2	1	0	1	1	9	8	-	536	0	0	6	10	0	0
Luton Airport Parkway	7	23	18	17	100	40	-	2	1	5	0	2	0	0	1	1	26	2	-	130	0	0	1	7	0	0
Cambridge	34	38	0	2	1	3	3	-	92	80	135	266	48	712	210	2	45	12	-	5	50	1	99	2	12	56
Ipswich	9	4	0	3	1	2	1	151	-	2	3	349	2	2	43	2	3	3	-	2	1	1	2	1	1	1
Hitchin	5	1	0	0	0	10	9	305	3	-	740	13	0	1	53	1	1	2	-	1	168	0	136	0	25	258
Stevenage	9	2	0	1	0	0	0	202	2	451	-	9	1	1	74	1	3	4	-	2	317	0	228	0	125	251
Norwich	12	10	0	3	1	2	3	315	205	7	7	-	3	54	142	2	14	3	-	2	2	1	5	1	1	4
Harlow Town	4	1	0	2	0	1	0	66	2	0	1	4	-	38	2	1	1	2	-	1	0	0	1	0	35	0
Stansted Airport	12	4	0	3	1	1	0	467	2	1	0	52	43	-	102	2	21	3	-	2	1	1	2	0	7	1
Peterborough	15	4	0	2	17	3	3	390	33	37	84	180	6	171	-	1	156	4	-	1	17	1	38	1	4	4
Northampton	8	43	39	625	8	1	1	1	2	0	1	2	1	1	0	-	17	74	-	1	0	14	1	30	1	0
Leicester	10	17	1	17	33	16	37	40	3	1	4	14	1	19	97	19	-	4	-	7	1	1	3	8	1	1
Watford Junction	7	40	20	176	33	2	1	4	1	0	3	1	1	2	2	43	3	-	-	0	1	124	3	26	8	0
Wixams	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
St.Albans City	44	36	28	51	62	220	163	21	11	0	1	6	27	3	1	48	8	0	-	-	51	17	22	18	18	12
Welwyn Garden City	5	1	0	1	0	0	0	42	1	52	227	2	0	1	9	1	1	1	-	12	-	0	479	0	2	35
Hemel Hempstead	3	13	10	104	14	0	0	2	0	0	0	1	0	0	1	11	1	345	-	0	0	-	0	12	2	0
Hatfield	9	3	0	2	1	1	1	95	2	42	215	5	1	2	19	2	3	3	-	0	572	0	-	1	5	39
Aylesbury	39	64	172	166	54	17	16	1	1	0	0	2	0	1	1	55	14	56	-	0	0	18	1	-	0	0
Hertford North	4	1	0	2	0	1	0	27	1	23	226	1	51	7	2	1	1	10	-	0	5	2	5	0	-	17
Letchworth	2	1	0	0	0	0	0	248	2	289	540	5	0	1	10	0	1	1	-	1	116	0	85	0	23	-

Units=Trips per average weekday

#### Table C-2 Rail Demand - Reference Case (2031): Local Plan growth scenario

	Reading	Oxford	Bletchley	Milton Keynes Central	Bedford Midland	Luton	Luton Airport Parkway	Cambridge	Ipswich	Hitchin	Stevenage	Norwich	Harlow Town	Stansted Airport	Peterborough	Northampton	Leicester	Watford Junction	Wixams	St.Albans City	Welwyn Garden City	Hemel Hempstead	Hatfield	Aylesbury	Hertford North	Letchworth
Reading	-	856	51	99	56	14	11	27	6	1	3	11	2	21	8	7	11	11	-	7	4	4	8	20	2	1
Oxford	767	-	92	118	85	25	23	21	3	1	1	8	1	4	3	36	16	38	-	11	1	9	2	28	1	1
Bletchley	76	163	-	123	221	31	32	0	0	0	0	0	0	0	0	45	1	143	-	0	0	23	0	130	0	0
Milton Keynes Central	139	193	92	-	143	1	29	1	3	0	1	4	2	5	2	367	14	262	-	2	1	61	3	124	1	0
Bedford Midland	83	149	200	151	-	523	193	0	1	0	0	1	0	1	16	9	54	58	-	199	0	17	2	41	0	0
Luton	10	42	31	1	381	-	144	2	1	9	0	2	1	1	2	1	12	9	-	679	0	1	7	13	0	0
Luton Airport Parkway	9	29	23	21	124	50	-	2	1	6	0	2	0	1	2	1	32	2	-	166	0	0	1	9	0	0
Cambridge	33	37	0	2	1	3	3	-	90	80	129	261	47	698	210	2	44	12	-	4	48	1	96	2	12	54
Ipswich	8	4	0	3	1	2	1	154	-	2	3	354	2	2	43	2	3	3	-	2	1	1	2	1	1	1
Hitchin	5	1	0	0	0	10	10	325	3	-	739	14	0	1	55	1	1	2	-	1	169	0	137	0	26	265
Stevenage	8	2	0	1	0	0	0	189	2	413	-	8	1	1	73	1	3	3	-	3	288	0	209	0	117	226
Norwich	15	12	0	4	1	3	3	405	264	9	8	-	4	70	183	2	17	4	-	2	2	1	6	1	2	4
Harlow Town	5	1	0	2	0	1	0	84	2	0	1	5	-	50	2	1	1	2	-	1	0	0	2	0	44	0
Stansted Airport	10	3	0	3	1	0	0	382	1	1	0	42	35	-	83	1	17	2	-	2	0	1	2	0	6	1
Peterborough	16	5	0	2	18	3	3	425	36	40	87	196	6	186	-	1	168	4	-	1	19	1	41	1	4	4
Northampton	8	47	40	756	9	1	1	1	2	0	1	2	1	1	1	-	18	77	-	1	0	15	1	32	1	0
Leicester	9	16	1	19	33	16	38	39	3	1	4	13	1	19	97	18	-	4	-	7	1	1	3	8	1	1
Watford Junction	7	38	18	206	31	2	1	4	1	0	3	1	1	2	2	41	2	-	-	0	1	116	3	24	7	0
Wixams	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
St.Albans City	47	38	29	56	68	241	185	23	12	0	1	6	29	3	1	51	9	0	-	-	54	18	23	19	20	13
Welwyn Garden City	6	1	0	1	0	0	0	45	1	55	238	2	0	1	10	1	1	1	-	13	-	0	485	0	2	36
Hemel Hempstead	3	14	10	129	16	0	0	2	1	0	0	1	0	0	1	12	1	367	-	0	0	-	0	13	2	0
Hatfield	9	3	0	2	1	1	1	97	2	42	210	5	1	2	20	2	3	3	-	0	565	0	-	1	5	38
Aylesbury	36	60	158	157	50	16	15	1	1	0	0	1	0	1	1	51	13	51	-	0	0	17	0	-	0	0
Hertford North	4	1	0	2	0	1	0	28	1	24	233	2	54	7	2	1	1	11	-	0	5	2	6	0	-	17
Letchworth	1	1	0	0	0	0	0	230	1	243	439	4	0	1	10	0	0	1	-	1	98	0	73	0	20	-

Units=Trips per average weekday

## C.2. Rail Freight



#### Figure C-1 Intermodal Rail Freight Forecast Demand 2030 (Source: Network Rail)

#### Figure C-2 Intermodal Rail Terminals



## Appendix D. Developing the Conditional Outputs

### D.1. Sifting Criteria

Figure D-1 Criteria for priority station and journey pair selection: Overall Methodology



## D.2. EWR-CS Journey Times

 Table D-1
 Indicative EWR-CS Service Journey Times (minutes)

	Reading	Oxford	Bletchley	Milton Keynes	Bedford	Luton Railway	Luton Parkway	Cambridge	Ipswich	Hitchin	Stevenage	Norwich	Harlow	Stansted Airport	Peterborough	Northampton	Leicester	Watford	Wixams	St.Albans city	Welwyn Garden City	Hemel Hemp stead	Hatfield	Aylesbury	Hertford	Letchworth
Reading		21	44	46	57	77	78	81	137	71	75	149	88	89	97	62	106	73	60	87	81	66	82	49	83	71
Oxford			23	26	36	56	57	60	116	51	54	129	68	69	76	42	86	53	39	66	60	46	62	40	62	50
Bletchley				2	13	32	33	36	92	27	31	105	44	45	53	18	62	29	16	43	36	22	38	17	38	26
Milton Keynes					11	30	31	34	90	25	29	103	42	43	51	16	60	32	14	41	34	25	36	30	36	24
Bedford						20	21	24	79	14	18	92	31	32	40	27	49	42	3	30	23	35	25	30	26	14
Luton Railway							1	29	84	7	8	97	21	26	60	46	69	61	13	10	10	54	11	49	13	9
Luton Parkway								29	84	7	7	97	20	25	61	47	70	62	14	9	9	55	10	50	13	9
Cambridge									56	26	30	68	33	24	49	50	73	66	25	33	38	59	40	54	40	23
lpswich										82	86	46	89	80	81	106	133	121	80	88	93	114	96	109	95	79
Hitchin											4	94	17	21	44	41	63	56	12	13	12	49	14	44	14	3
Stevenage												99	14	18	49	45	67	60	16	10	7	53	10	48	9	7
Norwich													101	93	81	119	133	134	93	101	106	127	109	122	108	92
Harlow														14	62	58	80	73	29	16	12	66	12	61	7	18
Stansted Airport															65	59	81	74	31	24	19	67	20	62	15	20
Peterborough																67	52	82	43	70	56	75	59	70	58	47
Northampton																	76	48	30	57	50	41	52	36	52	40
Leicester																		91	52	79	73	84	74	79	75	63
Watford																			45	72	65	7	67	46	68	55
Wixams																				27	21	38	23	33	23	12
St.Albans city																					6	65	2	60	9	15
Welwyn Garden City																						58	3	53	17	14
Hemel Hempstead																							60	39	61	48
Hatfield																								55	19	17
Aylesbury																									55	43
Hertford																										17
Letchworth																										

#### Table D-2 Comparison between via EWR-CS rail in-vehicle times and highway journey times (%)

	Reading	Oxford	Bletchley	Milton Keynes Central	Bedford Midland	Luton	Luton Airport Parkway	Cambridge	Ipswich	Hitchin	Stevenage	Norwich	Harlow Town	Stansted Airport	Peterborough	Northampton	Leicester	Watford Junction	Wixams	St.Albans city	Welwyn Garden City	Hemel Hempstead	Hatfield	Aylesbury	Hertford North	Letchworth
Reading		-59%	-58%	-54%	-46%	-8%	-2%	-37%	-12%	-24%	-12%	-24%	-9%	-17%	-32%	-39%	-22%	8%	-42%	23%	1%	-1%	7%	-32%	0%	-26%
Oxford			-65%	-60%	-60%	-32%	-27%	-53%	-26%	-46%	-35%	-34%	-30%	-36%	-39%	-28%	-8%	-23%	-56%	-6%	-25%	-32%	-20%	-25%	-25%	-47%
Bletchley				-81%	-63%	-20%	-23%	-53%	-33%	-54%	-51%	-31%	-48%	-54%	-31%	-52%	-14%	-54%	-51%	-23%	-45%	-52%	-41%	-57%	-45%	-58%
Milton Keynes Central					-69%	-18%	-24%	-56%	-34%	-56%	-54%	-32%	-48%	-55%	-33%	-52%	-11%	-47%	-57%	-22%	-47%	-48%	-41%	-26%	-46%	-62%
Bedford Midland						-51%	-53%	-61%	-33%	-65%	-57%	-32%	-57%	-60%	-27%	-41%	-39%	-35%	-75%	-46%	-62%	-37%	-58%	-54%	-57%	-68%
Luton							-83%	-58%	-30%	-67%	-72%	-31%	-63%	-63%	-27%	-4%	-16%	81%	-65%	-60%	-74%	118%	-69%	-7%	-67%	-69%
Luton Airport Parkway								-57%	-28%	-65%	-71%	-30%	-62%	-63%	-26%	-2%	-15%	95%	-64%	-59%	-74%	152%	-68%	-5%	-67%	-67%
Cambridge									-26%	-48%	-37%	-25%	-35%	-37%	-11%	-41%	-30%	-25%	-61%	-56%	-45%	-29%	-39%	-52%	-36%	-51%
lpswich										-23%	-17%	-39%	1%	11%	-29%	-24%	-17%	-5%	-30%	-26%	-17%	-10%	-11%	-30%	-4%	-25%
Hitchin											-69%	-23%	-61%	-64%	-38%	-36%	-35%	19%	-70%	-67%	-64%	29%	-54%	-36%	-57%	-73%
Stevenage												-18%	-55%	-62%	-29%	-35%	-34%	49%	-62%	-60%	-64%	55%	-45%	-27%	-48%	-53%
Norwich													-15%	-13%	-30%	-24%	-25%	-13%	-29%	-29%	-21%	-15%	-18%	-31%	-17%	-25%
Harlow Town														-45%	-26%	-33%	-33%	46%	-59%	-54%	-59%	50%	-50%	-19%	-51%	-61%
Stansted Airport															-19%	-45%	-36%	-3%	-64%	-61%	-66%	-5%	-61%	-39%	-65%	-67%
Peterborough																-14%	-32%	-24%	-32%	-30%	-40%	-24%	-35%	-37%	-37%	-38%
Northampton																	52%	-36%	-37%	-14%	-36%	-37%	-31%	-49%	-35%	-48%
Leicester																		-17%	-39%	-24%	-36%	-18%	-33%	-27%	-36%	-46%
Watford Junction																			-17%	199%	98%	-69%	124%	-9%	88%	15%
Wixams																				-50%	-67%	-29%	-63%	-47%	-62%	-74%
St.Albans city																					-70%	260%	-86%	22%	-57%	-56%
Welwyn Garden City																						124%	-68%	-5%	11%	-49%
Hemel Hempstead																							161%	31%	109%	18%
Hatfield																								0%	76%	-35%
Aylesbury																									-4%	-38%
Hertford North																										-47%
Letchworth																										

3. Jo	urn	ev	Pai	r Tr	ip (		ssif	ica	tior	า											Lege B2B		y stroi	ngbus	iness	trips
					lassi					-											B2B	Stro	, ong bu	usiness	strips	
																					Com	Cor	nmutii	ng trips	S	
	Reading	Oxford	Bletchley	Milton Keynes	Bedford	Luton Railway	Luton Parkway	Cambridge	Ipswich	Hitchin	Stevenage	Norwich	Harlow	Stansted Airport	Peterborough	Northampton	Leicester	Watford	Wixams	St.Albans city	Welwyn	Hemel Hempstead	Hatfield	Aylesbury	Hertford	Letchworth
Reading	-	B2B	Com	B2B	Com	B2B	B2B	B2B	B2B	Com	Com	B2B	Com	Com	B2B	B2B	B2B	B2B		B2B	Com	Com	Com	B2B	Com	Com
Oxford	B2B	-	Com	B2B	Com	B2B	B2B	B2B		Com	Com	B2B	Com	Com	B2B	B2B	B2B	B2B		B2B	Com		Com	B2B	Com	Com
Bletchley	Com	Com	-	Com	Com	Com	Com	Com		Com		Com	Com		Com	Com	Com	Com		Com	Com	Com	Com	Com	Com	Com
Milton Keynes	B2B	B2B	Com	-	Com	B2B	B2B	B2B		Com	Com	B2B	Com	Com	B2B	B2B	B2B	B2B	Com		Com		Com	B2B	Com	Com
Bedford	Com	Com	Com	Com	-	Com	Com	Com		Com		Com	Com			Com	Com	Com	Com		Com		Com		Com	Com
Luton Central	B2B	B2B	Com	B2B	Com	-	B2B	B2B		Com	Com	B2B	Com	Com	B2B	B2B	B2B	B2B		B2B	Com				Com	Com
Luton Parkway	B2B	B2B	Com	B2B	Com	B2B	-	B2B		Com	Com	B2B	Com	Com	B2B	B2B	B2B	B2B		B2B	Com		Com	B2B	Com	Com
Cambridge	B2B	B2B	Com	B2B	Com	B2B	B2B	-		Com	Com	B2B	Com	Com	B2B	B2B	B2B	B2B		B2B	Com		Com	B2B	Com	Com
lpswich	B2B	B2B	Com	B2B	Com	B2B	B2B	B2B	-	Com	Com	B2B	Com	Com	B2B	B2B	B2B	B2B		B2B	Com		Com	B2B	Com	Com
Hitchin	Com	Com		Com		Com	Com		Com	-		Com	Com	Com	Com	Com	Com	Com		Com			Com		Com	Com
Stevenage	Com	Com	Com	Com		Com	Com	Com		Com	-	Com	Com	Com	Com	Com	Com	Com		Com	Com	Com	Com	Com	Com	Com
Norwich	B2B	B2B	Com	B2B	Com	B2B	B2B	B2B		Com	Com	-	Com	Com	B2B	B2B	B2B	B2B		B2B	Com		Com		Com	Com
Harlow Stansted Airport	Com Com	Com Com	Com Com	Com Com		Com Com	Com Com			Com Com		Com Com	- Com	Com -	Com Com	Com Com	Com Com	Com Com		Com Com			Com Com	Com Com	Com Com	Com Com
Peterborough	B2B	B2B	Com	B2B	Com	B2B	B2B	B2B	B2B	Com	Com	B2B	Com	Com	-	B2B	B2B	B2B	Com	B2B	Com	Com	Com	B2B	Com	Com
Northampton	B2B	B2B	Com	B2B	Com	B2B	B2B	B2B	B2B	Com	Com	B2B	Com	Com	B2B	-	B2B	B2B	Com	B2B	Com				Com	Com
Leicester	B2B	B2B	Com	B2B	Com	B2B	B2B	B2B	B2B	Com	Com	B2B	Com	Com	B2B	B2B	-	B2B	Com	B2B	Com	Com	Com	B2B	Com	Com
Watford	B2B	B2B	Com	B2B	Com	B2B	B2B	B2B	B2B	Com		B2B	Com	Com	B2B	B2B	B2B	-	Com	B2B	Com	Com	Com	B2B	Com	Com
Wixams	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	-	Com	Com	Com	Com	Com	Com	Com
St.Albans city	B2B	B2B	Com	B2B	Com	B2B	B2B	B2B	B2B	Com	Com	B2B	Com	Com	B2B	B2B	B2B	B2B	Com	-	Com	Com	Com	B2B	Com	Com
Welwyn	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	-	Com	Com	Com	Com	Com
Hemel Hempstead	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	-	Com	Com	Com	Com
Hatfield	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	-	Com	Com	Com
Aylesbury	B2B	B2B	Com	B2B	Com	B2B	B2B	B2B	B2B	Com	Com	B2B	Com	Com	B2B	B2B	B2B	B2B	Com	B2B	Com	Com	Com	-	Com	Com
Hertford	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	-	Com
Letchworth	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	Com	-

## D.4. Journey time competitiveness

 Table D-4
 Journey time competitiveness

	Reading	Oxford	Bletchley	Milton Keynes	Bedford	Luton Railway	Luton Parkway	Cambridge	Ipswich	Hitchin	Stevenage	Norwich	Harlow	Stansted Airport	Peterborough	Northampton	Leicester	Watford	Wixams	St.Albans city	Welwyn Garden City	Hemel Hempstead	Hatfield	Aylesbury	Hertford	Letchworth	<u>Level of</u> <u>Competitiveness</u> Very strong Strong Moderate Weak
Reading																											
Oxford																											ĺ
Bletchley																											
Milton Keynes																											
Bedford																											
Luton Railway																											
Luton Parkway																											
Cambridge																											
lpswich																											
Hitchin																											
Stevenage																											
Norwich																											
Harlow																											1
Stansted Airport																											l
Peterborough																											
Northampton																											
Leicester																											
Watford																											
Wixams																											
St.Albans city																											
Welwyn Garden City																											
Hemel Hempstead																											
Hatfield																											
Aylesbury																											
Hertford																											
Letchworth																											

#### **Potential for Journey Enhancement D.5**.

Table D-5 Potential for Journey Enhancement

	Reading	Oxford	Bletch ley	Milton Keynes	Bedford	Luton Railway	Luton Parkway	Cambridge	lpswich	Hitchin	Stevenage	Norwich	Harlow	Stansted Airport	Peterborough	Northampton	Leicester	Watford	Wixams	St.Albans city	Welwyn Garden City	Hemel Hempstead	Hatfield	Aylesbury	Hertford	Letchworth	Potential for Enhancement: Very strong Strong Moderate Weak
Reading																											
Oxford																											
Bletchley																											
Milton Keynes																											
Bedford																											
Luton Railway																											
Luton Parkway																											
Cambridge																											
lpswich																											
Hitchin																											
Stevenage																											
Norwich																											
Harlow																											
Stansted Airport																											
Peterborough																											
Northampton																											
Leicester																											
Watford																											
Wixams																											
St.Albans city																											
Welwyn Garden City																											
Hemel Hempstead																											
Hatfield																											
Aylesbury																											
Hertford																											
Letchworth																											

## D.6. Identified priority journey pairs to "test"

 Table D-6
 Identified priority journey pairs to "test"

	Reading	Oxford	Bletchley	Milton Keynes	Bedford	Luton Railway	Luton Parkway	Cambridge	Ipswich	Hitchin	Stevenage	Norwich	Harlow	Stansted Airport	Peterborough	Northampton	Leicester	Watford	Wixams	St.Albans city	Welwyn Garden City	Hemel Hempstead	Hatfield	Aylesbury	Hertford	Letchworth	Pri Mc Lo Alı sci
Reading																											
Oxford																											
Bletchley																											
Milton Keynes																											
Bedford																											
Luton Railway																											
Luton Parkway																											
Cambridge																											
Ipswich																											
Hitchin																											
Stevenage																											
Norwich																											
Harlow																											
Stansted Airport																											
Peterborough																											
Northampton																											
Leicester																											
Watford																											
Wixams																											
St.Albans city																											
Welwyn Garden City																											
Hemel Hempstead																											
Hatfield																											
Aylesbury																											
Hertford																											
Letchworth																											

**Priority Level:** 

High priority Moderate priority Low priority Already a committed scheme

### D.7. Indicative EWR-CS rail in-vehicle times

 Table D-7
 Indicative EWR-CS rail in-vehicle times used in testing

	Reading	Oxford	Bletchley	Milton Keynes	Bedford	Luton Railway	Luton Parkway	Cambridge	Ipswich	Hitchin	Stevenage	Norwich	Harlow	Stansted Airport	Peterborough	Northampton	Leicester	Watford	Wixams	St.Albans city	Welwyn Garden City	Hemel Hempstead	Hatfield	Aylesbury	Hertford	Letchworth
Reading		21	44	46	57	77	78	81		71	75	149	88	89	97	62	106		60					49	83	71
Oxford			23	26	36	56	57	60	116	51	54	129	68	69	76	42	86	53	39	66	60	46	62	40	62	50
Bletchley				2	13	32	33	36	92	27	31	105	44	45	53		62		16	43	36		38	17	38	26
Milton Keynes					11	30	31	34	90	25	29	103	42	43	51				14	41	34		36	30	36	24
Bedford								24	79	14	18	92	31	32	40	27		42	3		23	35	25	30	26	14
Luton Railway								29	84	7	8	97	21	26	60	46	69		13		10		11		13	9
Luton Parkway								29	84	7	7	97	20	25	61	47	70		14		9		10		13	9
Cambridge									56							50		66	25	33		59		54	40	
Ipswich										82					81	106			80	88				109		79
Hitchin												94	17	21		41	63		12	13				44		
Stevenage													14	18		45	67		16	10				48		
Norwich																119	133		93	101	106			122		92
Harlow															62	58	80		29	16	12		12		7	18
Stansted Airport															65	59	81		31	24	19		20	62	15	20
Peterborough																	52	82	43	70		75		70	58	47
Northampton																			30	57	50		52	36	52	40
Leicester																			52	79	73	84	74	79	75	63
Watford																										
Wixams																				27	21	38	23	33	23	12
St.Albans city																					6		2		9	15
Welwyn Garden City																										
Hemel Hempstead																										
Hatfield																										
Aylesbury																										43
Hertford																										
Letchworth																										

We are assuming for "test" purposes that all journeys shown above can be made via a direct EWR-CS service operating at 2tph from 2026.
# D.8. Change in GJT's: Do Something minus Do Minimum (where DM is reference case including EWR-WS)

#### Table D-8Change in GJT's: DS - DM

	Reading	Oxford	Bletchley	Milton Keynes Central	Bedford Midland	Luton	Luton Airport Parkway	Cambridge	Ipswich	Hitchin	Stevenage	Norwich	Harlow Town	Stansted Airport	Peterborough	Northampton	Leicester	Watford Junction	Wixams	St.Albans City	Welwyn Garden City	Hemel Hempstead	Hatfield	Aylesbury	Hertford North	Letchworth
Reading		0	-13	-13	-13	-39	-39	-80	0	-68	-48	-29	-28	-53	-84	-25	-87	-8	-	-19	-32	0	-27	-14	-52	-84
Oxford			-13	-10	-13	-33	-33	-162	-69	-141	-118	-102	-99	-136	-129	0	-57	-2	-	-39	-118	0	-114	-4	-128	-156
Bletchley				0	-13	-29	-29	-156	-81	-134	-121	-133	-91	-120	-113	0	-52	0	-	-39	-97	0	-93	-13	-95	-143
Milton Keynes Central					-6	-20	-20	-83	-17	-97	-86	-66	-63	-76	-64	0	0	0	-	-24	-58	0	-53	-13	-55	-112
Bedford Midland						0	0	-136	-89	-110	-102	-89	-111	-124	-63	-37	0	-4	-	0	-102	-4	-97	-4	-112	-126
Luton							0	-101	-65	-91	-86	-83	-90	-111	-69	-67	-2	-1	-	0	-87	-13	-83	-11	-93	-102
Luton Airport Parkway								-100	-64	-90	-86	-82	-90	-111	-69	-67	0	0	-	0	-87	-17	-77	-11	-92	-101
Cambridge									-13	0	0	0	0	0	-3	-162	-35	-31	-	-87	0	-50	0	-110	-29	0
Ipswich										-20	-7	0	0	0	-17	-87	-17	0	-	-30	-20	0	-15	0	0	0
Hitchin											0	-19	-88	-80	0	-140	-72	0	-	-99	0	-20	0	-90	0	0
Stevenage												-4	-81	-90	0	-129	-83	0	-	-92	0	-12	0	-80	0	0
Norwich													0	0	0	-80	0	0	-	-69	-39	-11	-26	-19	-16	0
Harlow Town														0	-80	-73	-117	0	-	-76	-76	0	-73	-24	-28	-72
Stansted Airport															-38	-110	-75	0	-	-66	-91	0	-87	-49	-46	-57
Peterborough																-80	-13	-34	-	-82	0	-53	0	-75	-31	-25
Northampton																	-14	0	-	-54	-103	0	-98	0	-100	-152
Leicester																		-16	-	-17	-102	-72	-103	-25	-120	-91
Watford Junction																			-	-35	0	0	0	0	0	-15
Wixams																				-	-	-	-	-	-	-
St.Albans City																					-51	0	-51	0	-46	-56
Welwyn Garden City																						0	0	-32	-12	0
Hemel Hempstead																							0	0	0	-29
Hatfield																								-27	-12	0
Aylesbury																									-34	-113
Hertford North																										0
Letchworth																										

# D.9. Do Something Passenger Demand 2031 (NTEM/Tempro growth scenario)

 Table D-9
 Do Something Passenger Demand 2031 (NTEM/Tempro growth scenario)

Unit = trips per average weekday

	Reading	Oxford	Bletchley	Milton Keynes Central	Bedford Midland	Luton	Luton Airport Parkway	Cambridge	Ipswich	Hitchin	Stevenage	Norwich	Harlow Town	Stan sted Airport	Peterborough	Northampton	Leicester	Watford Junction	Wixams	St.Albans City	Welwyn Garden City	Hemel Hempstead	Hatfield	Aylesbury	Hertford North	Letchworth
Reading	-	884	72	133	74	58	54	57	8	22	41	17	19	35	30	46	50	68	1	23	31	10	12	45	13	20
Oxford	739	-	134	168	111	71	65	70	5	28	51	13	21	12	32	55	51	54	2	33	45	13	15	42	14	26
Bletchley	118	282	-	114	376	145	131	120	6	64	108	6	38	7	51	51	76	152	6	59	88	25	30	239	27	60
Milton Keynes Central	166	273	86	-	255	111	101	41	5	46	81	5	28	9	41	340	14	254	5	50	60	57	21	159	19	43
Bedford Midland	106	206	318	293	-	513	181	375	14	234	369	12	108	18	135	348	56	98	31	181	275	29	90	71	82	221
Luton	65	103	99	99	305	-	115	328	14	510	1,011	12	241	30	70	150	11	46	13	536	942	12	311	28	228	376
Luton Airport Parkway	45	71	68	67	100	40	-	241	10	376	784	8	185	22	49	104	26	2	9	130	748	8	243	19	175	275
Cambridge	77	122	108	49	380	424	405	-	106	80	135	266	48	712	215	170	59	53	8	229	50	15	99	35	61	56
lpswich	10	8	4	5	12	16	15	171	-	5	9	349	2	2	46	10	4	3	0	10	8	1	3	3	1	5
Hitchin	34	56	60	56	251	705	680	305	7	-	740	17	134	19	53	85	56	22	6	289	168	6	136	18	25	258
Stevenage	44	71	70	68	275	974	973	202	7	451	-	11	259	33	74	104	72	4	7	525	317	8	228	23	125	251
Norwich	17	18	3	5	7	10	10	315	205	9	8	-	3	59	142	4	16	4	0	6	6	1	6	2	2	4
Harlow Town	20	29	24	23	78	226	226	66	2	90	254	4	-	38	28	17	32	2	2	208	336	3	117	7	167	79
Stansted Airport	20	12	2	7	7	15	15	467	2	6	18	56	43	-	131	4	34	3	0	5	18	1	8	1	17	6
Peterborough	44	62	46	49	138	92	85	400	36	37	84	180	39	218	-	33	169	32	3	44	17	9	38	20	25	42
Northampton	45	71	39	625	240	133	121	115	8	54	97	5	16	3	22	-	64	74	4	60	83	14	28	51	26	50
Leicester	53	71	49	19	33	18	37	53	4	39	72	15	33	31	105	72	-	6	3	9	66	20	23	24	21	36
Watford Junction	57	61	20	176	58	32	1	29	1	12	3	2	1	2	18	43	3	-	1	84	1	124	3	34	8	11
Wixams	2	3	5	4	27	15	14	7	0	5	8	0	2	0	2	5	3	1	-	4	6	0	2	1	2	5
St.Albans City	44	44	37	51	62	220	163	162	11	191	503	7	203	8	31	61	9	99	3	-	875	17	463	18	200	146
Welwyn Garden City	27	52	47	41	171	767	784	42	6	52	227	5	287	28	9	75	55	1	4	770	-	5	479	12	58	35
Hemel Hempstead	11	21	10	104	24	12	11	12	1	5	9	1	4	1	7	11	23	345	0	0	7	-	0	15	3	4
Hatfield	13	24	21	19	74	337	344	95	3	42	215	7	134	13	19	34	26	3	2	547	572	0	-	6	25	39
Aylesbury	84	103	269	234	92	48	44	44	4	23	42	5	14	3	25	97	42	74	2	25	27	24	10	-	9	21
Hertford North	15	24	21	19	72	262	265	52	1	23	226	2	207	19	19	33	25	10	2	251	83	3	26	6		17
Letchworth	32	53	58	54	244	535	513	248	6	289	540	5	122	19	48	81	53	21	6	227	116	6	85	17	23	

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# D.10. Do Something minus Do Minimum Demand (NTEM/Tempro growth scenario)

 Table D-10
 Do Something – Do Minimum Demand (NTEM/Tempro growth scenario)

Unit = trips per average weekday

	Reading	Oxford	Bletchley	Milton Keynes Central	Bedford Midland	Luton	Luton Airport Parkway	Cambridge	Ipswich	Hitchin	Stevenage	Norwich	Harlow Town	Stan sted Airport	Peterbo ro ugh	Northampton	Leicester	Watford Junction	Wixams	St.Albans City	Welwyn Garden City	Hemel Hempstead	Hatfield	Aylesbury	Hertford North	Letchworth
Reading	-	0	18	32	16	43	42	29	2	21	38	5	17	13	22	39	39	56	-	16	27	5	4	24	10	19
Oxford	0	-	47	63	32	48	43	50	2	27	50	6	21	7	29	21	37	18	-	23	44	5	14	15	13	25
Bletchley	29	94	-	0	131	109	95	120	6	64	108	6	37	6	51	0	75	0	-	59	88	0	29	89	27	60
Milton Keynes Central	40	101	0	-	128	110	75	40	2	46	80	2	27	5	40	0	2	0	-	49	59	0	18	48	18	43
Bedford Midland	22	56	115	147	-	0	0	375	13	234	368	10	107	18	118	339	0	40	-	0	274	11	88	30	82	221
Luton	57	69	75	98	0	-	0	326	13	503	1,011	10	240	30	69	149	2	38	-	0	942	11	305	18	228	376
Luton Airport Parkway	38	48	49	51	0	0	-	239	9	371	784	7	184	22	47	103	0	0	-	0	748	8	242	12	175	275
Cambridge	44	85	107	47	379	421	402	-	14	0	0	0	0	0	6	168	14	41	-	225	0	14	0	33	49	0
Ipswich	2	5	4	2	11	14	14	20	-	4	6	0	0	0	3	8	1	0	-	8	8	0	1	2	0	4
Hitchin	29	55	60	56	251	696	670	0	4	-	0	4	133	18	0	84	55	21	-	287	0	6	0	18	0	0
Stevenage	34	69	70	67	274	974	973	0	5	0	-	2	258	32	0	104	69	0	-	522	0	7	0	23	0	0
Norwich	6	9	3	2	7	8	7	0	0	2	2	-	0	5	0	3	2	1	-	4	4	0	2	2	0	0
Harlow Town	16	28	24	21	77	225	226	0	0	90	253	0	-	0	26	16	31	0	-	207	336	3	115	7	133	79
Stansted Airport	8	8	2	4	6	15	14	0	0	6	17	5	0	-	28	2	13	0	-	3	18	0	6	0	11	5
Peterborough	30	57	46	47	121	90	82	10	3	0	0	0	34	48	-	32	12	28	-	43	0	7	0	19	21	38
Northampton	37	28	0	0	231	132	120	114	6	54	96	3	16	2	21	-	47	0	-	59	83	0	27	21	25	50
Leicester	44	54	48	2	0	2	0	12	1	38	68	2	32	11	8	53	-	2	-	2	65	19	20	16	21	35
Watford Junction	50	21	0	0	25	30	0	25	0	12	0	0	0	0	16	0	1	-	-	84	0	0	0	8	0	11
Wixams	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
St.Albans City	0	9	9	0	0	0	0	141	0	191	502	1	176	5	30	13	1	99	-	-	824	0	441	0	181	134
Welwyn Garden City	21	51	47	41	171	766	784	0	5	0	0	4	287	28	0	74	54	0	-	759	-	5	0	12	56	0
Hemel Hempstead	8	8	0	0	9	12	11	10	0	5	8	0	3	0	6	0	22	0	-	0	7	-	0	4	0	4
Hatfield	4	21	21	17	74	336	343	0	1	0	0	2	133	11	0	33	23	0	-	546	0	0	-	5	20	0
Aylesbury	45	39	97	68	39	31	28	43	4	23	41	3	14	2	24	41	27	19	-	24	27	6	9	-	9	21
Hertford North	11	22	21	17	71	262	265	25	0	0	0	1	156	12	17	33	24	0	-	251	79	0	21	6	-	0
Letchworth	30	52	58	53	244	535	513	0	5	0	0	1	121	18	37	80	53	20	-	226	0	6	0	17	0	

#### **Do Something Passenger Demand 2031 (Local Plan growth scenario)** D.11.

Do Something Passenger Demand 2031 (Local Plan growth scenario) Table D-11

Unit = trips per average weekday

																								0		
	Reading	Oxford	Bletchley	Milton Keynes Central	Bedford Midland	Luton	Luton Airport Parkway	Cambridge	Ipswich	Hitchin	Stevenage	Norwich	Harlow Town	Stansted Airport	Peterborough	Northampton	Leicester	Watford Junction	Wixams	St.Albans City	Welwyn Garden City	Hemel Hempstead	Hatfield	Aylesbury	Hertford North	Letchworth
Reading	-	856	68	133	72	56	52	55	8	21	39	16	18	33	29	44	47	64	1	22	29	9	12	43	12	19
Oxford	767	-	140	189	120	78	71	76	6	30	53	14	23	13	35	58	54	57	2	37	48	14	16	44	15	27
Bletchley	101	247	-	123	337	129	116	106	5	56	93	5	33	6	45	45	65	143	5	53	76	23	26	207	24	52
Milton Keynes Central	182	305	92	-	287	126	114	47	5	52	90	6	32	10	47	367	16	262	5	57	67	61	23	176	22	48
Bedford Midland	105	206	313	300	-	523	193	380	14	234	363	12	107	19	137	345	54	97	31	199	272	29	89	71	83	220
Luton	80	128	122	127	381	-	144	411	18	635	1,224	15	297	39	89	186	14	57	17	679	1,150	15	385	36	287	465
Luton Airport Parkway	55	88	82	87	124	50	-	300	13	464	933	11	225	29	61	127	32	3	11	166	900	10	297	24	219	336
Cambridge	76	121	105	49	378	426	407	-	105	80	129	261	47	698	216	166	58	52	8	231	48	15	96	34	60	54
lpswich	11	9	4	5	12	17	16	175	-	6	9	354	2	2	47	10	4	3	0	10	9	1	3	3	1	5
Hitchin	34	58	61	59	261	743	716	325	7	-	739	18	136	20	55	86	57	23	7	305	169	6	137	19	26	265
Stevenage	39	65	63	64	257	933	931	189	7	413	-	10	235	31	73	95	65	4	6	505	288	7	209	21	117	226
Norwich	22	23	4	6	10	13	12	405	264	12	10	-	4	76	183	6	20	5	0	8	8	2	8	3	2	5
Harlow Town	25	36	30	30	98	287	287	84	2	113	307	5	-	50	35	21	39	2	2	266	410	4	144	9	211	99
Stansted Airport	16	10	2	6	6	15	14	382	2	6	15	46	35	-	107	3	28	2	0	5	16	1	7	1	15	5
Peterborough	48	67	50	54	151	101	93	437	39	40	87	196	42	238	-	36	181	35	3	49	19	9	41	22	27	46
Northampton	48	77	40	756	261	146	132	125	8	59	102	5	18	3	23	-	69	77	5	66	89	15	30	54	28	54
Leicester	52	69	47	20	33	18	38	52	4	38	70	15	32	30	105	70	-	6	3	9	64	20	23	23	21	35
Watford Junction	54	57	18	206	55	30	1	27	1	12	3	2	1	2	17	41	3	-	1	82	1	116	3	32	7	11
Wixams	2	3	5	5	28	16	14	7	0	5	8	0	2	0	2	5	3	1	-	4	6	0	2	1	2	5
St.Albans City	47	47	39	56	68	241	185	176	12	205	524	7	215	9	33	65	9	106	3	-	919	18	488	19	215	154
Welwyn Garden City	28	55	49	45	184	840	860	45	6	55	238	6	301	31	10	79	57	1	4	853	-	5	485	13	62	36
Hemel Hempstead	12	23	10	129	26	14	12	13	1	5	10	1	4	1	7	12	25	367	1	0	8	-	0	17	3	5
Hatfield	13	24	21	20	76	349	357	97	3	42	210	7	133	13	20	34	25	3	2	574	565	0	-	6	25	38
Aylesbury	77	96	247	224	86	45	41	41	4	21	38	5	13	3	23	89	38	69	2	23	25	22	9	-	8	19
Hertford North	16	25	22	21	77	285	289	56	1	24	233	2	217	21	20	35	26	11	2	275	88	3	28	6	-	17
Letchworth	26	44	47	45	206	462	442	230	5	243	439	4	100	16	41	66	43	17	5	196	98	5	73	14	20	

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#### Do Something minus Do Minimum Demand (Local Plan growth scenario) D.12.

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Table D-12 Do Something minus Do Minimum Demand (Local Plan growth scenario)

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Unit = trips per average weekday -

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	Reading	Oxford	Bletchley	Milton Keynes Central	Bedford Midland	Luton	Luton Airport Parkway	Cambridge	Ipswich	Hitchin	Stevenage	Norwich	HarlowTown	Stan sted Airport	Peterborough	Northampton	Leicester	Watford Junction	Wixams	St.Albans City	Welwyn Garden City	Hemel Hempstead	Hatfield	Aylesbury	Hertford North	Letchworth
Reading	-	0	17	34	15	42	41	28	1	20	36	5	16	13	21	37	37	53	-	16	25	5	4	23	10	18
Oxford	0	-	48	71	35	52	48	54	2	29	52	7	22	8	32	22	38	20	-	26	47	5	15	16	14	27
Bletchley	25	84	-	0	115	99	84	106	5	56	92	5	32	6	45	0	64	0	-	52	76	0	25	77	24	52
Milton Keynes Central	44	112	0	-	144	125	85	45	2	52	89	2	30	5	45	0	2	0	-	56	65	0	21	52	21	48
Bedford Midland	22	56	113	149	-	0	0	380	14	234	362	11	106	18	120	336	0	39	-	0	272	11	87	29	82	220
Luton	71	86	91	126	0	-	0	408	17	626	1,224	13	296	39	87	185	2	49	-	0	1,150	14	377	23	286	464
Luton Airport Parkway	46	59	60	66	0	0	-	298	12	458	933	8	225	29	60	127	0	1	-	0	900	10	295	15	219	336
Cambridge	43	84	105	47	378	423	404	-	15	0	0	0	0	0	6	164	14	40	-	227	0	13	0	33	48	0
lpswich	2	5	4	2	11	15	15	21	-	4	6	0	0	0	3	8	1	0	-	8	8	0	1	2	0	4
Hitchin	29	56	61	58	261	734	707	0	4	-	0	4	136	19	0	86	56	21	-	304	0	6	0	19	0	0
Stevenage	31	63	63	63	256	932	931	0	5	0	-	2	234	31	0	94	62	0	-	502	0	7	0	21	0	0
Norwich	7	11	4	2	9	10	9	0	0	3	2	-	0	6	0	3	2	1	-	6	6	0	2	2	1	0
Harlow Town	20	35	29	28	98	286	287	0	0	112	306	0	-	0	32	20	38	0	-	265	409	4	142	9	167	98
Stansted Airport	6	6	2	3	5	14	14	0	0	5	15	4	0	-	23	2	11	0	-	3	15	0	5	0	9	5
Peterborough	32	62	50	52	132	98	90	11	3	0	0	0	36	52	-	35	13	31	-	48	0	8	0	21	23	42
Northampton	40	30	0	0	252	145	132	124	7	58	102	3	17	2	23	-	51	0	-	65	88	0	29	23	28	53
Leicester	42	53	47	2	0	2	0	12	1	37	66	2	31	11	8	52	-	2	-	2	63	18	20	15	20	34
Watford Junction	47	20	0	0	25	28	0	23	0	11	0	0	0	0	15	0	1	-	-	81	0	0	0	8	0	10
Wixams	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
St.Albans City	0	9	10	0	0	0	0	153	0	205	523	1	186	6	32	14	1	106	-	-	865	0	465	0	196	142
Welwyn Garden City	22	54	49	45	184	840	859	0	5	0	0	4	301	31	0	78	56	0	-	840	-	5	0	13	60	0
Hemel Hempstead	9	9	0	0	10	13	12	12	0	5	9	0	4	0	7	0	24	0	-	0	8	-	0	4	0	5
Hatfield	4	21	21	17	75	349	356	0	1	0	0	2	133	12	0	32	23	0	-	573	0	0	-	5	20	0
Aylesbury	42	36	89	67	36	28	26	40	4	21	38	3	12	2	23	38	25	17	-	22	25	5	8	-	8	19
Hertford North	12	24	22	18	77	284	288	27	0	0	0	1	163	14	18	34	26	0	-	275	84	0	22	6	-	0
Letchworth	25	43	47	45	206	462	442	0	4	0	0	0	100	15	31	66	43	16	-	195	0	5	0	14	0	-

# D.13. Do Something Passenger miles (NTEM/Tempro growth)

 Table D-13
 Do Something Passenger miles (NTEM/Tempro growth)

	Reading	Oxford	Bletchley	Milton Keynes Central	Bedford Midland	Luton	Luton Airport Parkway	Cambridge	Ipswich	Hitch in	Stevenage	Norwich	Harlow Town	Stan sted Airport	Peterborough	Northampton	Leicester	Watford Junction	Wixams	St.Albans City	Welwyn Garden City	Hemel Hempstead	Hatfield	Aylesbury	Hertford North	Letch worth
Reading	0	8,331	1,448	2,814	1,930	1,899	1,768	2,089	465	722	1,414	1,023	780	1,432	2,156	1,224	1,227	2,034	40	843	1,126	265	469	1,008	473	657
Oxford	6,965	0	1,421	1,974	1,832	1,645	1,524	1,917	238	641	1,259	680	662	365	1,708	996	938	1,105	36	890	1,229	240	434	536	402	584
Bletchley	2,356	3,002	0	126	2,158	1,804	1,667	1,994	205	781	1,499	241	758	135	1,708	1,041	332	1,512	44	947	1,439	192	512	1,864	476	713
Milton Keynes Central	3,503	3,204	95	0	1,743	1,502	1,402	731	175	613	1,214	214	596	186	332	882	1,855	2,812	38	861	1,046	489	383	1,416	359	557
Bedford Midland	2,760	3,412	1,825	2,001	0	3,431	1,274	4,070	417	1,509	3,008	394	1,530	271	941	1,955	4,271	1,535	42	1,850	2,927	383	1,036	962	961	1,367
Luton	2,110	2,388	1,232	1,338	2,039	0	39	4,267	461	1,674	3,654	438	2,259	358	249	1,485	2,845	1,026	78	1,901	4,095	235	1,501	575	1,386	<mark>1,584</mark>
Luton Airport Parkway	1,485	1,679	862	934	700	14	0	3,124	324	1,206	2,645	307	1,668	258	629	1,047	2,004	47	54	418	2,977	160	1,082	399	1,002	<mark>1,144</mark>
Cambridge	2,854	3,358	1,786	871	4,123	5,524	5,254	0	2,004	710	1,401	6,199	543	5,928	1,644	3,987	3,924	1,402	88	3,421	638	366	1,355	849	827	445
lpswich	584	394	156	174	361	516	490	3,245	0	151	261	5,500	47	64	183	1,274	416	141	8	325	252	38	109	127	38	140
Hitchin	1,097	1,293	729	744	1,615	2,316	2,182	2,704	182	0	1,087	562	1,058	179	1,311	797	1,584	492	35	1,665	665	123	665	368	119	238
Stevenage	1,495	1,745	974	1,024	2,242	3,521	3,284	2,097	217	661	0	383	1,636	271	1,806	1,236	2,130	94	48	2,470	790	168	771	507	402	599
Norwich	1,049	930	137	205	255	366	348	7,360	3,240	293	277	0	112	1,870	706	3,949	206	175	6	244	217	67	240	114	62	129
Harlow Town	798	896	476	484	1,105	2,122	2,043	741	47	713	1,605	143	0	188	986	635	450	53	24	1,558	1,776	86	641	206	564	639
Stansted Airport	812	372	41	150	98	180	173	3,888	55	60	145	1,789	209	0	1,080	3,102	106	90	2	60	156	23	74	25	118	55
Peterborough	1,800	1,923	939	1,047	2,000	1,956	1,821	7,401	988	560	1,396	5,003	908	5,187	2,995	0	883	965	42	1,100	332	238	771	560	499	679
Northampton	1,196	1,224	257	3,412	2,945	2,518	2,329	2,659	326	1,017	1,974	216	433	79	1,867	578	0	1,230	58	1,341	1,910	196	677	727	628	929
Leicester	2,277	2,371	1,108	441	549	426	882	1,452	165	911	1,801	690	1,016	964	0	1,872	2,093	194	48	255	1,811	610	655	720	612	828
Watford Junction	1,722	1,253	199	1,949	912	717	31	777	49	273	74	94	33	65	111	541	709	0	14	2,183	20	299	91	607	206	248
Wixams	48	59	33	36	38	90	85	75	7	28	58	7	29	5	55	34	74	19	0	33	58	7	20	17	18	25
St.Albans City	1,602	1,185	588	866	636	782	522	2,418	387	1,104	2,371	264	1,524	94	241	758	1,385	2,580	27	0	2,248	398	486	422	860	975
Welwyn Garden City	973	1,418	777	725	1,821	3,333	3,122	534	170	206	567	199	1,520	240	1,509	177	1,717	21	40	1,979	0	122	425	297	331	173
Hemel Hempstead	305	381	73	897	315	244	229	289	24	95	187	52	100	19	686	182	160	836	7	0	167	0	10	235	64	86
Hatfield	480	674	367	353	854	1,623	1,531	1,310	89	204	726	253	738	116	723	390	811	90	19	574	508	10	0	147	164	225
Aylesbury	1,869	1,328	2,093	2,075	1,250	968	909	1,067	194	457	902	235	384	83	1,266	704	1,387	1,322	28	583	651	370	242	0	229	415
Hertford North	584	666	361	350	841	1,594	1,520	707	27	106	724	75	696	126	715	368	800	287	19	1,083	475	66	173	146	0	93
Letchworth	1,029	1,215	686	696	1,507	2,256	2,136	1,972	174	266	1,289	162	978	169	1,228	771	1,490	457	33	1,516	567	115	492	344	131	0

# D.14. DS - DM Passenger miles (NTEM/Tempro growth)

 Table D-14
 DS - DM Passenger miles (NTEM/Tempro growth)

	Reading	Oxford	Bletchley	Milton Keynes Central	Bedford Midland	Luton	Luton Airport Parkway	Cambridge	lpswich	Hitchin	Stevenage	Norwich	Harlow Town	Stansted Airport	Peterborough	Northampton	Leicester	Watford Junction	Wixams	St.Albans City	Welwyn Garden City	Hemel Hempstead	Hatfield	Aylesbury	Hertford North	Letchworth
Reading	0	0	357	687	409	1,513	1,469	1,167	204	683	1,338	395	725	848	1,743	879	1,037	1,844	40	688	1,045	185	292	538	424	630
Oxford	0	0	498	736	528	1,111	1,023	1,075	97	619	1,216	234	642	210	1,311	871	359	375	36	623	1,208	92	383	196	370	566
Bletchley	580	1,001	0	0	751	1,360	1,208	1,990	195	781	1,496	227	746	128	1,681	1,035	0	0	44	943	1,439	0	504	690	476	713
Milton Keynes Central	854	1,180	0	0	875	1,488	1,046	691	70	607	1,197	34	563	69	53	839	0	0	38	838	1,017	0	324	424	333	557
Bedford Midland	583	932	659	1,005	0	0	0	4,061	395	1,509	2,995	341	1,518	242	0	1,567	4,162	621	42	0	2,917	153	983	401	950	1,367
Luton		1,606		1,324	0	0	0	4,210	428	1,517	3,651	357	2,240	348	37	1,446	2,826	889	78	0	4,091	227	1,389	365	1,381	1,580
Luton Airport Parkway	1,294	1,126	627	705	0	0	0	3,064	290	1,097	2,641	209	1,660	248	0	1,006	1,993	18	54	0	2,972	158	1,064	249	998	1,144
Cambridge	1,741	1,763	1,780	798	4,099	5,427	5,153	0	265	0	0	0	0	0	141	749	3,850	1,104	88	3,297	0	328	0	793	660	0
lpswich	255	209	147	61	323	449	454	373	0	103	185	0	3	6	44	92	342	52	8	271	231	13	38	100	8	117
Hitchin	973	1,248	729	734	1,615	2,103	1,978	0	110	0	0	133	1,054	161	1,264	0	1,567	467	35	1,643	0	120	0	368	0	0
Stevenage	1,272	1,677	974	999	2,228	3,516	3,280	0	154	0	0	75	1,623	255	1,687	0	2,110	40	48	2,428	0	161	0	499	0	0
Norwich	405	315	122	31	214	255	209	0	0	70	52	0	10	147	74	0	95	48	6	147	162	17	71	71	17	10
Harlow Town	713	864	471	444	1,095	2,099	2,039	0	3	710	1,591	13	0	0	943	584	419	30	24	1,549	1,773	82	623	200	414	635
Stansted Airport	487	221	36	59	69	167	161	0	5	48	137	141	0	0	199	675	49	42	2	18	144	10	37	12	56	44
Peterborough	1,205	1,743	939	985	1,600	1,872	1,744	1,391	71	0	0	0	760	1,129	218	0	856	853	42	1,064	0	195	0	542	426	615
Northampton	996	481	0	0	2,843	2,500	2,319	2,613	255	1,012	1,958	97	413	40	1,564	561	0	0	58	1,324	1,900	0	640	302	606	915
Leicester	1,920	1,909	1,086	58	0	53	0	123	40	879	1,672	73	984	166	0	142	1,760	51	48	57	1,779	571	548	470	586	807
Watford Junction	1,600	433	0	0	399	686	12	674	18	267	32	26	19	30	29	476	0	0	14	2,181	10	0	51	148	112	245
Wixams	48	59	33	36	38	90	85	75	7	28	58	7	29	5	55	34	74	19	0	33	58	7	20	17	18	25
St.Albans City	598	233	147	2	0	0	0	1,833	23	1,100	2,356	-3	1,086	28	15	731	303	2,578	27	0	1,495	111	185	0	595	739
Welwyn Garden City	858	1,384	777	706	1,815	3,331	3,120	0	154	0	0	132	1,519	230	1,479	0	1,698	11	40	1,805	0	122	0	292	321	0
Hemel Hempstead	252	147	0	0	124	240	229	248	8	95	182	13	95	10	658	162	0	0	7	0	167	0	4	54	31	86
Hatfield	300	595	363	298	840	1,610	1,521	0	41	0	0	75	726	84	623	0	767	51	19	570	0	4	0	130	133	0
Aylesbury	1,004	502	756	604	526	621	580	1,023	167	451	892	146	376	54	830	674	592	335	28	573	651	90	230	0	229	415
Hertford North	497	625	361	305	831	1,585	1,517	346	6	0	0	20	476	65	692	328	778	156	19	1,078	449	32	138	142	0	0
Letchworth	987	1,178	686	688	1,507	2,256	2,136	0	124	0	0	18	973	149	1,207	603	1,483	441	33	1,492	0	112	0	342	0	0

# D.15. DS Passenger miles (Local Plan growth)

 Table D-15
 DS Passenger miles (Local Plan growth)

	Reading	Oxford	Bletchley	Milton Keynes Central	Bedford Midland	Luton	Luton Airport Parkway	Cambridge	Ipswich	Hitchin	Stevenage	Norwich	Harlow Town	Stansted Airport	Leicester	Peterborough	Northampton	Watford Junction	Wixams	St.Albans City	Welwyn Garden City	Hemel Hempstead	Hatfield	Aylesbury	Hertford North	Letchworth
Reading	0	8,062	1,361	2,811	1,864	1,847	1,718	2,014	440	688	1,331	968	739	1,359	2,031	1,182	1,163	1,925	38	799	1,066	251	443	954	452	622
Oxford	7,226	0	1,483	2,220	1,990	1,804	1,670	2,078	258	687	1,320	733	703	397	1,796	1,084	1,000	1,177	38	980	1,301	257	462	571	434	620
Bletchley	2,030	2,625	0	136	1,930	1,606	1,482	1,760	177	677	1,285	208	654	120	1,465	916	293	1,422	38	842	1,241	176	441	1,613	414	614
Milton Keynes Central	3,858	3,573	101	0	1,963	1,698	1,585	823	197	687	1,347	241	666	211	369	994	2,005	2,898	43	977	1,165	528	428	1,565	404	622
Bedford Midland	2,731	3,413	1,795	2,050	0	3,496	1,356	4,124	418	1,510	2,957	394	1,520	278	915	1,981	4,241	1,525	42	2,041	2,900	381	1,029	956	965	1,356
Luton	2,618	2,984	1,519	1,718	2,549	0	49	5,351	586	2,085	4,423	556	2,787	464	318	1,877	3,526	1,286	99	2,409	5,001	300	1,854	725	1,744	1,958
Luton Airport Parkway	1,825	2,083	1,051	1,202	869	17	0	3,894	411	1,490	3,148	390	2,034	335	756	1,318	2,459	60	69	531	3,584	204	1,321	501	1,254	1,398
Cambridge	2,789	3,309	1,739	867	4,109	5,554	5,280	0	1,993	711	1,334	6,083	531	5,817	1,610	3,992	3,846	1,375	87	3,448	620	359	1,324	833	818	433
lpswich	593	401	158	177	369	529	503	3,316	0	154	265	5,590	48	65	186	1,295	422	143	8	330	256	39	111	129	39	143
Hitchin	1,117	1,330	739	781	1,681	2,441	2,300	2,881	187	0	1,085	578	1,080	190	1,331	834	1,618	505	36	1,762	667	126	667	377	124	244
Stevenage	1,347	1,596	873	960	2,093	3,370	3,142	1,962	195	607	0	343	1,487	258	1,621	1,223	1,933	85	44	2,377	718	151	706	457	377	540
Norwich	1,348	1,191	173	264	325	469	445	9,453	4,164	376	351	0	144	2,404	908	5,076	264	225	7	313	280	86	309	146	80	152
Harlow Town	992	1,124	590	625	1,396	2,692	2,592	947	61	892	1,944	184	0	242	1,221	806	568	67	31	1,990	2,166	110	792	261	710	792
Stansted Airport	665	309	34	127	91	174	167	3,185	45	54	123	1,459	171	0	883	2,530	87	74	2	54	136	19	63	21	101	47
Leicester	2,207	2,319	1,070	481	554	433	910	1,429	161	890	1,738	671	988	941	0	1,862	2,035	189	47	253	1,758	594	637	699	600	804
Peterborough	1,939	2,085	1,009	1,154	2,185	2,146	1,998	8,084	1,076	604	1,451	5,445	980	5,644	3,221	0	958	1,049	46	1,210	356	259	816	607	544	736
Northampton	1,281	1,321	264	4,131	3,210	2,766	2,558	2,895	354	1,097	2,088	234	466	87	2,020	628	0	1,265	63	1,478	2,036	211	725	781	681	993
Watford Junction	1,610	1,183	183	2,283	869	672	29	726	46	256	69	88	31	61	104	509	669	0	13	2,115	18	282	86	569	193	232
Wixams	47	60	32	38	39	95	89	78	7	29	58	7	29	5	55	35	74	19	0	35	57	7	20	17	19	25
St.Albans City	1,699	1,268	619	955	695	857	593	2,619	418	1,181	2,466	284	1,611	103	248	822	1,470	2,743	29	0	2,360	425	513	450	928	1 <u>,032</u>
Welwyn Garden City	1,028	1,505	808	793	1,962	3.653	3,422	574	181	218	594	212	1,590	268	1,572	188	1.805	22	42	2,190	0	130	431	315	353	178
Hemel Hempstead	337	419	76	1,116	349	270	254	320	26	105	207	58	111	21	744	201	174	890	8	0	185	0	11	257	71	95
Hatfield	477	676	362	362	870	1,684	1,588	1,341	89	206	709	252	734	122	714	393	808	90	19	602	501	10	0	146	164	222
Aylesbury	1,722	1,230	1,921	1,993	1,163	901	845	992	178	422	829	217	354	78	1,165	654	1,280	1,220	25	543	600	342	223	0	211	382
Hertford North	613	705	377	380	902	1,733	1,653	758	29	112	748	80	729	139	748	391	842	305	20	1,188	504	70	184	154	0	98
Letchworth	839	1,005	557	585	1,273	1,947	1,842	1,830	140	224	1,049	130	806	144	999	654	1,225	368	27	1,309	480	92	426	280	114	0

# D.16. DS - DM Passenger miles (Local Plan growth)

 Table D-16
 DS - DM Passenger miles (Local Plan growth)

			i —							· · · · ·										<b></b>			,			<i>'</i>
	Reading	Oxford	Bletchley	Milton Keynes Central	Bedford Midland	Luton	Luton Airport Parkway	Cambridge	Ipswich	Hitchin	Stevenage	Norwich	Harlow Town	Stansted Airport	Leicester	Peterborough	Northampton	Watford Junction	Wixams	St.Albans City	Welwyn Garden City	Hemel Hempstead	Hatfield	Aylesbury	Hertford North	Letchworth
Reading	0	0	334	719	402	1,470	1,435	1,138	193	651	1,259	374	688	806	1,640	855	983	1,744	38	652	989	175	276	509	406	597
Oxford	0	0	509	834	577	1,219	1,122	1,171	106	663	1,274	253	682	230	1,368	949	387	403	38	687	1,278	99	406	210	399	601
Bletchley	504	892	0	0	661	1,227	1,077	1,756	168	677	1,282	196	644	113	1,441	911	0	0	38	838	1,241	0	434	603	414	614
Milton Keynes Central	922	1,314	0	0	985	1,683	1,184	777	79	681	1,327	38	628	79	60	946	0	0	43	949	1,133	0	363	462	374	622
Bedford Midland	573	936	649	1,019	0	0	0	4,115	396	1,510	2,944	342	1,508	250	0	1,590	4,133	616	42	0	2,890	152	977	399	954	1,35
Luton	2,369	2,004	1,134	1,701	0	0	0	5,277	545	1,884	4,420	453	2,763	451	48	1,827	3,502	1,131	99	0	4,996	290	1,725	464	1,738	1,95
Luton Airport Parkway	1,580	1,394	762	909	0	0	0	3,818	368	1,350	3,143	264	2,024	322	0	1,267	2,446	23	69	0	3,578	202	1,298	316	1,249	1,39
Cambridge	1,698	1,744	1,733	795	4,085	5,458	5,181	0	287	0	0	0	0	0	139	750	3,774	1,083	87	3,327	0	322	0	777	653	0
lpswich	259	212	149	62	330	460	466	397	0	105	188	0	3	6	45	93	346	52	8	276	235	13	39	102	8	119
Hitchin	992	1,284	739	771	1,681	2,222	2,090	0	113	0	0	137	1,075	171	1,283	0	1,601	480	36	1,738	0	123	0	377	0	0
Stevenage	1,148	1,535	873	938	2,081	3,366	3,138	0	138	0	0	67	1,476	244	1,515	0	1,915	36	44	2,331	0	144	0	450	0	0
Norwich	520	400	155	39	273	325	267	0	0	90	66	0	13	189	95	0	122	61	7	189	208	22	91	91	22	13
Harlow Town	886	1,083	582	573	1,383	2,663	2,587	0	4	888	1,926	16	0	0	1,166	739	528	37	31	1,979	2,164	105	768	253	523	787
Stansted Airport	400	185	30	53	67	163	157	0	4	43	116	115	0	0	165	551	41	34	2	20	127	8	33	10	50	38
Leicester	1,859	1,869	1,048	59	0	52	0	121	39	860	1,612	70	956	166	0	144	1,711	50	47	56	1,727	556	532	457	575	784
Peterborough	1,304	1,889	1,009	1,086	1,748	2,054	1,913	1,520	78	0	0	0	820	1,229	233	0	928	929	46	1,170	0	212	0	587	464	668
Northampton	1,071	521	0	0	3,096	2,747	2,547	2,845	277	1,091	2,071	105	444	44	1,693	610	0	0	63	1,460	2,025	0	685	327	658	978
Watford Junction	1,497	406	0	0	389	642	11	631	17	250	30	24	17	28	27	445	0	0	13	2,113	10	0	49	138	105	229
Wixams	47	60	32	38	39	95	89	78	7	29	58	7	29	5	55	35	74	19	0	35	57	7	20	17	19	25
St.Albans City	635	248	153	2	0	0	0	1,988	24	1,177	2,452	-3	1,144	31	15	793	318	2,740	29	0	1,560	118	194	0	642	780
Welwyn Garden City	909	1,468	808	773	1,956	3,651	3,419	0	164	0	0	141	1,589	257	1,540	0	1,784	12	42	2,005	0	130	0	309	343	0
Hemel Hempstead	278	163	0	0	137	265	254	275	9	105	202	15	105	11	713	179	0	0	8	0	185	0	5	60	35	95
Hatfield	299	597	358	305	856	1,672	<u>1,578</u>	0	40	0	0	75	722	90	614	0	764	51	19	598	0	4	0	129	133	0
Aylesbury	925	464	693	600	487	574	536	951	153	417	820	135	346	50	764	626	545	309	25	534	600	83	212	0	211	382
Hertford North	520	662	377	332	892	1,724	1,650	371	6	0	0	22	497	74	722	349	818	166	20	1,182	477	34	146	151	0	0
Letchworth	806	975	557	579	1,273	1,947	1,842	0	100	0	0	15	802	128	982	492	1,220	355	27	1,289	0	90	0	277	0	0

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# **Appendix E. Gravity Modelling**

# E.1. Introduction

This Appendix gives a brief description of the gravity model mechanism and sets out the assumptions that have been applied to it. The model produces demand forecasts for each station to station OD pair identified. For each OD pair contained in the model, there are two sets of demand forecast subject to the change in GJT. When the GJT change is less than 30% compared to the Do Nothing scenario, the elasticity approach is adopted; otherwise the higher number between the gravity model forecast and the elasticity forecast is selected. This demand is then grown to future years (2016, 2021, 2026, and 2031) by the exogenous demand factors. Amongst the exogenous growth factors, we have taken the NTEM/Tempro growth factors for population and employment as the central case and used the growth factors derived from the Local Plan projections as a 'high growth' sensitivity test.

# E.2. Service Assumptions

#### • Do Nothing (DN)

The rail network is the same as the present day where no East West Rail (EWR) service is in place.

#### • Do Minimum (DM)

The Do Minimum scenario assumes the EWR Western section is in place with the headway of 60 minutes for all OD pairs.

#### • Do Something (DS)

The Do Something scenario assumes both of the Western and Central sections of the EWR are in place, with the headway of 30 minutes for the affected journeys.

# E.3. Model Scope

The model started with having 64 stations that were initially thought to be relevant to the study. This station list has since been reduced during a station sifting process to 26 key stations along the EWR route which have high level forecasts of population and employment in 2031 (shown in Table E1).

This sifting process then assigned priority ratings to O-D pairs between the 26 stations. This process is based on two factors:

- The extent to which journeys could be improved by an EWR central section (by examining existing service frequencies and number of required interchanges between station pairs); and
- The potential for rail journey times to be competitive with highway journey times.

This resulted in a list of priority O-D pairs which are assumed to be served by an EWR central section service.

#### Table E-1In – scope Stations

Reading	Ipswich	Northampton
Oxford	Hitchin	Watford Junction
Bletchley	Stevenage	Wixams (new station)
Milton Keynes Central	Norwich	St. Albans City
Bedford Midland	Harlow Town	Welwyn Garden City
Luton	Stansted Airport	Hemel Hempstead
Luton Airport Parkway	Leicester	Hatfield
Cambridge	Peterborough	Aylesbury
Hertford North	Letchworth	

### E.4. GJTs

GJTs for the DN scenario are obtained from MOIRA while for the DM and DS scenarios they are based on the following calculation:

*GJT* = *In Vehicle Time (IVT)* + *Interchange Penalty* + *Service Frequency Penalty* 

The interchange and service frequency penalties are taken from PDFH 5.1 guidance as follows:

#### Table E-2 Service Frequency Penalty

Headway (mins)	Full\Season (mins)	Reduced (mins)
5	5	5
10	10	10
15	15	14
20	19	17
30	26	21
40	31	23
60	39	27
90	51	33
120	63	39
180	87	51

#### Table E-3 Interchange Penalty

Distance (miles)	Full\Reduced (mins)	Season (mins)
0	10	7
15	15	10
30	19	12
50	25	16
70	31	20
100	40	26
150	55	36
200	65	36
300	85	36
over 325	90	36

The In Vehicle Time (IVT) for DN and DM scenarios are explained in the following sections.

#### E.4.1. Do Minimum

The IVT for the DM scenario is a calculation of track distance/speed. The average journey speed for existing lines is assumed to be 60mph. This assumption is based on the average speed of rail services serving Cambridge and the Midland Main Line covering a range of fast and semi-fast commuter and cross country services using existing rolling stock. EWR Western and Central Section services are assumed to operate at an average speed of 80mph, making use of both the high standard 'new' railway which would be built and the capabilities of the latest generation of rolling stock.

#### E.4.2. Do Something

The IVT between station O-D pairs for the DS scenario is calculated as follows:

- Existing lines: track distance/60mph (same as DM)
- EWR western section: track distance/80mph (same as DM)
- EWR central section: 1.2\*crow flies distance between central section stations/80mph

For station O-D pairs which travel on EWR central section and existing infrastructure/EWR western section, the IVTs were calculated in a number of stage (as detailed above) and summed to give the total IVT.

### E.4.3. Additional condition

As the GJTs for the DM and DS scenarios are based on calculations while for the DN they are from the MOIRA output, there are instances where the DN GJTs are lower than those of DM and DS due to differences in assumptions on service frequencies. When these instances occur, the lowest GJT is selected.

## E.5. Elasticity Approach

#### E.5.1. Base rail demand

The base rail demand is taken from MOIRA (2013), for the nature of the project and simplicity, this demand is treated as 2011 base year demand.

#### E.5.2. Elasticity

The following elasticity values have been adopted for the model from PDFH 5.1.

#### Table E-4Elasticity values

	Non London So	Non London South East				
	Non seasons	Seasons				
GDPpc	1.20					
Population	1.00	1.00				
Employment	0.00	1.00				
Car Ownership	0.71	0.00				
Fares	-1.00	-0.60				
Road Journey Times	0.30	0.30				

## E.6. Gravity Approach

#### E.6.1. Gravity model parameters and equation

The gravity forecast is a function of:

Forecast demand

 $= GJT^{a} \times OriginEmployment^{b} \times OriginPopulation^{c} \times DestinationEmployment^{d} \times \pounds/mile^{e}$ 

Where *a*, *b*, *c*, *d*, *e* are gravity model parameters:

- GJT (a)
- the number of jobs within 2km of origin (b)
- the number of population within 2km of origin (c)
- the number of jobs within 2km of destination (d)
- £/mile (e)

The model parameters are shown below in Table E-5.

#### Table E-5 Gravity model parameters

Ticket Type	а	b	С	d	е
Non Season	-2.80	0.46	0.48	0.88	-2.00
Season	-3.75	0	0.81	1.14	-2.49

For application within forecasting an average are per mile of £0.25/mile for Non Season and £0.20/mile for Season tickets has been applied. The following section explains how these parameters were derived.

#### E.6.2. Gravity model parameters calibration

The gravity model is calibrated on a set of existing origin-destination pairs on the rail network including stations covered in this appraisal and East Midland's services between Derby-St Albans and Leicester-Norwich. This ensured that O-D pairs selected for calibration covered a full range of:

- Areas of low and high population;
- Areas of low and high employment;
- Journey lengths;
- Levels of low and high rail accessibility

For each origin-destination pair used for model calibration

- MOIRA was used to extract; the existing bi-directional demand and revenue by Full/Reduced/Season ticket types, the generalised journey time, the average rail yield (fare), and the rail distance.
- The highway distances and journey times were imported from an external source.
- Population and employment were extracted from census data around each station in buffers ranging from 0.5km to 5km.

The above provided the input dataset for calibration where the single dependent variable (rail demand) is affected by the multiple independent variables (e.g. population, employment, fare/km, generalised journey time, relative levels of accessibility by rail and highway).

As the original function of the gravity model (shown under Section E.6.1 above) is a power function a log transformation was conducted to allow a least squared multiple linear regression to be carried out to provide a best fit regression between demand and the set of explanatory variables.

Over a hundred possible gravity model structures were tested in this way separately for season and nonseason journeys. The resulting models are those that provided the best fit to the calibrated data. Other model structures assessed included:

- Varying catchment areas for population and employment (covering a range from 0.5km to 5km);
- Multiple ranges for catchment areas (e.g. 0-1km and 1-2km rather than 0-2km;
- Aspects of highway accessibility (e.g. Rail GJT Highway Journey Time, Rail GJT/Highway Journey Time. (This did not significantly improve the level of model calibration).

The figure below shows observed flows against forecast flows for the dataset used to calibrate the gravity model, for non-season journeys.



#### Figure E-1 Gravity Model calibration

Figure E1 shows that although variation remains between the observed and forecast demand; the gravity model explains a considerable amount of the variation between station pairs. This is considered suitable for forecasting demand between O-D pairs where step changes in rail accessibility make forecasting an incremental change via GJT elasticity unreliable. Factors which are not considered within the gravity model, but which may account for some of the remaining variation in demand between O-D pairs include:

- Varying catchment areas for instance stations may attract passengers from varying areas depending on the direction of travel, or on the total length of the journey.
- Socio-economic factors for instance the University associations.
- The spatial setting of each station for example relatively isolated areas may attract a higher number of trips than station within an urban conglomeration.

### E.6.3. Base population and employment

The data source for the base population is from the 2011 ONS census and the employment data comes from the 2011 ONS business register and employment survey.

#### E.6.4. Exogenous growth factors - population and employment

Exogenous growth factors are used to forecast future demand for 2016, 2021, 2026 and 2031. Two of the exogenous growth factors for the central case come from NTEM/Tempro data at the district level. Additionally, the Local Plan projections for employment and population have been collated at the station level (5km from a station) for 2031. The growth rates obtained from the Local Plan data have been used in a 'high growth' sensitivity test.

#### E.6.5. Other exogenous growth factors

The rest of the exogenous growth factors are:

- Non car ownership
- GDP
- Road journey time
- Fares

The values of these factors are summarised in Table E-6 which are taken from PDFH 5.1 guidance.

#### Table E-6Exogenous growth factors

	2011	2016	2021	2026	2031
Fares Growth	1.00	1.05	1.10	1.16	1.22
GDP Growth	1.00	1.020	1.04	1.06	1.08
Road Journey Times	1.00	1.02	1.04	1.06	1.08

# **Appendix F. Prioritisation Results**

#### **Journey Times < 15 Minutes F.1**.

Table F-1 East West Rail Central Section – Conditional Outputs for Passenger Services of less than 15 minutes Journey Time using TEMPRO and Local Plan Growth Forecasts for 2031

#### EWR CS - Conditional Outputs Summary Table (TEMPRO)

	Service pe indic	rformance ators		Indication	Indication of scope for ea benefits		
Journey Pair	Journey Time	Indicative	Indicative	Indicative	Indicative	Indicative	
	(minutes)	Change in	Change in	value of	value of GVA		
	(minutes)	Rail GJT	Passenger		benefits	benefits	
			•	transport			
		(Full)			(B2B) (000's)		
			PaxMiles in 000's)	(£000 pa)		(000's)	
Luton - Stevenage	8	-97	7,167	6,213	154	131	
Luton - Welwyn Garden City	10	-104	7,422	5.252	157	99	
Luton Airport Parkway - Stevenage	7	-97	5,921	5,464	148	160	
Luton Airport Parkway - Welwyn Garden City	9	-103	6,092	4,698	152	121	
Bedford Midland - Hitchin	14	-124	3,124	1,968	24	43	
Bedford Midland - Letchworth	14	-147	2,875	2,147	25	46	
Harlow Town - Stevenage	14	-99	3,214	1,428	64	37	
Harlow Town - Welwyn Garden City	12	-94	3,292	1,603	72	36	
Hatfield - Luton	11	-100	3,000	1,911	55	131	
Hertford North - Luton	13	-115	2,966	1,572	28	25	
Hitchin - Luton	7	-102	3,620	4,114	63	106	
Hitchin - Luton Airport Parkway	7	-101	3,075	3,534	59	110	
Letchworth - Luton	9	-118	3,836	3,359	37	99	
Letchworth - Luton Airport Parkway	9	-117	3,280	2,872	36	101	
St.Albans City - Stevenage	10	-114	4,784	2,352	66	91	
St.Albans City - Welwyn Garden City	6	-51	3,300	3,754	128	102	
Bedford Midland - Bletchley	13	-13	1,410	467	34	25	
Bedford Midland - Milton Keynes Central Central	11	-13	1,880	220	52	9	
Bedford Midland - Wixams	3	29	80	0	0	1	
Bletchley - Milton Keynes Central Central	2	0	0	0	1	0	
Harlow Town - Hatfield	12	-91	1,349	618	25	54	
Harlow Town - Hertford North	7	-33	890	542	25	13	
Harlow Town - Stansted Airport	14	0	0	0	0	0	
Hatfield - Hitchin	14	0	0	0	0	0	
Hatfield - Luton Airport Parkway	10	-91	2,584	1,600	54	134	
Hatfield - St.Albans City	2	-89	755	2,354	49	166	
Hatfield - Stevenage	10	0	0	0	0	0	
Hatfield - Welwyn Garden City	3	0	0	0	0	0	
Hemel Hempstead - Watford Junction	7	0	0	0	0	0	
Hertford North - Hitchin	14	0	0	0	0	0	
Hertford North - Luton Airport Parkway	13	-114	2,515	1,407	27	28	
Hertford North - St.Albans City	9	-96	1,673	1,035	30	22	
Hertford North - Stevenage	9	0	0	0	2	0	
Hitchin - Letchworth	3	0	0	0	0	0	
Hitchin - St.Albans City	13	-121	2,743	1,166	28	52	
Hitchin - Stevenage	4	0	0	0	1	0	
Hitchin - Welwyn Garden City	12	0	0	0	1	0	
Hitchin - Wixams	12	38	63	0	0	0	
Letchworth - Stevenage	7	0	0	0	1	0	
Letchworth - Welwyn Garden City	14	0	0	0	3	0	
Letchworth - Wixams	12	38	58	0	0	1	
Luton - Luton Airport Park way	1	0	0	0	0	0	
Luton - St.Albans City	10	0	0	0	5	0	
Luton - Wixams	13	39	168	0	0	1	
Luton Airport Parkway - St.Albans City	9	0	0	0	2	0	
Luton Airport Parkway - Wixams	14	40	139	0	0	1	
Milton Keynes Central Central - Wixams	14	59	74	0	0	0	
Stevenage - Welwyn Garden City	7	0	0	0	1	0	

#### EWR CS - Conditional Outputs Summary Table (LOCAL PLAN)

Journey Pair	Journey Time (minutes)	Indicative Change in	Indicative			
	-			Indicative	Indicative	Indicative
	(minutes)		Change in	value of	value of GVA	
		Rail GJT	Passenger	transport	benefits	benefits
		(Full)	Miles (annual		(B2B) (000's)	
		(Full)	PaxMiles in	(£000 pa)	(626) (0003)	(000's)
			000's)			
Luton - Stevenage	8	-97	7,786	6,749	165	144
Luton - Welwyn Garden City	10	-104	8,647	6,119	179	117
Luton Airport Parkway - Stevenage	7	-97	6,281	5,797	159	176
Luton Airport Parkway - Welwyn Garden City	9	-103	6,997	5,396	174	143
Bedford Midland - Hitchin	14	-124	3,190	2,010	28	47
Harlow Town - Stevenage	14	-99	3,402	1,513	56	38
Harlow Town - Welwyn Garden City	12	-94	3,752	1,827	67	42
Hatfield - Luton	11	-100	3,396	2,165	63	156
Hatfield - Luton Airport Parkway	10	-91	2,876	1,782	63	160
Hertford North - Luton	13	-115	3,462	1,834 1.622	36	33
Hertford North - Luton Airport Parkway	13	-114	2,899		36	37
Hitchin - Luton Hitchin - Luton Airport Parkway	7	<u>-102</u> -101	4,106 3,440	4,667 3,952	79 74	132 137
Hitchin - St.Albans City	13		2,916	1,238	36	62
Hitchin - St. Albans City Letchworth - Luton	9	<u>-121</u> -118	3,900	3,416	42	104
Letchworth - Luton Airport Parkway	9	-110	3,900	2,837	42	104
St.Albans City - Stevenage	10	-114	4.783	2,340	74	91
St.Albans City - Welwyn Garden City	6	-51	3,565	4.058	152	109
Bedford Midland - Bletchley	13	-13	1,310	438	35	24
Bedford Midland - Letchworth	14	-147	2,629	1,963	27	44
Bedford Midland - Milton Keynes Central Central	11	-13	2,004	236	80	11
Bedford Midland - Wixams	3	29	81	0	0	2
Bletchley - Milton Keynes Central Central	2	0	0	0	1	0
Harlow Town - Hatfield	12	-91	1,491	684	23	54
Harlow Town - Hertford North	7	-33	1,020	618	27	17
Harlow Town - Stansted Airport	14	0	0	0	1	0
Hatfield - Hitchin	14	0	0	0	0	0
Hatfield - St.Albans City	2	-89	792	2,477	58	198
Hatfield - Stevenage	10	0	0	0	0	0
Hatfield - Welwyn Garden City	3	0	0	0	0	0
Hemel Hempstead - Watford Junction	7	0	0	0	0	0
Hertford North - Hitchin	14	0	0	0	0	0
Hertford North - St.Albans City	9	-96	1,824	1,128	41	27
Hertford North - Stevenage	9	0	0	0	2	0
Hitchin - Letchworth	3	0	0	0	0	0
Hitchin - Stevenage	4	0	0	0	1	0
Hitchin - Welwyn Garden City	12	0	0	0	1	0
Hitchin - Wixams	12	38	65	0	0	1
Letchworth - Stevenage	7	0	0	0	1	0
Letchworth - Welwyn Garden City	14	0	0	0	3	0
Letchworth - Wixams	12	38	52	0	0	1
Luton - Luton Airport Parkway	1	0	0	0	0	0
Luton - St.Albans City	10	0	0	0	8	0
Luton - Wixams	13	39	194	0	0	1
Luton Airport Parkway - St.Albans City	9	0	0	0	4	0
Luton Airport Park way - Wixams	14	40	158	0	0	1
Milton Keynes Central Central - Wixams Stevenage - Welwyn Garden City	14	59 0	81 0	0	0 0	0 0

Key:- Very High Priority Conditional Output High Priority Conditional Output Not a required conditional output



Value falls below minimum user benefits threshold Value falls below threshold level (See section 6.1)

Value is significantly higher than threshold level

#### Journey Times 15 – 30 minutes **F.2**.

East West Rail Central Section – Conditional Outputs for Passenger Services of 15 to 30 minutes Journey Time using TEMPRO and Local Plan Growth Forecasts for 2031 Table F-2

EWR CS - Conditional Outputs Summary Table (TEMPRO)

EWR CS - Conditional Outputs Summary Table (LOCAL PLAN)

	Service pe indic	rformance ators		Indication	Indication of scope for economic benefits	
Journey Pair	Journey Time (minutes)	Indicative Change in Rail GJT (Full)	Indicative Change in Passenger Miles (annual PaxMiles in 000's)	Indicative value of transport user benefits (£000 pa)	benefits	Indicative value of GVA benefits (Commuting) (000's)
Bedford Midland - Cambridge	24	-155	8,160	2,648	93	63
Bedford Midland - Stevenage	18	-116	5,223	2,400	55	47
Cambridge - Luton	29	-115	9,636	2,801	143	70
Cambridge - Luton Airport Parkway	29	-114	8,218	2,385	134	77
Bedford Midland - Northampton	27	-51	7,004	625	79	68
Bedford Midland - Welwyn Garden City	23	-123	4,733	1,605	63	35
Harlow Town - Luton	21	-112	4,339	1,458	59	51
Harlow Town - Luton Airport Parkway	20	-112	3,700	1,272	55	57
Aylesbury - Bletchley	17	-13	1,447	222	34	24
Bedford Midland - Hatfield	25	-118	1,823	570	20	40
Bedford Midland - Hertford North	26	-140	1,781	602	20	9
Bedford Midland - Luton	20	0	0	0	5	0
Bedford Midland - Luton Airport Parkway	21	0	0	0	-1	0
Bletchley - Hemel Hempstead	22	0	0	0	1	0
Bletchley - Hitchin Bletchley - Letchworth	27 26	-157 -168	1,510	577	14	14
Bletchley - Northampton	18	-100	1,399 0	612 0	8 3	15 0
Bletchley - Oxford	23	-13	1,499	185	36	15
Bletchley - Watford Junction	29	0	0	0	4	0
Bletchley - Wixams	16	42	76	0	0	0
Cambridge - Hitchin	26	0	0	Ő	0	0
Cambridge - Letchworth	23	0	0	Ő	-1	0
Cambridge - Stansted Airport	24	0	0	Ő	0	0
Cambridge - Wixams	25	51	163	Ő	0	0
Harlow Town - Hitchin	17	-109	1,764	675	17	24
Harlow Town - Letchworth	18	-83	1,608	509	23	24
Harlow Town - St.Albans City	16	-94	2,635	902	59	45
Harlow Town - Wixams	29	55	54	0	0	0
Hatfield - Hertford North	19	-19	271	28	6	2
Hatfield - Letchworth	17	0	0	0	0	0
Hatfield - Stansted Airport	20	-109	121	73	2	4
Hatfield - Wixams	23	49	39	0	0	1
Hemel Hempstead - Milton Keynes Central Central	25	0	0	-44	1	0
Hertford North - Letchworth	17	0	0	0	0	0
Hertford North - Stansted Airport	15	-58	121	72	2	0
Hertford North - Welwyn Garden City	17	-19	771	68	23	1
Hertford North - Wixams	23	49	37	0	0	0
Hitchin - Milton Keynes Central Central	25	-124	1,341	389	32	14
Hitchin - Stansted Airport	21	-101	209	75	3	2
Letchworth - Milton Keynes Central Central	24	-137	1,245	419	22	15
Letchworth - St.Albans City	15	-102	2,231	1,016	28	48
Letchworth - Stansted Airport	20	-66	193	52	3	2
Luton - Stansted Airport	26	-139	515	179	10	3
Luton Airport Parkway - Stansted Airport	25	-139	408	147	9	4
Milton Keynes Central Central - Northampton	16	0	0	0	0	0
Milton Keynes Central Central - Oxford	26 29	-13 -109	1,916 2 196	<b>193</b> <i>520</i>	<u>81</u> 71	8 17
Milton Keynes Central Central - Stevenage Oxford - Reading	29	-109	2,196 0	520 <b>0</b>		
St.Albans City - Stansted Airport	24	-26	0 47	0 35	-10 -10	0 1
St.Albans City - Stansted Airport	27	-20	47 61	35 0	4 0	0
Stansted Airport - Stevenage	18	-112	392	159	5	2
Stansted Airport - Stevenage Stansted Airport - Welwyn Garden City	19	-113	375	148	6	1
Stevenage - Wixams	16	42	107	0	0	0
Welwyn Garden City - Wixams	21	47	97	Ő	0	0

	Service pe indic			Indication of scope for economic benefits			
Journey Pair	Journey Time (minutes)	Indicative Change in Rail GJT (Full)	Indicative Change in Passenger Miles (annual PaxMiles in 000's)	Indicative value of transport user benefits (£000 pa)	Indicative value of GVA benefits (B2B) (000's)	benefits	
Bedford Midland - Cambridge	24	-155	8,200	2,661	118	71	
Bedford Midland - Stevenage	18	-116	5,025	2,308	56	44	
Cambridge - Luton	29	-115	10,735	3,119	193	91	
Cambridge - Luton Airport Parkway	29	-114	9,000	2,611	180	101	
Harlow Town - Luton	21	-112	5,426	1,824	68	68	
Bedford Midland - Northampton	27	-51	7,229	645	87	76	
Bedford Midland - Welwyn Garden City	23	-123	4,846	1,644	68	34	
Harlow Town - Luton Airport Parkway	20	-112	4,611	1,585	64	75	
Harlow Town - St.Albans City	16	-94	3,123	1,072	71	57	
Aylesbury - Bletchley	17	-13	1,296	199	29	20	
Bedford Midland - Hatfield Bedford Midland - Hertford North	25 26	-118	1,832	572	22	44	
Bedford Midland - Hertford North Bedford Midland - Luton	20	-140 0	1,846 0	624 0	25 6	10 0	
Bedford Midland - Luton Bedford Midland - Luton Airport Parkway	20	0	0	0	-2	0	
Bletchley - Hemel Hempstead	22	0	0	0	-2	0	
Bletchley - Hitchin	27	-157	1,417	541	13	12	
Bletchlev - Letchworth	26	-168	1,171	512	7	12	
Bletchley - Northampton	18	0	0	0	3	0	
Bletchley - Oxford	23	-13	1.401	172	34	14	
Bletchley - Watford Junction	29	0	0	0	3	0	
Bletchley - Wixams	16	42	70	0	0	0	
Cambridge - Hitchin	26	0	0	0	0	0	
Cambridge - Letchworth	23	0	0	0	-1	0	
Cambridge - Stansted Airport	24	0	0	0	0	0	
Cambridge - Wixams	25	51	164	0	0	0	
Harlow Town - Hitchin	17	-109	1,963	751	18	26	
Harlow Town - Letchworth	18	-83	1,589	503	22	22	
Harlow Town - Wixams	29	55	60	0	0	0	
Hatfield - Hertford North	19	-19	279	29	6	2	
Hatfield - Letchworth	17	0	0	0	0	0	
Hatfield - Stansted Airport	20	-109	122	70	3	6	
Hatfield - Wixams	23	49	39	0	0	1	
Hemel Hempstead - Milton Keynes Central Central	25 17	0	0 0	-52	1	0 0	
Hertford North - Letchworth	15	-58	124	0 70	3	1	
Hertford North - Stansted Airport Hertford North - Welwyn Garden City	17	-19	820	70 72	24	1	
Hertford North - Wixams	23	49	39	0	0	0	
Hitchin - Milton Keynes Central Central	25	-124	1,451	421	45	18	
Hitchin - Stansted Airport	21	-101	215	76	4	3	
Letchworth - Milton Keynes Central Central	24	-137	1,201	403	29	17	
Letchworth - St.Albans City	15	-102	2,070	941	34	49	
Letchworth - Stansted Airport	20	-66	166	45	4	2	
Luton - Stansted Airport	26	-139	615	212	18	6	
Luton Airport Park way - Stansted Airport	25	-139	480	171	17	7	
Milton Keynes Central Central - Northampton	16	0	0	0	0	0	
Milton Keynes Central Central - Oxford	26	-13	2,148	215	114	10	
Milton Keynes Central Central - Stevenage	29	-109	2,265	536	87	19	
Oxford - Reading	21	0	0	0	-10	0	
St.Albans City - Stansted Airport	24	-26	51	34	7	1	
St.Albans City - Wixams	27	53	64	0	0	1	
Stansted Airport - Stevenage	18	-112	361	146	7	2	
Stansted Airport - Welwyn Garden City	19	-113	384	151	8	1	
Stevenage - Wixams	16	42	102	0	0	0	

Key:- Very High Priority Conditional Output High Priority Conditional Output Not a required conditional output



Value falls below minimum user benefits threshold Value falls below threshold level (See section 6.1) Value is higher than threshold level

Value is significantly higher than threshold level

#### **F.3**. Journey Times 30 – 60 Minutes

Table F-3 East West Rail Central Section – Conditional Outputs for Passenger Services of 30 to 60 minutes Journey Time using TEMPRO and Local Plan Growth Forecasts for 2031

	Service -	former	יר	Indication of scope for economic				
	Service per indica			benefits				
				bononto				
Journey Pair	Journey Time	Indicative	Indicative	Indicative	Indicative	Indicative		
	(minutes)	Change in	Change in	value of		value of GVA		
		Rail GJT	Passenger	transport	benefits	benefits		
		(Full)	Miles (annual PaxMiles in		(B2B) (000's)	· · · · · · · · · · · · · · · · · · ·		
			000's)	(£000 pa)		(000's)		
Combridge Northomaton	50	404	C 4C4	4 204		64		
Cambridge - Northampton Cambridge - St.Albans City	50 33	<u>-194</u> -101	6,464 5,130	1,381 1,139	28 110	64 42		
Bedford Midland - Peterborough	40	-74	3,167	657	80	22		
Bletchley - Cambridge Cambridge - Oxford	36 60	-185 -194	3,770 2,838	1,059 1,081	8 28	23 17		
Luton - Northampton	46	-97	5,327	566	124	78		
Northampton - Stevenage Northampton - Welwyn Garden City	45 50	-155 -132	4,068 3,597	919 553	31 117	43 36		
Aylesbury - Bedford Midland	30	-13	927	51	16	4		
Aylesbury - Cambridge Aylesbury - Hatfield	54 55	-155 -58	1,815 360	263 24	13 12	5 0		
Aylesbury - Hemel Hempstead	39	-38	144	0	4	0		
Aylesbury - Hertford North	55	-67	371	25	11	0		
Aylesbury - Hitchin Avlesbury - Letchworth	44 43	-129 -159	819 756	143 163	3	6 6		
Aylesbury - Luton	49	-33	986	71	28	5		
Aylesbury - Luton Airport Parkway Aylesbury - Milton Keynes Central Central	50 30	-33 -13	829 1,028	60 179	27 38	6 16		
Aylesbury - Northampton	36	-13	894	62	39	0		
Aylesbury - Oxford	40	-13	698	63	23	5		
Aylesbury - Reading Aylesbury - St.Albans City	49 60	-25 -52	1,541 573	148 24	60 15	10 0		
Aylesbury - Stevenage	48	-117	1,391	200	18	6		
Aylesbury - Watford Junction Aylesbury - Welwyn Garden City	46 53	0 -62	483 943	0 64	<u>32</u> 37	0 0		
Aylesbury - Weiwyn Garden City Aylesbury - Wixams	33	-02	945 44	0	0	0		
Bedford Midland - Harlow Town	31	-139	2,613	719	45	22		
Bedford Midland - Hemel Hempstead Bedford Midland - Leicester	35 49	-13 0	276 0	23 0	6 5	1 0		
Bedford Midland - Oxford	36	-13	1,460	107	55	9		
Bedford Midland - Reading	57	-13	992	86	26	24		
Bedford Midland - St.Albans City Bedford Midland - Stansted Airport	30 32	0 -152	0 312	28 119	2 6	0 2		
Bedford Midland - Watford Junction	42	-13	1,020	66	29	3		
Bletchley - Harlow Town Bletchley - Hatfield	44 38	-121 -123	1,216 868	187 159	23	9 15		
Bletchley - Hertford North	38	-123	838	159	12 10	15 4		
Bletchley - Luton	32	-38	2,290	237	36	16		
Bletchley - Luton Airport Parkway Bletchley - Peterborough	33 53	-38 -150	1,834 1,974	197 367	33 10	15 11		
Bletchley - Reading	44	-13	937	89	21	10		
Bletchley - St.Albans City	43	-53	1,090	82	22	10		
Bletchley - Stansted Airport Bletchley - Stevenage	45 31	-158 -143	164 2,470	<b>37</b> 769	1 41	1 16		
Bletchley - Welwyn Garden City	36	-127	2,215	441	38	13		
Cambridge - Harlow Town	33	0	0	0	0	0		
Cambridge - Hatfield Cambridge - Hemel Hempstead	40 59	0 -81	0 576	0 63	0 32	0 0		
Cambridge - Hertford North	40	-38	1,006	118	18	4		
Cambridge - Ipswich Cambridge - Milton Keynes Central Central	56 34	-13 -111	638 1,489	139 275	22 12	12 5		
Cambridge - Nation Reynes Central Central	49	-2	2,141	286	6	3		
Cambridge - Stevenage	30	0	0	0	0	0		
Cambridge - Welwyn Garden City Harlow Town - Milton Keynes Central Central	38 42	0 -91	0 1,007	0 136	0 40	0 7		
Harlow Town - Northampton	58	-111	831	102	7	4		
Hatfield - Hemel Hempstead	60	0	9	-1	2	0		
Hatfield - Milton Keynes Central Central Hatfield - Northampton	36 52	-75 -127	622 1,407	100 215	17 40	13 36		
Hatfield - Peterborough	59	0	0	0	0	0		
Hemel Hempstead - Hitchin	49 48	-44	214	12 14	5	1		
Hemel Hempstead - Letchworth Hemel Hempstead - Luton	48 54	-57 -37	198 466	14	5 15	1 2		
Hemel Hempstead - Luton Airport Parkway	55	-41	387	18	15	0		
Hemel Hempstead - Northampton Hemel Hempstead - Oxford	41 46	0 -13	0 239	0 15	0 13	0 0		
Hemel Hempstead - Stevenage	53	-36	343	12	10	1		
Hemel Hempstead - Welwyn Garden City	58	-1	289	-3	5	0		
Hemel Hempstead - Wixams Hertford North - Milton Kevnes Central Central	38 36	89 -77	13 637	0 94	0 15	0 3		
Hertford North - Northampton	52	-129	1,384	205	32	10		
Hertford North - Peterborough Hitchin - Northampton	58 41	-42 -168	754 2,580	45 682	17	2 30		
Hitchin - Northampton Hitchin - Oxford	41 51	-168	2,580	082 343	6 6	30 14		
Hitchin - Peterborough	44	0	0	0	0	0		
Hitchin - Watford Junction Ipswich - Norwich	56 46	-12 0	734 0	3 0	13 -2	0 0		
Leicester - Milton Keynes Central Central	60	-6	111	16	48	0		
Leicester - Peterborough Leicester - Wixams	52 52	-13 78	361 103	141 0	<u>48</u> 0	18 0		
Leicester - Wixanis Letchworth - Northampton	40	-181	2,398	579	6	32		
Letchworth - Oxford	50	-184	1,744	370	6	16		
Letchworth - Peterborough Letchworth - Watford Junction	47 55	-38 -43	1,217 686	82 27	26 20	9 0		
Luton - Milton Keynes Central Central	30	-38	2,812	165	91	16		
Luton - Oxford	56	-44	2,717	176	109	22		
Luton - Peterborough Luton Airport Parkway - Milton Keynes Central	60 31	-83 -38	3,318 1,751	389 164	86 81	17 17		
Luton Airport Parkway - Northampton	47	-97	4,313	448	117	80		
Luton Airport Parkway - Oxford Milton Kaynas Central Central - Paterborough	57 51	-44 -92	2,149	138 237	102	25 7		
Milton Keynes Central Central - Peterborough Milton Keynes Central Central - Reading	51 46	-92 -13	1,824 1,541	237 140	80 46	7 32		
Milton Keynes Central Central - St. Albans City	41	-42	840	44	28	6		
Milton Keynes Central Central - Stansted Airport Milton Keynes Central Central - Watford Junction	43 32	-104 0	129 0	70 0	6 1	1 0		
Milton Keynes Central Central - Welwyn Garden City	34	-80	1,723	248	55	11		
Northampton - Oxford	42	-13	840	54	63	0		

	Service pe indic	erformance ators		Indication of scope for economic benefits			
Journey Pair	Journey Time (minutes)	Indicative Change in Rail GJT (Full)	Indicative Change in Passenger Miles (annual	Indicative value of transport user benefits	Indicative value of GVA benefits (B2B) (000's)	benefits	
			PaxMiles in 000's)	(£000 pa)		(000's)	
Cambridge - Northampton	50	-194	6,619	1,414	31	73	
Cambridge - St.Albans City	33	-101	5,315	1,179	154	50	
Bedford Midland - Harlow Town Bedford Midland - Peterborough	31 40	-139 -74	2,890 3,338	795 692	50 105	25 26	
Cambridge - Oxford	60	-194	2,916	1,102	33	18	
Luton - Northampton Luton Airport Parkway - Northampton	46 47	-97 -97	6,249 4,993	664 519	144 136	97 100	
Northampton - Welwyn Garden City	50	-132	3,809	586	109	37	
Aylesbury - Bedford Midland Aylesbury - Cambridge	30 54	-13 -155	885 1,727	49 251	17 15	4 5	
Aylesbury - Hatfield	55	-58	341	23	11	0	
Aylesbury - Hemel Hempstead Aylesbury - Hertford North	39 55	0 -67	143 362	0 24	4 11	0 0	
Aylesbury - Hitchin	44	-129	794	139	3	5	
Aylesbury - Letchworth	43 49	-159	660	142	3	5	
Aylesbury - Luton Aylesbury - Luton Airport Parkway	49 50	-33 -33	1,038 852	75 62	33 31	6 6	
Aylesbury - Milton Keynes Central Central	30	-13	1,062	182	50	19	
Aylesbury - Northampton Avlesbury - Oxford	36 40	-13 -13	872 673	61 61	36 23	0 4	
Aylesbury - Reading	49	-25	1,434	137	54	9	
Aylesbury - St.Albans City Aylesbury - Stevenage	60 48	-52 -117	534 1,270	21 183	17 15	0 5	
Aylesbury - Stevenage Aylesbury - Watford Junction	46	-117	447	0	30	0	
Aylesbury - Welwyn Garden City	53	-62	909	62	34	0	
Aylesbury - Wixams Bedford Midland - Hemel Hempstead	33 35	-13	42 289	0 24	0 7	0 1	
Bedford Midland - Leicester	49	0	0	0	5	0	
Bedford Midland - Oxford Bedford Midland - Reading	36 57	-13 -13	1,513 976	111 85	64 27	10 25	
Bedford Midland - Keading Bedford Midland - St.Albans City	30	0	0	31	3	0	
Bedford Midland - Stansted Airport	32	-152	317	118	10	3	
Bedford Midland - Watford Junction Bletchley - Cambridge	42 36	-13 -185	<b>1,005</b> 3,490	65 980	32 8	3 22	
Bletchley - Harlow Town	44	-121	1,226	189	20	9	
Bletchley - Hatfield Bletchley - Hertford North	38 38	-123 -124	793 791	145 143	11 10	13	
Bletchley - Luton	30	-124	2,361	244	38	4 17	
Bletchley - Luton Airport Parkway	33	-38	1,839	197	35	16	
Bletchley - Peterborough Bletchley - Reading	53 44	-150 -13	1,920 838	356 79	11 18	11 8	
Bletchley - St.Albans City	43	-53	991	76	24	10	
Bletchley - Stansted Airport Bletchlev - Stevenage	45 31	-158 -143	144	32	1 32	1	
Bletchley - Stevenage Bletchley - Welwyn Garden City	31 36	-143 -127	2,155 2,049	671 <b>408</b>	32	13 11	
Cambridge - Harlow Town	33	0	0	0	0	0	
Cambridge - Hatfield Cambridge - Hemel Hempstead	40 59	0 -81	0 597	0 65	0 35	0 0	
Cambridge - Hertford North	40	-38	1,024	122	22	4	
Cambridge - Ipswich Cambridge - Milton Keynes Central Central	56 34	-13 -111	685	140	30	14 6	
Cambridge - Millon Reynes Central Central	49	-111	1,572 2,270	290 303	19 7	3	
Cambridge - Stevenage	30	0	0	0	0	0	
Cambridge - Welwyn Garden City Harlow Town - Milton Keynes Central Central	38 42	0 -91	0 1,202	0 163	0 52	0 10	
Harlow Town - Northampton	58	-111	972	120	7	5	
Hatfield - Hemel Hempstead	60	0	9	-1	2	0	
Hatfield - Milton Keynes Central Central Hatfield - Northampton	36 52	-75 -127	668 1,448	107 222	23 38	17 35	
Hatfield - Peterborough	59	0	0	0	0	0	
Hemel Hempstead - Hitchin Hemel Hempstead - Letchworth	49 48	-44 -57	228 185	13 13	5 5	1	
Hemel Hempstead - Luton	40 54	-37	555	22	17	2	
Hemel Hempstead - Luton Airport Parkway	55 41	-41 0	456	21	18	0	
Hemel Hempstead - Northampton Hemel Hempstead - Oxford	41 46	-13	0 262	0 16	0 13	0 0	
Hemel Hempstead - Stevenage	53	-36	346	13	9	1	
Hemel Hempstead - Welwyn Garden City Hemel Hempstead - Wixams	58 38	-1 89	315 14	-4 0	5 0	0 0	
Hertford North - Milton Keynes Central Central	36	-77	706	104	22	4	
Hertford North - Northampton	52	-129	1,476	218	34	12	
Hertford North - Peterborough Hitchin - Northampton	58 41	-42 -168	812 2,692	48 712	22 6	2 32	
Hitchin - Oxford	51	-172	1,947	358	7	14	
Hitchin - Peterborough Hitchin - Watford Junction	44 56	0 -12	0	0 3	0	0	
Ipswich - Norwich	46	-12	729 0	0	14 -3	0 0	
Leicester - Milton Keynes Central Central	60	-6	119	17	59	0	
Leicester - Peterborough Leicester - Wixams	52 52	-13 78	376 102	148 0	50 0	20 0	
Letchworth - Northampton	40	-181	2,198	531	5	29	
Letchworth - Oxford Letchworth - Peterborough	50 47	-184 -38	1,576	334	6 29	14 9	
Letchworth - Peterborougn Letchworth - Watford Junction	47 55	-38 -43	1,160 583	78 23	29 18	9 0	
Luton - Milton Keynes Central Central	30	-38	3,384	199	147	24	
Luton - Oxford Luton - Peterborough	56 60	-44 -83	3,224 3,881	209 455	134 119	28 24	
Luton Airport Parkway - Milton Keynes Central	31	-38	2,094	195	131	26	
Luton Airport Parkway - Oxford Milton Kornos Control Control Poterborouch	57 51	-44 -92	2,517	162	127	32	
Milton Keynes Central Central - Peterborough Milton Keynes Central Central - Reading	51 46	-92 -13	2,033 1,641	264 148	126 59	9 38	
Milton Keynes Central Central - St. Albans City	41	-42	951	50	47	9	
Milton Keynes Central Central - Stansted Airport Milton Keynes Central Central - Watford Junction	43 32	-104 0	132 0	70 0	13 1	1 0	
Milton Keynes Central Central - Wattord Junction Milton Keynes Central Central - Welwyn Garden City	34	-80	1,906	274	72	12	
Northampton - Oxford	42	-13	907	58	64	0	
Northampton - St.Albans City Northampton - Stansted Airport	57 59	-77 -139	1,778 85	136 30	54 2	43 0	
		.00		00			

Northampton - St. Albans City	57	-//	1,628	125	45	3
Northampton - Stansted Airport	59	-139	89	32	1	(
Northampton - Watford Junction	48	0	0	0	-7	(
Northampton - Wixams	30	56	132	0	0	1
Oxford - Stevenage	54	-152	2,893	505	13	1
Oxford - Watford Junction	53	-13	808	51	57	(
Oxford - Welwyn Garden City	60	-159	2,592	388	15	e
Oxford - Wixams	39	65	94	0	0	(
Peterborough - Stevenage	49	0	0	0	1	(
Peterborough - Welwyn Garden City	56	0	0	0	0	(
Peterborough - Wixams	43	69	76	0	0	(
Reading - Wixams	60	86	87	0	0	(
Stansted Airport - Wixams	31	57	7	0	0	(
Stevenage - Watford Junction	60	-4	72	-3	37	(
Watford Junction - Wixams	45	115	33	0	0	(

54

63

Northampton - Stansted Airport	59	-139	60	30	2	0
Northampton - Stevenage	45	-155	3,985	900	27	41
Northampton - Watford Junction	48	0	0	0	-7	0
Northampton - Wixams	30	56	137	0	0	
Oxford - Stevenage	54	-152	2,809	490	12	10
Oxford - Watford Junction	53	-13	809	51	57	0
Oxford - Welwyn Garden City	60	-159	2,746	412	15	
Oxford - Wixams	39	65	98	0	0	0
Peterborough - Stevenage	49	0	0	0	1	0
Peterborough - Welwyn Garden City	56	0	0	0	0	
Peterborough - Wixams	43	69	81	0	0	0
Reading - Wixams	60	86	85	0	0	
Stansted Airport - Wixams	31	57	7	0	0	0
Stevenage - Watford Junction	60	-4	66	-3	32	0
Watford Junction - Wixams	45	115	32	0	0	0

Value falls below minimum user benefits threshold

Value falls below threshold level (See section 6.1)

Value is higher than threshold level

Value is significantly higher than threshold level

# Key:- Very High Priority Conditional Output High Priority Conditional Output

Not a required conditional output

# F.4. Journey Times > 60 minutes

 Table F-4
 East West Rail Central Section – Conditional Outputs for Passenger Services longer than 60 minutes Journey Time using TEMPRO and Local Plan Growth Forecasts for 2031

		Service performance indicators		Indication of scope for economic benefits		
Journey Pair	Journey Time (minutes)	Indicative Change in Rail GJT (Full)	Indicative Change in Passenger Miles (annual PaxMiles in 000's)	Indicative value of transport user benefits (£000 pa)	Indicative value of GVA benefits (B2B) (000's)	Indicative value of GVA benefits (Commuting (000's)
Cambridge - Reading	81	-108	2.908	503	108	23
Aylesbury - Harlow Town	61	-54	576	29	20	0
Aylesbury - Ipswich	109	-24	267	4	4	0
Aylesbury - Leicester	79	-53	1,300	96	77	0
Aylesbury - Norwich	122	-77	217	14	6	0
Aylesbury - Peterborough	70	-113	1,215	106	9	0
Aylesbury - Stansted Airport	62	-78	65	11	4	0
Bedford Midland - Ipswich Bedford Midland - Norwich	79 92	-121 -147	718 556	73 60	7	0
Bletchley - Ipswich	92	-113	342	38	11 4	0
Bletchley - Leicester	62	-73	2,768	192	55	23
Bletchley - Norwich	105	-173	349	47	8	0
Cambridge - Leicester	73	-35	265	329	85	19
Cambridge - Norwich	68	0	0	0	0	0
Cambridge - Watford Junction	66	-59	1,778	132	114	0
Harlow Town - Hemel Hempstead	66	0	177	-4	2	0
Harlow Town - Ipswich	89		6	-1	5	0
Harlow Town - Leicester	80	-144	1,927	229	14	10
Harlow Town - Norwich	101	0	22	0	1	0
Harlow Town - Oxford	68	-132	1,506	169	15	8
Harlow Town - Peterborough	62	-92	1,343	194	45	7
Harlow Town - Reading	88	-50	1,438	23	38	11
Harlow Town - Watford Junction	73	0	48	-7	14	0
Hatfield - Ipswich	96	-46	79	8	1	0
Hatfield - Leicester	74	-132	1,171	146	7	21
Hatfield - Norwich	109	-59	146	29	2	0
Hatfield - Oxford	62	-153	977	164	5	19
Hatfield - Reading	82	-55	592	27	24	7
Hatfield - Watford Junction	67	0	102	-15	7	0
Hemel Hempstead - Hertford North	61		64	-5	2	0
Hemel Hempstead - Ipswich	114	0	21	-1	1	0
Hemel Hempstead - Leicester	84	-103	1,229	96	40	7
Hemel Hempstead - Norwich	127	-47	30	7	2	0
Hemel Hempstead - Peterborough	75	-81	357	40	3	0
Hemel Hempstead - Reading	66	-12	436	0	12	0
Hemel Hempstead - St.Albans City	65	-9	111	-43	2	0
Hemel Hempstead - Stansted Airport	67	-21	20	1		0
Hertford North - Ipswich	95	-12	13	0	4	0
Hertford North - Leicester	75	-155	1,278	152	7	4
Hertford North - Norwich	108	-47	37	6		0
Hertford North - Oxford	62	-176	995	169	5	2
Hertford North - Reading	83	-85	921	44	29	4
Hertford North - Watford Junction	68	0	268	-40	6	0
Hitchin - Ipswich	82	-46	213	15	12	0
Hitchin - Leicester	63	-86	2,144	243	50	21
Hitchin - Norwich	94	-43	203	42	16	0
Hitchin - Reading	71	-96	1,656	127	45	13
Ipswich - Leicester	133	-55	84	14	10	0
Ipswich - Letchworth Ipswich - Luton	79 84	-13 -94	241	4	4 9	0 0
Ipswich - Luton Airport Parkway	84	-94	877 744	67 55	8	0
Ipswich - Milton Keynes Central Central	90	-49	131	30	4	0
Ipswich - Northampton	106	-123	596	78	12	0
lpswich - Oxford	116	-114	306	46	14	0
Ipswich - Peterborough	81	-17	163	154	11	0
Ipswich - Reading	137	-21	459	11	8	0
Ipswich - St.Albans City	88	-58	294	7	8	0
Ipswich - Stansted Airport	80	0	10	0		0
Ipswich - Stevenage	86	-32	338	14	23	0
Ipswich - Watford Junction	121	0	70	-10	2	0
Ipswich - Welwyn Garden City	93	-49	386	16	4	0
lpswich - Wixams	80	146	15	0	N/A	0
Leicester - Letchworth	63	-113	2,014	283	59	23
Leicester - Luton	69	-18	90	49	114	0
Leicester - Luton Airport Parkway	70	-2	0	115	5	0
Leicester - Northampton	76	-35	3,324	37	88	18
Leicester - Norwich	133	-13	147	11	7	0
Leicester - Oxford	86	-84	3,220	250	201	16
Leicester - Reading	106	-113	3,662	284	37	0
Leicester - St.Albans City	79	-33	72	23	40	8
Leicester - Stansted Airport	81	-75	365	316	10	1
Leicester - Stevenage	67	-99	3,359	320	142	22
Leicester - Watford Junction	91	-40	80	16	56	0
Leicester - Welwyn Garden City	73	-131	3,258	327	22	15
Letchworth - Norwich	92	-13	28	5	5	0
Letchworth - Reading	71	-109	1,617	142	41	14
Luton - Norwich	97	-137	612	71	17	0
Luton - Reading	77	-53	3,426	159	88	37
Luton - Watford Junction	61	-23	1,575	25	47	0
Luton Airport Parkway - Norwich	97	-120	418	59	16	0
Luton Airport Parkway - Peterborough	61	-83		320	82	20
Luton Airport Parkway - Reading	78	-53	2,750 2,763	129	83	38
Luton Airport Parkway - Watford Junction	62	-21	29	1	42	0
Milton Keynes Central Central - Norwich	103	-104	64	50	11	0
Northampton - Norwich	119	-120	192	49	17	0
Northampton - Peterborough	67	-104	1,417	157	14	0
Northampton - Reading	62	-53	2,033	116	114	0
Norwich - Oxford	129	-172	549	159	24	0
Norwich - Peterborough	81	0	0	0	0	0
Norwich - Reading	149	-87	800	88	18	0
Norwich - St.Albans City	101	-107	144	21	7	0
Norwich - Stansted Airport	93	0	288	1	1	0
Norwich - Stevenage Norwich - Watford Junction	99	-28 -24	127	20	28	0
Norwich - Welwyn Garden City	134 106	-69	73 294	10 22	9 6	0 0
Norwich - Wixams	93	174	13	0	N/A	0
Oxford - Peterborough	76	-175	2,614	348	23	5
Oxford - St.Albans City	66	-53	856	69	32	8
Oxford - Stansted Airport	69	-182	431	116	2	0
Peterborough - Reading	97	-114	2.085	274	19	8

		Service performance indicators		Indication of scope for economic			
Journey Pair	indic			benefits			
	Journey Time (minutes)	Indicative Change in Rail GJT (Full)	Indicative Change in Passenger Miles (annual PaxMiles in 000's)	Indicative value of transport user benefits (£000 pa)	Indicative value of GVA benefits (B2B) (000's)	Indicative value of GV/ benefits (Commuting (000's)	
Aylesbury - Harlow Town	61	-54	600	30	19	0	
Aylesbury - Ipswich	109	-24	256	4	4	0	
Aylesbury - Leicester	79	-53	1,221	91	67	0	
Aylesbury - Norwich	122	-77	226	15	7	0	
Aylesbury - Peterborough	70	-113	1,213	106	10	0	
Aylesbury - Stansted Airport	62	-78	60	10	5	0	
Bedford Midland - Ipswich	79	-121	726	74	9	0	
Bedford Midland - Norwich	92	-147	615	66	14	0	
Bletchley - Ipswich	92	-113	318	35	4	0	
Bletchley - Leicester	62	-73.45	2,490	173	44	19	
Bletchley - Norwich	105	-173	351	47	8	0	
Cambridge - Leicester	73	-35	259	323	86	20	
Cambridge - Norwich	68	0	0	0	0	0	
Cambridge - Reading	81	-108	2,836	488	114	24	
Cambridge - Watford Junction	66	-59	1,714	127	124	0	
Harlow Town - Hemel Hempstead	66	0	211	-5	2	0	
Harlow Town - Ipswich	89		7	-1	6	0	
Harlow Town - Leicester	80	-144	2,122	253	12	10	
Harlow Town - Norwich	101	0	29	0	1	0	
Harlow Town - Oxford	68	-132	1,765	198	15	9	
Harlow Town - Peterborough	62	-92	1,559	224	50	10	
Harlow Town - Reading	88	-50	1,573	25	35	11	
Harlow Town - Watford Junction	73	0	55	-8	13	0	
Hatfield - Ipswich	96	-46	80	8	1	0	
Hatfield - Leicester	74	-132	1,146	143	6	20	
Hatfield - Norwich	109	-59	166	33	2	0	
Hatfield - Oxford	62	-153	1,003	168	5	20	
Hatfield - Reading	82	-55	575	26	21	6	
Hatfield - Watford Junction	67	0	99	-15	7	0	
Hemel Hempstead - Hertford North	61	0	69	-5	2	0	
Hemel Hempstead - Ipswich	114	0	22	-1	36	0	
Hemel Hempstead - Leicester	84	-103	1,269	99		7	
Hemel Hempstead - Norwich	127	-47	36	8	2	0	
Hemel Hempstead - Peterborough	75	-81	391	44	3	0	
Hemel Hempstead - Reading	66 65	-12 -9	453	0 -46	11	0	
Hemel Hempstead - St.Albans City Hemel Hempstead - Stansted Airport	67	-21	118 19	1	3 1	0 0	
Hertford North - Ipswich	95	-12	14	0	5	0	
Hertford North - Leicester	75	-155	1,297	154	7	5	
Hertford North - Norwich	108	-47	43	7	2	0	
Hertford North - Oxford	62	-176	1,062	180		2	
Hertford North - Reading	83	-85	926	45	30	4	
Hertford North - Watford Junction	68	0	271	-40	6	0	
Hitchin - Ipswich	82	-46	218	16	14	0	
Hitchin - Leicester	63	-86	2,143	243	47	20	
Hitchin - Norwich	94	-43	226	47	18	0	
Hitchin - Reading	71	-96	1,644	126	44	13	
Ipswich - Leicester	133	-55	84	14	10	0	
Ipswich - Letchworth	79	-13	219	3	4	0	
Ipswich - Luton	84	-94	1,005	77	12	0	
Ipswich - Luton Airport Parkway	84	-94	834	62	11	0	
Ipswich - Milton Keynes Central Central	90	-49	141	32	6	0	
Ipswich - Northampton	106	-123	623	82	14	0	
Ipswich - Oxford	116	-114	319	48	17	0	
Ipswich - Peterborough	81	-17	171	161	16	0	
Ipswich - Reading	137	-21	452	11	9	0	
Ipswich - St.Albans City	88	-58	300	7	12	0	
Ipswich - Stansted Airport	80	0	10	0	1	0	
Ipswich - Stevenage	86	-32	326	14	24	0	
Ipswich - Watford Junction	121	0	69	-10	3	0	
Ipswich - Welwyn Garden City	93	-49	400	16	4	0	
Ipswich - Wixams	80	146	16	0	N/A	0	
Leicester - Letchworth	63	-113	1,766	248	51	19	
Leicester - Luton	69	-18	100	54	123	0	
Leicester - Luton Airport Parkway	70	-2	<b>0</b>	127	6	0	
Leicester - Northampton	76	-35	3,404	38	77	17	
Leicester - Norwich	133	-13	166	13	7	0	
Leicester - Oxford	86	-84	3,238	253	188	16	
Leicester - Reading	106	-113	3,499	272	32	0	
Leicester - St.Albans City	79	-33	71	23	44	9	
Leicester - Stansted Airport	81	-75	331	282	13	1	
Leicester - Stevenage	67	-99	3, 127	298	115	19	
Leicester - Watford Junction	91	-40	<b>77</b>	16	49	0	
Leicester - Welwyn Garden City	73	-131	3,267	328	19	14	
Letchworth - Norwich	92	-13	27	5	5	0	
Letchworth - Reading	71	-109	1,403	123	37	11	
Luton - Norwich	97	-137	778	90	23	0	
Luton - Reading	77	-53	3,839	176	98	42	
Luton - Watford Junction	61 97	-23	1,773	28	54	0	
Luton Airport Parkway - Norwich Luton Airport Parkway - Peterborough	61	-120 -83	<b>531</b> 3, 180	75 370	21 113	28	
Luton Airport Parkway - Reading	78	-53	<u>3,015</u>	140	93	<u>44</u>	
Luton Airport Parkway - Watford Junction	62	-21	34	1	49	0	
Milton Keynes Central Central - Norwich	103	-104	77	61	16	0	
Northampton - Norwich	119	-120	227	58	19	0	
Northampton - Peterborough	67	-104	1,537	171	16	0	
Northampton - Reading	62	-53	2,054	117	104	0	
Norwich - Oxford	129	-172	653	190	28	0	
Norwich - Peterborough	81	0	0	0	0	0	
Norwich - Reading	149	-87	894	99	19	0	
Norwich - St.Albans City	101	-107	186	27	10	0	
Norwich - Stansted Airport	93	0	304	1	2	0	
Norwich - Stevenage	99	-28	134	21	29	0	
Norwich - Watford Junction	134	-24	85	12	10	0	
Norwich - Welwyn Garden City	106	-69	349	26	7	0	
Norwich - Wixams	93	174	14	0	N/A	0	
Oxford - Peterborough	76	-175	2,838	378	27	5	
Oxford - St.Albans City	66	-53	934	75	41	10	
Oxford - Stansted Airport	69	-182	415	111	3	0	
Peterborough - Reading	97	-114	2.160	282	20	9	

Oxford - Stansted Anport	03	-102	401	110	2	0
Peterborough - Reading	97	-114	2,085	274	19	8
Peterborough - St.Albans City	70	-107	1,795	153	78	8
Peterborough - Stansted Airport	65	-35	1,805	966	4	0
Peterborough - Watford Junction	82	-60	1,329	88	69	0
Reading - St.Albans City	87	-41	1,286	-64	25	0
Reading - Stansted Airport	89	-81	1,335	128	9	
Reading - Stevenage	75	-70	2,610	128	80	20
Reading - Watford Junction	73	-26	3,444	1	101	11
Reading - Welwyn Garden City	81	-59	1,903	55	77	6
St.Albans City - Watford Junction	72	-43	4,758	-376	109	16
Stansted Airport - Watford Junction	74	-1	72	-4	2	0
Watford Junction - Welwyn Garden City	65	0	21	-3	22	0

Oxioiu - Stansteu Alipoit	09	=102	415		3	0
Peterborough - Reading	97	-114	2,160	282	20	9
Peterborough - St. Albans City	70	-107	1,963	168	112	10
Peterborough - Stansted Airport	65	-35	1,780	953	7	0
Peterborough - Watford Junction	82	-60	1,374	91	77	0
Reading - St.Albans City	87	-41	1,286	-69	30	0
Reading - Stansted Airport	89	-81	1,205	115	12	
Reading - Stevenage	75	-70	2,406	118	67	17
Reading - Watford Junction	73	-26	3,241	1	91	11
Reading - Welwyn Garden City	81	-59	1,898	55	69	6
St.Albans City - Watford Junction	72	-43	4,853	-384	132	17
Stansted Airport - Watford Junction	74	-1	62	-4	3	0
Watford Junction - Welwyn Garden City	65	0	21	-3	20	0

Key:- Very High Priority Conditional Output High Priority Conditional Output Not a required conditional output



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