M25 South West Quadrant Strategic Study

Evidence Report

Department for Transport

highways england

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Glossary

Term	Meaning
AC	Anticlockwise direction of traffic flow on M25
AONB	Area of Outstanding Natural Beauty
AQMA	Air Quality Management Area
BAP	Biodiversity Action Plan
BML	Brighton Mainline
bn	billion
BRES	Business Register and Employment Survey
Casualty collision	Road collision resulting in injuries to people, either slight, serious or fatal
CCTV	Closed circuit television
CO2	Carbon Dioxide
CP	Control Period, a term used by Network Rail to describe five-year financial and planning periods. CP covers 2014/15 to 2018/19 and CP6 covers 2019/20 to 2023/24
CW	Clockwise direction of traffic flow on M25
Defra	Department of Environment, Food and Rural Affairs
DfT	Department for Transport, the sponsor of the M25SWQ Strategic Study
EAST	Early Assessment and Sifting Tool published by the Department for Transport to identify potential impacts of transport interventions and schemes
EB	Eastbound direction of travel
END	Environmental Noise Directive
EU	European Union
FTE	Full Time Equivalent – used to convert part time jobs to full time jobs to allow like for like comparisons of employment creation
GDP	Gross Domestic Product
GPS	Global Positioning System
GVA	Gross Value Added - a measure of gross income from sales to businesses in an area
GWML	Great Western Mainline, the railway from London to Reading, Bristol, Wales, Oxford and the West Country
HLOS	High Level Output Specification
IEP	Intercity Express Programme
J	Junction/s
KSI	Killed & Seriously Injured
LB	London Borough
LEP	Local Enterprise Partnership
LGV	Light Goods Vehicle
LQ	Location Quotient – a measure of the density of jobs of a specific type in a given area relative to the national average density of those jobs

Term	Meaning
LSOA	Lower Layer Super Output Area - A geography for the collection and publication of small area statistics, smaller in scale and population than wards
LU	London Underground
MSOA	Middle Layer Super Output Area
NB	Northbound direction of travel
NCA	National Character Area
NIA	Noise Important Area
NNR	National Nature Reserve
NO_2	Nitrogen Dioxide
NOx	Oxides of Nitrogen
NPPF	National Planning Policy Framework
NPS	National Policy Statement
NPSE	Noise Policy Statement for England
NRTF	National Road Traffic Forecast
NSIP	Nationally Significant Infrastructure Project
NTM	National Transport Model
origins and destinations	The start point and end point of a trip
ORBIT	London Orbital Multi-Modal Study
PiXC	Passengers in Excess of Capacity
PM10	Particulate matter with a diameter smaller than 10 microns
Ramsar	The Ramsar Convention on Wetlands is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.
RIS	Road Investment Strategy
SAC	Special Area of Conservation
SAM	Scheduled Ancient Monument
Satnav	Satellite Navigation system
SB	Southbound direction of travel
SEP	Strategic Economic Plan, prepared by each LEP
Smart Motorways	A term used by Highways England to describe the different designs of actively controlled motorways. These motorways use technology to convert the hard shoulder into an additional, controlled running lane
SOBC	Strategic Outline Business Case – a document produced to capture the early assessment work supporting a specific transport intervention
SPA	Special Protection Area
SPZ	Source Protection Zone
SRG	Stakeholder Reference Group
SRN	Strategic Road Network, the motorways and trunk roads in England maintained and operated by Highways England
SSSI	Site of Special Scientific Interest
SWML	South West Mainline

Term	Meaning
SWQ	South West Quadrant, the section of M25 between and including Junction 10 (A3) and J16 (M40) and its connecting motorway and trunk road spur approaches.
T	Terminal
TERN	Trans-European Road Network
TfL	Transport for London
tph	Trains per hour
TrafficMaster	A source of GPS data showing vehicle movements in the highway network
Vehicle Hours Delay	Vehicle Hours Delay is an estimate of the total travel time experienced by all road users over and above the expected theoretical free-flow travel time. Data analysed: April 2012 – March 2013
	Variable Message Sign
VMS	Volatile Organic Compounds
VOC	Westbound direction of travel
WB	West Coast Mainline
WCML	Highways England's Web-based Traffic Information System, containing average journey time, speed and traffic flow information
WebTRIS	Variable Message Sign
WB	Westbound direction of travel
WCML	West Coast Mainline
WebTRIS	Highways England's Web-based Traffic Information System, containing average journey time, speed and traffic flow information

0 Executive Summary

0.1 Introduction

0.1.1 The M25 South West Quadrant between Junction 10 and Junction 16 (A3 and M40) (M25SWQ) is the busiest section of road in the country. Since 2004, the stretch between Junction 11 and Junction 12 has grown from carrying 158,000 vehicles a day to over 187,000; and the busiest parts now carry over 220,000. Nine of the ten busiest sections of the Strategic Road Network are in this area, and severe congestion is a regular occurrence, often extending well beyond the morning and evening peaks with an absence of viable alternative routes.

0.1.2 Existing infrastructure is now reaching fundamental engineering limits with opportunities for increasing capacity of this section of the M25 through smart motorway technology, hard shoulder running and improved incident management procedures being, or about to be, fully exploited.

0.2 Policy context

0.2.1 Driving up productivity is a key facet of Government economic policy to drive growth in the UK. This will be done by encouraging investment in economic capital, including infrastructure, skills, and knowledge and by promoting a dynamic economy that encourages innovation and helps resources flow to their most productive use.

0.2.2 Transport policy, which is set by the Department for Transport, sets out a vision whereby Government is investing to make journeys simpler, faster and more reliable. The policy further supports jobs, enables business growth, and brings the country closer together.

0.2.3 National planning policy is in favour of sustainable development which supports economic, social, and environmental dimensions. In particular this framework places an emphasis on good design which makes places better for people and avoids significant adverse effects on health and/or quality of life.

0.2.4 Both road and rail industry investment strategies support investment in networks which improve access to and around cities, facilitate commuter travel into urban centres, and balance routes by improving radial and orbital connectivity.

0.2.5 These aspirations are balanced against elements of environmental policy – particularly that which relates to air and noise pollution. The UK must comply with European Union Directives on pollutants and noise levels, and new developments must consider the impacts which may be had on existing Air Quality Management Areas and Noise Important Areas, both of which exist within the study area.

0.3 Previous studies

0.3.1 A number of studies have already been undertaken in the M25SWQ and wider area, including the London Orbital Multi-Modal Study, M25 SWQ National Network Study and Airports Commission Final Report. These identify a range of issues in the study area that may contribute to the traffic problems seen on the M25, including a lack of alternative orbital roads or public transport routes or services, inadequate public transport to airports (particularly from directions other than London), and overcrowding on rail services (particularly on services into London). Further analysis

demonstrates that journeys made on the M25 in peak periods cannot be easily made by the current public transport system.

0.3.2 These transport concerns are compounded by societal changes which have seen an increase in dependence on the car and dispersed car commuting. Further changes in society include households choosing to locate where housing is relatively cheaper, but possibly distant from jobs, on the basis that the Strategic Road Network is generally good. People are also prioritising living close to family or friends, or particular schools.

0.3.3 Another characteristic of the study area are a number of employment centres which have employees undertaking longer than average commuting journeys, in part to fulfil an extremely imbalanced ratio of jobs to workers in central London, Crawley, and Reading.

0.3.4 The Airports Commission considered the need for additional runway capacity in the south east of England, identifying potentially viable options at Heathrow and Gatwick, and Government has announced its preference for a new north-west runway at Heathrow Airport. The draft Airports NPS was published for consultation in February 2017, setting out the requirements that the applicant will need to meet to gain development consent for it. A key theme to emerge from the Commission's analysis is the extent of the challenge which will be faced as a result of the background demand growth from commuters, intercity travellers and freight in London and the south east.

0.3.5 These previous studies identify that many of the key road and rail links in the region are expected to be at or close to capacity by 2030.

0.4 Economic conditions

0.4.1 The M25SWQ is a nationally significant piece of infrastructure in terms of the role it plays in connecting many parts of the UK with Heathrow, Gatwick, and key Channel and East Anglian ports. It further plays a significant role in connecting people with jobs, leisure, and cultural venues – all of which make an important contribution to the UK economy.

0.4.2 The study area is economically prosperous with a strong, highly skilled labour market. There are high employment rates, very low levels of unemployment, and low levels of economic inactivity compared to the national average.

0.4.3 There tends to be above average Gross Value Added per hour worked with all six Local Economic Partnerships in the study area ranked in the top ten (out of 39) in the UK. Workplace salaries are also higher than the national average with the study area containing 6 of the top 7 Local Enterprise Partnerships in the UK for average salary.

0.4.4 There are a number of employment clusters in the wider study area, in particular in the information and communication and professional, scientific, and technical sectors. The former accounts for around 183,000 jobs – double the proportion of people employed in the sector relative to the national average. The latter accounts for the greatest number of jobs within the study area and a disproportionately large share of employment relative to the national average.

0.4.5 The area is characterised by complex and diffuse commuting patterns between key employment centres, although the majority (>70%) of commuters in the study area both live and work there. According to the 2011 census the majority of commuters

(1.3m) in the study area both live and work there. A further 510,000 residents commute to locations outside the study area and 397,000 commute in – making the area a net exporter of 113,000 employees. Of those commuting out of the study area substantial numbers commute to central London (307,000).

0.4.6 Employment tends to be concentrated in a small number of employment clusters, the most significant of which is Heathrow. Heathrow is the UK's biggest air freight and passenger airport, carrying 65% of air freight tonnage and 34% of air passenger movements respectively. It directly employs 69,700 on site, 7,000 off-site, and a further 40,000 Full Time Equivalent (FTE) jobs through its supply chain.

0.4.7 The employment at, and related to, Heathrow gives rise to significant travel demand and road freight movements. 51% of commuting to Heathrow is car based, and 56% of air passenger arrivals are by car (26% as driver; 30% in a taxi or minicab).

0.4.8 All Local Enterprise Partnerships in the study area identify Heathrow as key to developing knowledge based sectors and attracting inward investment, with the hub airport seen as fundamental in influencing the location of headquarters functions and foreign-owned businesses. Indeed the M25SWQ supports a higher proportion of both than the UK average.

0.4.9 The study area contains many urban centres, each with their own complex commuting patterns. This inevitably means the area will rely heavily on car-based commuting, and with forecast increases in housing and employment it is essential that congestion and journey time variability are addressed to sustain the economic vitality of the study area.

0.4.10 With other things being equal, unmitigated congestion on the M25 will in future serve to limit the effective labour market catchment from which businesses can recruit, hence undermining the economy of the study area.

0.5 Existing road network

0.5.1 Analysis demonstrates that the majority (52%) of trips are already on the M25 when they enter the SWQ, and either use one of the study area radials to travel away from London (30%) or towards London (22%). A further 25% of trips enter the M25 on one of the study area radial routes and transfer to another radial route in the same direction.

0.5.2 Less than one fifth of trips (15%) use the M25SWQ for trips which start and finish outside of the M25, by switching between the study area radial routes. Only 6% of trips use the M25SWQ for trips which start and finish inside the M25, and just 2% of trips stay on the M25 for the full length of the SWQ (J10-J16)[1].

0.5.3 The M25SWQ has a high proportion of vehicles (>40%) making journeys over 60 miles (100 km) in length. Less than a third of traffic undertakes journeys of under 30 miles (50 km).

0.5.4 Vehicles travelling anti-clockwise have a wide variety of origins, including the west, the Midlands, the east Midlands, the east, Essex, and trips from within the M25 predominantly on the M40 and M4/A4 corridors. Destinations of these vehicles are dispersed across Surrey, Hampshire, east and west Sussex and Kent.

0.5.5 A similar pattern is observed for traffic travelling in the opposite direction. Heathrow and Gatwick airports and the Channel Tunnel are particularly significant locations.

1 Once the South East Regional Transport Model (SERTM) modelling outputs are available, further evidence will be available to substantiate the traffic data provided.

0.5.6 Traffic volumes are fairly consistent on all weekdays, above 200,000 vehicles per day with an average of just 2% variation between daily traffic flows. Thursday does however typically exhibit the highest daily flows.

0.5.7 In essence, the M25SWQ has a 'peak period' between 06:00 and 18:00. The busiest section is between J14 and J15 in both directions, with average daily traffic flows of approximately 112,000 vehicles in each direction of travel.

0.5.8 In terms of congestion, all sections of the M25SWQ fall within the worst performing 10% of the Strategic Road Network in terms of vehicle hours delay.

0.5.9 At weekends – and in contrast with weekdays – the M25SWQ performs with little or no congestion before 10:00. However, congestion builds later in the day peaking at similar levels to weekdays during the afternoon and early evening.

0.5.10 Lowest average speeds are recorded on Thursdays and Fridays, and the highest average speeds on weekends. The section between junctions 13 and 15 has the slowest average speeds; as low as 29 mph between 17:00 – 18:00 clockwise and 35mph between 16:00 – 18:00 anticlockwise.

0.5.11 Journey times are most variable during the middle part of the day between the traditional morning and afternoon peak periods, and least variable following the traditional afternoon and evening peak periods. Journey times are typically more variable between 06:00 – 08:00 than 08:00 – 09:00, and between 15:00 – 17:00 than 17:00 – 19:00.

0.5.12 Journey times during the peaks are longer due to higher traffic volumes at these times. Analysis demonstrates however, that peak time journeys are more predictable in terms of journey time.

0.5.13 Accident rates (collisions and casualties per billion vehicles kilometres) are higher on the M25SWQ when compared to other motorways, making road safety an important issue to consider. Seventeen of the top 250 collision sites in the UK are located either on the M25SWQ or its approaches. This includes junctio 10 (Wisley) which is ranked 1st nationally with an average of 13 collisions per year, and J13 (Staines) which is ranked 21st nationally with an average of 10 collisions per year.

0.5.14 Delays caused by incidents including collisions are compounded by the high volumes of traffic and the paucity of alternative routes. All parts of the M25SWQ have tactical diversionary routes but these are up to 25 miles (40 km) in length. They are generally only a single lane and do not have Closed Circuit Television or Variable Message Signs to guide diverted traffic. As such, enacting these routes causes a severe impact on local and strategic traffic when trying to accommodate the volume of traffic which normally travels on the M25.

0.5.15 Poor diversionary routes also impact on the availability of the motorway for routine and emergency maintenance. All sections of the M25SWQ are required to be resurfaced in the period to 2020, something which is predicted to have a significant impact on road users.

0.5.16 There are limited parallel routes available, although a complex set of factors may encourage drivers to make use of these routes which run broadly parallel to the M25. This includes the use of satellite navigation systems, previous experience of the M25 and the likelihood (perceived or actual) of delay, travel reports, habitual behaviour, and quality and capacity of the route.

0.5.17 There is no complete parallel route, with only sections of dual carriageway connecting some neighbouring radial routes. Analysis demonstrates that journey times are unreliable on all routes parallel to the M25, and particularly where these routes meet radial routes. In any case, these routes are not of a size or standard to accommodate the traffic the M25 currently caters for. In short there are limited road alternatives to using the M25 in the study area.

0.6 Existing public transport network

0.6.1 The rail network in the study area is some of the densest in the UK and includes some of the most frequent rail services, particularly into London.

0.6.2 One or more central London termini are accessible from almost all stations in the study area, including Blackfriars, Euston, Marylebone, Paddington, Waterloo, Victoria and London Bridge.

0.6.3 TfL's London Underground (LU) network extends into some eastern and northern parts of the study area, with most services feeding into central London.

0.6.4 In 2014/15, rail passenger entries and exits in the study areas totalled 298.5 million, equating to 10.7% of the UK total. Gatwick Airport, Reading, Richmond, Surbiton, Guildford, and Woking ranked in the top 50 most heavily used stations in the UK. This is set against a context of sustained passenger growth of 65% since 2004/5.

0.6.5 Even before future growth can be considered, crowding is already an issue, particularly on peak hour services into and out of central London. Some major arterial routes into Paddington, Waterloo, and Victoria already require an additional 20% capacity now to deal with overcrowding on these routes.

0.6.6 Six of the UK's top 10 most overcrowded train services operate in the study area. All have a passenger load factor in excess of 150%.

0.6.7 Car and cycle parking at rail stations in the study area is highly variable. Some 40% of rail stations have no car parking at all; however nine stations provide more than 500 spaces.

0.6.8 Accessibility by rail and to railway stations is not uniform. Some substantial urban areas are distant from the nearest station including parts of Hillingdon, Hemel Hempstead, and Cranleigh. Similarly there are several key employment sites or major employers which are distant from rail stations or have poor rail connectivity in some directions. For example Heathrow Airport has direct access from central London, but limited orbital or other connections from the north, south, and west.

0.6.9 The ability to make direct journeys by rail is often limited, with many requiring travel into central London to change onto other radial routes. The lack of a complete (or even partial) orbital rail route around London means that trips currently made on the M25 may not be easily transferred.

0.6.10 Travelling by road is faster than rail for the vast majority of example journeys analysed. There are many geographically proximate stations (3 – 6 miles apart) which have journey times by rail of more than 60 minutes.

0.6.11 Bus services in the study area tend to radiate out from, and terminate in, a relatively limited number of hubs, either significant town centres or trip attractors. Bus journeys tend to be short in distance, with average trip lengths being 3.8 miles in London and 5 miles outside London.

0.6.12 Relatively few settlements in the study area are served by coach services; however the UK coach network relies heavily on the SRN and the motorways in the study area. This makes them particularly vulnerable to delays and congestion experienced on the M25.

0.7 Environmental considerations

0.7.1 Approximately 85% of the M25SWQ is designated as an Air Quality Management Area, as well as most of the wider study area to the east of J12 – 16 towards London. Road transport is a key contributor to the poor air quality in the designated AQMAs.

0.7.2 There are several Noise Important Areas within the study area, where the population is likely to be at greater risk of experiencing a significant adverse impact to health and quality of life as a result of their exposure to road traffic noise.

0.7.3 There are 8 Scheduled Ancient Monuments and 81 Listed Buildings within 500m of the M25SWQ alignment. Important cultural venues in the wider study area include the Royal Botanic Gardens at Kew and Windsor Castle.

0.7.4 There are no statutory landscape designations within 1 mile of the M25SWQ although within the wider study area there are two Areas of Outstanding Natural Beauty. Much of the corridor is located within the Metropolitan Greenbelt.

0.7.5 There are a number of internationally designated sites close to the M25SWQ including Special Areas of Conservation, Sites of Special Scientific Interest (SSSI), Special Protection Areas, National Nature Reserves, Ramsar, and UK Biodiversity Action Plan priority habitats.

0.7.6 Due to the proximity of the area to a number of major watercourses, much of the study area is located within Flood Risk Zone 2 or 3 (1 in 100 to 1 in 1000 or greater probability of flooding annually) zone. These are considered by the Environment Agency as having a medium and high risk of flooding respectively.

0.7.7 There are also large areas of Groundwater Special Protection Zones (Zones 1 – 3), indicating high groundwater sensitivity within the study area.

0.7.8 There are no Geological SSSI within 1.25 miles (2km) of the M25SWQ.

0.7.9 There are a number of designations and constraints which any interventions will need to address as their designs evolve. Of these designations and constraints, some are the result of negative impacts associated with traffic whereas others demonstrate that the study area benefits from a number of positive environmental attributes.

1 Introduction

1.1 Introduction

1.1.1 The M25SWQ Strategic Study is one of six sponsored by the Department for Transport (DfT). The requirement for this study is set out in the first Road Investment Strategy (RIS), published in December 2014 (Department for Transport, 2014), which announced a programme of new Strategic Studies to explore options to address some of the largest and most complex challenges faced on the Strategic Road Network (SRN). The results of these high-level studies will inform the development of the next RIS.

1.1.2 As the RIS Investment Plan explains:

'It is time for a far-reaching study that can consider all of the options for transport in this area, taking account of any relevant findings from the Airports Commission. This will need to consider how to make best use of different transport modes and the local road network. It will also need to consider whether it is possible to strengthen or provide alternative routes for traffic to relieve pressure on the M25 itself. The end result needs to be a lasting solution, which can keep people moving for a generation to come.' (Department for Transport, 2015c)

1.2 Problem identification

1.2.1 The M25 between J10 and 16 (A3 and M40) (hereafter referred to as the M25SWQ) is the busiest section of road in the country. Since 2004, traffic on the stretch between J11 and 12 has grown from 158,000 vehicles a day to over 187,000; and the busiest parts now carry over 220,000. Nine of the ten busiest sections of the SRN are in this area, and severe congestion is a regular occurrence, often extending well beyond the morning and evening peaks with an absence of viable alternative routes.

1.2.2 Existing infrastructure is now reaching fundamental engineering limits with opportunities for increasing capacity of this section of the M25 through smart motorway technology, hard shoulder running and improved incident management procedures being, or about to be, fully exploited.

1.3 Study objectives

1.3.1 The strategic aim of the study is to identify and appraise options for improving the performance of the transport network across all modes in and around the M25SWQ, boosting economic growth and prosperity and improving journeys.

1.3.2 More specifically, the identified solutions should:

- Support Government (and regional) aspirations for economic growth;
- Improve the flow of through traffic travelling around the M25 junctions J10 – 16 and local roads in the study area;
- Improve road safety for all, including road users, non-motorised users, road workers, and local residents; and
- Reduce and eliminate where possible adverse environmental impacts, addressing existing;
  - Air Quality Management Areas (AQMAs) and ensure no further air quality issues are created as a result of any selected option; and
  - Noise Important Areas (NIAs) and ensure no further noise issues are created as a result of any selected option.

1.3.3 The study specification sets study objectives as follows:

- Assess and form a preliminary strategic case for improving the transport network (all modes) in the region based on the strategic and economic benefits;
- Define the transport objectives that this on-going study should seek to identify options for;
- Identify a long-list of options which could meet the transport objectives, and undertake a high level assessment of the potential Value for Money (VfM), benefits and impacts of the different options using the Early Assessment and Sifting Tool (EAST);
- Short-list the better options to be carried forward; and
- Prepare a Strategic Outline Business Case (SOBC) for the short-listed options for consideration in development of future RIS.

1.3.4 Within the RIS there are eight performance areas which the outputs of this study will also align with. These are:

- Making the SRN safer;
- Improving user satisfaction;
- Supporting the smooth flow of traffic;
- Encouraging economic growth;
- Delivering better environmental outcomes;
- Helping cyclists, walkers and other vulnerable users of the Network;
- Achieving real efficiency; and
- Keeping the Network in good condition.

1.4 Study tasks

1.4.1 The study objectives set out above are divided into tasks. This report constitutes the submission for Task 1 – Making the high level strategic case for new transport infrastructure and services and setting the transport objectives. Following the completion of Task 1 the study will proceed as follows:

- Task 2 – Identification of a long list of transport interventions which aim to meet the RIS Performance Specification objectives within the M25SWQ. Development of an agreed 'sifting' methodology for Stages 3a and 3b;
- Task 3a – Sifting the long list of transport interventions; and
- Task 3b – Detailing the short list of transport interventions identified at Stage 3a.

1.4.2 This report constitutes the evidence base setting out the case for change.

1.5 Defining the study area

1.5.1 The study brief specifies that the M25SWQ corridor is considered to extend up to 15 miles beyond the relevant section of M25. For the purposes of analysis the study area has been extended to include the key adjacent destinations of Reading and Crawley (including Gatwick Airport).

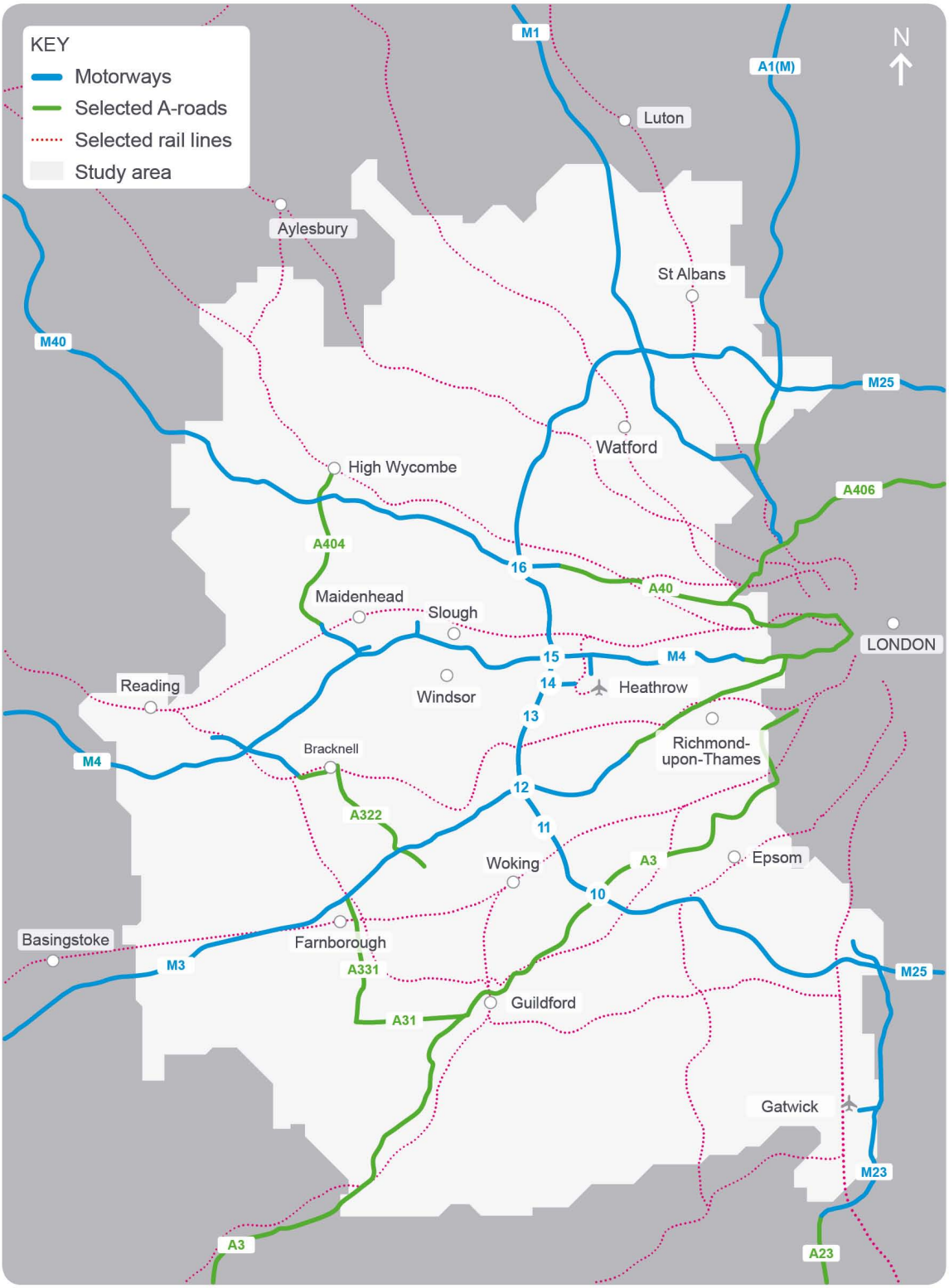
1.5.2 Within London the study area has been reduced in size by removing inner and central London Boroughs (LB) which on the whole tend to have a relatively weak relationship to the M25SWQ. Notwithstanding this, it is recognised that there are some commercial enterprises which do rely on the M25SWQ so these are not completely dismissed from the analysis.

1.5.3 It is also recognised that the M25 caters for a mix of short and long distance journeys, such that many of the origins and destinations lie outside the immediate study area. Journeys from all parts of the UK use it to reach key destinations, including key international airports and ports and economic markets. Reference is made as appropriate through the report to trip origins and destinations outside of the study area as these are key to the understanding of how the M25SWQ is used.

1.5.4 In addition, whilst the focus for the study is the M25SWQ, this is a multi-modal study which considers the ability of a wide range of interventions to meet the study objectives.

1.5.5 In light of the above it is intended to keep the boundary of the study area fairly fluid – to ensure the full impact of the M25SWQ's transport problems are captured – but an indicative boundary can be seen shaded in grey in Figure 1-1.

Figure 1-1: Study area



1.6 The M25

1.6.1 As stated the M25SWQ refers to the section of the M25 between J10 and 16.

1.6.2 Completed in 1986, the M25 is a 117 mile orbital motorway encircling London. The SWQ is the most heavily trafficked section of road in Great Britain and is 19.3 miles in length.

1.6.3 The M25 forms part of the Trans-European Road Network (TERN) forming part of one of the Trans-European Transport Networks. The aim of the TERN, which includes motorways and high quality roads, is to:

- Play an important role in long-distance traffic;
- Bypass main urban centres;
- Provide interaction with other modes of transport; and
- Link landlocked and peripheral regions to central regions of the EU.

1.6.4 A key requirement for routes which are part of the TERN is to guarantee users a high, uniform and continuous level of service, comfort and safety.

1.6.5 The majority of junctions in the M25SWQ provide connections onto other SRN routes as follows:

- The A3 at J10 (Wisley) for Guildford, Portsmouth and south west London;
- The M3 at J12 (Thorpe) for Basingstoke, Southampton and South West London;
- The M4 at J15 (Colnbrook) for Bristol, South Wales, Heathrow Terminals (T) 1-3 and West London; and
- The M40 at J16 (Denham) for Birmingham and West London.

1.6.6 To tackle the congestion associated with the high traffic volumes experienced on the M25SWQ, it has been widened several times since its construction to provide additional running lanes. At present the route is:

- 8 lanes wide (4 lanes each direction) between J10-12 and J15-16;
- 10 lanes wide between J12-14; and
- 12 lanes wide between J14-15.

1.7 Population and workforce

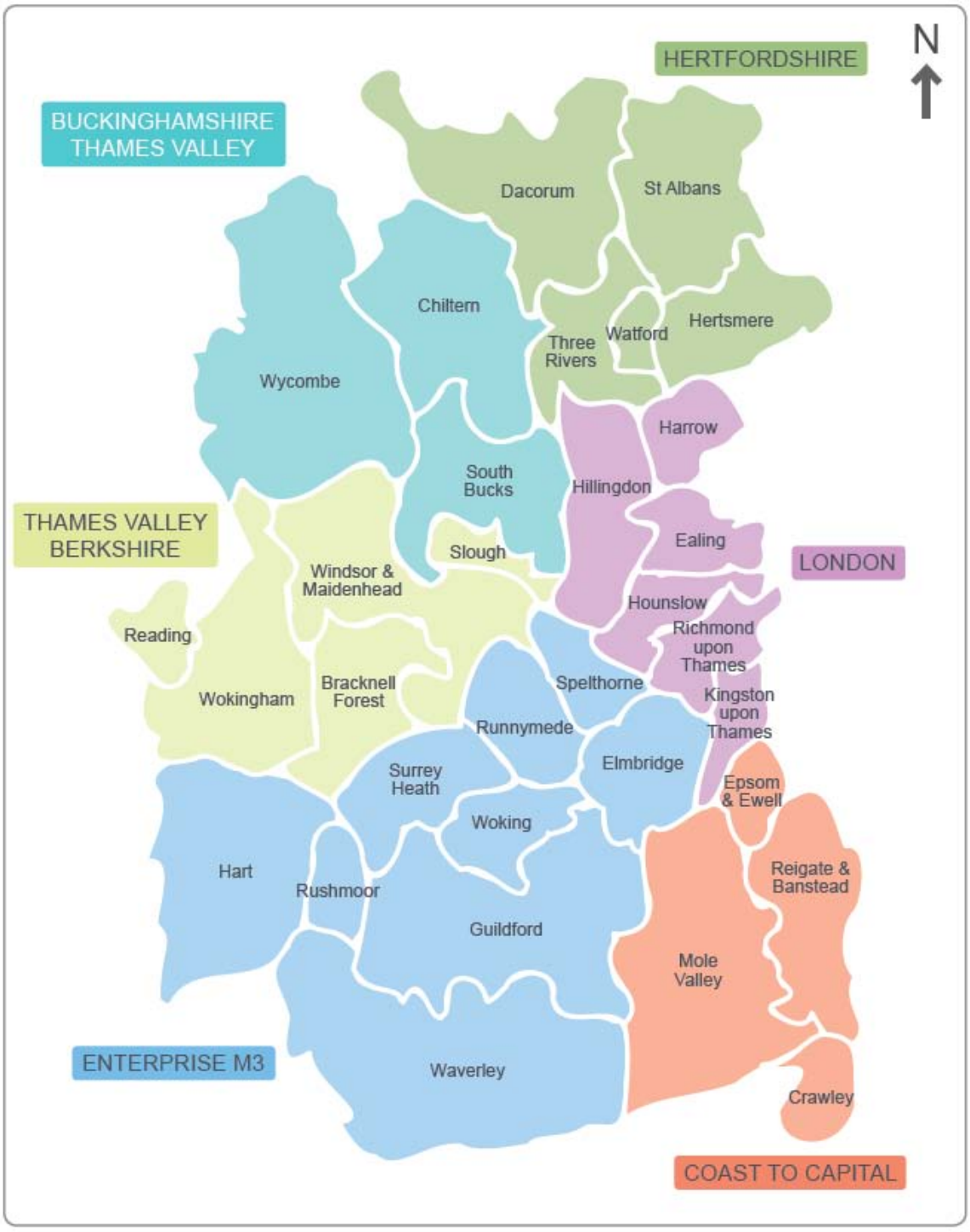
1.7.1 The study area is home to 4.5 million people, approximately 8% of the population of England and Wales, and is approximately 1,500 square miles in area, approximately 2.5% of the land area of England and Wales. The study area is more densely populated than the national average, with just over 3,000 people per square mile, but substantially less crowded than Greater London, which has over 14,000 people per square mile.

1.7.2 The population is unevenly spread across the study area, with the greatest concentration of people east of the M25 and most sparsely populated areas on the Surrey/Sussex borders and on the Chiltern Hills. The 2011 census recorded the study area as having 2.22m residents in employment (Office for National Statistics, 2013).

1.8 Local Enterprise Partnerships

1.8.1 Figure 1-2 shows that the study area covers parts of six different LEPs – Buckinghamshire Thames Valley, Coast to Capital, Enterprise M3, Hertfordshire, London and Thames Valley Buckinghamshire. These have been used for the purposes of analysing key labour market indicators within the study area. The same area includes 32 local planning and 16 local transport authorities.

Figure 1-2: LEPs and local authorities within the study area



1.8.2 The geography of five of the six sub-areas broadly relates to each of the main radial road corridors that interact with the M25, as follows:

- M23/A23 – Coast to Capital;
- M3 – Enterprise M3;
- M4 – Thames Valley Berkshire;
- M40 – Buckinghamshire Thames Valley; and
- M1/A41 – Hertfordshire.

1.8.3 Future growth plans for each of the LEPs are set out in Chapter 7.

1.9 Stakeholders

1.9.1 To inform the project a Stakeholder Reference Group (SRG) has been established to ensure that stakeholder views are understood throughout the study and that they have the opportunity to review and provide feedback on study outputs and outcomes. The SRG includes representatives from local authorities, LEPs and organisations which have an interest in transport-related issues within the study area.

1.10 Report structure

1.10.1 The remainder of this report is structured as follows:

- Chapter 2 Background and Context: summarises the Government policies and strategies for economic growth and transport and highlights the key issues which were documented in previous studies on the SWQ;
- Chapter 3 Existing Economic Conditions: provides an overview of the current economic performance of the study area;
- Chapter 4 Existing Road Conditions: provides an overview of how the M25SWQ, its approaches, and routes parallel to it operate, and reviews road travel patterns in the study area;
- Chapter 5 Existing Public Transport Conditions: describes the availability and use of public transport;
- Chapter 6 Existing Environmental Conditions: provides an overview of the environmental issues within the study area;
- Chapter 7 Future Conditions: identifies future growth scenarios and key emerging economic and transport trends and interprets the likely impacts on the M25SWQ; and
- Chapter 8 Study Objectives: refines the study objectives in light of the evidence.

2 Background and Context

2.1 Introduction

2.1.1 This section sets out the relevant policies for the economy, transport, planning, and environment. It further discusses key reports on the M25 and airport capacity in the study area.

2.2 Economic policy

2.2.1 Government economic policy is set out in Fixing the Foundations, a fifteen point plan for productivity. Growth comes either from more employment, or higher productivity. It has been acknowledged that the UK has a long-term productivity problem, made worse by the financial crisis.

2.2.2 The Government's framework for raising productivity is built around two pillars:

1. Encouraging long-term investment in economic capital, including infrastructure, skills and knowledge; and
2. Promoting a dynamic economy that encourages innovation and helps resources flow to their most productive use.

2.2.3 At a sub-national level economic strategy is guided by the Strategic Economic Plans (SEPs) prepared by each LEP. Detailed analysis of these growth plans is provided in Chapter 7.

2.3 Transport policy

2.3.1 The Government identifies a modern transport system as one of the mechanisms of raising productivity. Transport is also intrinsically linked to many of the other mechanisms of raising productivity, such as facilitating access to employment and enabling trade between nations.

2.3.2 The DfT's Single Departmental Plan identifies the following objectives:

- Boosting economic growth and opportunity: investing in infrastructure, getting the regulatory framework right and supporting the UK transport sector;
- Building a One Nation Britain: rebalancing the economy by building the Northern Powerhouse, investing in the regions, devolving powers and keeping costs down for commuters and making transport accessible to all;
- Improving journeys: rolling out new technology and innovation on our transport networks enhancing and maintaining our transport networks; and
- Safe, secure and sustainable transport: ensuring the safety of people using and working on the transport system, maintaining and improving the security and resilience of the transport system against the full range of threats and hazards, and supporting wider Government objectives to protect the environment and public health.

2.3.3 As the DfT Single Departmental Plan explains:

'Transport is at the heart of the economy, moving people and goods around, connecting homes and businesses…Better transport provides opportunity and increases productivity. It directly reduces the cost to businesses of getting the materials they need and delivering their goods to market. It means people and businesses have greater choice of products, and this competition drives quality up and prices down. Better transport increases the range of jobs people can access, increasing productivity through lower unemployment and a better match between skills and jobs. It increases the positive interactions between businesses that improve skills networks and boost innovation.' (DfT, 2016)

2.3.4 The Plan sets out a vision whereby Government is investing to make journeys simpler, faster and more reliable. The plan further supports jobs, enables business growth, and brings the country closer together.

Road Investment Strategy (RIS)

2.3.5 The RIS covers five financial years 2015/16 to 2019/20 (referred to as the first Road Period). The RIS has four key parts – Strategic Vision, Investment Plan, Statement of Funds Available and Performance Specification. The RIS outlines the state of the SRN today and the challenges being faced and was informed by 18 Route Strategies covering the entire SRN in England. Five key long-term challenges were identified:

- Access around cities, which are anticipated to be the drivers of greatest growth, but which in some cases, particularly London, have serious congestion around their peripheries;
- Connecting outlying areas to the centre of the country, help them better compete in the national and international economy;
- Improving east/west connectivity;
- Balancing radial and ring routes, by improving missing cross-connections between the existing 'spokes' of major roads which tend to radiate out from major cities, to enable more balanced growth across the country; and
- Building a smarter network, with technology innovations to maximise the potential of vehicles and infrastructure.

2.3.6 The Performance Specification sets five outcomes for the strategic road network (SRN):

- A strategic road network which supports and facilitates economic growth;
- A strategic road network which is maintained to a safe and serviceable condition;
- An efficiently and effectively operated strategic road network;
- A strategic road network which minimises its negative impacts on users, local communities and the environment; and
- A strategic road network which balances the needs of individuals and businesses that use and rely on it.

Rail Investment Strategy (Network Rail's High Level Output Specification (HLOS))

2.3.7 The HLOS, published in 2012 (DfT, 2012) sets out the railway that Government wants to see achieved during the period 2014 to 2019 (known as Control Period (CP) 5). It is built around four priorities:

- The creation of an 'electric spine', a high capacity passenger and freight corridor from the South Coast to Yorkshire;
- Increasing capacity and accelerating journey times between key cities through faster trains (Intercity Express Programme (IEP)) and route improvements;
- Facilitating commuter travel into major urban areas, to expand the effective labour market and help people access a wider range of jobs; and
- Improving railway links to major ports and airports, including a new railway link to give western rail access to Heathrow Airport.

2.3.8 The strategy intends to meet the forecasts in passenger growth through the delivery of more efficient and sustainable electric trains. The Government wishes to see a significant increase in the carrying capacity of both the freight and passenger railway and sets the number of passengers arriving into main urban centres during the three-hour morning peak (07:00-10:00) and one hour high peak (08:00-09:00) which the railway should accommodate. Other HLOS elements are the continued safe operation of the railway, setting reliability and cancellation targets, rail industry efficiency and customer value for money, customer satisfaction and environmental performance.

2.3.9 The strategy includes £5.2bn of infrastructure enhancements which have already been committed for CP5 to reduce crowding, cut journey times, increase efficiency and improve the passenger experience including:

- In or close to the study area
  - Thameslink;
  - Crossrail;
  - IEP;
  - East-West Rail (Oxford-Bedford);
  - Electrification of the Great Western Mainline (GWML) to Cardiff, Oxford and Newbury; and
  - Reading Station upgrade.
- Investment elsewhere in the UK
  - West Coast Main Line (WCML) capacity and power supply upgrades;
  - Electrification of the north Transpennine line and lines in the North West Triangle (Liverpool, Manchester and Preston/Blackpool); and
  - Capacity enhancements within Manchester and to Preston, Sheffield and Bradford.

2.3.10 HLOS sets out a number of additional schemes (within or close to the study area) for development during CP5 (2014-2019), including:

- Electric Spine: including Basingstoke-Reading, and East-West Rail core route;
- Thames Valley electrification: including lines to Willesden, Windsor, Marlow and Henley;
- Oxford station capacity and expansion;
- Western Rail Access to Heathrow; and
- Capacity enhancement at Redhill: to augment rail access to Gatwick Airport.

2.3.11 HLOS also allocates ring-fenced funds for improvements to the strategic rail freight network, East Coast Main Line connectivity, passenger journey time improvements, station improvements, addressing level crossing safety and developing schemes for CP6 (2019-2024).

2.4 Planning policy

National Planning Policy Framework (NPPF)

2.4.1 The NPPF, published by the Department for Communities and Local Government in 2012 states that the purpose of the planning system is to help achieve sustainable development and recognises three interlinked dimensions in achieving this; economic, social and environmental. The policies within the framework intend to improve health, social and cultural wellbeing for all, deliver adequate community and cultural facilities and provide services to meet the demand of local people and create a good standard of amenity for all existing and future occupants of land and buildings. Development that takes place under the framework is expected to contribute to the conservation and enhancement of the natural and historic environment as well as prevent development that lead to unacceptable levels of pollution. The framework places emphasis on good design, a key aspect of sustainable development. These designs should contribute to making places better for people and should avoid significant adverse impacts on health and/or quality of life.

Nationally Significant Infrastructure Projects (NSIP)

2.4.2 The Planning Act 2008 (as amended) introduced a new consent process for major infrastructure, referred to as Nationally Significant Infrastructure Projects (NSIPs). The National Policy Statement (NPS) for National Networks (DfT, 2014) sets out the need for (and policies to deliver) the development of NSIPs on the national road and rail networks in England. It provides planning guidance for promoters of these types of NSIPs, and forms the basis for their examination by the Examining Authority and decisions by the Secretary of State.

2.4.3 The National Networks NPS sets out the Government's vision and strategic objectives for the national networks, stating that:

- *'The Government will deliver national networks that meet the country's long-term needs; supporting a prosperous and competitive economy and improving overall quality of life, as part of a wider transport system. This means:*
  - *Networks with the capacity, connectivity and resilience to support national and local economic activity, and facilitate growth and create jobs;*
  - *Networks which support and improve journey quality, reliability and safety;*
  - *Networks which support the delivery of environmental goals and the move to a low carbon economy; and*
  - *Networks which join up our communities and link effectively to each other.'*

2.4.4 The National Networks NPS also recognises that for development to be sustainable it should be designed to minimise social and environmental impacts and improve overall quality of life. It states that developments should be delivered in an environmentally sensitive manner including consideration of opportunities to deliver and provide environmental benefit. Government policy is to address existing environmental problems and improve performance of the network by reconnecting habitats and ecosystems, enhancing the historic and cultural heritage features, respecting and enhancing landscape character, improving water quality and reducing flood risk, avoiding significant adverse effects from noise and vibration and addressing areas of poor air quality.

2.5 Environmental policy

Air quality policy

EU Ambient Air Quality Directive

2.5.1 The EU Ambient Air Quality Directive[2] sets limit values for the concentration of pollutants in air for the protection of health and ecosystems. In contrast to the objectives in the UK Air Quality Strategy, which are policy targets, the limit values in the Directive are legally binding on Member States.

2.5.2 The objectives are set down in UK legislation in the Air Quality (England) Regulations 2000 and the Air Quality (England) (Amendment) Regulations 2002. EU Directives, setting out limit values for air quality, are transcribed into UK legislation in the Air Quality Standards Regulations 2010. For the pollutants of interest (Oxides of Nitrogen (NOx) and particulate matter (PM10)) for assessment within the study, the EU limit

2 EU Directive on ambient air and cleaner air for Europe, 2008/50/EC

values are numerically identical to the UK's air quality objectives. Compliance with limit values is the duty of central government rather than local authorities.

UK Air Quality Strategy

2.5.3 In the UK, the Secretary of State for Environment, Food and Rural Affairs has responsibility for meeting the limit values in England and the Department for Environment, Food and Rural Affairs (Defra) co-ordinates assessment and air quality plans for the UK as a whole.

2.5.4 The UK Government and the devolved administrations are required under the Environment Act 1995 to produce a national air quality strategy. The most recent version of the Air Quality Strategy was published in 2011 and sets out their air quality objectives and the measures selected to achieve the desired improvements in air quality.

National Networks NPS

2.5.5 The National Networks NPS makes extensive reference to air quality and requires all development schemes with the potential to affect air quality to undertake an air quality assessment that describes baseline air quality and future air quality with and without the proposed scheme. Paragraph 5.11 of the National Networks NPS states that:

- *'Air quality considerations are likely to be particularly relevant where schemes are proposed: within or adjacent to Air Quality Management Areas (AQMA); roads identified as being above Limit Values or nature conservation sites (including Natura 2000 sites and SSSIs, including those outside England); and where changes are sufficient to bring about the need for a new AQMAs or change the size of an existing AQMA; or bring about changes to exceedences of the Limit Values, or where they may have the potential to impact on nature conservation sites'* (DfT 2014 pp48-49)

2.5.6 Moreover, the NPS states that the Secretary of State should refuse consent for schemes where:

- *'…after taking into account mitigation, the air quality impacts of the scheme will: result in a zone/agglomeration which is currently reported as being compliant with the Air Quality Directive becoming non-compliant; or affect the ability of a non-compliant area to achieve compliance within the most recent timescales reported to the European Commission at the time of the decision'* (ibid p49)

Local Air Quality Management

2.5.7 One of the main components of the UK Air Quality Strategy is Local Air Quality Management (LAQM). Part IV of the Environment Act 1995 and Part II of the Environment (Northern Ireland) Order 2002 requires local authorities in the UK to review air quality in their area and designate AQMAs if improvements are necessary. Since 1997, all local authorities have been assessing the air quality in their area and, where a problem is found, action plans have been developed to address the situation.

2.5.8 Where an AQMA is designated, local authorities are required to work towards the UK Air Quality Strategy's objectives prescribed in regulations. An air quality action plan describing the pollution reduction measures must then be put in place. These plans contribute to the achievement of air quality limit values at local level.

2.5.9 There are a number of AQMAs which have been designated by local authorities within the study area. These are discussed further within Chapter 6.

Defra's Air Quality Plan for the Achievement of EU Air Quality Limit Values for Nitrogen Dioxide in the UK, 2015

2.5.10 Emissions as a result of road traffic are considered a major threat to clean air. Sources include petrol and diesel-engine motor vehicles which emit a wide variety of pollutants, principally carbon monoxide (CO), NOx, volatile organic compounds and PM10, which have an increasing impact on urban air quality.

2.5.11 Defra has produced a set of air quality plans which together form the Government's plan for reducing nitrogen dioxide (NO_2) emissions as soon as possible were published in December 2015. There are 38 zone plans for the UK, of which there are three most relevant to the study, including the Greater London urban area (UK0001), Reading and Wokingham urban area (UK 0016) and the South East (UK0031). Each of the plans provides information about the zone, including:

- Data on NO_2 collected since 2001, and the source, which arises predominately from road traffic sources;
- Provides details of measures potentially affecting NO_2 within each Zone, which have been undertaken or are planned at a European level, national level, or local administrative level; and
- Provides a projection of future air quality, for 2020, 2025 and 2030 starting from a 2013 reference year.

Noise and vibration policy

Environmental Noise Directive

2.5.12 The Environmental Noise Directive (END) (Directive 2002/49/EC) is focused on the impact of noise on individuals and is designed to complement existing EU legislation which sets standards for noise emissions from specific sources. The Directive requires:

- The determination of exposure to environmental noise, through noise mapping;
- Provision of information on environmental noise and its effects on the public;
- Adoption of action plans, based upon noise mapping results, which should be designed to manage noise issues and effects, including noise reduction if necessary; and
- Preservation of environmental noise quality where it is good.

2.5.13 END has been transposed into English law as the Environmental Noise (England) regulations 2006 (as amended). As part of this process, noise mapping has been undertaken and NIAs have been identified where the 1% of the population who are affected by the highest noise levels are located. The main objective of this process is to identify the areas which require potential action.

2.5.14 A number of NIAs are situated within the study area and are linked to the M25 Corridor. These are discussed further within Chapter 6.

National Planning Policy Framework (NPPF)

2.5.15 NPPF sets out the Government's planning policies for England. It provides a framework within which local people and councils can produce their own Local and Neighbourhood Plans.

2.5.16 The NPPF states that planning policies and decisions should aim to:

- Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;
- Mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of planning conditions;
- Recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established; and
- Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

2.5.17 The NPPF refers to the Noise Policy Statement for England to expand on the definition of adverse impacts.

Noise Policy Statement for England

2.5.18 The Noise Policy Statement for England (NPSE) was produced by Defra in 2010. The vision of the NPSE is to promote good health and good quality of life through the effective management of noise within the context of Government policy on sustainable development. The noise policy aims to:

- Avoid significant adverse impacts on health and quality of life;
- Mitigate and minimise adverse impacts on health and quality of life; and
- Where possible, contribute to the improvement of health and quality of life.

2.5.19 The NPSE identifies whether the overall noise effect will be below the significant and lowest observed adverse effect levels. Significant observed adverse effect level is the level of noise exposure above which adverse effects on health and quality of life can be detected. Lowest observed adverse effect level is the level of noise exposure above which adverse effects on health and quality of life can be detected.

2.6 Previous studies

2.6.1 Three reports particularly relevant to the study are reviewed herein:

- The London Orbital Multi-Modal Study (ORBIT);
- National Networks Study – M25 South West Quadrant; and
- Airports Commission (Davies Report) Final Report.

2.6.2 Information and data from relevant Route Strategy and Route Strategy Evidence Reports, in particular for the London Orbital and Gatwick Airport Route Strategy, have been referred to throughout this document where they provide appropriate evidence.

London Orbital Multi-Modal Study

2.6.3 The London Orbital Multi-Modal Study (ORBIT) commenced in February 2000 and completed in November 2002 (Thompson & Coombe, 2003). In terms of problems the study identified the severe congestion on the M25 and other parts of the road network along with the consequent unpredictability of journeys, and it sought to understand the causes. Analysis by the ORBIT study team found that, in the morning peak period:

- About 50% of traffic was making a journey to work;
- Over 40% of trips using the M25 were more than 60 miles (100km) in length;
- The average length of M25 used was relatively short (40% of vehicles travel 1 or 2 junctions only);
- Average rates of car occupancy were low (1.15 people per car); and
- Origins and destinations are widely dispersed – 40% had both trip ends outside the M25 and 20% had both trip ends inside the M25.

2.6.4 Other key issues comprised the lack of alternative orbital roads, the absence of orbital public transport routes or services, inadequate public transport to airports, especially from directions other than London and overcrowding on rail lines and services, especially into London. Analysis indicated that journeys made on the M25 at peak periods cannot easily be made by the current public transport system.

2.6.5 Alongside issues relating to the transport network itself, issues were identified relating to the environment (noise and air pollution experienced by communities near main roads), the planning system (permitting developments generating significant trips in the M25 corridor) and historic attempts to keep pace with demand for road travel with additional road space. Finally the relationship between certain changes in society (greater dependence on the car and dispersed car commuting) and the problems on the M25 were explored. The study team attributed these changes to a range of factors, be they:

- Economic
  - Making decisions about home and work locations on the basis of a generally good motorway and trunk road system outside London, and real term changes in prices of fuel and cars;
  - Households choosing to locate where housing is relatively more affordable, which may be distant from jobs;
  - Households choosing home locations which give flexibility of access to different employment locations in the context of reduced job security;
  - Households with two incomes choosing home locations which enable commuting to different employment centres, one or other which may be some distance away; and
  - Responding to the out-of-centre location of employment, retail and leisure developments.
- Social
  - Prioritising living close to friends and family or proximity to preferred schools.

- Environmental
  - Prioritising quality of life when determining places to live.

2.6.6 The ORBIT study recommends the following measures to improve, to an extent, travel times and reliability on the M25 in the short to medium term:

- Best practice traffic management to ensure best use is made of the M25;
- Ways of reducing traffic levels on the existing motorways, from 'soft' or 'mobility management' measures to area-wide road charging;
- Alternatives to travel by car on the M25, principally through improvements to public transport;
- Increases in the capacity of the M25, but only to a level consistent with optimum area-wide road user charging, and with methods for managing demand;
- Methods of managing the use of the increased main road capacity to control induced traffic – physical measures on the widened sections, physical measures plus tolls on the widened sections, motorway tolls on the widened sections, and area-wide road user charging; and
- Provision for freight.

2.6.7 For the strategy for **2002 to 2011**, the ORBIT study recommended the following actions:

- Commencement of a feasibility study for area wide road user charging;
- Improvements to the management of incidents to minimise the closure of traffic lanes;
- Monitoring of the effectiveness of 'soft' or 'mobility management' measures to reduce the rate of traffic growth and traffic levels;
- A combination of integral demand management measures and road improvements including the widening of sections of the M25 (not including sections of the M25SWQ);
- A review of the controls on land use development adjacent to the trunk road and motorway network; and
- Improvements to public transport.

2.6.8 The ORBIT Study recommended the following actions for the strategy for **2011 to 2021**:

- Area wide road user charging to be implemented as soon as possible in this time period; and
- Developing the public transport system to cater for restrained car movements utilising the revenue from the road user charging.

2.6.9 The study further states the intention of these demand management measures is to:

- *'de-couple traffic growth from economic growth at least to some extent, by increasing the charges and thereby reducing the extra capacity required… In the case without area-wide road user charging, if no further road capacity is provided, congestion will increase as traffic grows in response to continued economic growth. Without any other action, the increasing congestion is likely to inhibit economic growth.'* (Thompson & Coombe, 2003), pp. 364-365.

National Networks Study – M25 South West Quadrant

2.6.10 The M25SWQ National Networks Study (Atkins, 2010) investigated transport issues on the section of motorway between J9 (Leatherhead) and J16 (M40) and within the study area (defined as Surrey, East Berkshire, Wycombe and South Bucks districts). The study identified the following key characteristics:

- Average commuting lengths on the M25 were 30 miles (50km);
- 60% of commuting trips on the M25 were more than 25 miles (40km) and are significantly longer than in the study area as a whole (where 8-12% of commuting trips were 25 miles (40km) or more);
- Key employment centres in the study area had employees undertaking longer distance commuting journeys than the average;
- The ratio of jobs to workers is extremely imbalanced in central London, Crawley and Reading, leading to longer commuting to enable these areas to fill their employment; and
- The National Transport Model indicated that the predominant use of the M25 is by trips which start and end outside the M25, with fewer crossing the M25 and fewer still which start and end inside the M25.

2.6.11 Traffic models forecast that:

- 32% of traffic on the M25SWQ had both trip ends within the study area and 19% of traffic has neither origin or destination in the study area;
- 70% of trips on the M25SWQ travelling for business purposes had an origin, destination or both in the study area; and
- 85% of trips in the AM peak hour are for commuting business or freight, falling to 40% of trips between the peak hours.

2.6.12 The study identified that pressure on the transport system in the SWQ area including the M25SWQ is at risk of constraining future economic growth in the area. It also identified the challenge of supporting the economic competitiveness of the area whilst managing the negative impacts of the current travel demands.

2.6.13 To address these challenges the study recommended a combination of transport and non-transport interventions.

2.6.14 In addition to supply management and demand management the transport interventions which were recommended include the following (some of which are now in the process of being delivered or are committed):

- Crossrail to Reading;
- Rail connection to Heathrow from south and west;
- Slough ‘regional transport hub’ major scheme concept;
- Thames Valley express bus and coach network;
- Enhanced inter-urban rail services along orbital routes; and
- Public transport improvements in Guildford, Woking, Reigate and Redhill and Crawley/Gatwick.

2.6.15 Further to the above, the study recommended the following new highway infrastructure:

- Widening at M25 J11 and 15;
- Managed Motorways on the M25 between J11 and 12 and J15 and 16; and
- Improvement to operation of Junctions 9 to 16, on spurs (M40, M4 and M3) and the local road network that interacts with M25 traffic.

2.6.16 The following non-transport interventions to influence travel choices and behaviours were recommended:

- Measures promoting additional affordable housing in local districts;
- Measures addressing skills gaps in the Thames Valley – Berkshire and the Gatwick Diamond;
- Release of additional employment and housing land;
- Locating new services at economic activity hubs on the basis of sustainable access; and
- Rollout of high-speed broadband and more flexible working.

Airport Capacity in South East England

2.6.17 The Airports Commission (the Davies Commission) was set up by the Government in 2012 to provide an independent, evidenced discussion around the need for additional runway capacity in the south east of England.

2.6.18 The Interim Report shortlisted three preferred options:

- Heathrow Extended Northern Runway
- Heathrow Northwest Runway
- Gatwick Second Runway

2.6.19 Each scheme promoter submitted a transport strategy outlining the forecast demands and requirements. The Commission subsequently engaged independent transport consultants to undertake a high-level independent assessment of each scheme's transport evidence.

2.6.20 In short, the core baseline comprises the current road and rail transport networks together with a number of future road and rail schemes which are already funded and committed; while the extended baseline contains an indicative package of additional investment which broadly reflects the level of on-going intervention needed to accommodate background demand in the absence of any airport expansion.

2.6.21 A high-level assessment of each scheme for future year scenarios was undertaken using a combination of bespoke spread sheet analysis and existing Transport for London (TfL) localised assignment models.

2.6.22 A key theme to emerge from both the Commission's analysis and the responses to consultation is the extent of the challenge that arises as a result of background demand growth from commuters, intercity travellers and freight in London and the South East.

2.6.23 On 25 October 2016, the Government announced its preference for a new northwest runway at Heathrow Airport. The draft Airports NPS was published for consultation in February 2017, outlining the need for additional capacity, why government believes this is best met by a north-west runway at Heathrow Airport, and the requirements that the applicant would need to meet to gain development consent for it.

2.6.24 The location of the third runway is expected to cross the alignment of the M25 between J14 and 15. Construction is not likely to begin until 2020 or 2021. A third runway at Heathrow is expected to generate tens of thousands additional jobs by 2030 (DfT, 2016a).

2.6.25 Many key road and rail links in the region are expected to be close to capacity by 2030, even assuming the delivery of the Commission's extended baseline scenario. Although all three preferred airport expansion options were forecast to have only a modest impact on congestion on most routes, the scale of the growth in background demand means that these impacts cannot be discounted.

2.7 Key findings – Policy context

2.7.1 Driving up productivity is a key facet of Government economic policy. This in turn will drive growth in the UK. This will be done by encouraging investment in economic capital, including infrastructure, skills, and knowledge and by promoting a dynamic economy that encourages innovation and helps resources flow to their most productive use.

2.7.2 A further facet of this policy is to create a modern transport system which is intrinsically linked to mechanisms of raising productivity such as facilitating access to employment and enabling trade between nations.

2.7.3 Transport policy, which is delivered by the DfT, sets out a vision whereby Government is investing to make journeys simpler, faster and more reliable. The plan further supports jobs, enables business growth, and brings the country closer together.

2.7.4 National planning policy is in favour of sustainable development which supports economic, social, and environmental dimensions. In particular this framework places an emphasis on good design which makes places better for people and avoids significant adverse effects on health and/or quality of life.

2.7.5 Both road and rail industry investment strategies support investment in networks which improve access to and around cities, facilitate commuter travel into urban centres, and balance routes by improving radial and orbital connectivity.

2.7.6 These aspirations are balanced against elements of environmental policy – particularly that which relates to air and noise pollution. The UK must comply with EU Directives on pollutants (NOx, PM10) and noise levels, and new developments must consider the impacts which may be had on existing AQMAs and NIAs, both of which exist within the study area.

2.8 Key findings – Previous studies

2.8.1 A number of studies have already been undertaken in the M25SWQ and wider area. These identify a number of issues in the study area which may contribute to the issues seen on the M25. This includes a lack of alternative orbital roads or public transport routes or services, inadequate public transport to airports (particularly from directions other than London), and overcrowding on rail services (particularly on services into London). Further analysis demonstrates that journeys made on the M25 in peak periods cannot be easily made by the current public transport system.

2.8.2 These transport concerns are compounded by societal changes which have seen an increase in dependence on the car and dispersed car commuting. Further changes in society include households choosing to locate where housing is relatively cheaper, but possibly distant from jobs, on the basis that the SRN is generally good. People are also prioritising living close to family or friends, or particular schools, all of which may be remote from employment opportunities.

2.8.3 Another characteristic of the study area are a number of employment centres which have employees undertaking longer than average commuting journeys, in part to fulfil an extremely imbalanced ratio of jobs to workers in central London, Crawley, and Reading.

2.8.4 The Airports Commission reported on the need for additional runway capacity in the south east of England, identifying potentially viable options at Heathrow and Gatwick, and Government has announced its preference for a third runway at Heathrow Airport. The draft Airports NPS has been published for consultation in February 2017 and this outlines the requirements that the applicant will need to meet to gain development consent for it. A key theme to emerge from the Commission's analysis is the extent of the challenge which will be faced as a result of the background demand growth from commuters, intercity travellers and freight in London and the south east.

2.8.5 All studies identify that many of the key road and rail links in the region are expected to be at or close to capacity by 2030.

3 Existing Economic Conditions

3.1 Introduction

3.1.1 The section presents evidence about the local economy discussing its performance relative to other regions in the UK and considering employment rates, incomes and the economic sectors which are present in the Study Area.

3.2 Economic performance and activity

Employment

3.2.1 Analysis demonstrates that the study area has a strong labour market, with high employment rates in comparison to the UK national average. In general the outer London Boroughs trend towards the national average (e.g. Harrow, Hillingdon, Hounslow), as do larger urban authorities (Guildford, Slough). The only districts with employment rates below the national average are Reading (where there is localised deprivation, and a large student population), Ealing (reflecting patterns prevalent in London), and Hertsmere (which is south Hertfordshire but shares characteristics with outer-London Boroughs).

3.2.2 Elsewhere most authorities have employment rates well above the national average. Within Rushmoor and Watford, employment rates are in excess of 10% above the national average, partly explained by the presence of large employment hubs and head offices in these areas.

Unemployment

3.2.3 The study area demonstrates very low levels of unemployment relative to the UK national average. Low unemployment rates are especially prevalent in the predominately rural local authorities in Surrey and Berkshire – unemployment within Hart district and Epsom and Ewell borough, for example, is less than half the national average of 5.5%.

3.2.4 Higher levels of unemployment are concentrated in the outer London Boroughs of Ealing, Hillingdon and Hounslow, together with the larger urban centres outside of London, such as Reading and Crawley, and Hertsmere on the fringe of outer north London (which includes the towns of Potters Bar, Radlett and Borehamwood). This is indicative of a weaker labour market, which reflects historic patterns of economic development in these respective areas.

Economic inactivity

3.2.5 Economic inactivity is a measure of gauging the overall activity and strength of a labour market in an area, and is defined by the Office for National Statistics (ONS) as *'people not in employment who have not been seeking work within the last 4 weeks and/or are unable to start work within the next 2 weeks'*. This includes students, the long-term sick, those looking after family and those who have taken early retirement; those who are directly seeking work are not included.

3.2.6 Within the study area few people have withdrawn from the labour market relative to the national average. Notably, the few districts within the study area with above-average economic inactivity rates are likely to be a result of a high student population

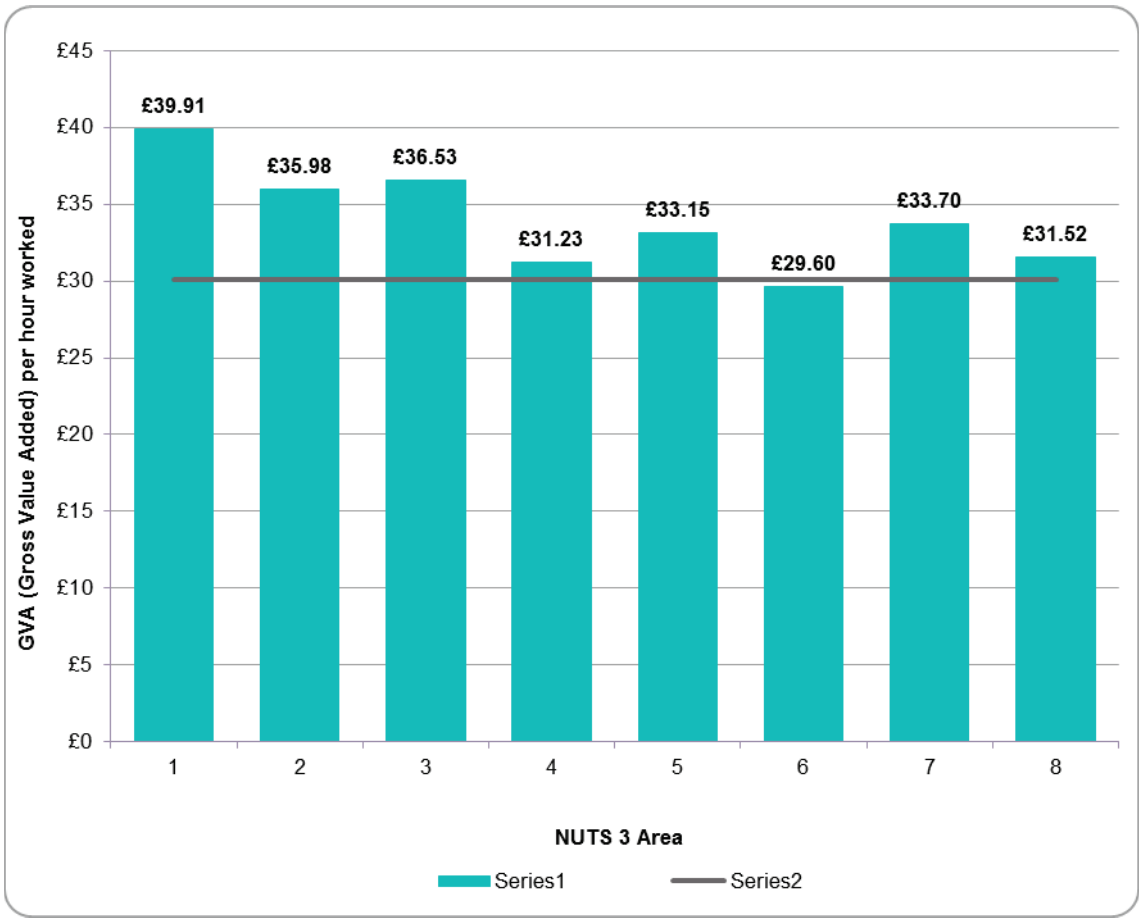
(such as the University of Reading and the University of Surrey in Guildford), and the prevalence of early retirees who are no longer in employment through their own choice, but are still of working age.

Productivity

3.2.7 Gross Value Added (GVA) provides an indicator of the contribution of an area to an economy. This data is only available at EU NUTS3[3] which is broadly County level in the UK.

3.2.8 Figure 3-1 shows the GVA per hour worked within the eight NUTS3 areas which are partly or wholly in the study area.

Figure 3-1: GVA per hours worked by sub-region[4]



3.2.9 This shows that the study area tends to be above the national average for value added per hour worked and is therefore home to strong, dynamic economies.

3 EU NUTS3 – European Union Nomenclature of territorial units for statistics

4 The CC refers to the County Council area within the Study Area where reporting the whole LEP result would be misleading, for example Enterprise M3 includes Southampton and Portsmouth which lie outside the Study Area.

3.3 Economic indicators by Local Enterprise Partnership

Key economic indicators

3.3.1 Table 3-1 shows a selection of the economic indicators which demonstrate the strength of the LEPs in the study area relative to those in the rest of England.

Table 3-1: Selected economic indicators by LEP

Economic Indicator	GVA (per head)		GVA growth (1997-2012)		Median workplace annual salary		Enterprises per 1,000 residents	
		*Rank**		*Rank*		*Rank*		*Rank*
TV Berkshire	£35,000	2	4.2%	12	£33,250	2	48	5
Bucks TV	£24,100	9	4%	17	£29,200	4	57	1
Coast to Capital	£24,900	4	4.2%	9	£28,200	7	42	10
Enterprise M3	£25,300	3	4.5%	3	£30,100	3	52	3
London LEP	£37,200	1	5.1%	1	£36,500	1	53	2
Hertfordshire	£24,200	8	3.9%	20	£28,800	5	30	35

* Note: Rank represents UK Ranking out of the 39 LEPs

3.3.2 A summary of the key labour market indicators is presented in Figure 3-2 and Figure 3-3 by grouping the local authorities within the study area into six sub-areas, based on the LEP to which they belong.

3.3.3 Overall, this analysis demonstrates the broader patterns of economic prosperity at the LEP level, confirming the trends highlighted at local authority level. Enterprise M3 is particularly prosperous with the lowest unemployment and economic inactivity rates and the second highest median hourly pay.

3.3.4 The London LEP has the lowest employment, highest unemployment, highest claimant count and highest economic inactivity rate. This is in contrast to the fact that the London LEP has the highest GVA and average salaries.

Figure 3-2: Median hourly pay by LEP compared to the UK average

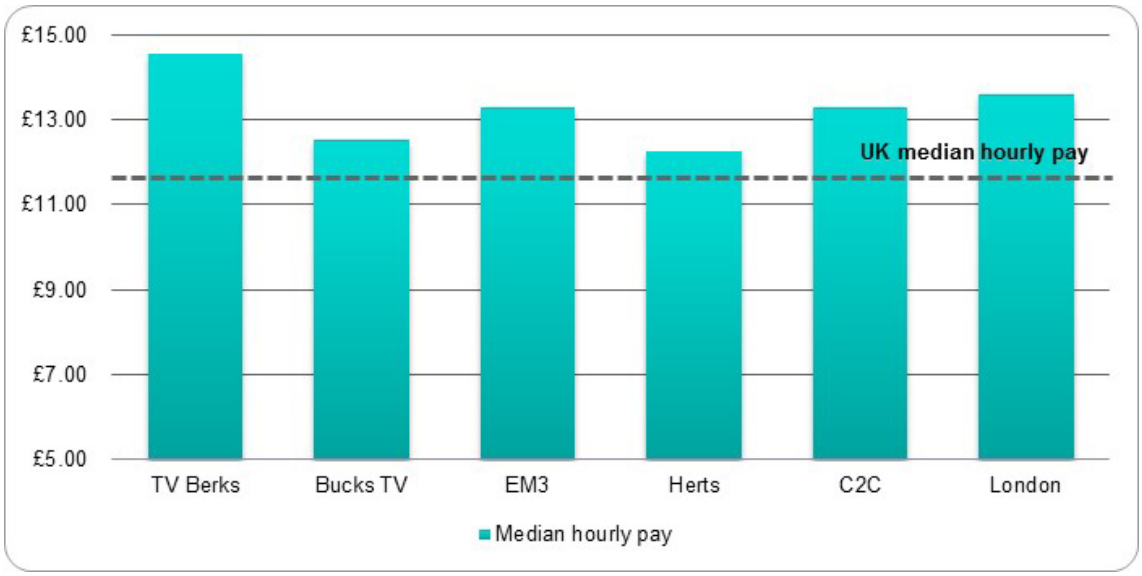
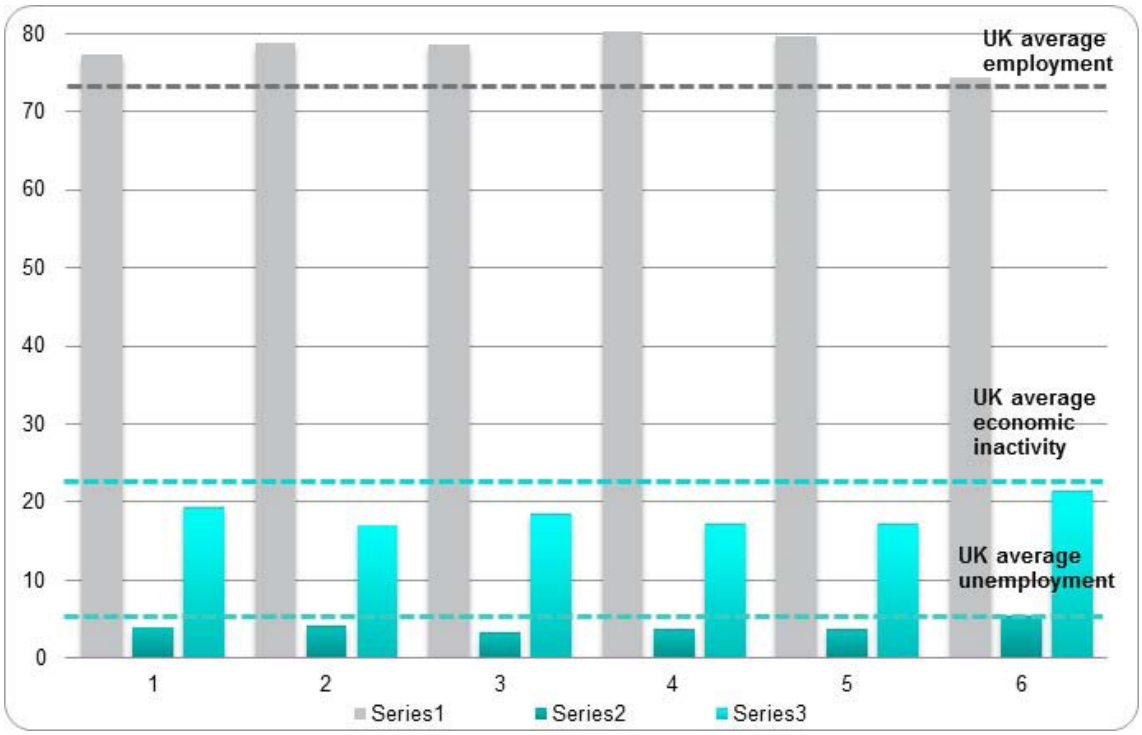


Figure 3-3: Study area (by LEP) employment, unemployment and economic activity compared to the UK average



Major Employment Sectors

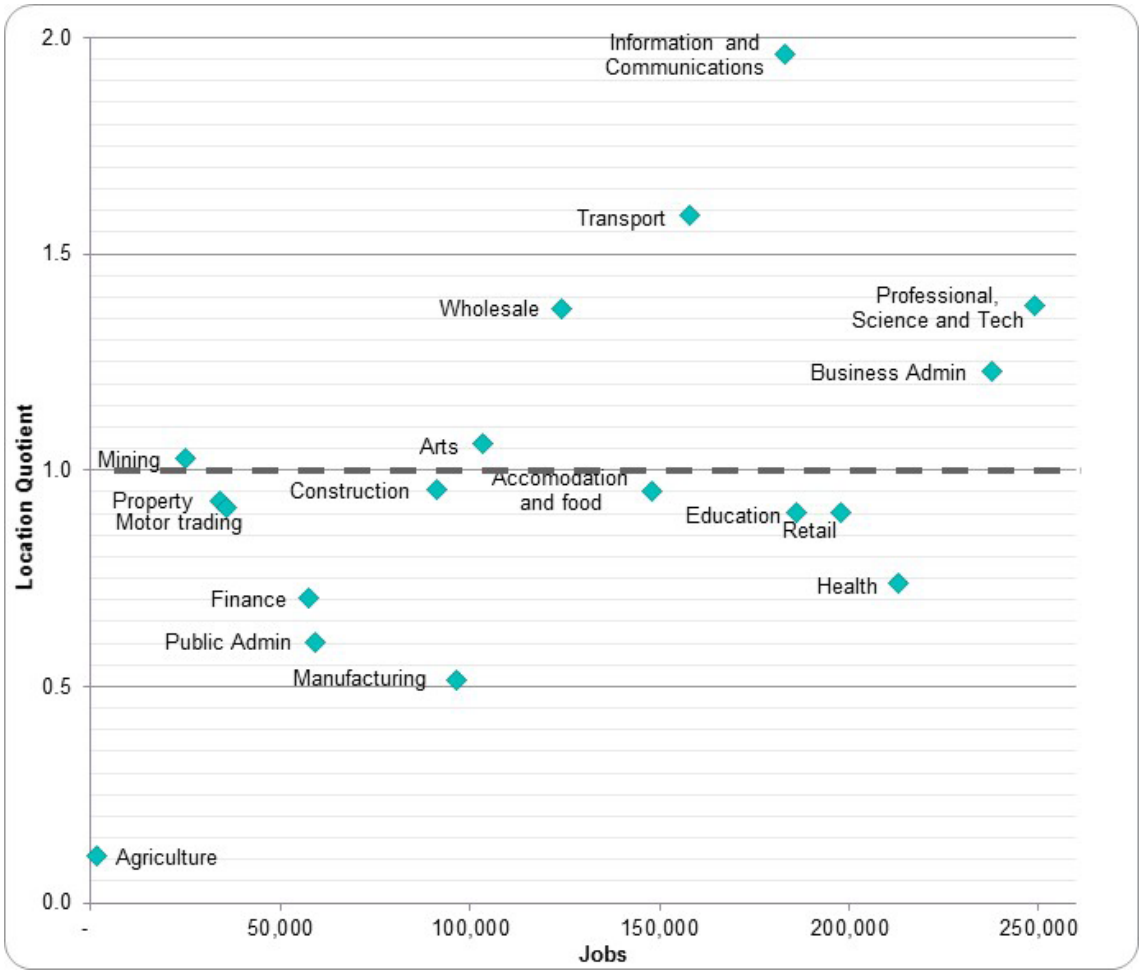
3.3.5 Figure 3-4 shows the Location Quotient (LQ) for each industrial category, together with the total number of jobs within that sector. The LQ highlights not only whether an industrial sector is large relative to the national average (where the LQ is greater than 1), but also its absolute size to the sector in terms of jobs.

3.3.6 LQ is a good measure of the degree of clustering of different activities – sectors/ industries in the top right hand quadrant are those that employ a high absolute number of people and are highly clustered (i.e. employment density above the national average). The analysis shows that the following sectors are large employers and are highly clustered:

- **Information and Communication** – these include information technology, information services and computer programming but also publishing and video production – and account for approximately 183,000 jobs, with double the proportion of people employed in the sector relative to the national average;
- **Professional, scientific and technical occupations** – such as legal services or architecture. This sector contributes not only the greatest number of jobs within the study area by sector but also accounts for a disproportionately large share of employment relative to the national average; and
- **Business administration** – such as renting and leasing activities or human resources. This accounts for a high number of employees in the study area, but the differential of the LQ between the study area and UK average is lower than for the sectors above.

3.3.7 Whilst Education, Retail and Health form key sources of employment, in proportional terms they are less well represented in the study area economy than the national average. Manufacturing employs only half the national average (97,000) in the study area.

Figure 3-4: Location Quotients of broad industrial categories within the study area (2014)



3.4 Spatial analysis of two key employment sectors

3.4.1 The study area is economically prosperous and productive with a strong and highly skilled labour market. To consider in greater detail the industries that are driving this prosperity, employment data was obtained from the Business Register and Employment Survey (BRES) classification. This data gives a detailed breakdown of employment within the study area.

3.4.2 Two categorisations were defined at the 2-digit industrial 'division' level for the study:

3.4.3 'Transport-dependent' sectors these are fundamentally reliant on good road connectivity, including three BRES divisions:

- "Warehousing and support activities for transportation"
- "Postal and courier activities"
- "Land transport and transport via pipelines"

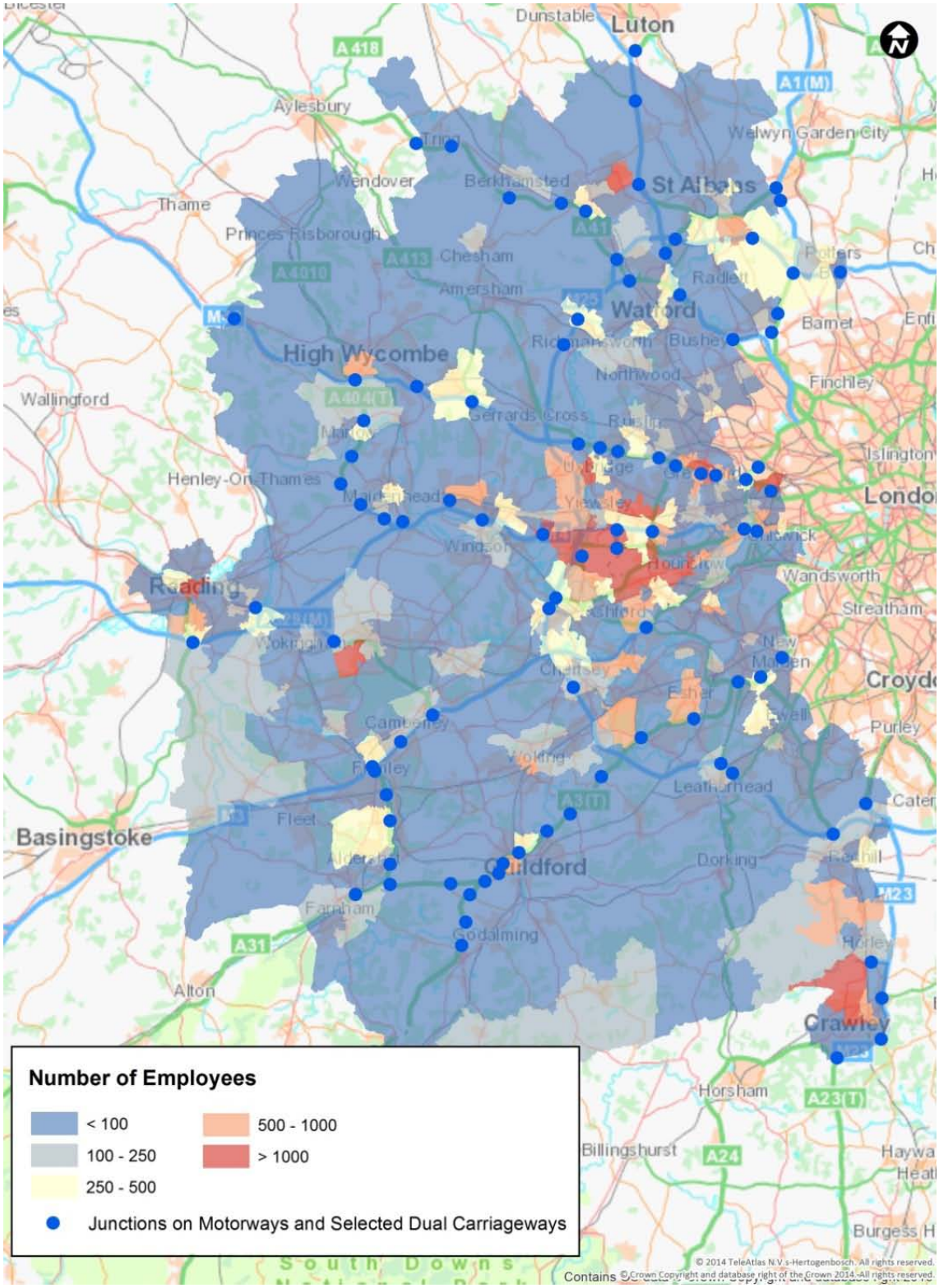
- 'Knowledge-intensive' sectors these are identified by LEPs within the study area as key contributors to their economic growth aspirations. These comprise of high-skilled, well-paid jobs in sectors such as
  - computer programming;
  - research and development;
  - engineering; and
  - financial services.

Transport dependent jobs

3.4.4 Approximately 112,000 transport-dependent jobs are located within the study area, and Figure 3-5 demonstrates that such employment is geographically concentrated in a handful of Middle Layer Super Output Areas (MSOAs) in close proximity to Heathrow and Gatwick airports and the SRN.

3.4.5 Heathrow forms the largest cluster, with the airport and surrounding industry accounting for more than 40,000 transport-dependent jobs. Approximately 10,000 transport-dependent jobs are located at Gatwick Airport, and important clusters are also situated along the A40 corridor in Greenford and Park Royal, as well as Bracknell and Hemel Hempstead.

Figure 3-5: Distribution of transport dependent sector jobs

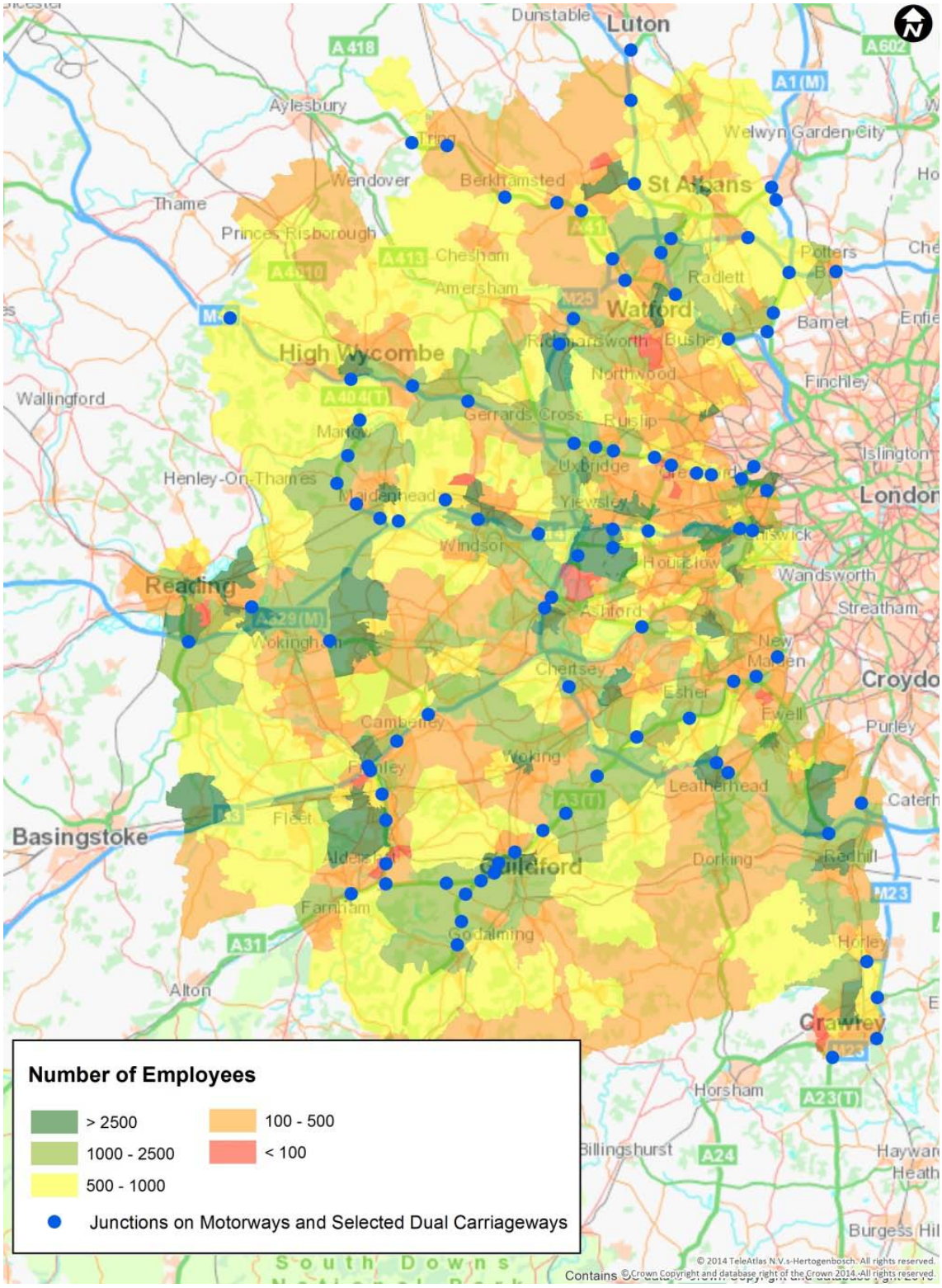


Knowledge intensive jobs

3.4.6 Approximately 564,000 knowledge intensive jobs are located in the study area, accounting for 25.6% of total employment compared to the national average of 19.8%.

3.4.7 Figure 3-6 highlights the geographic distribution of these jobs across the study area. Although knowledge-intensive employment is widely dispersed, there appears to be a broad pattern of knowledge-intensive employment focused on the key arterial road corridors within the study area. It is also clear that there are key clusters located around Reading, Heathrow, High Wycombe and Aldershot.

Figure 3-6: Distribution of knowledge intensive sector jobs



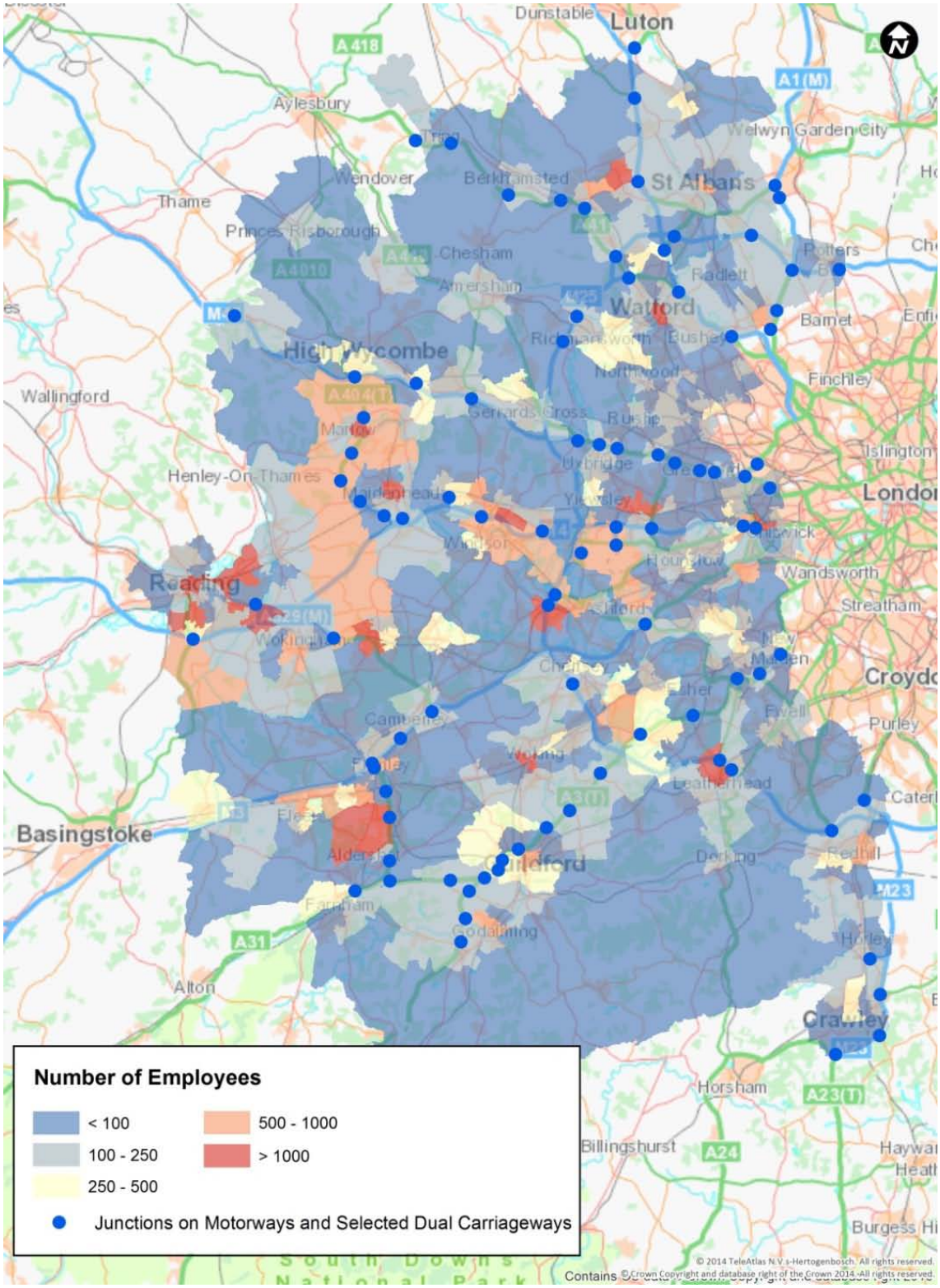
3.4.8 In the next section more detail is provided with analysis of the distribution of some of the constituent industries of these employment sectors. The employment distribution of the three BRES knowledge-intensive sectors with the greatest employment in the study area is highlighted below.

Computer programming and IT

3.4.9 Approximately 147,000 people are employed within IT-related sectors, with more than 110,000 of this total employed within the 2-digit BRES division "computer programming, consultancy and related activities", shown in Figure 3-7.

3.4.10 This demonstrates that a strong computer programming cluster exists along the M4 and A404 corridor, linking the towns of Reading, Slough and High Wycombe. Smaller clusters are located within Farnborough and Aldershot – close to the A331 – and Egham, Woking, Leatherhead, Watford and Hemel Hempstead.

Figure 3-7: Distribution of 'computer programming, consultancy and related activities' jobs



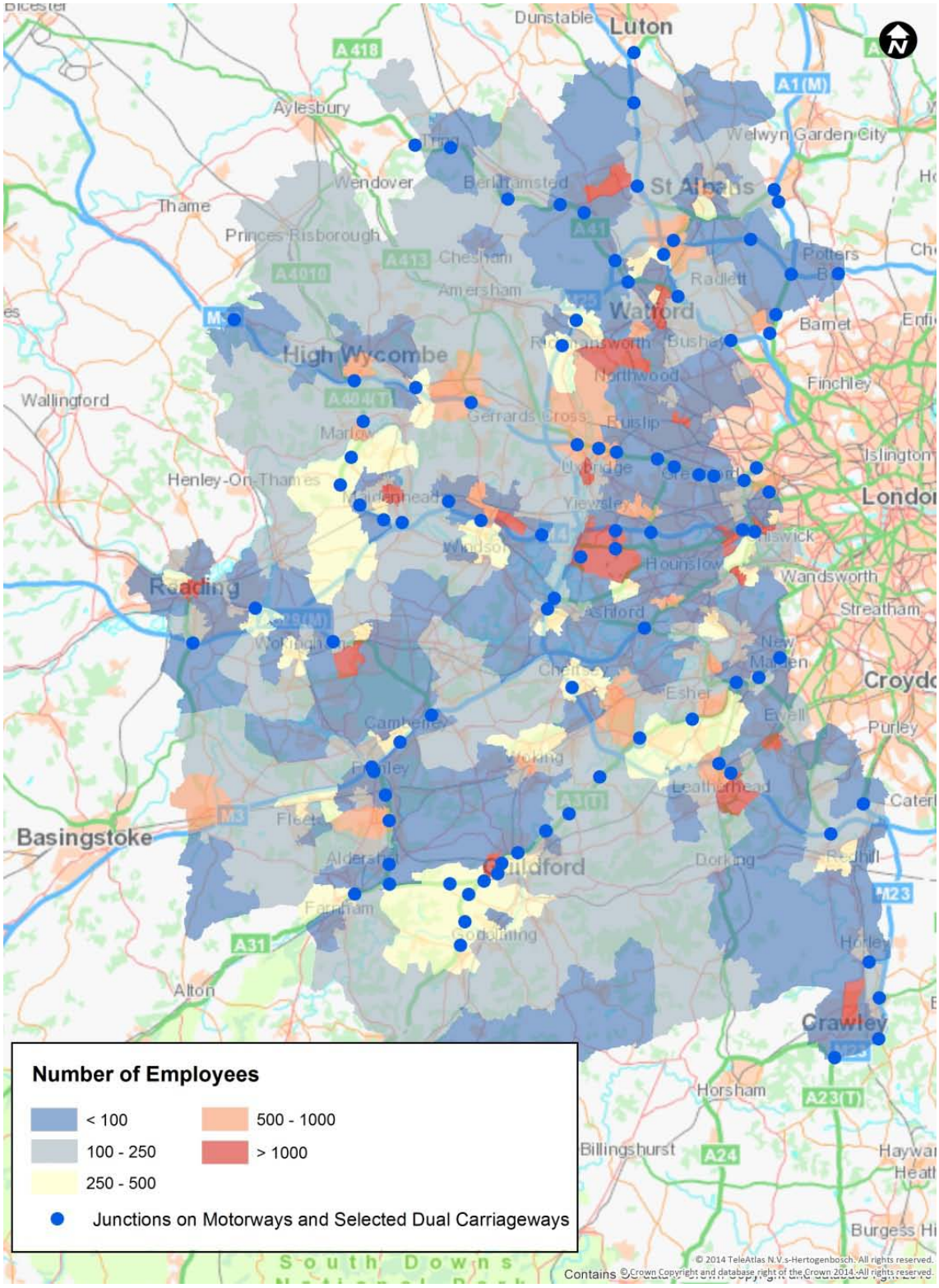
Financial, management and legal services

3.4.11 Approximately 97,000 people are employed within BRES division 70: "activities of head offices; management consultancy activities", mapped in Figure 3-8.

3.4.12 In comparison to the clustering associated with employment in computer programming, within head office and management functions employment is more

broadly spread across the study area. Employment clustering does exist, however, within Guildford (focused in the MSOA to the west of the city around the University of Surrey and Surrey Research Park), as well as around Maidenhead, Reading, Leatherhead and Crawley, and an arc parallel to the M25 from Heathrow and Uxbridge to Watford and St Albans.

Figure 3-8: Distribution of 'financial, management and legal services' jobs

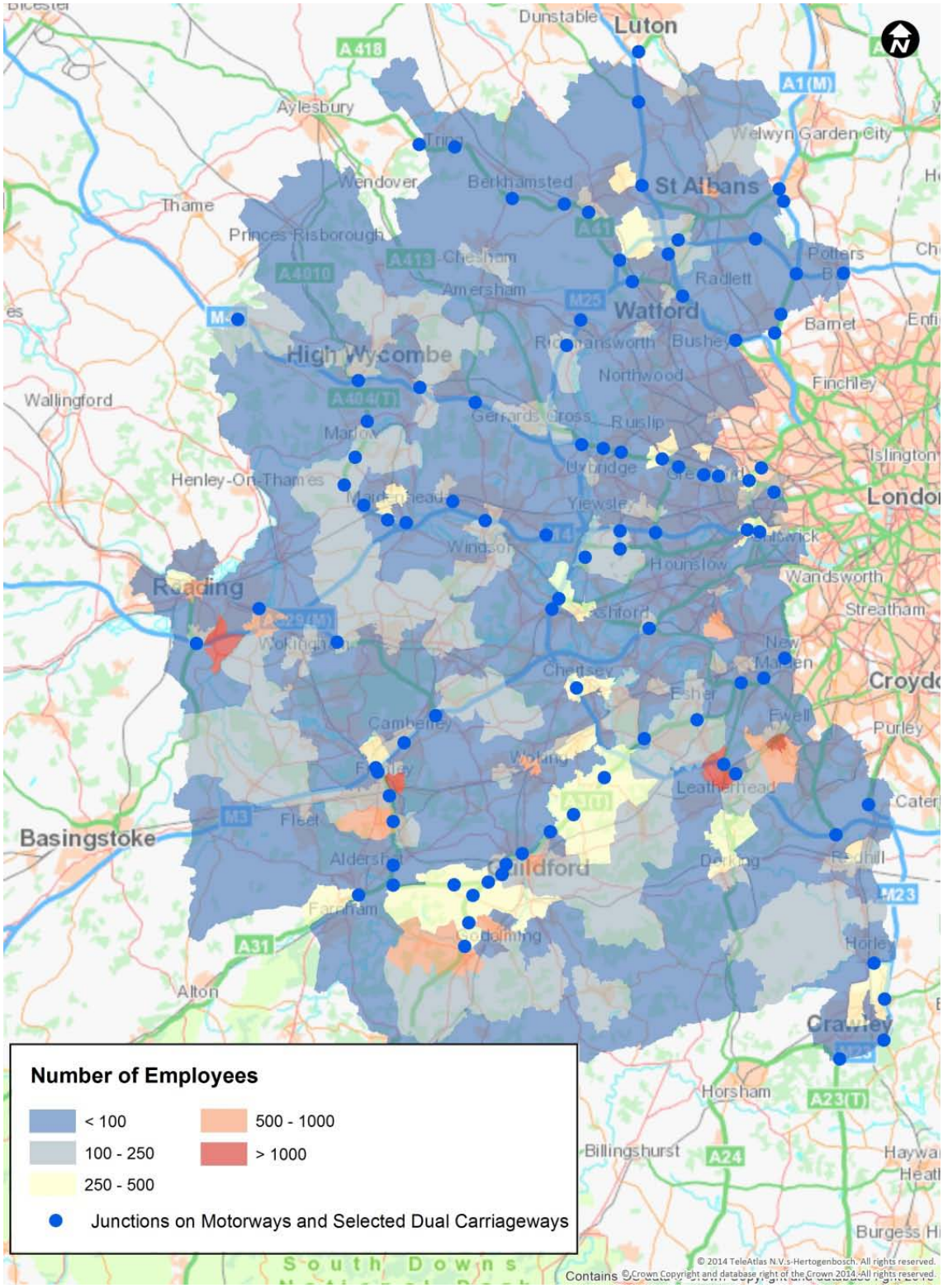


Architecture, engineering and technical testing

3.4.13 Approximately 46,000 people are employed within BRES division 71: 'architecture and engineering activities; technical testing and analysis', mapped in Figure 3-9.

3.4.14 Such employment is strongly clustered within Guildford and the A3 corridor, together with Leatherhead and Epsom, and within South Reading. Overall, the sector accounts for less employment than computer programming and head office functions; many MSOAs outside of the clusters identified, especially outside Outer London, have fewer than 50 people employed in the sector.

Figure 3-9: Distribution of architecture and engineering industry jobs



3.5 Travel and economic activity

Travel to work

3.5.1 The study area is characterised by complex and diffuse commuting patterns between the key employment centres which can vary markedly from one area to the next.

3.5.2 According to the 2011 census the majority of commuters (1.3m) in the study area both live and work there. A further 510,000 residents commute to locations outside the study area and 397,000 commute in – making the area a net exporter of 113,000 employees. Of those commuting out of the study area substantial numbers commute to central London (307,000).

3.5.3 Levels of self-containment at a local authority scale are lower, ranging between 17% and 61% of residents. Self-containment in the study area has tended to reduce over time; a characteristic it shares with many non-metropolitan districts in the Midlands and East of England (Murphy, 2013).

Commuting to key employment clusters

3.5.4 Figure 3-10 shows the number of jobs in each MSOA in the study area. It illustrates that jobs are not evenly spread across the study area and tend to be concentrated in a small number of employment clusters.

3.5.5 Table 3-2 below identifies the top ten employment clusters within 5 miles of the M25SWQ with the highest number of employees commuting to them for work.

3.5.6 The most significant of the hubs is Heathrow Airport and its immediate surroundings, with 46,000 employees recorded travelling to reach jobs there in the 2011 census (Office for National Statistics, 2013).

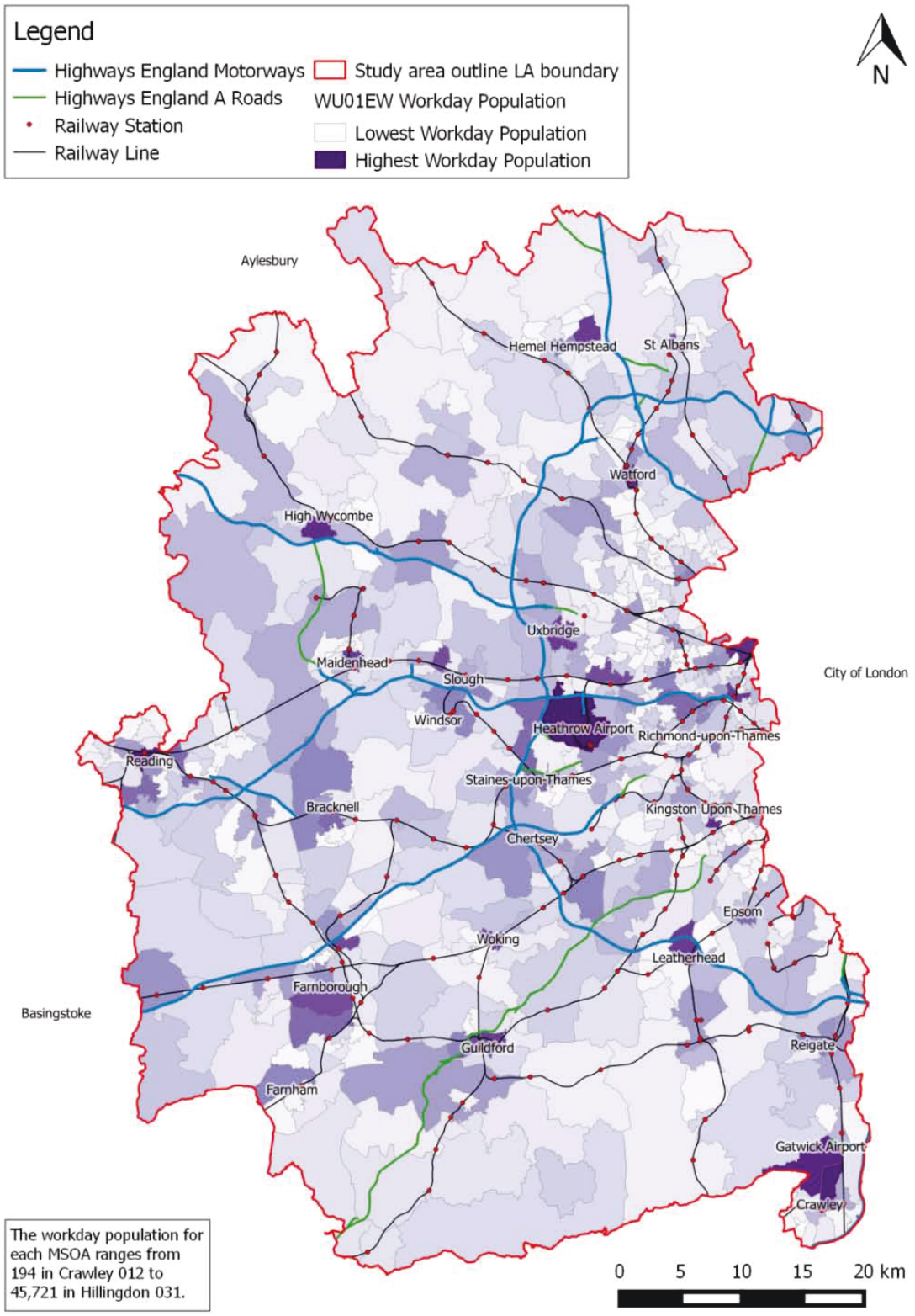
3.5.7 The next largest employment clusters include town centre locations (Uxbridge, Slough, Woking, Egham, Windsor and Eton), which tend to be relatively well-served by public transport. It also includes the mixed industrial area of Poyle and Colnbrook, immediately to the west of the M25, and some out-of-centre or out-of-town business parks, which tend to be less accessible by public transport.

Table 3-2: Top ten employment clusters within 5 miles of M25SWQ

Employment cluster	MSOA Ref(s)	Employees travelling to employment cluster
Heathrow Airport	Hillingdon 031	45,700
Uxbridge Town Centre/Brunel University	Hillingdon 015 and 016	25,400
Slough town centre	Slough 009 and 011	15,500
Woking town centre	Woking 008	13,400
Egham Town Centre and The Causeway	Runnymede 001 and 003	12,100
Stockley Park	Hillingdon 027	11,700
Staines-upon-Thames town centre	Spelthorne 004	9,200
Poyle and Colnbrook	Slough 014	9,000
Windsor and Eton town centres	Windsor and Maidenhead 010	8,100
Brooklands Business Park and The Heights	Elmbridge 016	8,000

Source: Office for National Statistics 2013

Figure 3-10: Workday population



Source: Office for National Statistics 2013

3.5.8 The ten largest employment hubs in the study area depend on employees commuting from a wide spread of different home locations.Eight out of ten of the hubs have less than 40% of their workforce originating in the local authority where they are situated.

Commuting to Heathrow Airport

3.5.9 Heathrow Airport has the lowest proportion of commuters originating from the authority it is situated in (17% from Hillingdon) and has a particularly diffuse commuting pattern spreading across the study area and into wider south-east England. Approximately 40% of workers commute from the three outer London boroughs of Hounslow, Hillingdon and Ealing, with a further 12% commuting from Spelthorne and Slough. However, 15% commute more significant distances, from local authorities within the study area that rely primarily on access via the M25SWQ. Significant numbers of workers travel even further, for example commuting from Wiltshire and South Oxfordshire.

3.5.10 Limited public transport accessibility from much of the study area means that 51% commuting to Heathrow is car based travel although the proximity to London does allow 36% of employees to arrive by public transport - 25% by bus and 9% by Underground (Heathrow Airport Limited 2014). As a large proportion of travel is longer distance car travel dominates as only 2% of employees indicated rail is the predominant mode for their travel.

Implications of M25 for labour markets

3.5.11 Congestion on the M25 will serve to limit the effective labour market catchment from which businesses can recruit, hence undermining the economy of the study area. The time and quality of workers' commute will also be a factor in firms' ability to retain employees. The degree of congestion and variability in travel times (which people must factor in to their journeys) are important elements in determining the quality of people's commute and hence the attractiveness of employment locations.

3.5.12 The study area is heavily dependent on cross-regional commuting flows; approximately 29% of workers within the study area travel outside it for employment, with this commuting dominated by flows into the capital. Especially within knowledge-based sectors, the ability for businesses to attract workers has been identified as a key issue across the LEP areas. Although skills shortages form a key constraint, transport access plays a key role in determining the effective labour market catchment of businesses, and the job search horizons of workers. Workers will inevitably base their decisions on where to work (or look for jobs) in part on the travel time and cost of their commute, with workers in higher-value, higher paid jobs typically attracting workers willing to commute further to work.

3.5.13 Whilst most LEPs have policy priorities to supporting housing delivery – which in turn has the potential to support a more sustainable balance of workers and jobs – it is also the case that commuting patterns will remain complex and car-based commuting within and across the study area will continue. The polycentric nature of the M25 corridor – and diffuse commuting patterns – inevitably mean the area will rely heavily on car-based commuting, and with forecast increases in housing and employment it is essential that congestion and journey time unreliability are addressed to avoid shrinking labour market catchments and sustain the economic vitality of the study area.

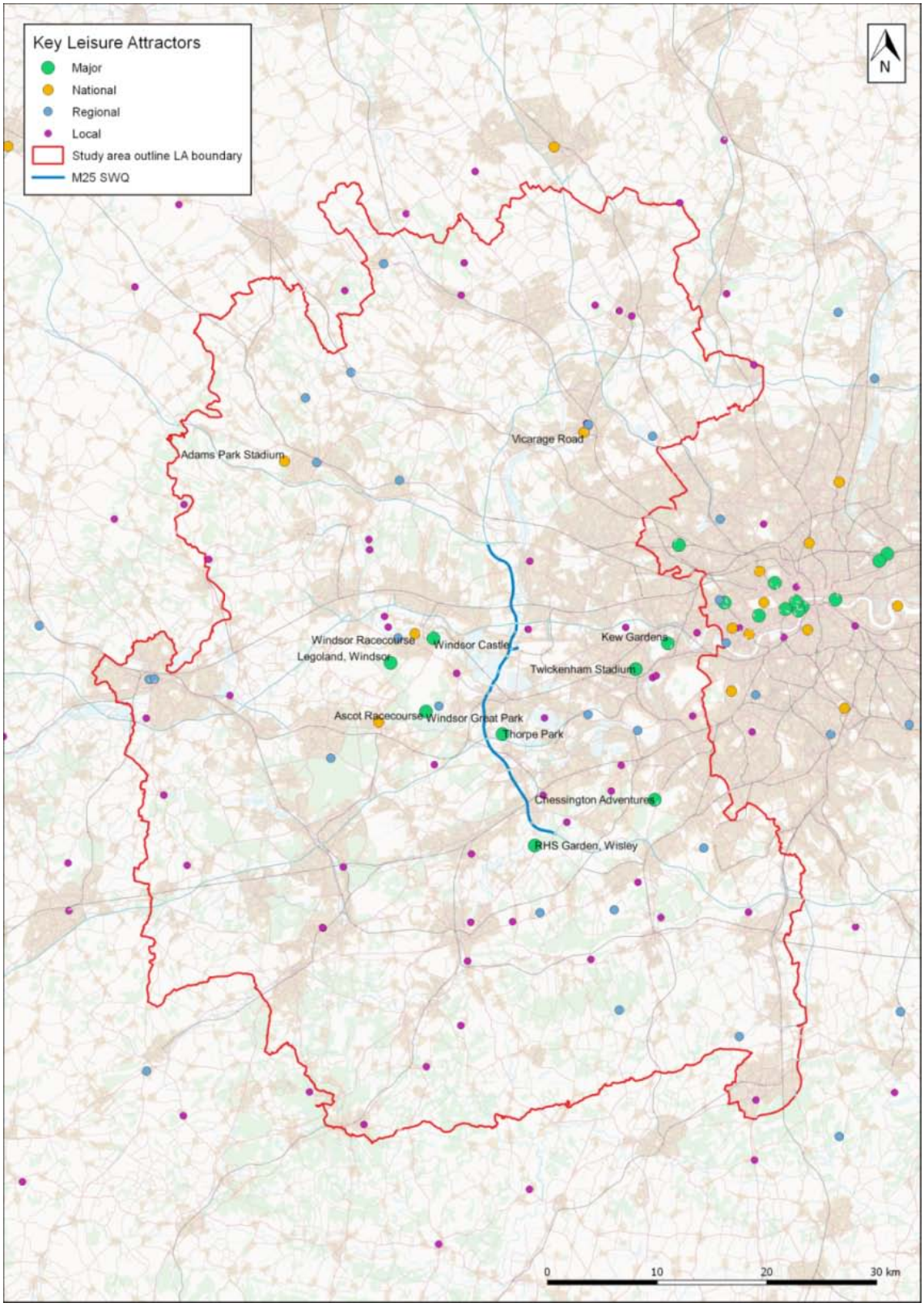
Travel to sport, recreation and cultural venues

3.5.14 The M25SWQ is home to a number of nationally significant sporting venues, leisure, tourist and cultural attractions which are of economic significance to the study area and national economy. They include:

- Sporting venues, including Twickenham Stadium and Vicarage Road,
- Racecourses: Ascot and Windsor;
- Cultural attractions, including Windsor Castle, Royal Horticultural Society Gardens, Kew Gardens and Windsor Great Park; and
- Theme parks: Thorpe Park, Chessington World of Adventures and Legoland.

3.5.15 The locations of the major venues are shown in Figure 3-11. The major trip attractors in the study area are located in close proximity to the M25, M4, M3 and the M40, as well as the rail lines. This highlights the importance of the transport network in providing access to each attractor. Each attraction generates demand for travel on the road and public transport networks, often focused on specific event days.

Figure 3-11: Key leisure attractions in M25SWQ study area



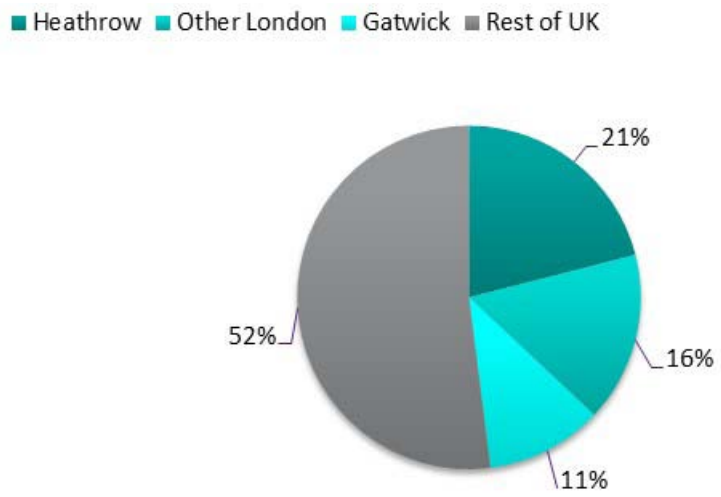
3.6 Economic role of airports

3.6.1 The study area contains the country's busiest air freight airport and two busiest passenger airports, and the M25SWQ provides the main route for parts of the UK to reach key Channel and East Anglian ports.

3.6.2 Heathrow accounts for 34% of UK terminal passenger arrivals and departures and 27% of UK air traffic take-offs and landings (DfT, 2015). Gatwick Airport accounts for 17% of passenger arrivals and landings and 4% of air freight tonnage handled; adjacent to the study area Stansted accounts for 9% of passengers and 8% of air freight tonnage and Luton 5% of passengers and 1% air freight tonnage.

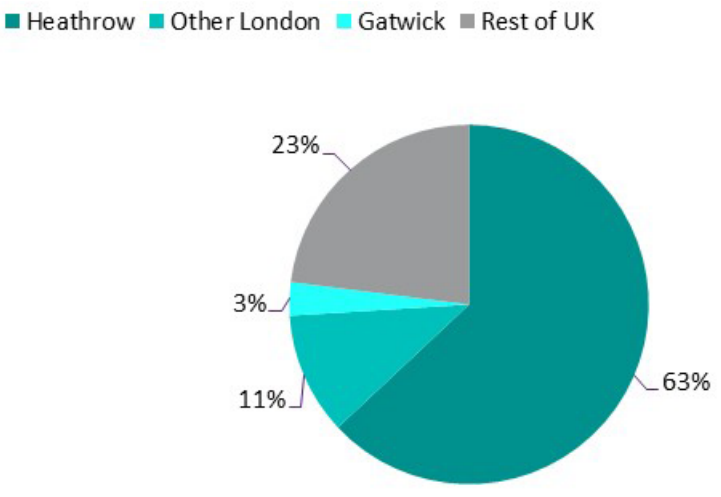
3.6.3 The charts below in Figure 3-12 and Figure 3-13 underscore the key role of the study area's major airports to the UK economy.

Figure 3-12: UK air passenger flows



Source: DfT 2015a

Figure 3-13: UK air freight and mail flows



Source: DfT 2015a

Passenger travel to airports

3.6.4 Surface access transport networks and services vary between airports and are a major factor in influencing journey choices for airport employees and air passengers. Other interrelated key factors determining choice are:

- Flight arrival and departure times;
- Employee shift patterns and start and end times;
- Relationship of home location to the airport;
- Relative journey time taken by car compared with public transport options; and
- Reduced frequency or total non-availability of public transport services early in the morning, late at night and on Sundays.

3.6.5 Data presented within the Airports Commission Final Report shows that Gatwick currently has a higher proportion of passengers arriving by public transport than Heathrow (44% vs. 41%) (Airports Commission, 2015). These are substantially higher rates than those recorded at Luton or Manchester but lower than Stansted. At 26% Heathrow has the lowest proportion of passenger arrivals by car of any major UK airport surveyed but it also has a substantial percentage arriving by taxi/minicab (30%) (DfT 2015a).

Heathrow and Gatwick airports accessibility analysis

3.6.6 The accessibility planning software TRACC has been used to analyse journey times by public transport and car to Heathrow and Gatwick Airports in the AM and PM peak periods. Analysis indicates that from most parts of the study area it is quicker to travel by car to airports than by public transport - in some cases significantly so.

3.6.7 In specific relation to Heathrow Airport the accessibility analysis identifies that fast public transport connections exist towards central London, with much of west London within 30 minutes' journey time. Conversely slower connections exist to destinations a similar distance from the airport which are located to the west and south, which do not benefit from direct rail services to the airport. Examples of these include Bracknell and Weybridge, both with journey times of 1h 20 mins. Whilst most parts of the study area can access the airport within 2 hours, there are a few locations to the south and west of the study area which take longer still. The Airports Commission Final Report highlights that substantial committed investment is planned to local and national transport connections, which will widen its accessibility.

3.6.8 The accessibility analysis for Gatwick Airport shows that locations on or close to the Brighton Main Line can be reached within 30 minutes, including in Croydon, Mid Sussex, Horsham and Brighton and Hove authority areas. Conversely, public transport accessibility is poorer west and east of the airport. This is likely to be a factor influencing the substantial variations in use of public transport for travel to the airport along different transport corridors – accounting for 77.4% of travel from central London in 2008, compared with 51.3% from Brighton and Hove and 26.4% from the M4/M40 corridors (London Gatwick Airport, 2009).

Major employer and supply chain effects

3.6.9 Heathrow is a major employer within the study area. A report commissioned by four LEPs and West London Business examined the current economic role of Heathrow (Regeneris Consulting, 2013), and found that Heathrow directly employs 77,000 FTE jobs (69,700 on-site and a further 7,000 off-site), and supports a further 40,000 FTE jobs through its supply chain (indirect and induced impacts).

3.6.10 Analysis within the Airports Commission Final Report identifies that the airport is an important employer across the surrounding local authorities, with more than 6% of the workforce directly employed at the airport in every case except Ealing (where the airport still provides 3.7% of local jobs) (Airports Commission, 2015).

3.6.11 The supply chain jobs related to Heathrow are also geographically focused around the Airport in the boroughs of Hounslow, Hillingdon, Slough and Spelthorne. For example, the Hounslow Local Economic Assessment Report, August 2011 states that 10-15% of businesses have some supply chain link to Heathrow, and that these account for up to 20% of employment in the borough.

3.6.12 The employment at, and related to, Heathrow gives rise to significant travel demand. The Airports Commission Report sets out that the ten local authority areas closest to the airport account for only 63% of on-airport employment, with the remainder being drawn from still further afield. The report suggests this reflects the strong transport links to the airport, which make it accessible from much of London and other surrounding areas, including in particular the Thames Valley region.

Impact on business location and productivity

3.6.13 The SEPs produced by the LEPs surrounding Heathrow each identify the airport as playing a vital role in supporting the development of knowledge-based sectors and, in particular, its role in attracting inward investment. These impacts are not directly measurable or attributable to Heathrow but the hub-airport is seen as fundamental in influencing the location of, and explaining the preponderance of, head office functions and foreign-owned businesses.

3.6.14 The London Heathrow Economic Impact Study (Regeneris Consulting, 2013) highlighted that LEPs in the M25SWQ had higher proportions of foreign-owned enterprises than the England average and supports a concentration of headquarter activity greater than the UK average.

3.6.15 The same report surveyed 464 businesses in broadly the area defined by the M25SWQ, and the results highlight the importance of Heathrow by both location and sector[5]:

- The locations in which businesses viewed Heathrow as most importance were West London (44% very important, and a further 18% important) followed by Berkshire/Thames Valley (36% and 18%) and Surrey (33% and 11%).
- Of firms that were foreign owned 48% viewed Heathrow as very important (a further 29% important) to their operations, which increased to 67% (22%) for joint UK/foreign owned businesses and 55% (19%) for UK firms with significant overseas operations.

5 The detailed findings are reported in Appendix B of the Regeneris study.

- Knowledge-intensive business sectors viewed Heathrow as vital to their operations, with ITC (44% very important, 15% important), Scientific and technical (36% and 33%) and business services (25% and 19%).
- Other business sectors were more directly reliant on Heathrow, with 88% of airlines and aviation services view Heathrow as very important, and 69% of transport and storage businesses.

Airport related freight

3.6.16 DfT statistics show that Heathrow airport accounted for 65% of air freight tonnage handled in the UK during 2014, with Gatwick handling a further 4% (DfT, 2015). The volume of air freight at Heathrow results in 15,000 daily freight-vehicle movements, which comprise air freight, servicing and mail/parcel traffic handling more than 1.5 million tonnes of cargo (Heathrow Airport, 2014).

3.6.17 Air freight cargo accounted for 56% of freight vehicle movements based on the 2007 Surface Access Report (The Denvil Coombe Practice, 2007). At Heathrow as much air freight is carried by road (typically for journeys under 500 miles) as by air, and Heathrow acts as an air-freight consolidation centre before being sent (or received) by air to (in general) longer-haul destinations, resulting in an established network of logistics companies around the airport and in the local area.

3.6.18 Heathrow Airport also generates significant servicing needs for buildings and aircraft. This accounts for around 30% of the airport's freight traffic (Heathrow Airport, 2014) and is serviced largely from local businesses. The airport also carries significant volumes of mail and parcel traffic, which accounts for 27% of freight movements (The Denvil CoombePractice, 2007).

3.6.19 The Airports Commission (2015) presents a number of points about the importance of Heathrow in the air freight market in the UK. It highlights *'the dense route network and, in particular, a broad range of long-haul connections'* together with *'effective access to the national motorway network is crucial for air freight'* as key reasons to the significant difference in tonnage at the airports (Airports Commission, 2015).

3.7 Key findings – Economic conditions in the M25SWQ

3.7.1 The M25SWQ is a nationally significant piece of infrastructure in terms of the role it plays in connecting many parts of the UK with Heathrow, Gatwick, and key Channel and east Anglian ports. It further plays a significant role in connecting people with jobs, leisure, and cultural venues – all of which make an important contribution to the UK economy.

3.7.2 The study area is economically prosperous with a strong, highly skilled labour market. There are high employment rates, very low levels of unemployment, and low levels of economic inactivity when compared to the national average.

3.7.3 There tends to be above average GVA per hour worked with all areas ranked in the top ten LEPs (out of 39) in the UK. Median average workplace salaries are also higher than the national average, with the LEPs comprising 6 of the top 7 in the UK.

3.7.4 There are a number of employment clusters in the wider study area, in particular in the information and communication and professional, scientific, and technical sectors. The former accounts for around 183,000 jobs – double the proportion of people employed in the sector relative to the national average. The latter accounts for the greatest number of jobs within the study area and a disproportionately large share of employment relative to the national average.

3.7.5 The area is characterised by complex and diffuse commuting patterns between key employment centres, although the majority (>70%) of commuters in the study area both live and work there. Of those commuting out of the study area, around 307,000 travel to London, which contributes to a net export of 113,000 employees.

3.7.6 Employment tends to be concentrated in a small number of employment clusters, the most significant of which is Heathrow. Heathrow is the UK's biggest air freight and passenger airport, carrying 63% and 34% of flows respectively. It directly employs 69,700 on site, 7,000 off-site, and a further 40,000 FTE jobs through its supply chain.

3.7.7 The employment at, and related to, Heathrow gives rise to significant travel demand and also road freight movements (in the region of 15,000 per day). Limited public transport accessibility means that 51% of commuting to Heathrow is car based, and 56% of air passenger arrivals are by car (26% as driver; 30% in a taxi or minicab).

3.7.8 All LEPs in the study area identify Heathrow as key to developing knowledge based sectors and attracting inward investment, with the hub airport seen as fundamental in influencing the location of headquarters functions and foreign-owned businesses. Indeed the M25SWQ supports a higher proportion of both than the UK average.

3.7.9 With other things being equal, congestion on the M25 will serve to limit the effective labour market catchment from which businesses can recruit, hence undermining the economy of the study area.

3.7.10 The polycentric nature of the M25SWQ – and diffuse commuting patterns – inevitably mean the area will rely heavily on car-based commuting, and with forecast increases in housing and employment it is essential that congestion and journey time variability are addressed to sustain the economic vitality of the study area.

4 Existing Road Conditions

4.1 Introduction

4.1.1 The M25SWQ study area is one of the most well connected parts of the country, both in terms of geographic proximity to major international airports and access to strategic road and rail routes to London. However, this conceals a more complex picture, with congestion prevalent on road and rail, unpredictable journey times and many journeys that are difficult to achieve by public transport.

4.1.2 This chapter reports on the M25, its SRN approaches, and routes parallel to the M25 which may be considered viable alternatives by road users.

4.1.3 Extensive analysis has been undertaken to understand the following topics in relation to the M25SWQ:

- Key traffic movements;
- Length of trips;
- Origins and destinations;
- Route performance, including:
  - Traffic volumes
  - Congestion
  - Journey times
  - Journey time variability
  - Resilience
  - Asset management;
- Freight traffic;
- Safety; and
- Routes parallel to the M25.

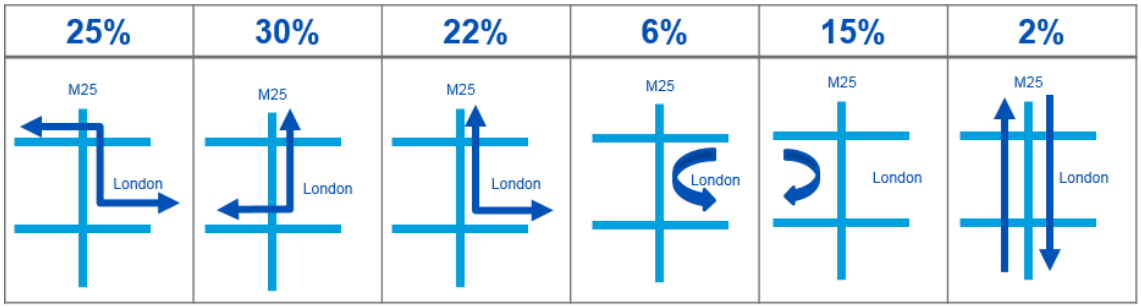
4.1.4 Data sources used for this analysis include Trafficmaster[6], Highways England WebTRIS (Traffic Information System), Traffic England Updates, Google Maps, and Route Strategies.

6 Whilst Trafficmaster data provides a useful insight into journeys using the M25, it does not provide a comprehensive dataset, and has some limitations. Moreover, Trafficmaster defines a trip as being from 'ignition on' status to 'ignition off' status (excluding stop/start engines), and therefore any journey which includes a short stop – for example at a service station – will be disaggregated into two trips. There are also some discontinuous journeys as a result of weak/lost satellite signals. This should be borne in mind when considering the findings presented as it accounts for the concentration of origins and destinations in Lower Layer Super Output Layers (LSOA) which contain service areas. Notwithstanding the above, Trafficmaster still provides a useful insight into the pattern of vehicles using the M25SWQ.

4.2 Key traffic movements

4.2.1 Trafficmaster data has been used to identify the key patterns of traffic entering and leaving the M25SWQ and how many sections they used. The broad categories of traffic are illustrated in Figure 4-1. It represents the overall proportion of trip movements made through the study area during 2014 – 2015 and includes all vehicle classes in all time periods.

Figure 4-1: Types of traffic movement within the M25SWQ



4.2.2 Analysis has found there are six key types of traffic movement on the M25:

- Type A trips which enter via one of the Study Area radials outside London to route to an alternative Study Area radial heading away from London. For example from the M40 via the M25 to the M4. This type of trip accounts for 15%;
- Type B trips which enter the M25 from one of the Study Area radials outside London to route to an alternative Study Area radial into London. For example from the M4 via the M25 to the M3 and vice versa. This trend is observed on all of the radial routes to the M25 and accounts for 25% of trips;
- Type C trips originating from inside the M25 which then use the M25 to route back towards London. For example on the M4 from London onto the M25 and then on the M40 back towards London. This accounts for 6% of trips;
- Type D trips remain on the M25 for the entirety of the SWQ. These trips comprise a very small proportion of traffic in both directions accounting for 2% of observations;
- Type E trips are already on the M25 when they enter the SWQ and use one of the Study Area radials to route towards London. This type of trip accounts for 22% of observations; and
- Type F trips are already on the M25 when they enter the SWQ and use one of the Study Area radials to route away from London. This type of trip accounts for 30% of observations.

4.2.3 These findings show the M25 is performing a distinct set of functions. The route is used by a combination of trips which have both ends of the trip outside the M25, an origin outside the M25 and destination within the M25 and trips which have both ends within the M25.

4.3 Trip lengths

4.3.1 Trafficmaster data has also been analysed to understand the length of journeys being undertaken on the M25SWQ. Data has been analysed for selected links on the M25, including J11 – 12; J13 – 14; and J15 – 16. This data has been grouped into the following distance bands (0-30 miles (50km), 30 – 60 miles (50-100km) and 60 miles+ (100km+).

Table 4-1: Journeys on selected M25SWQ sections by length

Road and Section	Distance Bands		
	0-30 miles	30 – 60 miles	60 miles+
J15 to J16 (CW)	17%	35%	48%
J16 to J15 (AC)	16%	36%	48%
J13 to J14 (CW)	24%	34%	41%
J14 to J13 (AC)	29%	33%	38%
J12 to J11 (CW)	21%	36%	43%
J11 to J12 (AC)	19%	37%	44%

4.3.2 The data shows that the M25 has a higher proportion of vehicles making journeys over 60 miles (100km). Less than a third of traffic on the selected M25 sections are undertaking journeys of less than 30 miles (50km) in length.

4.4 Trip origins and destinations

4.4.1 Satellite navigation (Satnav) data for 2014 and 2015 from vehicles using Trafficmaster systems has been analysed to understand the origins and destinations pattern of vehicles using the M25SWQ. The start and end location of the journey is assigned to the LSOA in which it occurred. The Trafficmaster sample is an annual average of data between September 2014 and August 2015 comprising 120,000 vehicles. The sample is composed of 40% cars, 58% light vans and 2% HGVs and Other Vehicle Types.

4.4.2 Figure 4-2 and Figure 4-3 illustrate the origins and destinations of vehicles travelling between J14 and J15 in both directions.

Figure 4-2: with Origins and destinations of M25 traffic between J14 and J13 (anticlockwise), average weekday 08:00-09:00

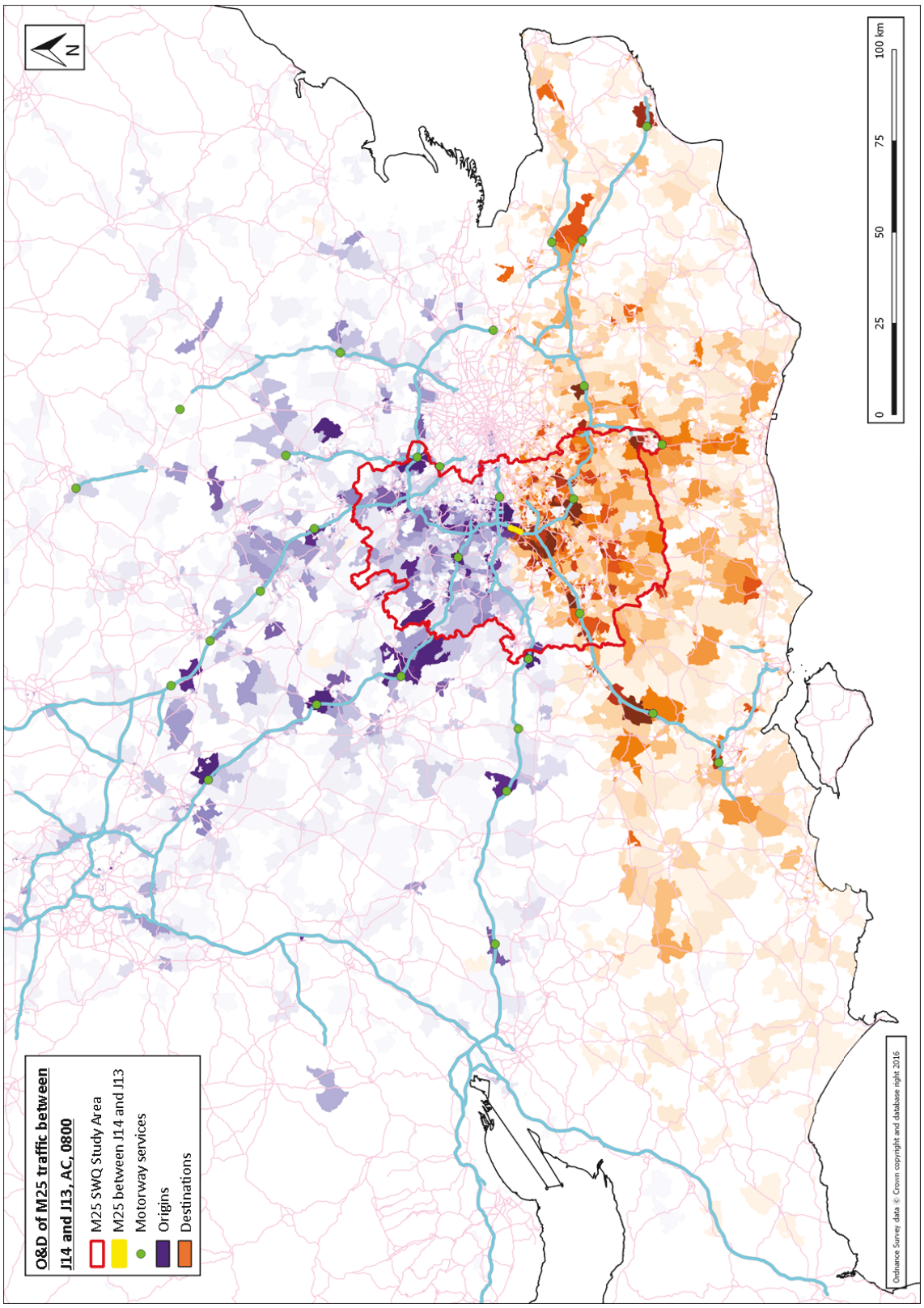
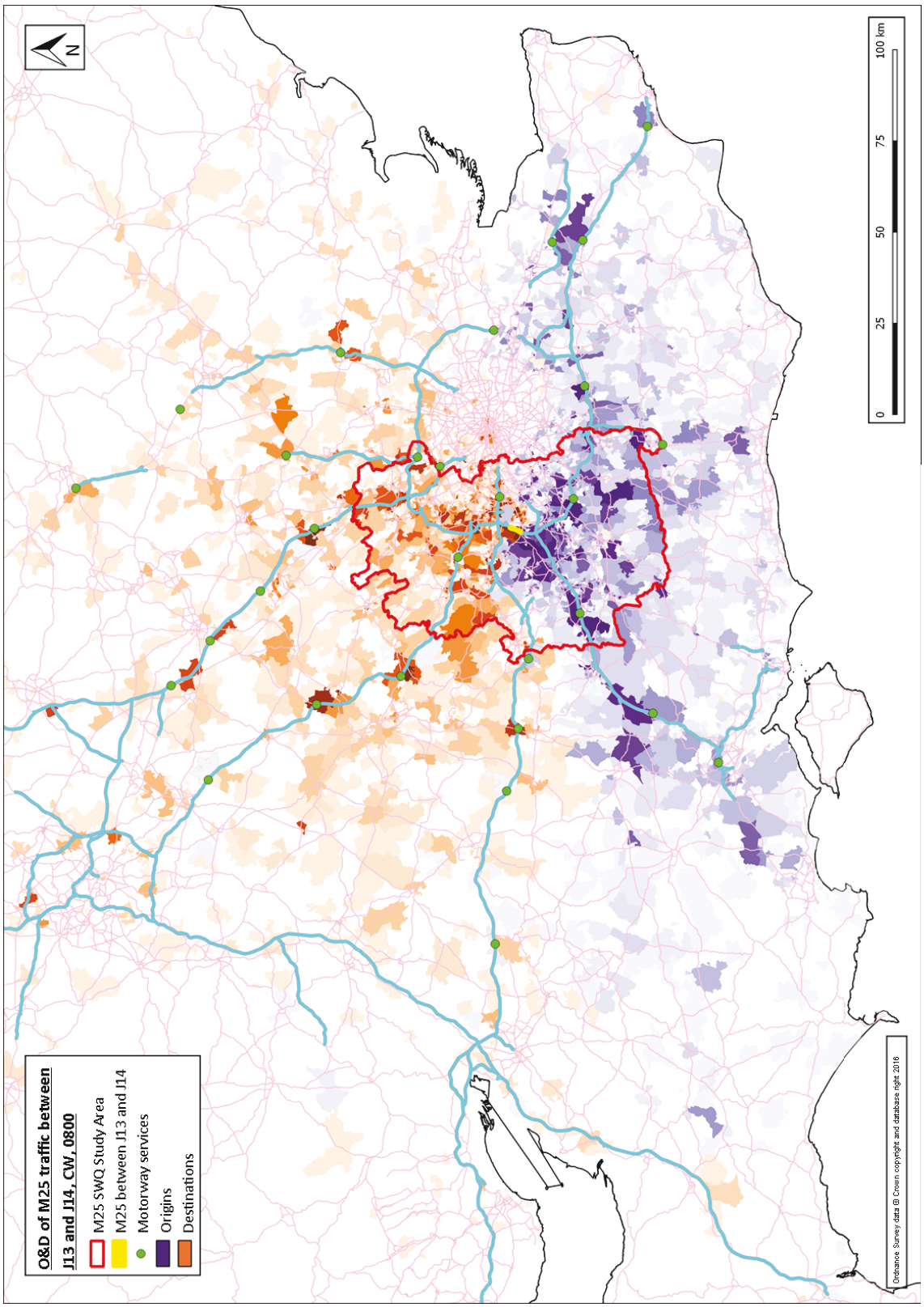


Figure 4-3: Origins and destinations of M25 traffic between J13 and J14 (clockwise), average weekday, 08:00-09:00



4.4.3 Vehicles travelling in this section have a wide variety of origins and destinations, including the west (via the M4), the West Midlands (via the M1 or M40), the east Midlands (via the A1 (M)), the East (via the M11) and Essex via the M25. They also include trips originating inside the M25, predominantly from the A40 and M4/A4 corridors.

4.4.4 The destinations of these vehicles are dispersed across Surrey, Hampshire, east and west Sussex and Kent, accessed via the M3, A3 and M25 corridors. Gatwick Airport, the Channel Tunnel terminal in Kent and places in close proximity to the M25/M3 interchange are particularly significant destinations. A similar pattern is observed for traffic travelling in the opposite direction.

4.4.5 Trafficmaster data analysis indicates that trips using the M25SWQ continue to be from a very widespread origins and destinations, as noted in the 2002 ORBIT Study.

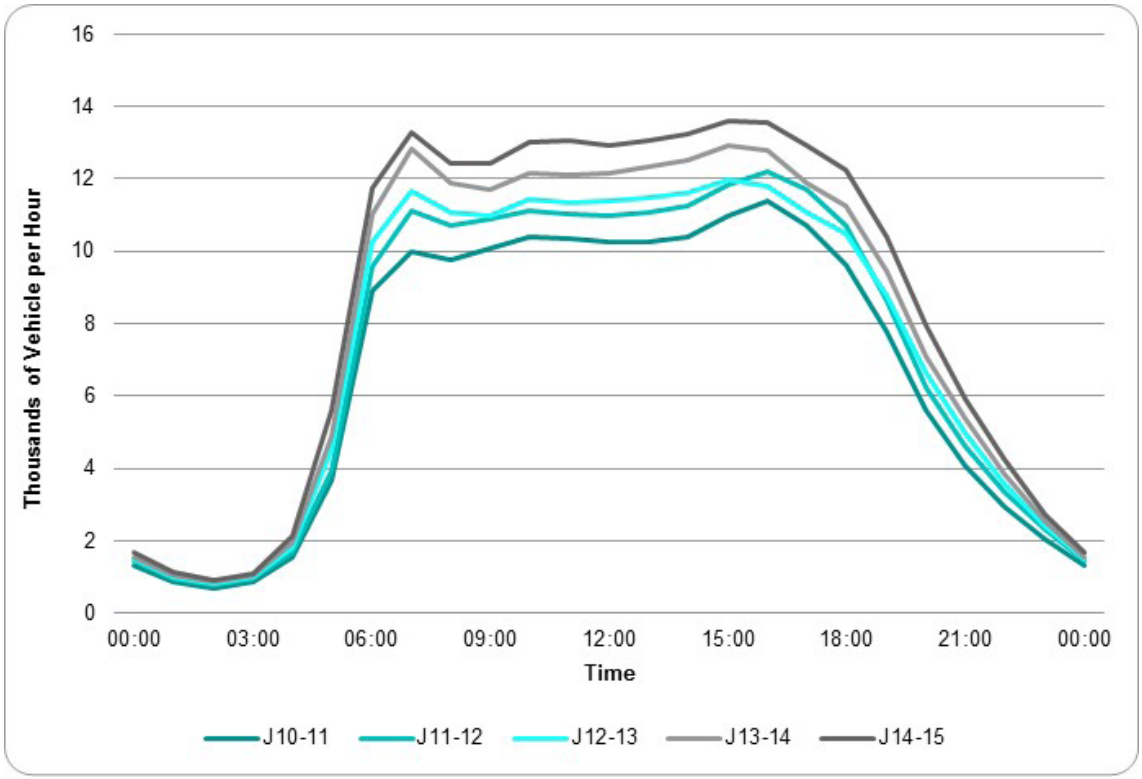
4.5 Route performance

Traffic volumes

4.5.1 Data analysis of the M25SWQ traffic flows for the period 2014-2015 has been carried out using Highways England's WebTRIS (Traffic Information System) data.

4.5.2 Figure 4-4 shows the daily traffic flow profile for M25SWQ and Table 4-2 summarises key headlines with figures for adjoining motorways for comparison.

Figure 4-4: Daily two way traffic flows[7]



7 Data for Junction 15 to Junction 16 is incomplete and not reported.

Table 4-2: Summary of traffic volumes

	M25 Clockwise	M25 Anticlockwise	M4 Eastbound	M4 Westbound	M3 Eastbound	M3 Westbound	M40 Eastbound	M4 Eastbound
Busiest Day (Average)	Thursday	Thursday	Thursday	Friday	Tuesday	Tuesday	Thursday	Friday
Busiest Day Flow (Average)	111,071	112,790	73,130	80,078	72,389	68,888	66,634	68,528
Section	Within J14 and J15	Between J15 and J14	Between J4 and J3	Between J4B and J5	Between J2 and J3	Between J3 and J4	Between J3 and J2	Between J2 and J3
Quietest Day (Average)	Saturday	Saturday	Saturday	Saturday	Wednesday	Thursday	Saturday	Sunday
Quietest Day Flow (Average)	54,904	54,656	21,429	47,226	22,908	10,577	30,067	29,049
Section	Within J15	Within J15	Between J4B and J4	Between J10 and J8	Between J2 and J1	Within J2	Within J4	Within J1
Busiest Time (Average)	16:00-17:00	16:00-17:00	18:00-19:00	17:00-18:00	18:00-19:00	18:00-19:00	18:00-19:00	18:00-19:00
Busiest Time (Avg. peak hour flow)	6,841	7,043	4,802	5,142	4,800	4,557	4,739	4,752
Section	Within J14 and J15	Between J15 and J14	Between J4 and J3	Between J4B and J5	Between J2 and J3	Between J3 and J4	Between J3 and J2	Between J2 and J3
Quietest Time (Average)	03:00-04:00	03:00-04:00	03:00-04:00	03:00-04:00	03:00-04:00	04:00-05:00	04:00-05:00	04:00-05:00
Quietest Time (Avg. hourly flow)	244	288	108	201	85	41	139	165
Section	Within J15	Within J15	Between J4B and J4	Between J10 and J8	Between J2 and J1	Within J2	Within J1	Within J4
Busiest Month	July	July	September	July	July	July	July	July
Busiest daily flow in this month	114,688	116,980	76,067	78,762	68,265	63,828	66,835	65,238
Section	Within J14 and J15	Between J15 and J14	Between J4 and J3	Between J4B and J5	Between J2 and J3	Between J3 and J4	Between J3 and J2	Between J2 and J3
Quietest Month	January	January	January	January	December	January	January	January
Quietest daily flow in this month	56,846	56,925	21,996	34,325	26,989	12,343	22,504	31,623
Section	Within J15	Within J15	Between J4B and J4	Within J4B	Between J2 and J1	Within J2	Within J1A	Within J4

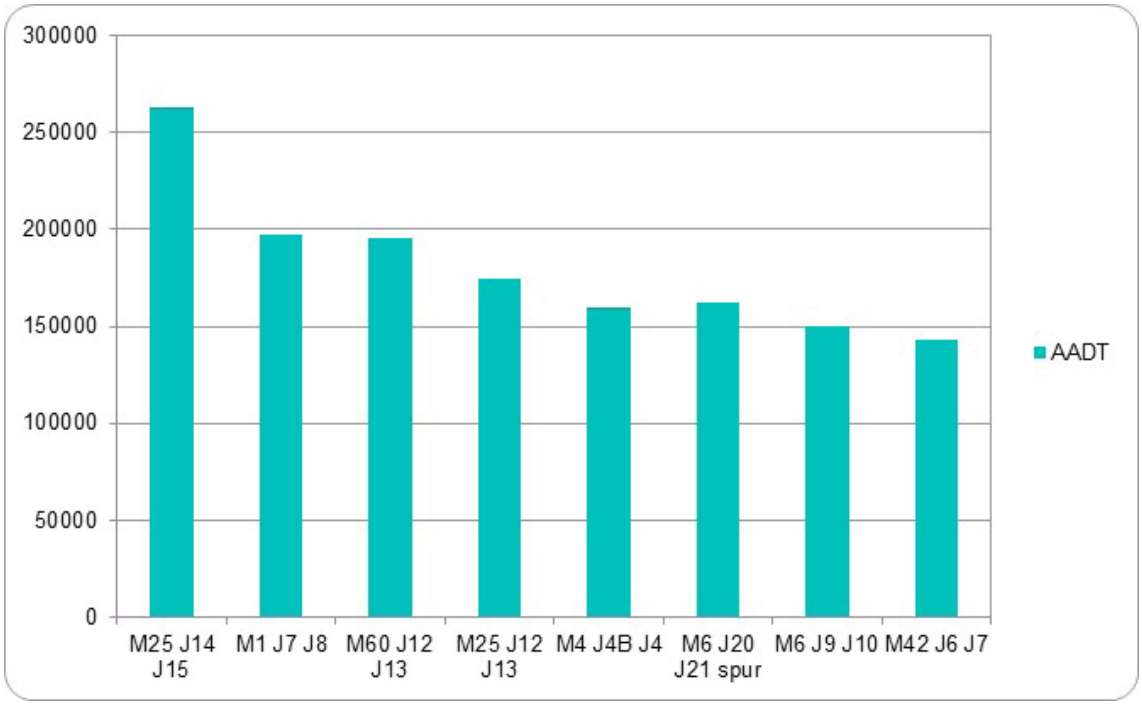
Source: Highways England TRIS

4.5.3 The key trends are as follows:

- Traffic volumes are fairly consistent on all weekdays, above 200,000 vehicles per day and with an average of 2% difference between daily traffic flows, although Thursdays typically exhibit the highest flows;
- In essence the 'peak period' covers the 12 hour period from 06:00 until 18:00;
- The lowest flows are in January (when they are 10% lower than the highest flows in July) but still remain in excess of 200,000 vehicles on the busiest sections; and
- The busiest section of the M25SWQ is between J14 and J15 in both directions, with average daily traffic flows of approximately 112,000 vehicles in each direction of travel.

4.5.4 The volume of traffic on the M25SWQ is also substantially greater than any other motorway in England. Figure 4-5 shows how the busiest sections of other major motorways compare to the busiest and least busy sections of the M25SWQ (columns 1 and 4 respectively).

Figure 4-5: Comparison of busiest motorway sections



Congestion

4.5.5 The Route Strategy (Highways England 2015) identifies that all sections of the M25SWQ fall within the worst performing 10% of the SRN in terms of vehicle hours delay. Analysis has been undertaken into levels of congestion on the highway network using publically available journey planning websites (Google Maps, Traffic England Updates[8]).

4.5.6 The review indicates that the typical congestion hotspots in the weekday morning peak period are as follows:

- M25 Anticlockwise
  - Delays are experienced from Watford to J15 (M4). Congestion lessens from this point until J13 (where there is a lane drop through the junction). Congestion is shown from J13 (A30) to J11 (A317) and on the approach to J10 (A3). The journey time information indicates there is little or no congestion east of J10.
- M25 Clockwise
  - Delays are experienced from J8 (A217) to J12 (M3). It should be noted that the traffic flows on this section of the M25 are the lowest in the study area despite the congestion observed. Congestion is less severe from J12 to J14 (A3113/Heathrow T5). Congestion is shown from J14 to the mid-way point between J15 (M4) and J16 (M40). The journey time information indicates there is little or no congestion travelling clockwise north of J16.

4.5.7 The review shows the typical congestion hotspots on highway network in the PM peak period on weekdays is generally as follows:

- M25 Anticlockwise
  - Congestion between J16 (M40) and J15 (M4), Congestion is less severe from this point until J14 (Heathrow T5). There is congestion from J14 until J11 (A317). The journey time information indicates there is little or no congestion anticlockwise south of J11 within the study area.
- M25 Clockwise
  - The M25 is heavily congested between J11 (A317) and J15 (M4) clockwise. North of J15 there is some congestion on the approach to J16 (M40) which reduces through the junction. North of J16 there is some congestion on the approach to J17. The journey time information indicates there is little or no congestion on the clockwise section of the M25 south of J11 within the study area.

4.5.8 At weekends, the review indicates the M25SWQ network performs with little or no congestion between before 10:00, in contrast to weekdays. However, congestion builds later in the day peaking at similar levels to weekdays during the afternoon and early evening.

4.5.9 Comparing the congestion review findings to traffic flow data shows the times of greatest congestion are matched by the highest traffic flows and lowest speeds.

8 Highways England's National Traffic Information Service.

M25SWQ speed data

4.5.10 Speed data for 2015-2016 from WebTRIS has been extensively analysed on a monthly, daily and hourly basis for each section of the M25SWQ. The monthly and daily analysis has been undertaken for a 14 hour period between 06:00 and 20:00.

Figure 4-6: Daily average speeds, 2015-2016 (clockwise)

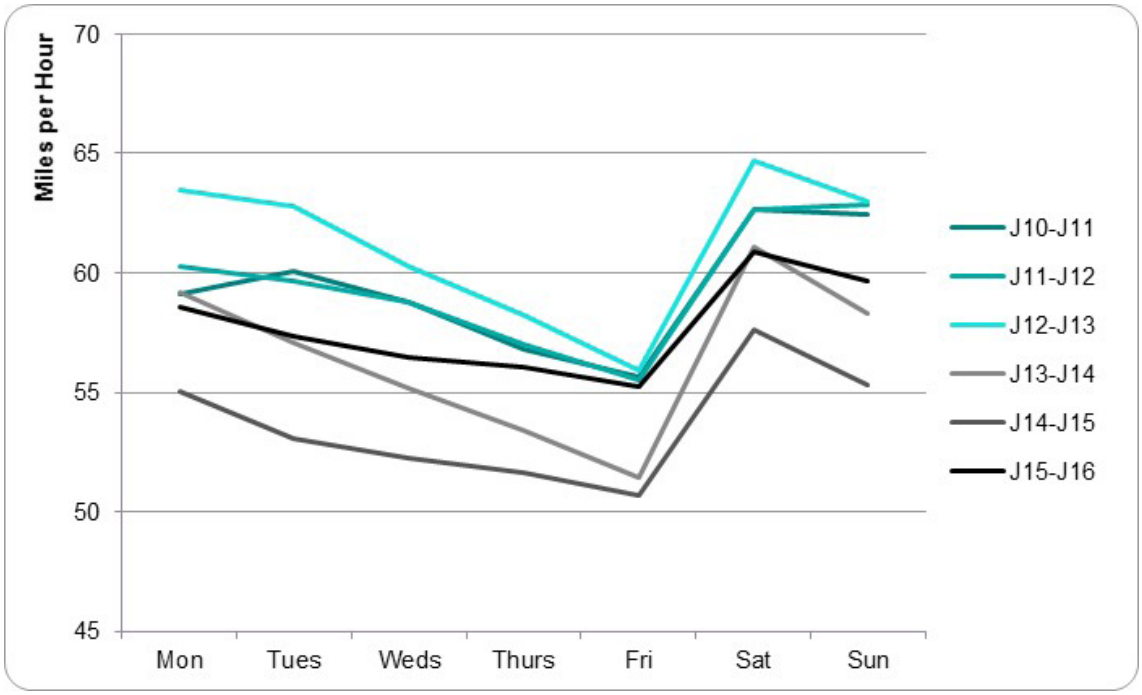
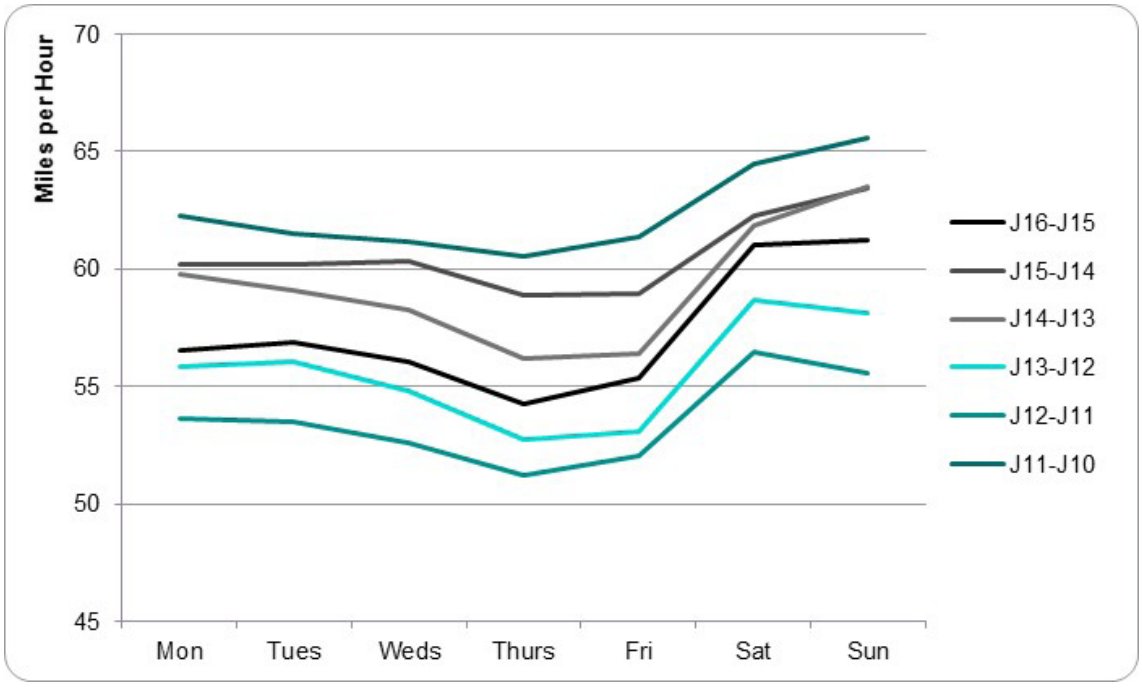


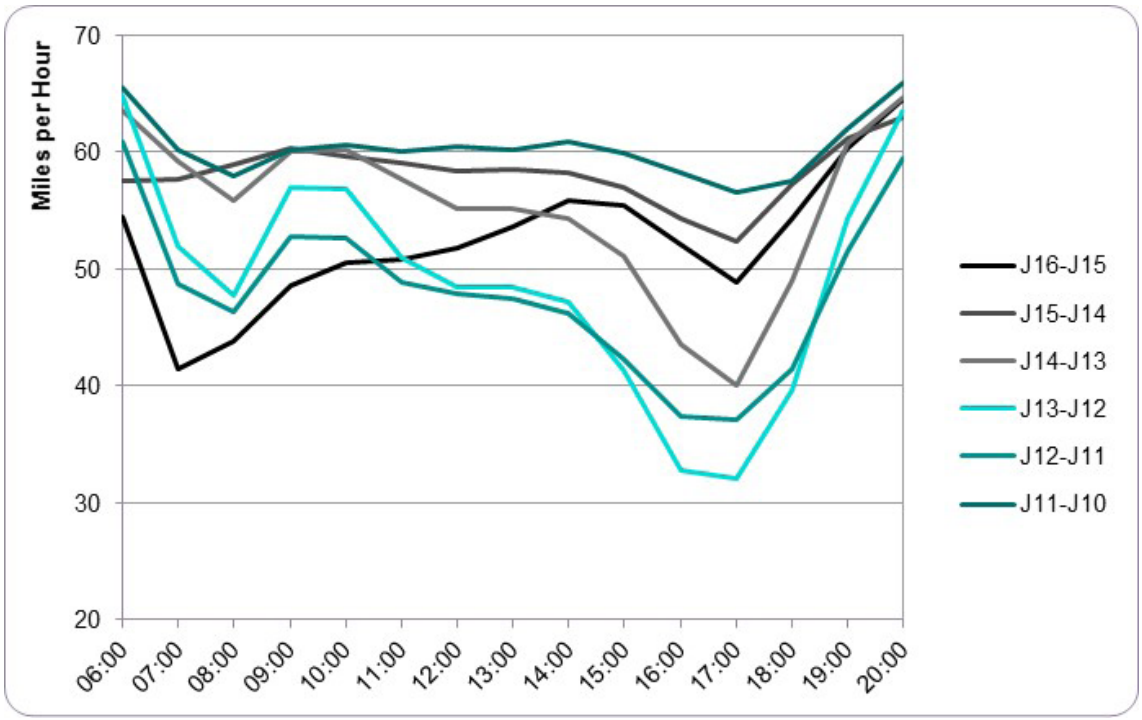
Figure 4-7: Daily average speeds, 2015-2016 (anticlockwise)



4.5.11 The tables above indicate lowest average speeds are recorded on Thursdays and Fridays and the highest average speeds on weekends. However, the key finding is that on any given section of the motorway there is very little variance between any day of the week.

Figure 4-8: Annual hourly average speeds, 2015-2016 (clockwise)

Figure 4-9: Hourly average speeds, 2015-2016 (anticlockwise)



4.5.12 Not surprisingly, the highest average speeds are shown through the night. Average speeds reduce through the day with the lowest speeds occurring during the afternoon peak periods (correlating to times of highest traffic volumes). The section between J13 and J15 has the slowest average speeds, as follows:

- In the clockwise direction average traffic speeds are below 35mph between 16:00 and 19:00 –and as low as 29mph between 17:00 and 18:00 between J13 and J14; and
- In the anticlockwise direction average speeds are below 45mph between 15:00 and 19:00 and below 35mph between 16:00 and 18:00 on the section between J13 and J14.

4.5.13 Travel speeds and journey time reliability along the M25SWQ show considerable variation throughout the day and week. The traditional peak hours are characterised by very slow travel speeds often falling below 35 miles per hour with correspondingly longer journey times.

4.5.14 Although the inter-peak period appears to benefit from higher average speeds, these averages mask a wider variation in speed and consequently journey times are less predictable at these times. Figure 4-10 to Figure 4-15 show how average speeds vary through the week day as well as at the weekend.

4.5.15 The evidence in these Figures clearly demonstrates that travellers on the M25SWQ almost always travel at speeds well below normal motorway speeds. These average speeds show that there is considerable time wasted which leads to a poor user experience.

Figure 4-10: Weekday morning peak (07:00 - 10:00)

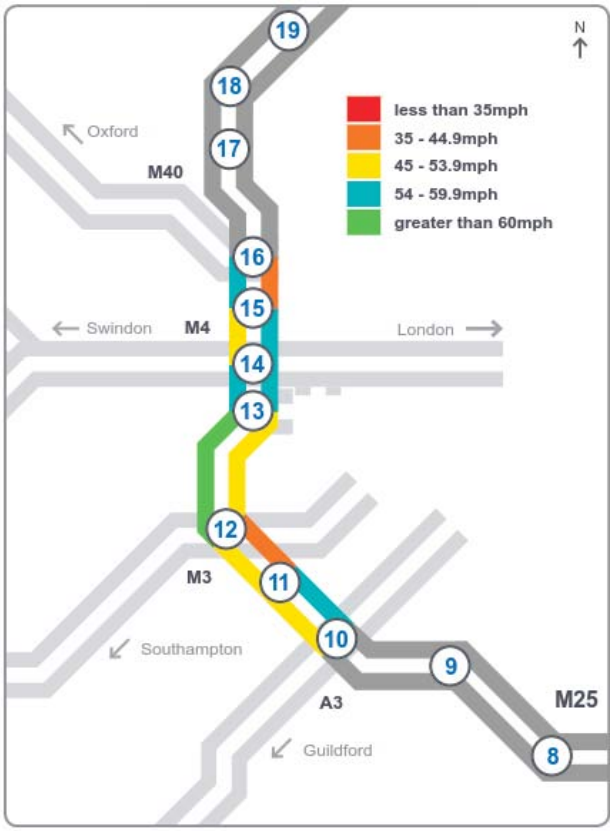


Figure 4-11: Weekday inter-peak (10:00 - 16:00)

Figure 4-12: Weekday evening peak (16:00 - 19:00)

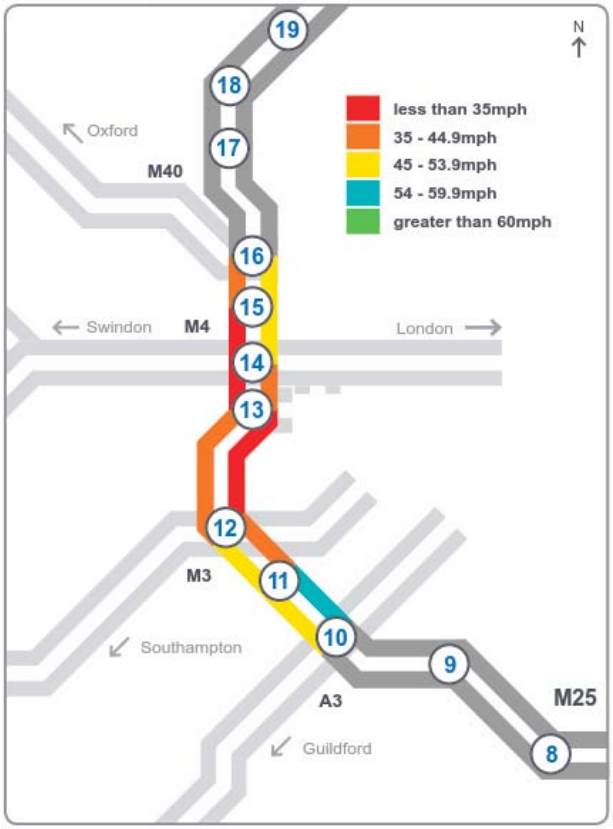


Figure 4-13: Weekend morning (07:00 - 10:00)

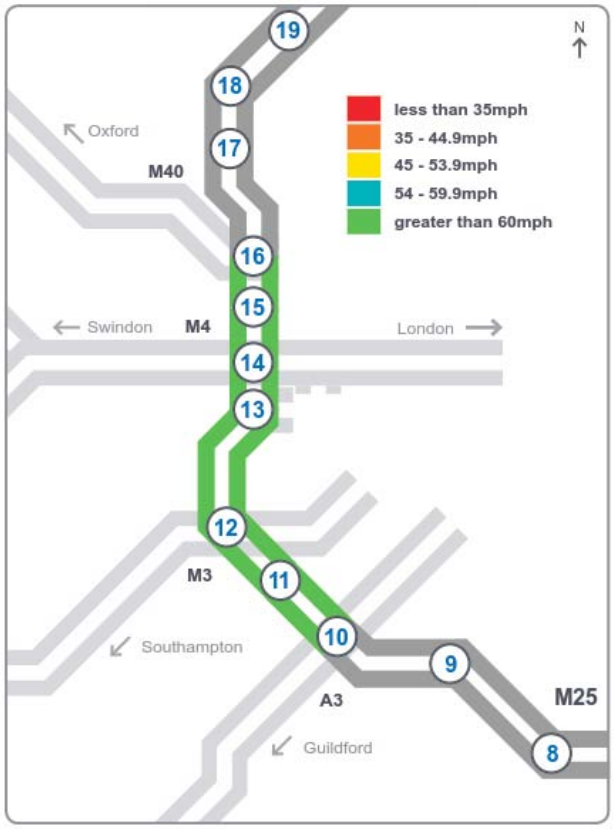


Figure 4-14: Weekend lunch period (11:00 - 15:00)

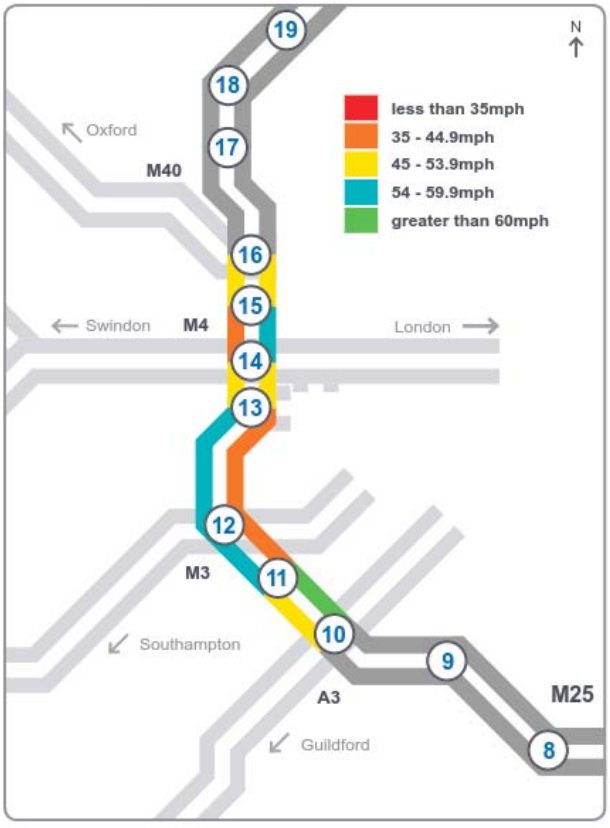
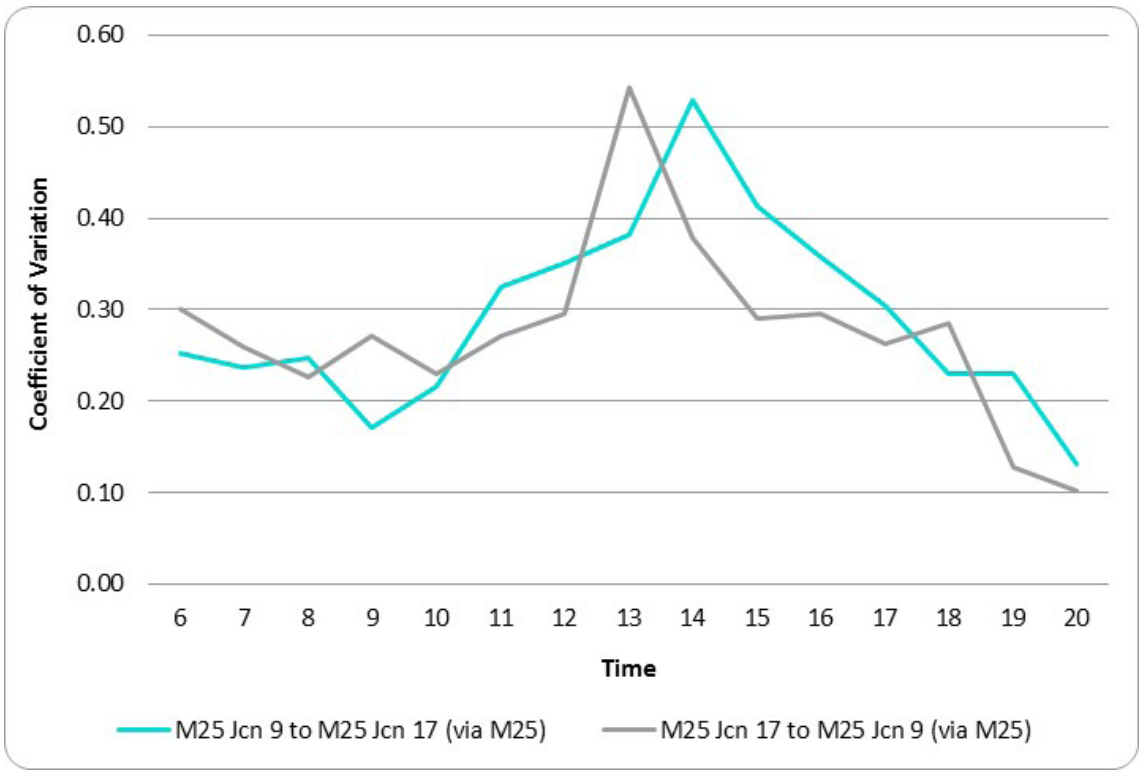


Figure 4-15: Weekend early evening (16:00 - 19:00)

Journey time variability

4.5.16 Trafficmaster data collected over the 2014-2015 period for the M25SWQ highway network has been used to analyse the speed of movements undertaken through the study area. The data has been used to assess the variance of weekday journey times to provide an overview of the journey time reliability. Figure 4-16 shows the journey time variability across a typical working day in both directions.

Figure 4-16: Journey time variability (Coefficient of Variation)*



*A higher Coefficient of Variation equates to higher journey time variability.

4.5.17 The findings of this analysis indicate that journey times are:

- Most variable during the middle part of the working day between the traditional morning and afternoon peak periods;
- Least variable following the traditional afternoon and evening peak periods;
- Typically more variable over the period 06:00-08:00 than 08:00-09:00; and
- Typically more variable over the period 15:00-17:00 than 17:00-18:00.

4.5.18 It is important to consider this analysis alongside the congestion analysis undertaken using route planning information and the traffic flows through the study area. When considered in combination the results suggest the journey times are more predictable in the traditional morning and afternoon peak periods – albeit journeys take longer and traffic is moving more slowly. This arises due to the traffic volume being consistently high during the peak periods.

4.5.19 In the middle part of the working day there is more variation in speeds and journey times which is a function of marginally lower traffic volumes during this inter-peak period. As a consequence there is more variation in speeds with free flow conditions at some times and congestion at other times making journey times in this period of the day less predictable.

Asset management

4.5.20 The whole of the M25 is maintained by Connect Plus through a design, build, finance, and operate contract. The M25 in the study area was built between 1976 and 1985 and subsequently, the majority of carriageway structure is nearing the end

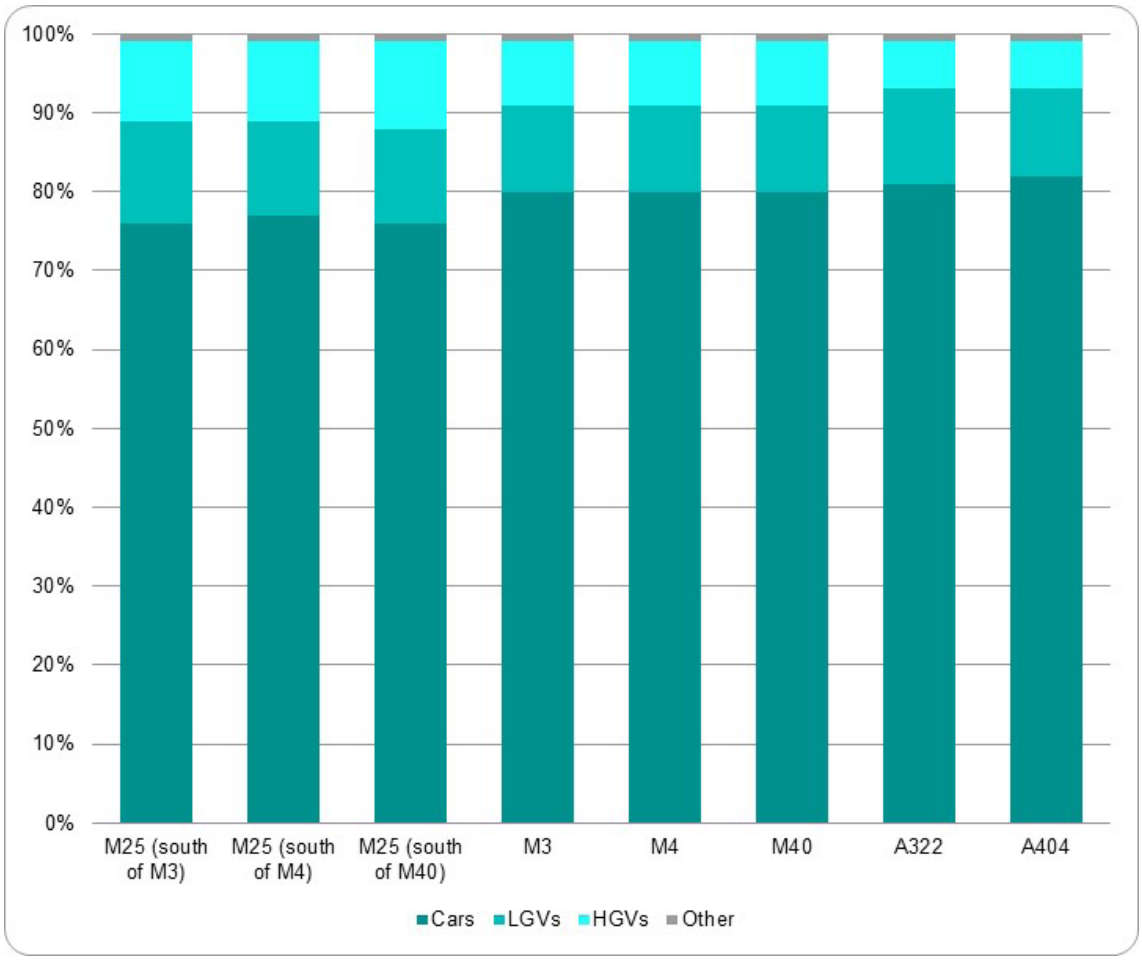
of its design life. Most of the carriageway in the M25SWQ is planned to be resurfaced by 2020, with some of the greatest impacts of this work likely to be felt between J8 and J11, where a technique to extend the life of the concrete road surface will be undertaken.

4.5.21 The high traffic volumes on the M25SWQ and limited capacity of the tactical diversion routes impact upon asset maintenance. Routine maintenance is scheduled overnight to minimise impacts on traffic flow, but limits the amount of work and techniques which can be used.

4.6 Freight

4.6.1 The use of the M25SWQ by HGVs and Light Goods Vehicles (LGVs) has been analysed using available DfT annual traffic counts for the period 2000 – 2010. The proportional split by vehicle classification is shown in Figure 4-17.

Figure 4-17: Vehicle types on motorways and A-roads*



*Using available DfT count site data for select links. Note that: M25 (south of M3) represents Junctions 12-11; M25 (south of M4) represents Junctions 13-14; and M25 (south of M40) represents Junctions 16-15.

4.6.2 The data shows the split of traffic is relatively consistent for each section of the M25 analysed, with approximately 11% HGVs, 12% LGVs and the remainder (75%) cars. The proportion of goods vehicles on the connecting motorways (M3, M4 and M40) is lower, with 11% LGVs and 8% HGVs and the remainder cars (81%).

4.6.3 On selected routes parallel to the M25, HGVs comprise a lower proportion of all vehicles (6%) and cars represent in excess of 80% of all vehicles.

4.7 Road safety

4.7.1 Accident rates (collisions and casualties per billion vehicles kilometres) are higher on the M25SWQ when compared to other motorways, making road safety another issue to consider. Seventeen of the top 250 collision sites in the UK are located either on the M25SWQ or its approaches. This includes J10 (Wisley) which is ranked 1st nationally with an average of 13 collisions per year, and J13 (Staines-upon-Thames) which is ranked 21st nationally with an average of 10 collisions per year.

4.7.2 Table 4-3 below highlights the accident rates for all links in the M25SWQ between 2012 and 2014. The national accident average has been calculated using COBALT* User Guide, Version 2013.02 for dual 4 lane motorways.

Table 4-3: Accident rates on M25SWQ (2012-2014) Personal Injury Accidents/million vehicle kilometres (PIA/mvkm)

	2012	2013	2014	2012-2014 average
National Accident Average (dual four-lane motorways)	0.066	0.063	0.060	0.063
J10-11	N/A	0.085	0.074	0.079
J11-12	0.086	0.094	0.061	0.080
J12-13	0.088	0.078	0.108	0.091
J13-14	0.075	0.103	0.082	0.087
J14-15	N/A	0.031	0.029	0.030
J15-16	Data unavailable	Data unavailable	Data unavailable	Data unavailable

4.7.3 All results are consistently above the national average but annual rates are inconsistent and do not indicate a trend to an increasing or decreasing rate. The highest accident rate on the M25SWQ is between J12 and J13.

4.7.4 Table 4-4 below highlights the number of accidents that occurred at junctions within the M25SWQ, along with the percentage which included a Killed and Seriously Injured (KSI) casualty. When compared to the link data, there are a smaller proportion of KSI accidents occurring at junctions.

Table 4-4: Number of accidents at junctions on the M25SWQ

	2012		2013		2014	
	All	KSI	All	KSI	All	KSI
J10	9	0%	4	0%	2	0%
J11	7	0%	3	0%	2	0%
J12	7	14%	2	0%	7	0%
J13	5	0%	0	0%	2	0%
J14	3	0%	3	0%	1	0%
J15	2	0%	0	0%	4	25%
J16	3	33%	0	0%	2	0%

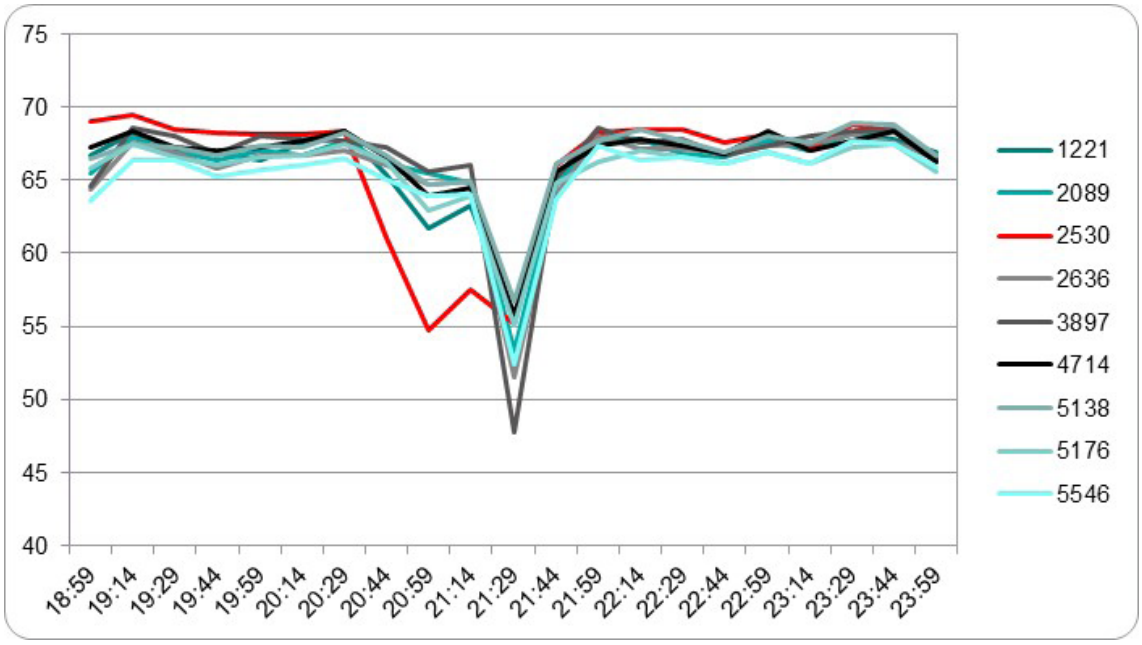
* Cost and Benefits to Accidents - Light Touch (accident analysis for transport schemes)

4.8 Resilience

4.8.1 Data compiled for the Route Strategy indicates that the average lane impact duration after incidents on the carriageway is less than 1 hr on all parts of the London Orbital except the Dartford Crossings and less than 30 mins on substantial sections of the M25SWQ, except for J13 to 14 and J15 to J16. However, the exceptionally high traffic volume on this section of motorway exacerbates the impact of any incident and consequently the time taken for the network to recover can extend over several hours.

4.8.2 An example to illustrate this is shown in Figure 4-18 which displays speed data recorded downstream of a single incident.

Figure 4-18: Speed data following a collision on M25 (between J10 and J11)



4.8.3 The incident occurred immediately downstream of counter number 2530 at approximately 8:25pm on the clockwise carriageway between J10 and J11. The speed at that location drops quickly and the subsequent counters also show rapidly falling speeds.

4.8.4 A second dip in speed occurred approximately 45 minutes after the incident, which would be associated with emergency services implementing traffic management at the site of the incident.

4.8.5 The striking feature of the chart is that network speeds only return to normal almost 90 minutes after the incident occurred. This incident was selected as although it is late in the evening it clearly demonstrates that even when traffic flows are low incidents impose delays on users of the network for a considerable period of time.

4.8.6 Delays caused by incidents including collisions are compounded by the high volumes of traffic and the paucity of alternative routes. All parts of the M25SWQ have tactical diversionary routes but these are up to 25 miles (40 km) in length. They are generally only a single lane and do not have Closed Circuit Television (CCTV) or Variable Message Signs (VMS) to guide diverted traffic. As such, enacting these routes

causes a severe impact on local and strategic traffic when trying to accommodate the volume of traffic which normally travels on the M25.

4.8.7 Poor diversionary routes also impact on the availability of the motorway for routine and emergency maintenance. All sections of the M25SWQ are required to be resurfaced in the period to 2020, something which is predicted to have a significant impact on road users.

4.8.8 All sections of the M25 are covered by tactical diversion routes of between 2 miles (3km) and 25 miles (40km) in length which come into operation as necessary, in partnership with local highway authorities. Most of these routes have changed little since first being established, with the exception of the route between J10 and J12 introduced at the time of the Olympic cycling events.

4.8.9 The Route Strategy Evidence Report (Highways Agency, 2014) recognises that there are few good alternative routes, and in dealing with the highest traffic volumes in the country implementing these diversion routes can result in severe impact on road users (both local and strategic). The quality of the diversion route between J10 and J12 is defined as having a 'very severe impact on traffic' involving use of entirely single carriageway roads and being more than 75% longer than the M25. The diversion routes do not usually have CCTV or VMS to guide diverted traffic.

4.9 Routes parallel to the M25

4.9.1 A complex set of factors may encourage drivers to make use of roads which broadly run parallel to the M25 instead of the motorway, including use of satnavs, previous experience of using the M25 and likelihood (real or perceived) of delay, travel reports, habitual behaviour and quality and capacity of the route. Different drivers may choose the better quality route (M25) over shorter routes, or conversely choose lower quality routes to avoid the congestion on the M25.

4.9.2 Figure 4-19 illustrates the location of motorways and dual carriageway standard roads in the study area. Other than the M25, only limited sections exist of other orbital dual carriageway standard roads. Where they exist, they tend to only connect between two neighbouring radial routes and are not of a standard to accommodate the traffic that the M25 caters for. Examples of these routes comprise:

- A331 from the A31 to M3 in the Blackwater Valley;
- A329(M)/A322 from M3 J3 (Bagshot) to M4 J10 (Winnersh);
- The A404/A404(M) from M40 J4 (Handy Cross) to M4 J8 (Maidenhead);
- A406 (North Circular Road) from the A40 to M1; and
- A312 from A4 to M4 and A40 in West London.

4.9.3 The location of motorways and dual carriageway routes across a wider extent of Southern England are shown in Figure 4-20. There is no complete dual carriageway route south of the M25 in Surrey or Sussex and the nearest comprehensive dual carriageway link situated west and north west of the M25 is the A34/A43, approximately 40 miles away.

Figure 4-19: Motorway and other dual carriageway roads in the study area

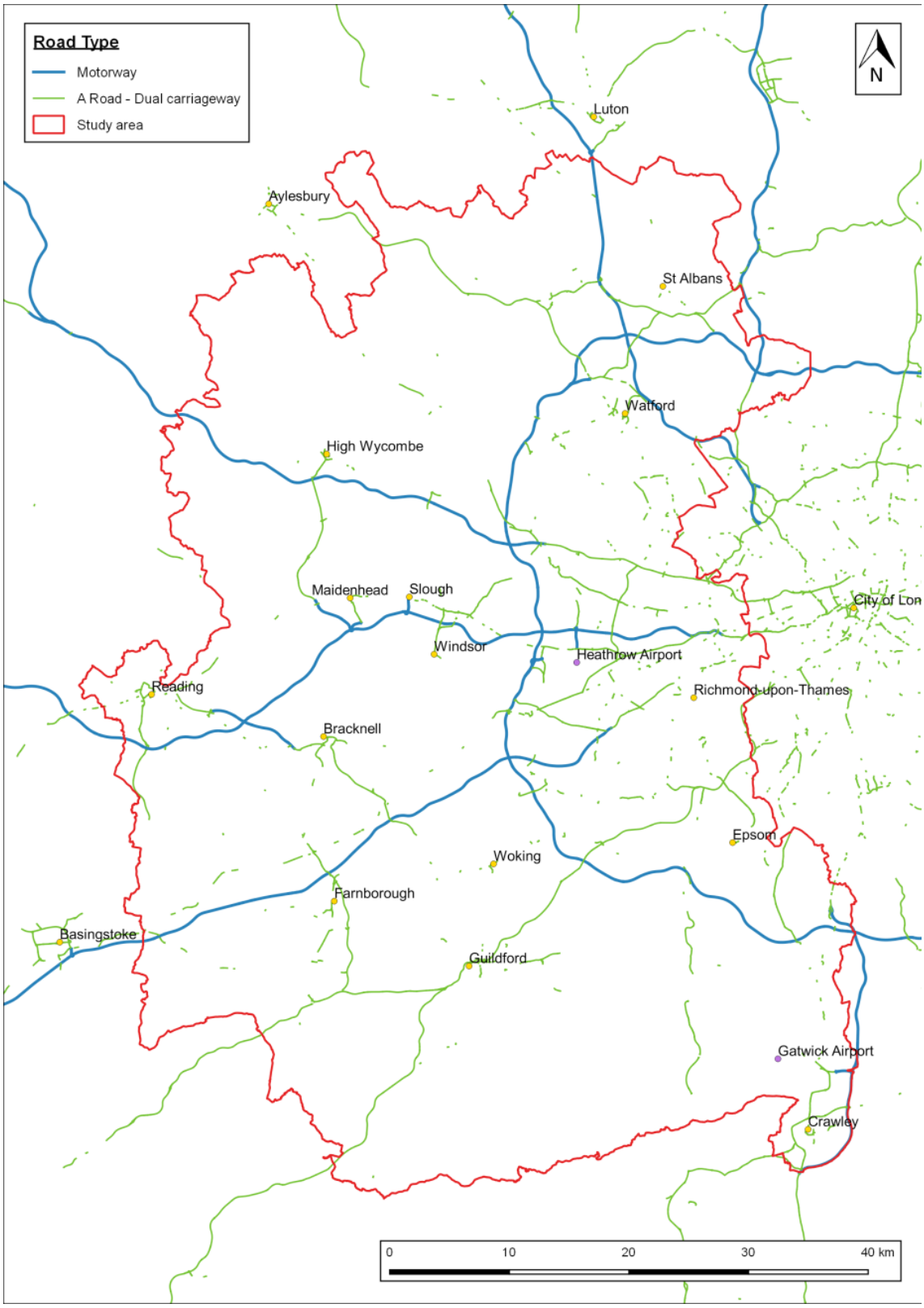
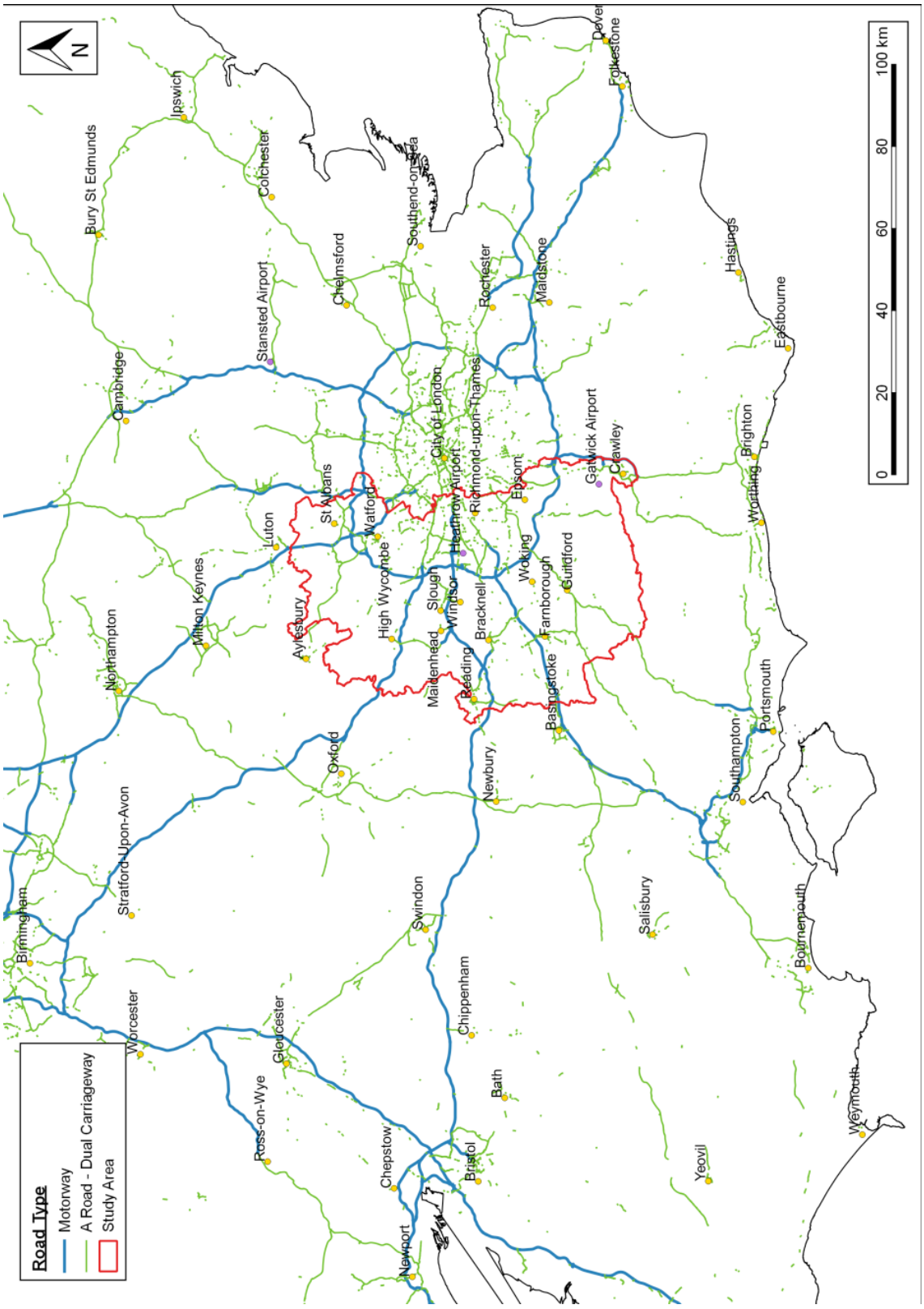


Figure 4-20: Motorway and dual carriageway network in southern England

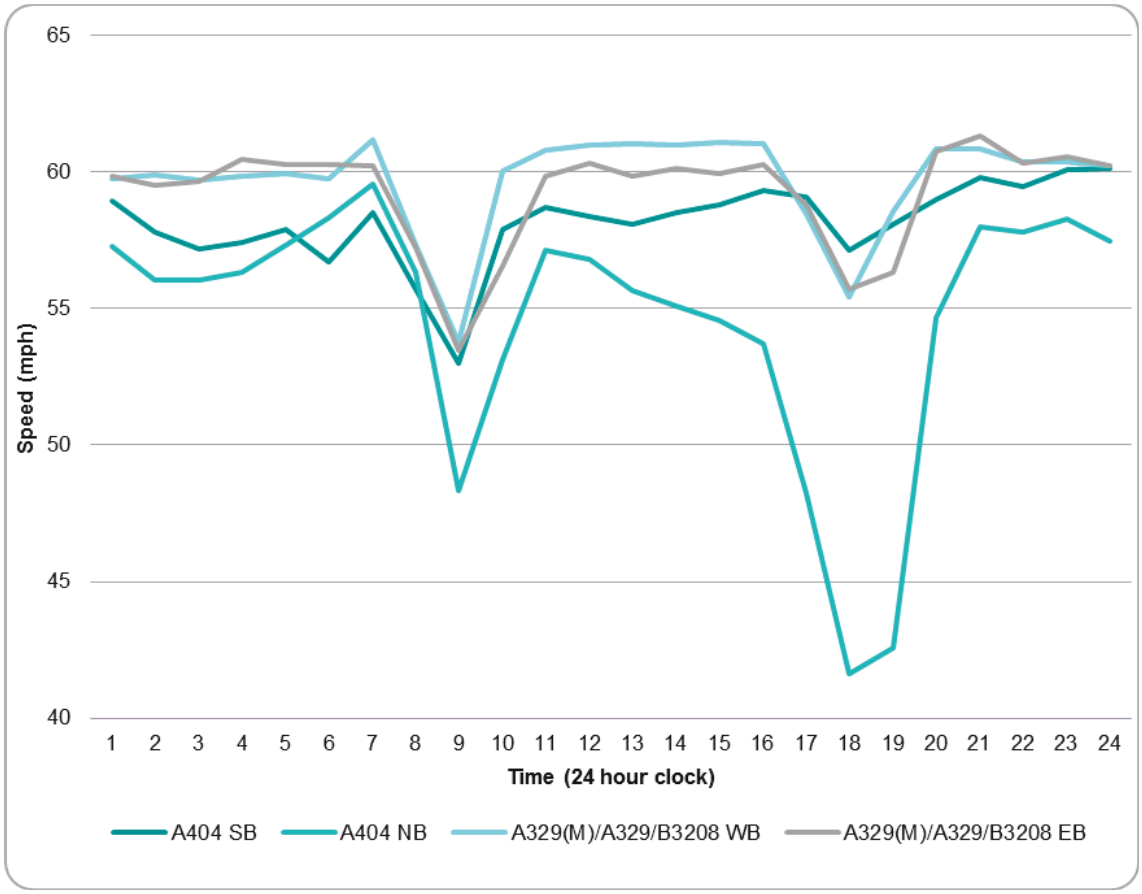


Traffic volumes and speeds on routes parallel to the M25

4.9.4 WebTRIS data has been analysed for the roads which run parallel to the M25. Results highlight that flows throughout the year are fairly consistent, with highest flows occurring during the week, before decreasing on the weekend. Traffic flows show a clear morning and evening peak between 07:00 and 10:00, and 16:00 to 19:00 respectively. This finding agrees with the results from WebTRIS data; when flows are highest, average speeds are also at their lowest.

4.9.5 Figure 4-21 highlights a clear morning and evening peak shown in WebTRIS speed data. Average speeds start to decline from 07:00, reaching lowest speeds between 08:00 and 09:00. Speeds start to increase after 09:00 and reach a steady average speed from 10:00. Speeds decline again from 16:00, with lowest speeds between 17:00 and 18:00. After 18:00, average speeds increase to a steady average.

Figure 4-21: Average daily speeds on roads parallel to the M25



4.9.6 This data demonstrates that the potential alternative routes are operating at capacity and do not offer an untapped resource which would be readily available and capable of providing relief to traffic on the M25SWQ.

4.10 Key findings – Road conditions

4.10.1 Analysis demonstrates that the majority (52%) of trips are already on the M25 when they enter the SWQ, and either use one of the study area radials to travel away from London (30%) or towards London (22%). A further 25% of trips enter the M25 on one of the study area radial routes and transfer to another radial route in the same direction and vice versa.

4.10.2 Less than one fifth of trips (15%) use the M25 for trips which start and finish outside of London, by switching between the study area radial routes. Only 6% of trips use the M25 for trips which start and finish inside London, and just 2% of trips stay on the M25 for the full length of the SWQ (J10-J16).

4.10.3 The M25SWQ has a high proportion of vehicles (>40%) making journeys over 60 miles (100km) in length. Less than a third of traffic undertakes journeys of under 30 miles (50km).

4.10.4 Vehicles travelling anti-clockwise have a wide variety of origins, including the west, the Midlands, the east Midlands, the east, Essex, and trips from within the M25 predominantly on the M40 and M4/A4 corridors. Destinations of these vehicles are dispersed across Surrey, Hampshire, east and west Sussex and Kent.

4.10.5 A similar pattern is observed for traffic travelling in the opposite direction. Heathrow and Gatwick airports and the Channel Tunnel are particularly significant locations.

4.10.6 Traffic volumes are fairly consistent on all weekdays, above 200,000 vehicles per day with an average of just 2% variation between daily traffic flows. Thursday does however typically exhibit the highest daily flows.

4.10.7 In essence, the M25SWQ is so busy that the 'peak period' extends from 06:00 – 18:00. The busiest section is between J14 and 15 in both directions, with average daily traffic flows of approximately 112,000 vehicles in each direction of travel.

4.10.8 In terms of congestion, all sections of the M25SWQ fall within the worst performing 10% of the SRN in terms of vehicle hours' delay.

4.10.9 At weekends – and in contrast with weekdays – the M25SWQ performs with little or no congestion between 08:00 - 09:00. However, congestion builds later in the day peaking at similar levels to weekdays during the afternoon and early evening.

4.10.10 Lowest average speeds are recorded on Thursdays and Fridays, and the highest average speeds on weekends. The section between J13 and 15 has the slowest average speeds; as low as 29mph between 17:00 – 18:00 (clockwise) and 35mph between 16:00 – 18:00 (anticlockwise).

4.10.11 Journey times are most variable during the middle part of the day between the traditional morning and afternoon peak periods, and least variable following the traditional afternoon and evening peak periods. Journey times are typically more variable between 06:00 – 08:00 than 08:00 – 09:00, and between 15:00 – 17:00 than 17:00 – 19:00.

4.10.12 Although journeys are more predictable in terms of time during the peaks, they take longer because there is more traffic which is moving slower.

4.10.13 The M25SWQ displays low resilience when incidents occur despite all parts of the M25SWQ having tactical diversionary routes. These routes are generally only a single

lane and do not have CCTV or VMS to guide diverted traffic. As such, enacting these routes causes a severe impact on local and strategic traffic when trying to accommodate the volume of traffic which normally travels on the M25.

4.10.14 Poor diversionary routes also impact on the availability of the motorway for routine and emergency maintenance. All sections of the M25SWQ are required to be resurfaced in the period to 2020, something which is predicted to have a significant impact on road users.

4.10.15 Road safety is another issue as collision rates are higher than the national average, however annual rates are inconsistent and do not indicate a trend to either an increasing or decreasing number of collisions. What is notable is that consequential delays are severe due to the volume of traffic and lack of alternative routes to provide relief.

4.10.16 There are limited parallel routes available, although a complex set of factors may encourage drivers to make use of these routes which run broadly parallel to the M25. This includes the use of satnavs, previous experience of the M25 and the likelihood (perceived or actual) of delay, travel reports, habitual behaviour, and quality and capacity of the route.

4.10.17 There is no complete parallel route, with only sections of dual carriageway connecting neighbouring radial routes. Analysis demonstrates that journey times are unreliable on all routes parallel to the M25, and particularly where these routes meet radial routes. In any case, these routes are not of a size or standard to accommodate the traffic the M25 currently caters for. In short there are limited road alternatives to using the M25 in the study area.

4.10.18 The analysis presented in this section has generally considered average conditions which have been calculated over a number of different periods such as hours, days and years. It is important to note that these averages may mask severe but relatively uncommon events. A further point to consider is that much of the data is collected at a specific point and will not necessarily capture events before or after that point – for example, much of the speed data is recorded away from junctions so does not represent the impact on speed of merging and diverging traffic.

5 Existing Public Transport Conditions

5.1 Introduction

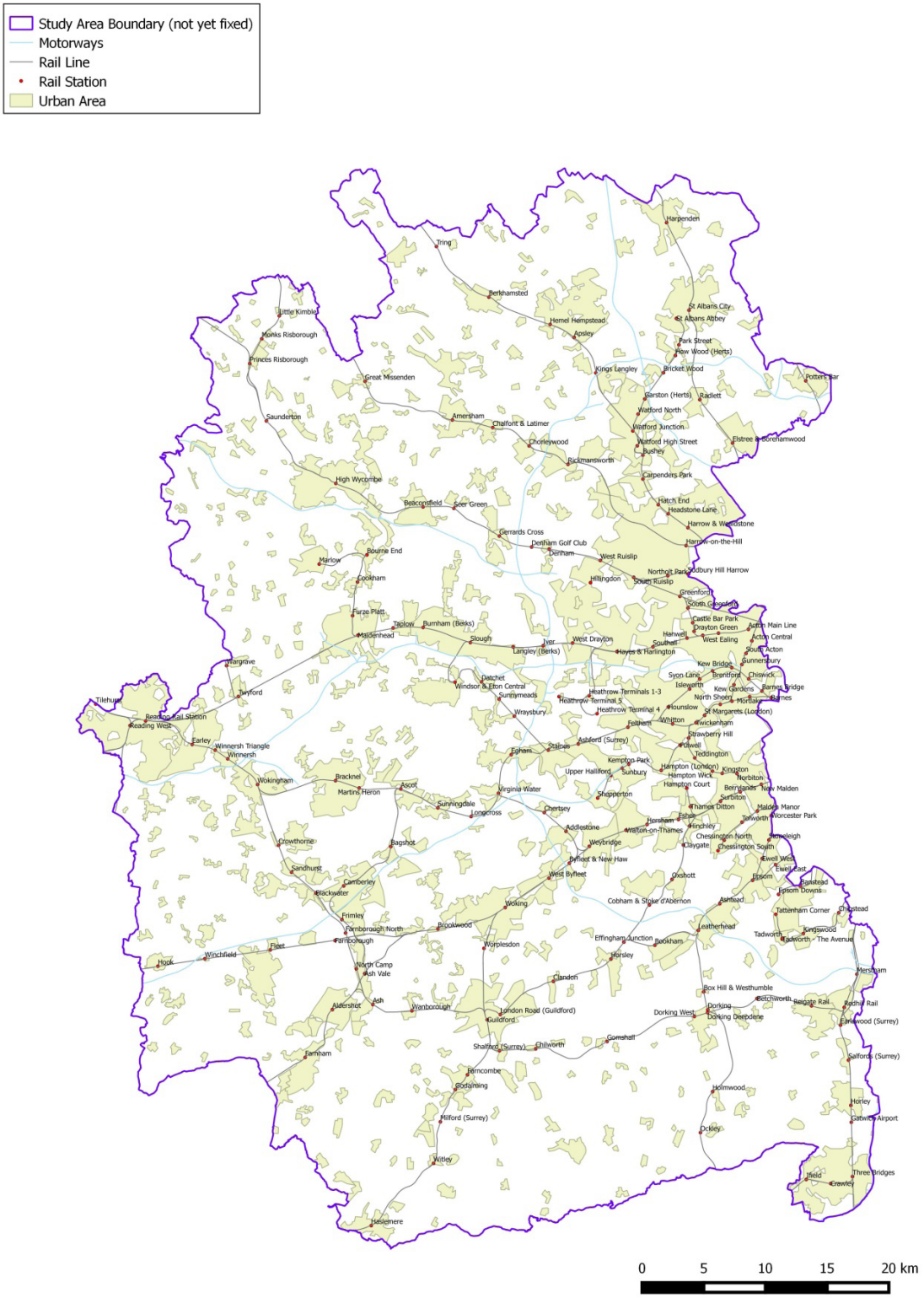
5.1.1 This section of the report considers the different public transport networks and services within the Study Area to identify whether there would be opportunities or barriers to utilising public transport as part of a package of interventions to address the traffic related challenges of the M25SWQ.

5.2 Rail network

Routes and services

5.2.1 Figure 5-1 illustrates the network of rail lines and stations in the M25SWQ. It is some of the densest in the UK and includes some of the most frequent rail services, particularly into London. The study area is served by a predominantly radial rail network, with services focused on London. A substantial proportion of the network is already electrified.

Figure 5-1: Rail network in the study area



5.2.2 One or more central London termini are accessible from almost all stations within the study area; Blackfriars, Euston, Marylebone, Paddington, Waterloo, Victoria and London Bridge. The small number of stations without direct services to London includes intermediate stops on the North Downs Line between Reigate and Wokingham, some stations on the North London Line in LB Ealing, and Windsor and Eton Central. There are also some stations which have only peak time direct services to London (Ash Vale to Ascot, Henley branch).

5.2.3 A range of train operating companies serve the study area, usually running services into a single central London station. In some cases multiple operators serve stations (e.g. Gatwick Express, Great Western Railway and Southern to Gatwick Airport) or one operator runs services into multiple central London stations (e.g. Southern).

5.2.4 TfL's London Underground (LU) network extends into some eastern and northern parts of the study area, with services to Richmond, Heathrow, Ealing Broadway, West Ruislip, Uxbridge, Harrow and Wealdstone, Stanmore, Amersham, Chesham and Watford. In common with the heavy rail network, these services feed into central London.

5.2.5 Whilst the combined rail and underground network in the study area is relatively dense when compared to the UK as a whole, accessibility is not uniform. There are some substantial urban areas which are distant from the nearest railhead, including parts of Hillingdon, much of Hemel Hempstead and Cranleigh (south-west of Dorking). Similarly there are several key employment sites or major employers which are distant from rail stations or have poor rail connectivity in some directions. Heathrow Airport is highlighted as having poor orbital connections, with direct services from London Paddington and via the Piccadilly Line but direct services not being available from north, west or south.

5.2.6 Within the wider zone of influence the accessibility to rail stations is substantially lower, with many sizeable towns having no station (Witney, Buckingham, Brackley, and Wantage) and thus the mode's ability to capture journeys close to source is much reduced.

5.2.7 Even in the study area, and away from the radial rail lines to London, the ability to make direct rail journeys is limited. Key inter-radial connections which avoid the need to travel into, and interchange, in London, are provided by the:

- North Downs Line – connecting Reading, on the GWML, Guildford, on the South Western Mainline (SWML), and Redhill, on the Brighton Mainline (BML);
- Reading to Basingstoke Line – connecting the GWML and SWML;
- Kingston Loop Line – connecting New Malden to Kingston, Twickenham and Richmond;
- Hounslow Loop Line – connecting Richmond to Hounslow and Brentford;
- Woking/Weybridge to Virginia Water/Staines-upon-Thames; and
- North London Line (London Overground) – connecting East Croydon on the BML to Clapham Junction (SWML) and Watford Junction.

5.2.8 The lack of a complete orbital rail route around London means that trips currently made on the M25SWQ may not be easily transferred, which in the short term may discount rail as a possible solution to the traffic issues identified earlier.

5.2.9 Whilst stations at the intersection of rail lines tend to enable passenger to interchange between services on different lines, there are instances in the study area where this is not possible. Interchange is not possible where the SWML crosses the Reading-Guildford line near Farnborough, or where the North London Line crosses the GWML at Old Oak Common, for example.

Network capacity

5.2.10 The capacity of each rail line is governed by a complex set of factors, namely the number of services and how closely they are timetabled together, the mix of the services (in terms of their speed, stopping patterns, and traffic type) and infrastructure capability in terms of signalling headways, margins at junctions and stations, electrification and platform length. Key capacity issues are highlighted in the review that follows.

Number of tracks and minimum signalling headways

5.2.11 The SWML fast line runs inwards from Surbiton and is the most densely operated rail mainline in the UK. 24 trains per hour (tph) arrive at Waterloo using the fast line, with specific periods of 60 minutes within the three hour peak when this rises to 25tph (Network Rail, 2015). The SWML slow line has 19tph between 0802 and 0901 (Network Rail, 2015).

5.2.12 Other sections of line are operating at close to capacity, such as on the WCML from Euston to Rugby, and future growth will be difficult to accommodate without affecting performance (Network Rail, 2011). The implication is that even the smallest delay can quickly be transferred to other services and evidence suggests that increasing services above these levels on current infrastructure is likely to affect performance adversely (without mitigating measures).

5.2.13 Single line sections of track restrict service frequency on the lines between Frimley and Ash Vale, Farnham and Alton, Watford Junction and St Albans Abbey and the approaches to Reading station.

Track layouts

5.2.14 Track layout on the approaches to London Termini, including Euston and Waterloo often restricts the number of services which can access the platforms at any one time. This also applies to the heavily used sections of the BML (between Battersea Park and East Croydon);

5.2.15 There are also number of at-grade junctions (known as flat junctions) which limit available train paths on each approach line, for example:

- On the SWML at Woking; and
- On the BML (including at Gatwick Airport, Purley, Stoat's Nest Junction (Coulsdon), South Croydon Junction, Windmill Bridge Junction).

5.2.16 When combined with dense service operation, at grade junctions mean that any delays can be swiftly transferred to other services.

5.2.17 Further restrictions are caused by the track layout at East Croydon and Clapham Junction, where layout does not allow all trains that currently pass through the station to stop there.

Level crossings

5.2.18 In the Richmond area a particular issue is level crossing down time, which prevents additional services being routed via Richmond and causes significant impacts elsewhere, including Egham and Reigate.

Platform issues

5.2.19 A further issue relates to platform use at a number of stations on key arterial routes into London. Dwell (waiting) times and platform re-occupation margins at stations from Wimbledon into London Waterloo restrict any additional use of SWML slow lines.

5.2.20 There are limited platform lengths on some platforms, e.g. London Euston causing peak hour constraints, and Watford Junction bay platform limits peak hour services to 8-car trains.

5.2.21 Significant levels of station passenger congestion experienced at key stations such as London Waterloo and Clapham Junction during peak periods impact on the number of passengers which can safely transit through a station at any given time.

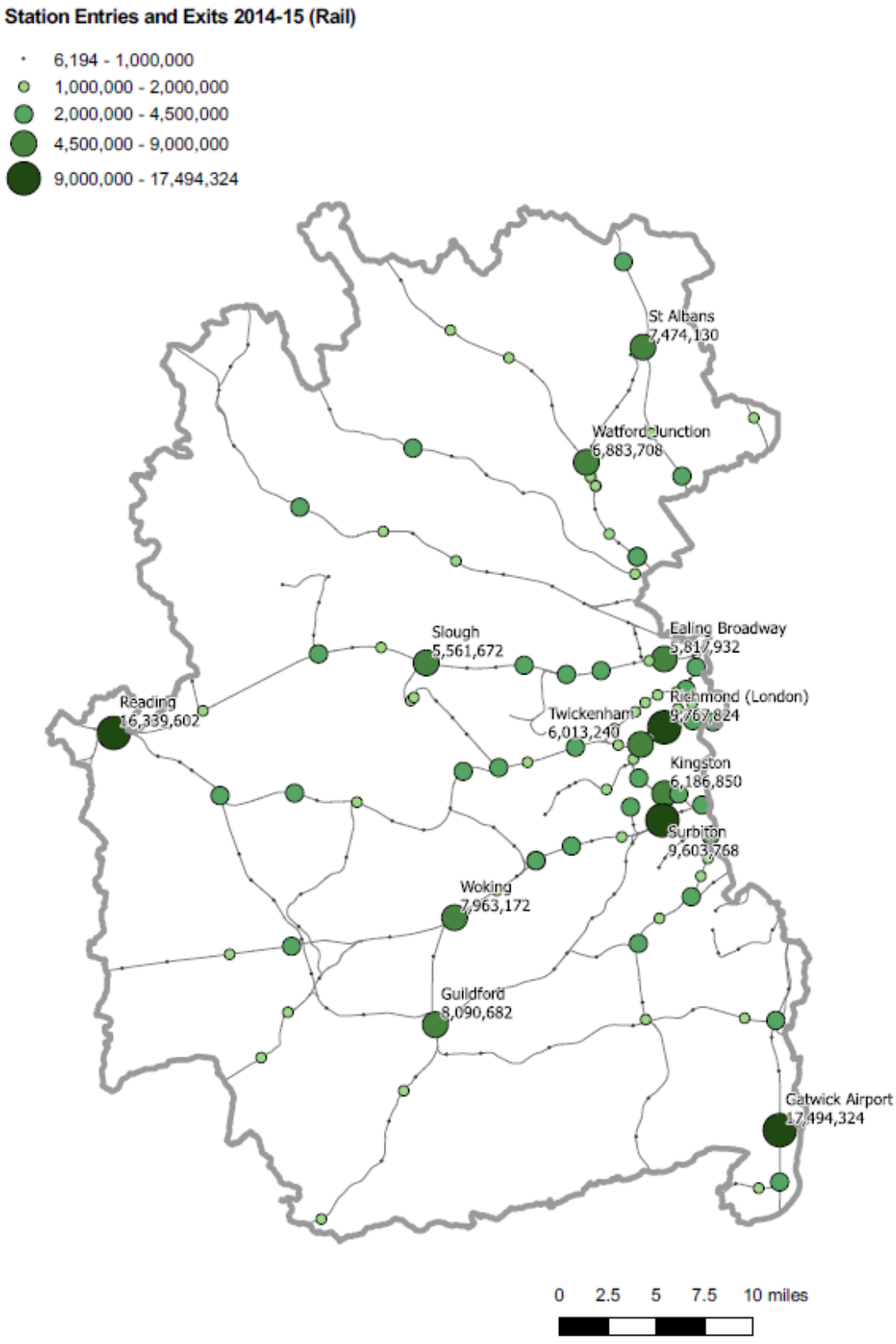
5.2.22 The factors above means that in some cases the railway has either minimal capacity for growth (e.g. on the WCML) or has reached its maximum capacity based on current signalling capability (2 minute headways between trains), the number of tracks (SWML), or station capacity.

5.3 Existing rail usage

Rail patronage

5.3.1 In 2014/15 298.5m rail passenger entries/exits took place in the study area, equating to 10.7% of all UK totals (Office of Rail and Road, 2015). Figure 5-2 identifies the number of passenger entries and exits at each station in the study area, with Gatwick Airport, Reading, Richmond, Surbiton, Guildford and Woking ranked in the top 50 most heavily used stations in the UK. Many of these also have a key passenger interchange role.

Figure 5-2: Station passenger entries and exits by station(2014/15)

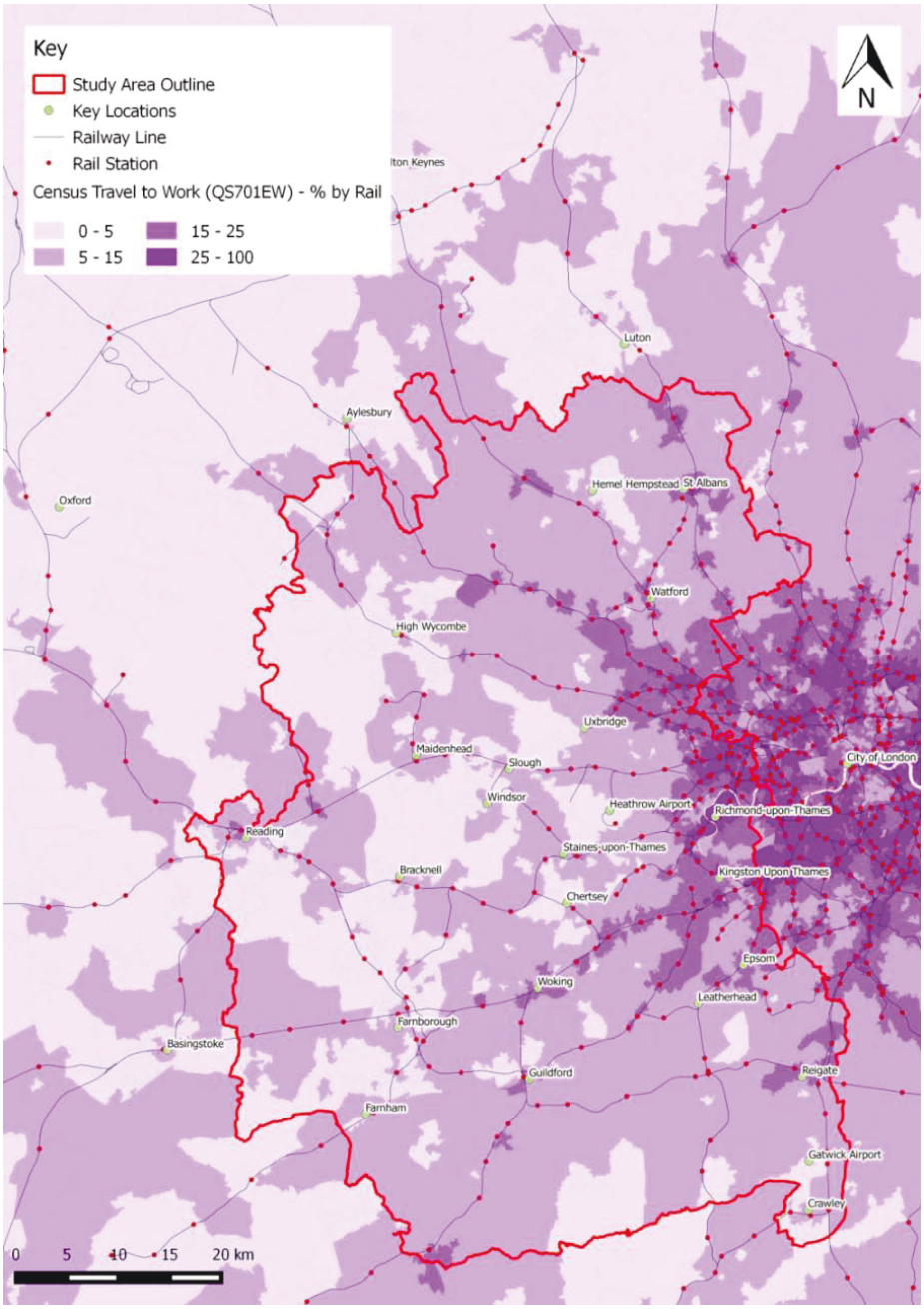


Source: ORR Estimates of station usage 2014-15 (Office of Rail and Road, 2016)

5.3.2 In line with the rail network as a whole, the study area has seen sustained rail passenger growth over recent years with station entries/exits increasing by 65% in the decade since 2004/2005[9] (Office of Rail and Road, 2015). This is attributed to factors working in favour of rail, such as a growing population, structural changes in employment markets and road congestion, which have continued to drive growth.

5.3.3 The use of rail (including the Underground) as a mode of travel to work is illustrated in Figure 5-3. It both indicates the high proportion of residents using rail for commuting along the key radial mainline railways and Underground lines where service frequencies are highest, but also the small catchments from stations within which most rail commuters tend to live.

Figure 5-3: Use of rail for travel to work (Census 2011)



Source: Office for National Statistics 2013

9 Excluding Heathrow terminals, for which data is not available.

5.3.4 The most pronounced levels of passenger growth have arisen in clusters around South West London, and at Gatwick Airport and Reading. Some pockets of higher growth are also seen around Watford to the north. Data shows that stations on GWML and SWML have seen much lower levels of growth in passenger numbers than across the region as a whole (Office of Rail and Road, 2015).

Passenger capacity and crowding

5.3.5 The numbers of passengers relative to the number of train seats or theoretical train capacity is another key issue in the study area. Even before future growth is considered, crowding is already an issue across many parts of the network, particularly on peak hour services into and out of central London. Total maximum stated passenger capacity allows for a degree of passengers standing where time between stops is less than 20 minutes (up to an additional 35% of seating capacity).

5.3.6 Network Rail highlights the following areas of particular concern:

- 59% of trains into London in the morning peak have standing passengers (DfT, 2015b). The proportion is slightly lower in the evening peak (48%);
- 22% of all rail passengers in the morning peak are standing when measured at the busiest point on train journeys into London, some 139,000 passengers (ibid). This compares to 15% of all rail passengers in the evening peak (78,000 passengers);
- Standing is commonplace on the following sections, as follows:
  - On the SWML from Woking and Basingstoke to London Waterloo, with passengers standing from as far away as Winchester on fast services, a journey of over an hour. An additional 20% capacity is needed now to deal with existing overcrowding on these services (Network Rail, 2015).
  - On the BML, notably in the morning peak into London Victoria ; and
  - On the West London Line; very high levels of crowding on services between Watford Junction and Clapham Junction, with 50-100 standing per carriage on some peak services (ibid).

5.3.7 Data is specifically collected in relation to Passengers in eXcess of (train) Capacity (known as PiXC). Overall peak crowding on services in, and into, London is higher than in other cities (4.1% of PiXC compared with 3.3% PiXC in Manchester, the city with next most crowding) (DfT, 2015b).

5.3.8 However, the proportions of PiXC varies markedly between parts of the rail network, with morning services into London Paddington being the worst performing of all London (10.1% PiXC). Waterloo and Euston exceed the average London crowding levels (4.6% and 4.2% PiXC), whilst Marylebone and Victoria are lower (3.9% and 1.9% PiXC).

5.3.9 According to Autumn 2014 data, 6 of the top 10 most overcrowded trains in the UK operate in the study area, included three en route to Paddington (measured at Ealing Broadway), two en route for London Waterloo and one Thameslink service (measured at Blackfriars). All of these services had a passenger load factor (defined as the passenger load as a proportion of passenger capacity) of greater than 150% (DfT, 2015b).

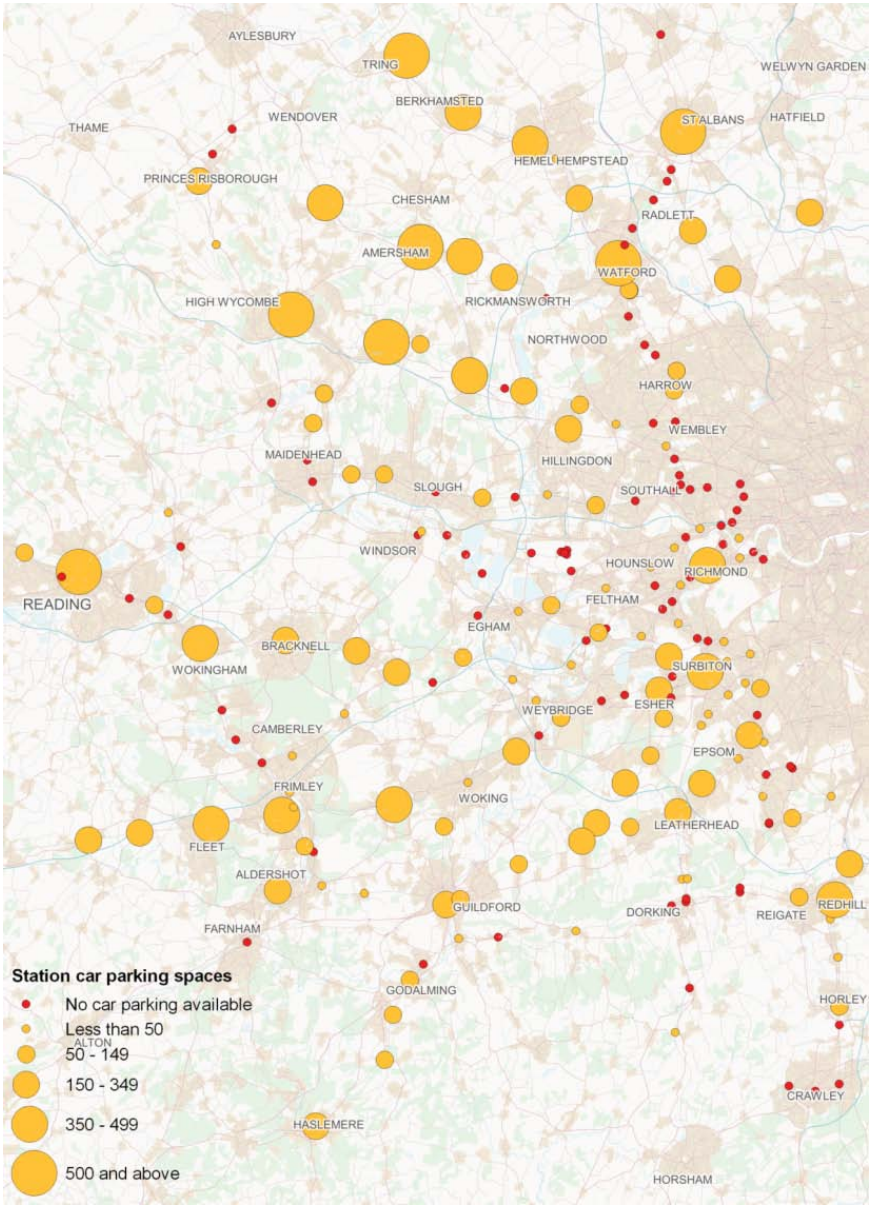
Interchange and Connections

5.3.10 The ease by which passengers can access public transport influences its attractiveness relative to other transport modes.

Car Parking at Rail Stations

5.3.11 Car parking at stations widens the catchment of the rail network and can be a major factor in influencing travel decisions (and thus demand for services). Figure 5-4 shows the numbers of car parking spaces available at railway stations within the study area[10], highlighting the substantial variation in the quantity of provision. 40% of the stations have no on-site car parking whilst nine stations have more than 500 spaces, all of which are at stations with frequent services on mainlines into London, such as Reading, High Wycombe, Beaconsfield and Watford Junction.

Figure 5-4: Car parking at rail stations in the study area



Source: National Rail, 2016

10 Calculations exclude nearby on-street car parking or car parks outside the railway land curtilage.

5.3.12 Whilst comprehensive data is difficult to obtain, anecdotal evidences highlights stakeholder concerns that demand for parking spaces outstrips supply at many stations, with car parks being at or near capacity by the end of the morning peak. This can act as a barrier to rail use and the potential for rail to provide a viable alternative to using the M25SWQ.

Cycle parking

5.3.13 Most stations have provision for cycle parking but the majority have fewer than 50 spaces and only six stations have space for more than 300. This includes St Albans City Station, which has the largest cycle parking capacity of any rail station in the UK (1,150 spaces) (National Rail, 2016). Across the area the quality of provision ranges from uncovered Sheffield Stands through to secure compounds with swipe card entry. Provision is increasing, with several schemes receiving contributions from the DfT Cycle Rail Fund and double-deck racks are being used as a means to increase capacity where station space is at a premium.

5.4 Comparison with other modes

Journey times

5.4.1 As inferred above, a substantial number of rail journeys in the study area require interchange in central London, often with a connection using the Underground, even where the origin and destination are within a few miles of each other (e.g. Slough to High Wycombe). Except where the origins and destinations are on the same (usually radial) line, journey times can be substantial and include an interchange penalty (waiting for the next train; which can be a significant disincentive to using rail). Furthermore, in the study area there is often a requirement to travel in to central London to change to an alternative radial rail route.

5.4.2 Travelling by road is faster than rail for a number of key journeys within the study area and the data highlights the substantial time taken for rail travel between geographically proximate locations; for example:

- Staines-upon-Thames to Heathrow T1-3: whilst the straight line distance is just over 3 miles (5km), there is no link between the two radial lines and thus the journey takes 71 minutes by rail; and
- Marlow to High Wycombe: The straight line distance between the stations is 4 miles (6.7 km). However, the journey via central London takes 2 hours 48 minutes by train.

5.4.3 There are also instances where stopping patterns mean journeys between two places served by direct services have very slow average speeds. As an example Wokingham to London Waterloo has an average train speed of 32mph.

5.4.4 Longer-distance rail journeys within or through the wider area of influence tend to require interchange in central London as there are limited alternative routes. Where alternative routes exist journey times can be longer, have relatively lower frequencies, or both.

5.5 Bus and coach

Bus networks and services

5.5.1 Bus services in the study area tend to radiate out from, and terminate in, a relatively limited number of hubs, either significant town centres (Reading, Watford, Guildford) or significant trip attractors, for example Heathrow Airport and central London.

5.5.2 These locations act as some of the principal interchanges, both between buses and other modes including rail and London Underground services and substantial investment has been made in recent years to improve the quality of many interchanges. Nevertheless the geographical proximity of bus interchanges to rail stations can vary widely between locations which limits the potential for buses to work in tandem with rail for many journeys.

5.5.3 Outside of London the majority of bus mileage is operated by a range of companies operating on a commercial basis and thus the availability of routes and services is dictated by commercial viability. Within London, competitive tendering arrangements apply, with routes, frequencies (including times of first and last buses) and service quality being specified by TfL. Whilst bus and coach services are susceptible to the same congestion as private vehicles the need to serve specified routes (as stipulated by bus service registration arrangements) means that in general they cannot re-route when congestion or disruption arises.

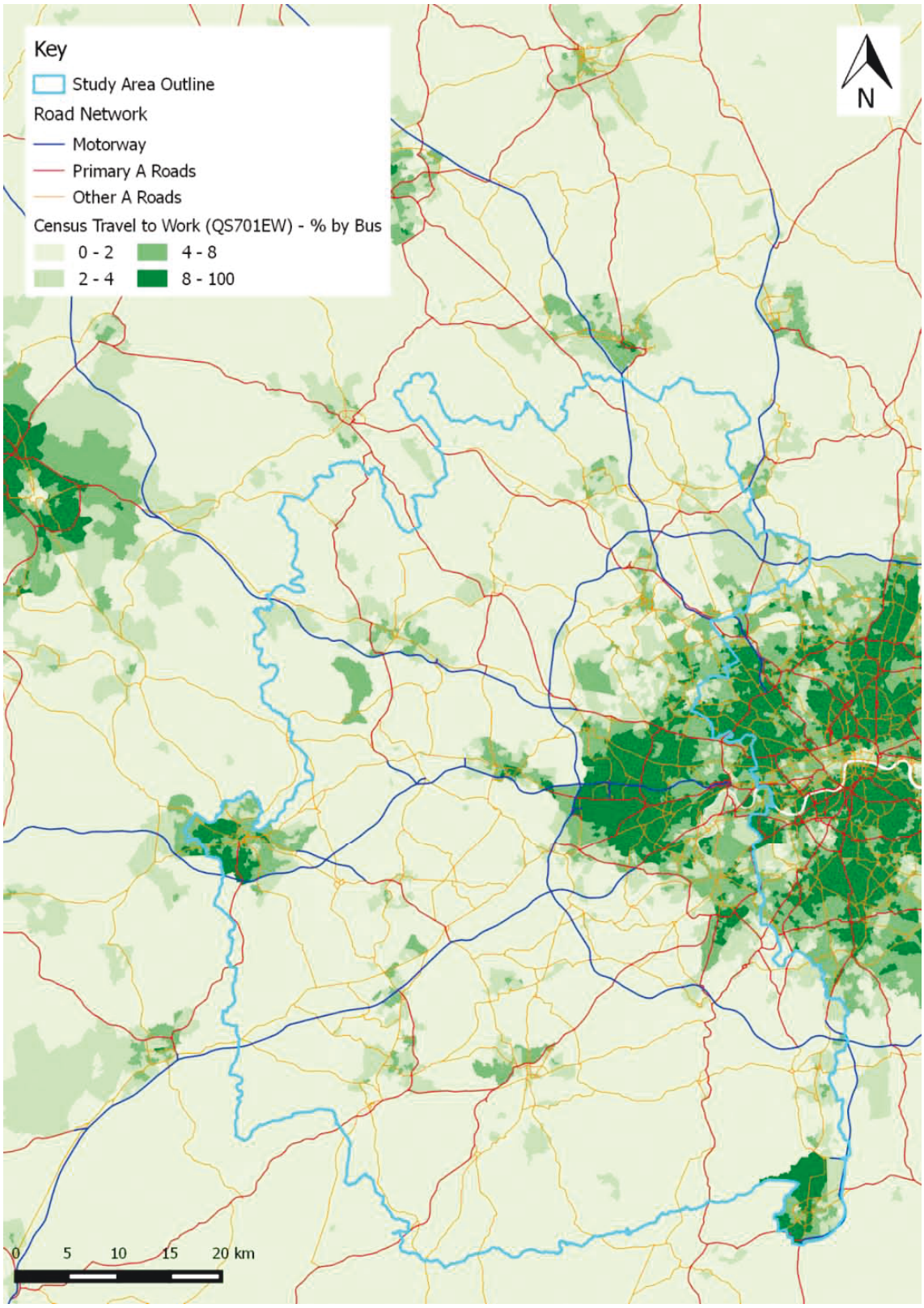
5.5.4 The frequency and hours of operation of bus services varies considerably across the study area. Selected routes operate 24 hours a day and in the immediate M25SWQ corridor these are mostly run wholly within Greater London or radiate out from Heathrow to key settlements beyond the Greater London boundary (Maidenhead and Slough). Daytime bus frequencies on many routes within Greater London operate a 10-minute or better frequency. However, bus connections on many inter-urban corridors elsewhere in the study area tend to be less frequent, for example operating on a 30-minute or hourly basis.

Bus usage

5.5.5 Bus journeys tend to be short in distance, with average trip lengths in 2014 being 3.8 miles in London and 5 miles outside London (DfT, 2016c). Average per capita bus patronage in non-metropolitan England has declined slowly over the last twenty years; in London it rose sharply through the 1990s and 2000s before levelling off in recent years (ibid).

5.5.6 Figure 5-5 below illustrates the proportion of residents in each middle layer super output area (MSOA) travelling to work who use the bus.

Figure 5-5: Use of bus for travel to work (Census 2011)



Source: Office for National Statistics 2013

5.5.7 The map shows the concentration of relatively high levels of bus commuting in west London, including the area around Heathrow Airport, where some areas have 30% of commuters travelling by bus, but with levels tending to fall away sharply at the Greater London boundary. Selected other urban areas have 8% or more of commuters travelling by bus, including in parts of Crawley, Reading and Slough (Office for National Statistics, 2013).

5.5.8 Other local authority level data reinforces the huge variance in per capita bus use across the study area. At one end of the scale Greater London has an annual average of 277 passenger journeys per head of population, and Reading has the fourth highest number of passenger trips per head of population in England outside London with an average of 119 passenger journeys (Department for Transport, 2016b). Several local transport authorities in the study area (Wokingham, Windsor and Maidenhead, Bracknell Forest, Buckinghamshire, and Surrey) have on average fewer than 25 bus journeys per person per year, placing them in the bottom 20% of authorities.

Coach networks and services

5.5.9 Coach services serving locations within the study area predominantly radiate out from the three major hubs - central London and Heathrow and Gatwick Airports. The majority of services calling at locations in the study area are operated by National Express, with other operators (Greenline, Oxford Tube) on selected routes. Of particular note is the frequency of services from Oxford to central London – up to every 12 minutes – routed along the M40 and A40.

5.5.10 Whilst relatively few settlements in the study area are themselves directly served by coach services, the wider UK coach network relies heavily on the motorways in the study area, both the M25SWQ and the radial routes which intersect it. The reliance of coach services on the SRN makes them particularly vulnerable to delays and congestion experienced on the M25.

Dedicated rail connections

5.5.11 Railair coaches provide connections to Heathrow Airport from mainline railway services at Watford Junction (WCML), Reading (GWML) and Woking (SWML) and TfL bus connections are available to connect the airport to National Rail services at Feltham. Whilst these widen the accessibility of the airport from radial rail lines there is an interchange penalty arising from the need to change modes.

5.6 Key findings – Public transport

5.6.1 The rail network in the study area is some of the densest in the UK and includes some of the most frequent rail services, particularly into London.

5.6.2 One or more central London termini are accessible from almost all stations in the study area, including Blackfriars, Euston, Marylebone, Paddington, Waterloo, Victoria and London Bridge.

5.6.3 TfL's LU network extends into some eastern and northern parts of the study area, with most services feeding into central London.

5.6.4 In 2014/15, rail passenger entries and exits in the study areas totalled 298.5 million, equating to 10.7% of the UK total. Gatwick Airport, Reading, Richmond, Surbiton, Guildford, and Woking ranked in the top 50 most heavily used stations in the UK. This is set against a context of sustained passenger growth of 65% since 2004/5.

5.6.5 Even before future growth can be considered crowding is already an issue, particularly on peak hour services into and out of central London. Some major arterial routes into Paddington, Waterloo, and Victoria already require an additional 20% capacity to deal with existing overcrowding on these routes.

5.6.6 Six of the UK's top 10 most overcrowded trains operate in the study area. All had a passenger load factor in excess of 150%.

5.6.7 Car and cycle parking at rail stations in the study area is highly variable, with the former often influencing travel decisions. 40% of rail stations have no car parking at all; however nine stations provide more than 500 spaces.

5.6.8 Accessibility by rail and to railway stations is not uniform. Some substantial urban areas are distant from the nearest station including Hillingdon, Hemel Hempstead, and Cranleigh. Similarly there are several key employment sites or major employers which are distant from rail stations or have poor rail connectivity in some directions. For example Heathrow Airport has direct access from central London, but limited orbital or other connections from the north, south, and west.

5.6.9 The ability to make direct journeys by rail is often limited, with many requiring travel into central London to change onto other radial routes. The lack of a complete (or even partial) orbital rail route around London means that trips currently made on the M25 may not be easily transferred, which in the short term may discount rail as a possible solution to traffic issues.

5.6.10 Travelling by road is faster than rail for a significant proportion of journeys. There are many geographically proximate stations (3 – 6 miles apart) which have journey times by rail of more than 60 minutes.

5.6.11 Bus services in the study area tend to radiate out from, and terminate in, a relatively limited number of hubs, either significant town centres or trip attractors. Bus journeys tend to be short in distance, with average trip lengths being 3.8 miles in London and 5 miles outside London.

5.6.12 Relatively few settlements in the study area are served by coach services; however the UK coach network relies heavily on the SRN and the motorways in the study area. This makes them particularly vulnerable to delays and congestion experienced on the M25.

6 Existing Environmental Conditions

6.1 Introduction

6.1.1 This section identifies the environmental setting in both the immediate corridor of the M25SWQ and also the study area as a whole. Environmental topic policy, particularly relating to air quality and noise is discussed earlier in the report.

6.2 Immediate M25 corridor

6.2.1 The key environmental constraints within and near to the M25SWQ corridor are discussed by topic below. Due to the high number of designations close to the M25SWQ, this is not an exhaustive list; however the types of designations present and examples have been described.

Air quality

6.2.2 Approximately 85% of the M25 within the SWQ is designated as an AQMA, as well as the majority of Greater London to the east of the corridor. AQMAs are monitored annually in order to determine whether areas are complying, or improving towards compliance, with national air quality targets as specified by Defra. Projects or schemes that worsen air quality in these AQMAs will conflict with National and Highways England policy. The M25SWQ corridor passes through dense urban areas in Surrey, Berkshire and Buckinghamshire and therefore sensitive residential and commercial receptors are located close to the M25.

6.2.3 A number of AQMAs have been designated by the local authorities on the M25 Corridor including the M25 AQMA, Wraysbury AQMA, Spelthorne AQMA, Hillingdon AQMA and South Bucks AQMA. The reason for designation of all these AQMAs has been recorded as being due to road transport.

Cultural heritage

6.2.4 There are eight Scheduled Ancient Monuments (SAM) and 81 Listed Buildings (majority Grade II) within 500m of the M25SWQ alignment. Examples of SAM within the study area are those close to J10, including a bell barrow on Cockrow Hill and Hengi Form monument at Red Hill. Between Weybridge and Newfleet, approximately 400m east of the M25, is Brooklands motor racing circuit, (but separated from it by intervening development) and a Bronze Age Settlement at Runnymede where the M25 crosses the River Thames. The number of heritage assets within 0.6 miles (1km) of the M25 varies along its alignment, with the highest concentration of these assets being between J12-13 and the least being between J13-15.

6.2.5 The National Trust has large landholdings within 500m of the M25SWQ at Runnymede, southwest of Junction 13, as the site of the sealing of the Magna Carta in 1215. The National Trust also owns the ‘Wey Navigations’ which includes the River Wey from Godalming to Weybridge and runs beneath the existing M25 to the north of J10.

Landscape

6.2.6 There are no statutory landscape designations within 0.9 miles (1.5km) of the M25 corridor study area. Natural England has produced National Character Area (NCA) profiles, which cover the M25SWQ study area, and include the Thames Basin

Lowlands NCA, Thames Basin Heaths NCA and the Thames Valley NCA. Much of the M25 corridor in the study area is also located within the Metropolitan Greenbelt. Greenbelts are designed to limit unrestricted urban sprawl, prevent neighbouring towns from merging, safe guard the countryside, preserve the setting of historic towns and assist in urban regeneration.

Nature conservation and biodiversity

6.2.7 There are internationally designated sites close to the M25SWQ including the South West London Water Bodies Special Protection Area (SPA) and a Ramsar site, adjacent to the M25 between J13 and 14, which includes a further water body near J12. These water bodies are also designated as four SSSI (Staines Moor SSSI, Wraysbury Reservoir, Wraysbury and Hythe End Gravel Pits SSSI and Thorpe Park Gravel Pit SSSI). In addition there are a further six SSSI within 500m of M25SWQ. There are also UK Biodiversity Action Plan (BAP) priority habitats close to the M25SWQ area in several locations including small pockets of Ancient Woodland, for example adjacent to J12 at St Ann's Hill. Other BAP habitats present include deciduous woodland, wood pasture and parkland.

Noise and vibration

6.2.8 Approximately 36% of the M25SWQ is located within NIAs as designated by Defra. These are areas where the 1% of the population that are affected by the highest noise levels from major roads are located on the basis of the results of strategic noise mapping. This approach has been taken because the population in these locations are likely to be at the greatest risk of experiencing a significant adverse impact to health and quality of life as a result of their exposure to road traffic noise. The NIAs are primarily located near or within residential areas, such as Staines-upon-Thames and Addlestone, as well as on roads near designated ecological sites such as the South West London Water Bodies Ramsar SPA.

Road drainage and the water environment

6.2.9 Between J10 and 16, the M25 crosses a number of main rivers, including the River Wey Navigations, The Bourne, The River Thames, Wraysbury River and a canal (the Slough Arm of the Grand Union Canal). Due to the proximity of the study area to these main rivers much of the M25SWQ is located within areas of Flood Risk Zone 2 (land having between a 1 in 100 and 1 in 1,000 annual probability of flooding) or Flood Risk Zone 3 (land having a 1 in 100 or greater annual probability of flooding), which are considered by the Environment Agency as being of medium and high risk of flooding respectively. The section between J10-13 is also located within a Groundwater Source Protection Zone (SPZ), zones defined by the Environment Agency to protect groundwater sources, which may be used for drinking water supply, in this section it has been designated as SPZ 3, Total Catchment. The M25SWQ is located almost entirely within a principal or secondary aquifer.

Geology and soils

6.2.10 There are no Geological SSSIs within 1.25 miles (2km) of the M25SWQ corridor. The land adjacent to the M25SWQ is quite heavily urbanised; however, there are sections bounded by agricultural land which has been classified as Grades 2 to 4, for example to the north east of J12 and immediately south of J10.

6.3 Summary of environmental designations in the M25SWQ corridor

6.3.1 To establish a baseline of the M25SWQ corridor a constraints study has been undertaken against which future options developed for improvements in the study area can be appraised. Table 6-1 summarises the key environmental designations present in the M25SWQ corridor on a topic-by-topic basis and section-by-section (between each motorway junction).

6.3.2 A Red/Amber/Green rating has been adopted based on the significance of the designation and the distance between the motorway and the designation. This approach has been developed in discussion with Highways England as a means to complete Environmental Risk Assessments.

6.3.3 There are a substantial number of environmental designations close to the M25 for which avoidance or minimisation of impact is a key consideration in developing the potential scheme options (red category). This high risk rating recognises the sensitivity of the environment adjacent to the M25, as described earlier in paragraph 6.2; for example sections of the corridor are designated as a result of the site's high ecological value, but have also been identified by Defra as a NIA.

Table 6-1: Summary and importance of environmental designations in the M25 corridor

Technical topic	Section of M25 existing alignment					
	J10-11	**J11-12**	**J12-13**	**J13-14**	**J14-15**	**J15-16**
Air Quality and Greenhouse Gases	Carriageway within M25 AQMA.	Carriageway within M25 AQMA.	Carriageway within M25 AQMA.	Carriageway within 3 AQMAs.	Carriageway adjacent to Hillingdon AQMA.	Carriageway within South Bucks AQMA.
Cultural Heritage	4 SAMs within Ockham Common adjacent to J10. Approx. 25 Listed Buildings within 0.6 mi.	SAM located 500m east of J12. Approx. 20 Listed Buildings within 0.6 mi.	2 SAMs located adjacent to road alignment. Approx. 35 Listed Buildings within 0.6 mi.	Approx. 5 Listed Buildings within 0.6 mi.	Approx. 10 Listed Buildings within 0.6 mi.	SAM at Thorney 50m from existing alignment. Approx. 25 Listed Buildings within 0.6 mi.
Landscape	Corridor within London Greenbelt	Corridor within London Greenbelt	Corridor within London Greenbelt	Corridor within London Greenbelt	Corridor within London Greenbelt	Corridor within London Greenbelt
Nature Conservation/ Biodiversity	J10 is located within Ockham and Wisley Commons SSSI. Within 0.6 mi. of Basingstoke Canal SSSI.	Approximately 0.3mi. from Thorpe Park No.1 Gravel Pit SSSI and SW London Waterbodies Ramsar. Approximately 2.2 mi. from Thursleys, Ash, Pirbright and Chobham SAC.	Within 0.3 mi. of Thorpe Park No.1 Gravel Pit SSSI and SW London Waterbodies Ramsar. Approximately 0.6 mi. from Thorpe Hay Meadow and Langham Pond SSSI.	Adjacent to the South West London Waterbodies Ramsar and multiple related SSSIs.	Within 1.25 mi. of the South West London Waterbodies Ramsar and related SSSIs.	Approximately 0.2 mi. from Kingcup Meadows and Oldhouse Wood SSSI. Approximately 0.7 mi. from Black Park SSSI.
Noise and Vibration*	Sections within/ adjacent to Noise Important Areas.	Sections within/ adjacent to Noise Important Areas.	Sections within/ adjacent to Noise Important Areas.	Sections within/ adjacent to Noise Important Areas.	Sections within/ adjacent to Noise Important Areas.	Sections within/ adjacent to Noise Important Areas.
Road Drainage and Water Environment	Sections within or adjacent to Flood Zone 3.	Sections within or adjacent to Flood Zone 3.	Sections within or adjacent to Flood Zone 3.	Sections within or adjacent to Flood Zone 3.	Sections within or adjacent to Flood Zone 3.	Sections within or adjacent to Flood Zone 3.
Peoples and Communities^	Crossed by National Cycle Route 221.	Crossed by National Cycle Route 223.	Crossed by National Cycle Route 4 and Thames Path National Trail.	Thames Path National Trail within 0.9 mi. of Junction 13.	Link to National Cycle Route 61.	Crossed by National Cycle Route 61.
Geology, Soils$	No Geological SSSIs within 1.25 mi.	No Geological SSSIs within 1.25 mi.	No Geological SSSIs within 1.25 mi.	No Geological SSSIs within 1.25 mi.	No Geological SSSIs within 1.25 mi.	No Geological SSSIs within 1.25 mi.

Key **Red** – avoidance or minimisation of impact is a key consideration in developing potential scheme options.
Amber – avoidance or minimisation of impact is an important consideration and all options should be designed to facilitate mitigation where avoidance cannot be achieved.
Green – avoidance or minimisation of impact is desirable but is a lesser consideration in development of potential scheme options.

[1]* Note some NIAs relate to individual properties; ^ Refers to national trails and national and regional cycle routes only; $ Geological SSSIs only

6.4 Environmental designations in the wider study area

Study area

6.4.1 As well as the existing M25SWQ corridor, environmental constraints and sensitivities of the wider study area were also considered. The key environmental constraints within the study area are summarised below by topic. Due to the large study area, the preliminary environmental desk study has identified a significant number of potential environmental constraints across 36 local authority areas.

Air quality

6.4.2 The wider study M25 study area includes a number of AQMAs. To the east of the M25 towards London between J12 and J16, the area has largely all been designated as an AQMA. Outside of this in the wider study area AQMAs have been designated primarily within settlements in the region, such as much of Reading and areas of Maidenhead and Slough, as well as on other motorways which link to the M25 such as the M3, M4 and M40. The wider study area contains a large number of receptors that have the potential to be sensitive to changes in air quality, such as residential, commercial, recreational and community facilities as well as nature conservation sites.

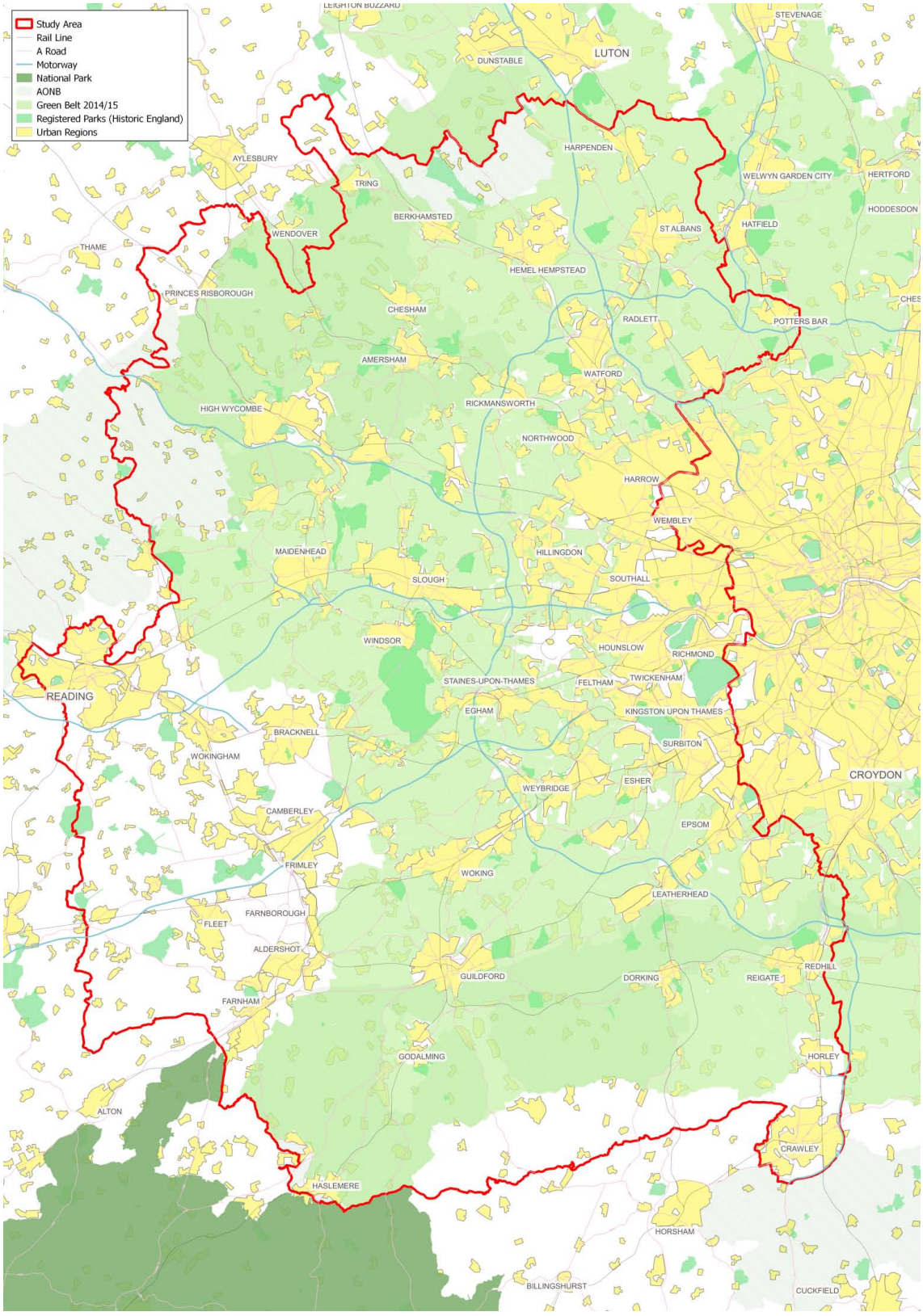
Cultural heritage

6.4.3 There is a large number of cultural heritage assets within the wider study area including the Royal Botanic Gardens, Kew, a World Heritage Site to the east of the M25 corridor. Many major and minor settlements within the study area contain numerous built heritage assets, including Grade I, II* and II Listed Buildings and SAMs. Other notable heritage assets found within the study area such as Windsor Castle, a Grade I Listed Building and Scheduled Monument.

Landscape

6.4.4 The large proportion of the wider study area is classified as Green Belt and has been categorised into several NCA including Northern Thames Basin, Thames Valley, Thames Basin Heaths, Thames Basin Lowlands and Hampshire Downs. The wider study area contains two Areas of Outstanding Natural Beauty (AONB), as illustrated on Figure 6-1. The Chiltern Hills AONB, located in the north west of the study area, is designated for its notable chalk escarpment landscape whilst the Surrey Hills AONB, located in the south east part of the study area, is designated for the chalk slopes which form the North Downs as well as areas of woodland. The southern boundary of the study area abuts the northern extent of the South Downs National Park.

Figure 6-1: Green belt and national landscape designations in the study area



Nature conservation and biodiversity

6.4.5 The study area west of the M25 contains a number of nationally and internationally important nature conservation sites including multiple Ramsar sites, Special Areas of Conservation (SACs), SPAs, SSSIs and National Nature Reserves (NNR) as shown in Figure 6-1. Examples include Thursleys, Ash, Pirbright and Chobham SAC, and Thames Basin Heaths SPA located 2.2 miles (3.5km) west the M25 between J11 and J12. Windsor Forest and Great Park SAC and SSSI is also situated approximately 2.8 miles (4.5km) west of the M25 between J12 and J13. Similarly the area to the east of the M25 contains a number of national and international ecological designations, including Richmond Park and Wimbledon Common SACs.

6.4.6 The study area also contains a large number of areas of UKBAP priority habitats including large areas of ancient woodland. The largest area of woodland forms part of Windsor Great Park and woodlands to the north of Slough, including Burnham Beeches.

Noise and vibration

6.4.7 There are a high number of NIAs throughout the wider study area associated with roads within settlements, or near important nature conservation designations where there are sensitive receptors particularly residential properties, community facilities and sensitive ecological receptors. For example there are large NIA on the M3 between J4a and 3, M4 between J4B and J8/9 and on the M40 between J4 and J2 where residential properties are directly adjacent to the highway boundary. There are also NIA along the rail lines for example between Slough and Maidenhead, particularly through Burnham where the rail line is bordered to the north by residential properties. Town centres are also subject to NIA in the wider SWQ study area in particular Slough, Wokingham, Windsor, Reading and Guildford.

Road drainage and the water environment

6.4.8 The study area is situated in the Thames River Basin District and contains a large number of main rivers, the largest being the River Thames and its tributaries. Such tributaries include the River Kennet which flows through Reading, the River Loddon which flows through Basingstoke and the River Wey near Godalming. Due to the presence of these watercourses there are large areas of Flood Zone 3 and Flood Zone 2 within the study area, in particular in Slough, Maidenhead and Staines-upon-Thames. Within the study area there are also large areas of Groundwater SPZs, Zones 1-3, indicating high groundwater sensitivity within the study area. For example there are SPZ over Guildford, Basingstoke, Watford/Rickmansworth and Maidenhead.

People and communities

6.4.9 The wider study area is one of the most densely populated areas of the country. Greater London to the east of the M25SWQ corridor is densely urbanised, with a population of approximately 8.5 million people, and includes nationally important infrastructure such as major rail links, highway routes, and Heathrow Airport (located approximately 600m from the M25 between J14 and J15) as well as routes to key ports including Southampton and Portsmouth. West of the M25 corridor the study area has pockets of dense urbanisation (e.g. High Wycombe, Beaconsfield, Slough, Maidenhead, Reading, Basingstoke, Farnborough, Guildford, Woking and Windsor),

each containing a large concentration of commercial and residential properties and community facilities. The study area also contains two National Trails, the Thames Path and the North Downs Way, large sections of the National Cycle Network as well as many other public rights of way.

Geology and soils

6.4.10 There are a large number of SSSIs in the study area, some of which are either solely designated for geology, or designated for both geology and nature conservation. A desk study has indicated that there are approximately 14 SSSI within the wider study area which have been designated at least partly for geological reasons the largest of these is the Mole Gap to Reigate Escarpment. The majority though are small areas of former mining extraction, examples of which include Cold Ash Quarry SSSI, Harrow Weald SSSI and Fernhouse Pit SSSI.

6.4.11 Parts of the study area have been assessed as having the Best and Most Versatile (BMV) agricultural land, indicating that soils are of highest quality. Locations with the greatest concentration of Grade 1 and 2 lands are found surrounding Slough and Maidenhead.

6.5 Key findings – Environmental conditions

6.5.1 Approximately 85% of the M25SWQ is designated as an AQMA, as well as most of the wider study area to the east of J12 – J16 towards London. All of these AQMAs have been recorded as being due to road transport.

6.5.2 There are several Noise Important Areas within the study area, where the population is likely to be at greater risk of experiencing a significant adverse impact to health and quality of life as a result of their exposure to road traffic noise.

6.5.3 There are eight SAM and 81 Listed Buildings within 500m of the M25SWQ alignment. Other important cultural venues include the Royal Botanic Gardens at Kew and Windsor Castle.

6.5.4 There are no statutory landscape designations within 1 mile of the M25SWQ; however much of the corridor is located within the Metropolitan Greenbelt. Within the wider study area there are two AONB.

6.5.5 There are a number of internationally designated sites close to the M25SWQ including SAC, SSSI, SPA, NNR, Ramsar, and UKBAP priority habitats.

6.5.6 Due to the proximity of the area to a number of major watercourses, much of it is located within Flood Risk Zone 2 or 3 (1 in 100 to 1 in 1000 or greater probability of flooding annually) zone. These are considered by the Environment Agency as having a medium and high risk of flooding respectively.

6.5.7 There are also large areas of Groundwater SPZs (Zones 1 – 3), indicating high groundwater sensitivity within the study area.

6.5.8 There are no Geological SSSI within 1.25 miles (2km) of the M25SWQ.

6.5.9 There are a number of designations and constraints which any interventions will need to address as their designs evolve. Of these designations and constraints, some are the result of negative impacts associated with traffic whereas others demonstrate the study area benefits from a number of positive environmental attributes.

7 Future Conditions

7.1 Introduction

7.1.1 There are several key external influences which will continue to shape the way the M25SWQ operates. This chapter reviews these influences which include (but are not limited to):

- Levels of projected household and employment growth;
- Forecast future road and rail conditions, including National Road Traffic Forecasts (NRTF);
- Location and scale of committed development;
- Government's announcement of a third runway at Heathrow Airport; and
- Committed and funded investment in roads and public transport across the wider area of influence.

7.2 Third party growth forecasts

Economic policy and the wider growth agenda

7.2.1 The economic importance of the LEP areas within the study area is reinforced by the findings of the 2014 LEP Network Report 'Building Local Advantage - Review of Local Enterprise Partnership area economies' (Athey Consulting Limited , 2014). The report summarised the economic performance and profile of each of the 39 LEPs. This provides insight into the relative strengths of respective LEP areas, the key sectors and skills base that are likely to drive future growth.

7.2.2 Each LEP published a SEP in March 2014 setting out their local growth aspirations, economic priorities and supporting policy and infrastructure priorities. SEPs are being implemented through Local Growth Deals, as part of the Government's commitment to the devolution agenda.

7.2.3 Key themes emerging from the review of the SEPs are:

- The evidence of a highly successful economy and ambitious growth plans;
- A focus on key sectors, particularly knowledge sectors;
- The role of connectivity to Heathrow and London as being fundamental to business and, in particular, attracting inward investment;
- Concern that linkages between businesses in key sectors within and across SEP areas are not as pronounced as they could be – developing these linkages would lead to greater benefits of clustering, support higher growth, and make the area more resilient;
- Skills are viewed as a key issue/constraint, and is linked to housing issues;
- Despite an overall strong economy, some areas are underperforming;
- Prosperity of these LEPs is vital to national growth;
- Very substantial growth is planned in terms of both housing and employment; and
- Infrastructure to support growth is at capacity (road, rail, utilities and land).

Household growth

7.2.4 Over the 25 years from 2012-2037 England as a whole is projected to see a 24% increase in the number of households (Department for Communities & Local Government, 2015). However, two-thirds of the study area authorities are projected to have levels of new household formation above this national average. Above average household formation is also projected to be concentrated in an arc to the north of London, from Oxfordshire to Suffolk through Hertfordshire and Cambridgeshire, and in Kent.

7.2.5 The majority of local plans in the study area are based on more conservative growth assumptions as they were adopted prior to the more recent guidance which now requires authorities to significantly boost housing supply informed by housing market signals and affordability data. There is a gap between the estimated numbers of new households and current level of planned new homes and the capacity of areas to meet housing demand close to source.

7.2.6 Two key implications arising from these projections are:

- Higher rates of house building are required than has historically been provided for in adopted plans, giving rise to greater transport demand; and
- Housing supply may be provided some distance from the source of housing demand, which is likely to have significant implications for commuting and travel patterns across the study area.

Local Enterprise Partnership ambitions

7.2.8 The published Strategic Economic Plans (SEPs) set out the growth and development ambitions for each of the LEP areas in the study area. These plans are summarised below.

Hertfordshire LEP

7.2.9 Hertfordshire identifies three growth areas defined around strategic (and generally radial) road and railway links and the corridors these create. The three areas are:

1. The M1/M25 Growth Area: in the west of Hertfordshire is the M1/M25 Growth Area which is defined spatially in terms of five local authority districts: Dacorum, Hertsmere, St Albans, Three Rivers and Watford. On most metrics (population, GVA and jobs) it accounts for about half of Hertfordshire's economy;
2. The A1(M) Growth Area: running north to south through the centre of Hertfordshire, this area has been defined spatially in terms of three local authority districts: North Hertfordshire, Stevenage and Welwyn Hatfield; and
3. The A10/M11 Growth Area: the third of the Growth Areas is the smallest in absolute terms; and it is defined around two local authority districts (Broxbourne and East Hertfordshire).

7.2.10 Of these, the M1/M25 Growth Area is the most relevant to the M25SWQ study area and although it accounts for under half of Hertfordshire's resident population it has the majority of jobs and GVA. Figure 7-1 shows Hertfordshire's projections for population and job growth.

Table 7-1: Hertfordshire's growth areas - headline statistics

Indicator	M1/M25 Growth Area	A1(M) Growth Area	A10/M11 Growth Area	Source
Resident population 2013 ('000)	575.8	328.9	236.1	ONS – Midyear population estimates/Aecom
Projected population 2031 ('000)	682.3 (+18.5%)	386.7 (+17.6%)	275.1 (+16.5%)	ONS – Midyear population projections/Aecom
Total jobs 2013 ('000)	345.7	182.2	116.1	East of England Forecasting Model 2014 Baseline
Projected jobs 2030 ('000)	392.7 (+13.6%)	210.4 (+13.1%)	134.0 (+10.5%)	East of England Forecasting Model 2014 Baseline

7.2.11 The M1/M25 Growth Area has a strong reputation in relation to two key clusters. It is home to major film and television studios at Leavesden and Elstree. It can also claim major assets linked to a broadly-defined environment sector; key organisations in this context include Rothamsted Research (located close to Harpenden) and BRE (in Watford). There are important growth opportunities in relation to both of these clusters.

7.2.12 The M1/M25 Growth Area, particularly in the south, has very strong connections to London. These reflect a mix of local travel to work patterns (to and from adjacent boroughs (e.g. Harrow)) but also into central London. Also important in understanding the character of the area are links to international gateways, particularly to London Heathrow Airport, which is less than an hour away.

Buckinghamshire Thames Valley LEP

7.2.13 Buckinghamshire Thames Valley's SEP identifies strategic economic priorities under the themes of Sustainable Economic Growth, Business Critical Infrastructure and Skilled, Flexible Workforce. There are a number of these that relate to the existing economic strengths of the area.

- Sustainable economic growth
  - Forcing a step change in Buckinghamshire's export performance: particularly in mid-sized and large businesses, which appear to be lagging behind;
  - Accelerating innovation in ambitious, growth orientated companies and priority sectors including High Performance Technology; Life-sciences and Medical Technologies; Medical devices and Healthcare systems and services; Information Economy; Creative Industries; and
  - Stimulating more ambitious high growth start-up businesses: particularly in the 'Plan for Growth' sectors in which the local skills system and industrial base excels.

- Business critical infrastructure
  - Making our major transport infrastructure fit for our economic purpose;
  - Unblocking major commercial property investments which support the needs of business; and
  - Ensuring housing growth develops appropriately to meet the needs of businesses and communities.
- Skilled, flexible workforce
  - Improving the market intelligence about the local labour market: to help providers meet employment need and provide high quality information and advice to young people and adults looking to enter employment;
  - Continuing to develop the number and range of apprenticeship opportunities within Buckinghamshire: with a focus in key employment sectors for example engineering and digital information and communications technology. Develop a much wider range of opportunities at Advanced and Higher apprenticeship levels; and
  - Developing a more effective local system of careers advice and guidance: to work with the local schools, colleges, providers and local employers to develop a more effective careers information.

7.2.14 The plan aims to achieve the following targets:

- Economic Performance and Productivity - To achieve additional GVA growth of £319m over the lifetime of this plan by achieving an average annual increase in Gross Value Added per capita of at least 3%.
- Skills Performance - Increase the number of adults with the skills required for employability and careers in the key plan for growth sectors, supported by the creation of over 5,200 apprenticeships.
- Sustainable Communities - To generate 6,800 additional net new jobs above pre-recession peak by 2020, to maintain high employment rates and to reduce youth unemployment, and to achieve a better balance between housing availability and the local jobs.

Thames Valley Berkshire LEP

7.2.15 The Thames Valley Berkshire (TVB) SEP identifies that of all LEP areas outside London, TVB has the highest proportion of knowledge based workers, highest economic output per head, highest business birth rate, and the highest proportion of foreign owned businesses. The SEP focuses on the key strengths of the area which are the:

- Importance of technology based activity;
- Significance of internationalisation; and
- Role of the corporates.

7.2.16 The role of strategic connectivity – links to Heathrow, London and the M4 corridor – are seen as the underpinning of TVB's attractiveness as a business location. However, connectivity between towns within TVB was identified as being critical both to support the effective labour market available to businesses, and also to foster deeper linkages between businesses. Increasing congestion, in particular, is seen as limiting connectivity threatening to undermine TVB's intrinsic growth potential.

7.2.17 The plan aims to increase GVA to 3.0% per annum, against a baseline of 2.5%, over the period 2015–20. If successful, this would increase TVB's economic output by about £700m per year (by 2020, on 2009 prices) compared to the baseline projection.

Enterprise M3 LEP

7.2.18 The Enterprise M3 SEP 'Working for a Smarter Future', identified the need to build in the area's core strength in high growth, high value sectors in ICT and digital media, pharmaceuticals, aerospace and defence and professional and business services.

7.2.19 For instance, Enterprise M3 is ranked 2nd out of 39 LEPs in terms of the local business base and characterised by businesses in growth sectors.

7.2.20 While economic performance at the LEP wide level is strong, there are significant disparities between the better performing towns of Guildford, Woking, Basingstoke, Farnborough and the poorer performing towns of Aldershot, Andover, Camberley, Whitehill and Bordon and Staines-upon-Thames. Improved transport connectivity between poorer and better performing towns, and to key gateways, was identified as a requirement to improve the performance of poorer performing towns.

7.2.21 The plan aims to deliver GVA per capita at 25% ahead of the national average (compared to the current 18%), to ensure that the LEP area remains ahead of the top performing economic areas in the UK outside London, and to become one of the top preferred business hubs in Europe for conducting businesses globally. The plan aims to support the creation of 52,000 new jobs, one in five of which will be in research and development and high value added industries.

Coast to Capital LEP

7.2.22 The Coast to Capital SEP seeks to emphasise the fact that the LEP area uniquely spans the UK's two strongest economic regions – Greater London and the South East and connects two international cities, London and Brighton.

7.2.23 The Coast to Capital economy contributed £38.9 billion of added-value to the UK economy in 2010. Using GVA per head as a measure of productivity, the Coast to Capital economy was ranked 4th out of 39 LEP areas.

7.2.24 Gatwick Airport sits at the centre of this LEP providing access to global market support by the international ports of Newhaven and Shoreham. Rail and road connections are good, serving the UK's largest domestic consumer and business markets, but capacity is increasingly strained.

7.2.25 The SEP also highlights that the skilled workforce gives a powerful competitive advantage to the companies already here and those companies considering moving to the Coast to Capital area.

7.2.26 The SEP identified five distinctive sub-areas:

- Croydon;

- Gatwick Diamond;
- Brighton and Hove;
- Coastal West Sussex; and
- Rural West Sussex.

7.2.27 The Gatwick Diamond is the sub area most closely linked with the M25SWQ. This area is centred on Gatwick Airport, a key economic driver and international hub with a hinterland of strategic employment locations with potential for substantial business and residential growth.

7.2.28 The private sector business community cites international trading potential as the core economic driver in the Coast to Capital area. As a result Gatwick Airport and its potential to act as the catalyst to a cluster of economic activity, is at the core of the strategic economic plan.

7.2.29 The SEP highlights the fact that the Gatwick Diamond is pivotal to the Coast to Capital economy. It has a number of important business locations and is home to 45,000 businesses, ranging from global blue chip companies to small and innovative enterprises. Generating Gross Domestic Product (GDP) of £19.2 billion 2011 the Gatwick Diamond is one of the strongest regional economies in the UK.

7.2.30 Crucial to the success of the Gatwick Diamond are the towns of Crawley and Horsham. Both are important business locations performing unique economic functions in the Gatwick Diamond. Manor Royal in Crawley, is UK's largest industrial estate. It covers 240 hectares, with 500 businesses and 30,000 employees and is situated just two miles from of Gatwick Airport.

7.2.31 The aim of the plan is to deliver 60,000 new jobs, 27,000 additional homes and 970,000 square metres of new employment space. From 2010 baseline of £38.9bn Coast to Capital aims to increase its total GVA to £55bn by 2020.

Traffic growth

7.2.32 DfT traffic forecasts suggest there will be a continued increase in the demand for highway trips within the study area over the coming years as a result of residential and workplace population growth. This increased demand for travel will impact on traffic using the M25.

7.2.33 The DfT's Road Traffic Forecasts (DfT, 2015d) are used to inform Government strategy. The forecast changes in traffic flows are predicted using a broad range of evidence and data on travel behaviour and the factors that influence it. This is brought together in the National Transport Model (NTM) which is designed to forecast long-term trends and provide a strategic view of possible future trends in road traffic. The road traffic forecasts employ a scenario approach in an attempt to reflect more of the uncertainty.

7.2.34 The purpose of the scenarios is to set out the broad range of potential outcomes given the uncertainty and evidence available. The forecasts show how traffic levels may change as a result of assumptions regarding the growth in GDP and population or changes in fuel costs. Tests undertaken to determine how well the NTM forecasts traffic trends show that it continues to perform well when inputs for GDP growth, fuel costs and population are correct.

7.2.35 The 2015 Road Traffic Forecasts indicate:

- National traffic is forecast to increase in all of the DfT's scenarios but the size of the growth varies. The forecast range of growth ranges from 19% to 55% over the period between 2010 and 2040. The size of the growth varies depending on the number and types of journeys that people make, the effect of rising incomes on car ownership and car use, and future trends in income growth and fuel prices;
- Growth in national traffic levels is predominantly driven by the projected growth in population levels;
- Growth in national traffic levels masks much more variation across areas, road and vehicle types. Growth is expected to be particularly strong on the SRN – increasing by between 29% to 60% from 2010 to 2040 – compared to 12% to 51% on other principal roads and 10% to 54% on minor roads. Most scenarios show traffic to grow strongly on local roads and in urban areas and cities; however, the lower end of growth forecast spectrum would reflect a continuation of the recent trend of a reduction in trips in urban areas over the next 30 years; and
- Growth in LGV traffic is an important contributor to the forecast growth in national road traffic. (ibid)

7.2.36 In terms of the SRN the forecasts indicate:

- Traffic growth on the SRN is forecast to be strong and positive in all scenarios, driven by increases in the number of car trips and length of trip distances as well as increasing LGV traffic;
- Under the scenario where overall road traffic is forecast to grow more slowly, the growth forecast for the SRN remains strong; and
- Congestion on the SRN is forecast to increase under all growth scenarios.

7.2.37 Table 7-2 and Table 7-3 reproduce key excerpts relating to the range of scenarios presented in the 2015 Road Traffic Forecasts.

Table 7-2: 2015 Road Traffic Forecasts

Summary of Variations Between Forecast Scenarios			
	Trip rates	**Income relationship**	**Macroeconomic**
Scenario 1	Historic average	Positive and declining	Central
Scenario 2	Historic average	Zero	Central
Scenario 3	Extrapolated trend	Positive and declining	Central
Scenario 4	Historic average	Positive and declining	High oil, low GDP
Scenario 5	Historic average	Positive and declining	Low oil, high GDP

Source: DfT 2015d

Table 7-3: Demand growth and congestion

Demand Growth and Congestion on Strategic Road Network		
Scenario	**Traffic growth**	**Congested traffic (>80% capacity)**
2010 modelled (all scenarios)		5.9%
Scenario 1 2040	+45%	12.7%
Scenario 2 2040	+36%	10.1%
Scenario 3 2040	+36%	7.3%
Scenario 4 2040	+29%	8.1%
Scenario 5 2040	+60%	19.5%

Source: DfT 2015d

7.2.38 Recent evidence already suggests there is a significant level of suppressed demand for trips wanting to use the M25. A recent Highways England commissioned report by Atkins states *'the Smart Motorway All Lane Running Scheme* [between M25 J23-J27] *has experienced traffic growth of approximately 10% between the before and after period, which is far higher than national motorway* [3.5%]*, national* [3.3%] *and regional* [2.1%] *traffic growth over the same period'.* (Atkins 2016 p6) The report states the increase in traffic flow is *'likely to be because the stretch of road was previously at capacity so flows were constrained and have now been able to match the level of demand'.* (ibid p6)

Rail patronage growth

7.2.39 Substantial growth in rail passengers is predicted to continue, with selected key Network Rail forecasts as follows:

- There is expected to be a 60% growth in demand for mainline services to/from Waterloo by 2043, including the 20% additional capacity required to deal with existing overcrowding. This equates to 13 additional train paths in the high peak hour (assuming the majority of trains are 12-car length configured with 3+2 seating, otherwise 16 train paths required) (Network Rail 2015);
- 40% growth in demand for suburban rail services to/from Waterloo;
- 37% growth in demand for Windsor line services to/from Waterloo;
- There is significant development and growth projected in the outer commuter markets and on the BML in the next 20 years. Modest growth is projected in the inner commuter markets but may be relieved by ten-car lengthening;
- The West London Line is predicted to grow as much as 109% peak passenger growth to 2031 (ibid), with severe crowding forecast on all morning peak hour services; and
- 85% of all peak hour services into Euston (07:00-09:59 arrivals and 16:00-18:59 departures) are forecast to have passengers exceeding seated capacity by 2024, of which half are expected to have PiXC (Network Rail, 2011).

7.2.40 Lack of rail capacity and major crowding on key radial rail routes into central London and at key terminal and interchange stations, particularly at Clapham Junction and Waterloo, is one of the four transport infrastructure challenges identified by the National Infrastructure Commission. TfL's modelling of AM peak crowding on the London rail network in 2031, indicates sections of radial routes with up to five passengers standing per square metre on average; sufficient to cause operational difficulties such a station closures and queuing to get onto trains (Mayor of London, 2014).

7.2.41 Studies have forecast that increasing pressure on demand would be likely to result not so much in passengers standing (as might be more the case on commuter services), but in increased fares, wider restrictions on travel, and fewer passengers travelling. Crowding is also forecast to spread into the off-peaks, (Network Rail, 2011).

7.3 Committed development

7.3.1 Substantial levels of committed development exist in the study area, with variation in the amounts across the sub-areas. In terms of absolute numbers the London and Thames Valley Berkshire sub-areas have the highest amount of committed development, where provision is already in place for more than 40,000 new homes apiece. Table 7-4, Table 7-5 and Figure 7-1 outline the volume and locations of key committed housing in and adjacent to the study area.

Table 7-4: Deliverable housing by LEP

LEP Area	Deliverable Housing Total
Thames Valley Berkshire	14,906
Coast to Capital	8,079
Enterprise M3	19,400
Hertfordshire	10,295
London	19,867
Buckinghamshire Thames Valley	5,860
Total	**78,407**

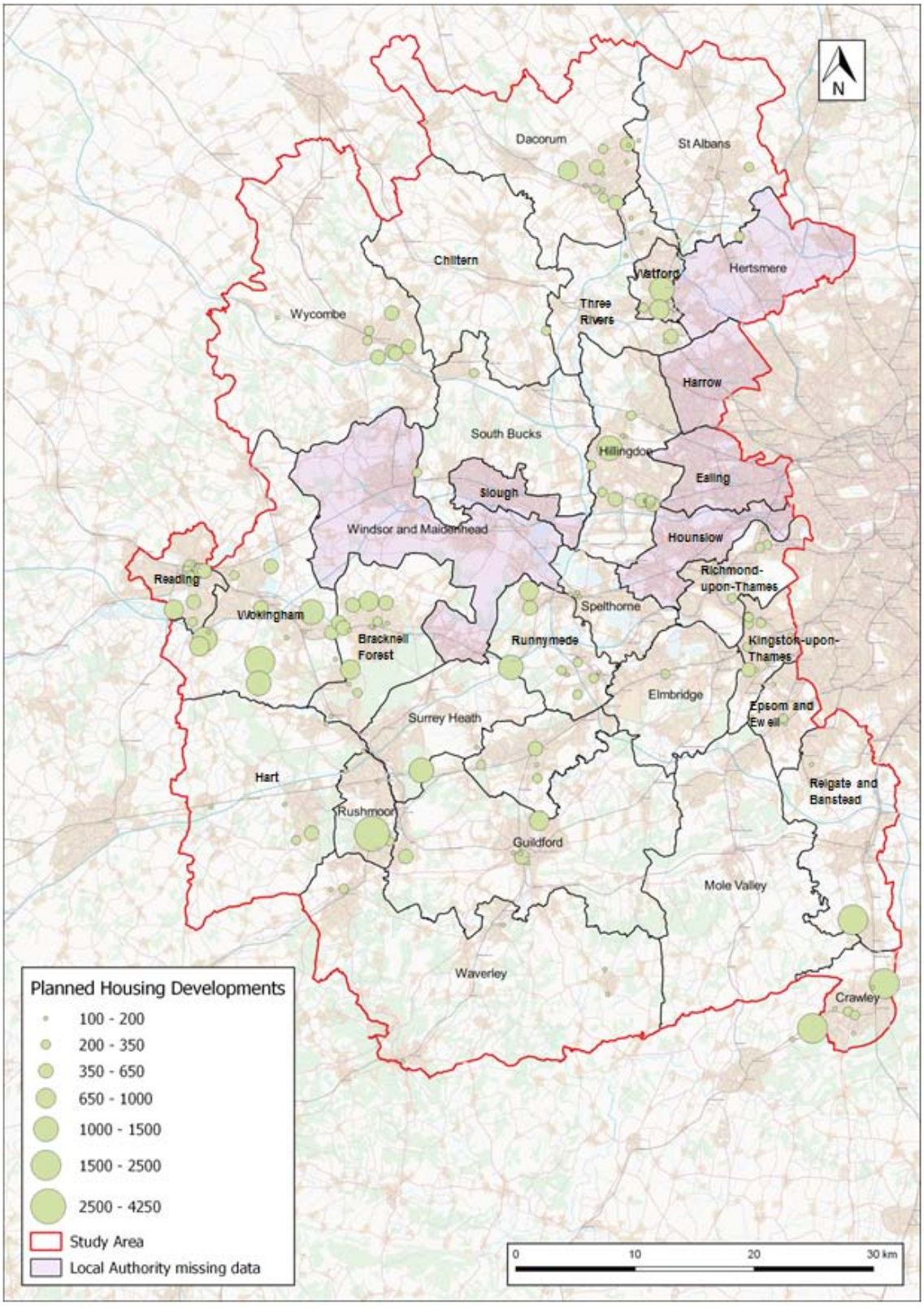
Source: Published local planning authority housing monitoring reports

Table 7-5: Deliverable housing by local planning authority

Study Sub-Area	Local Planning Authority	Five Year Housing Land Supply (Deliverable Housing)
Thames Valley Berkshire	Bracknell Forest	3,236
Thames Valley Berkshire	Reading	4,516
Thames Valley Berkshire	Slough	No information available
Thames Valley Berkshire	Windsor & Maidenhead	No information available
Thames Valley Berkshire	Wokingham	7,154
Coast to Capital	Crawley	2,827
Coast to Capital	Epsom & Ewell	1,237
Coast to Capital	Mole Valley	1,126
Coast to Capital	Reigate & Banstead	2,889
Enterprise M3	Elmbridge	1,323
Enterprise M3	Guildford	2,449
Enterprise M3	Hart	3,187
Enterprise M3	Runnymede	1,763
Enterprise M3	Rushmoor	3,321
Enterprise M3	Spelthorne	918
Enterprise M3	Surrey Heath	1,839
Enterprise M3	Waverley	2,555
Enterprise M3	Woking	2,045
Hertfordshire	Dacorum	2,995
Hertfordshire	Hertsmere	1,792
Hertfordshire	St Albans	2,336
Hertfordshire	Three Rivers	1,381
Hertfordshire	Watford	1,791
London	Ealing	6,355
London	Harrow	No information available
London	Hillingdon	2,781
London	Hounslow	5,179
London	Kingston-on-Thames	3,703
London	Richmond-on-Thames	1,849
Buckinghamshire TV	Chiltern	1,210
Buckinghamshire TV	South Bucks	1,008
Buckinghamshire TV	Wycombe	3,642
Total		**78,407**

Source: Published local planning authority housing monitoring reports

Figure 7-1: Location of key committed housing developments



Note: map based on most recent data available from each LPA.

7.3.2 Two underlying drivers (influencing demand for travel) are in action across the study area:

- Making best use of previously developed land (in order to protect areas where national policy indicates development should be restricted (for example within the green belt or AONB) – these are often located in urban areas where congestion levels can already be severe and competing demands for road space from different road user groups is most acute; and
- Large-scale urban extensions (where housing demand cannot be accommodated within the existing urban areas, usually beyond the green belt) – these are often well-served by strategic road connections and attractive for out-commuting but relatively remote from rail connections.

7.3.3 The substantial levels of growth in the wider area of influence outside of the study area will also impact on travel demand on the M25SWQ.

7.4 Airport capacity

Airports Commission

7.4.1 Current Government policy is set out in the 2013 Aviation Policy Framework, which identifies the key objective of ensuring the UK's air links continue to make it one of the best connected countries in the world (DfT, 2013). This objective includes increasing links to emerging markets so the country can compete successfully for economic growth opportunities.

7.4.2 The policy recognises that beyond 2020 there will be a capacity challenge at all of the major airports in South East England. In September 2012, the Government established the independent Airports Commission to identify and recommend options which could effectively maintain the UK's position as Europe's most important aviation hub. The Commission has published two reports - an Interim Report in December 2013, and a Final Report in July 2015.

7.4.3 The Interim Report set out the Commission's assessment of the UK's future aviation capacity need and concluded that one net additional runway would be required in south east England by 2030. The Commission's forecasts also indicated that there is likely to be a case for a second additional runway in operation by 2050, or in some potential scenarios, before that date. The report assessed 52 proposals to provide an additional runway and short-listed three (for further analysis within the Final Report). These were:

- A new southern runway at Gatwick;
- A new north west runway at Heathrow; and
- An extension of the existing northern runway at Heathrow.

Airports Commission (Davies Report) June 2015 Recommendation

7.4.4 The final Commission report considered three shortlisted options:

- Heathrow Extended Northern Runway;
- Heathrow Northwest Runway; and
- Gatwick Second Runway.

7.4.5 Each of the three schemes shortlisted was considered a credible option for expansion, capable of delivering valuable enhancements to the UK's aviation capacity and connectively. Each would also have environmental impacts, which would need to be carefully managed.

7.4.6 The Commission unanimously concluded that the proposal for a new Northwest Runway at Heathrow Airport would deliver more substantial economic and strategic benefits than the other shortlisted options. It would strengthen connectivity for passengers and freight users and boost the productivity of the UK economy and was deemed to strike a fair balance between national and local priorities.

Conclusion

7.4.7 Following a review of the Airports Commission's Final Report, the Government announced in December 2015 that it accepted both the case for airport expansion and the Airport Commission's shortlist of options considered. The Government also set out its intention to undertake a further package of work, including on air quality impacts and the development of measures to mitigate the impacts on local people and the environment.

7.4.8 The Government announced in October 2016 its preference for a new northwest runway at Heathrow Airport.

7.4.9 The draft Airports NPS was published for consultation in February 2017, setting out the requirements that the applicant would need to meet in order to gain development consent for it.

7.4.10 For the purposes of the M25SWQ Strategic Study, it is evident that as set out in the draft NPS, upgraded and new transport infrastructure would be required to support the proposed additional airport capacity at Heathrow. The challenge will be to ensure airport-related travel demand does not unduly impact on the efficient operation of the transport networks.

7.5 Committed transport investment

Road investment

7.5.1 Road investment plans relevant to the study area, both with committed funding and further proposals, and for the SRN and local road network, have been reviewed as part of this commission.

7.5.2 The RIS (DfT, 2015c) announced a commitment to upgrade the section of M25 between J10 and J16 through a mixture of enhancements, including hard shoulder running between J15 and 16, as well as four-lane through-junction running between J10 and 12, with construction intended to commence late in Road Period 1. The RIS also announced a scheme to improve M25 J10/A3 Wisley Interchange to allow free-flowing traffic in all directions, together with improvements to the neighbouring Painshill interchange on the A3 to improve safety and congestion across the two sites.

7.5.3 Elsewhere in the study area on the SRN key sections of the M4 and M23 leading up to the M25 are also programmed to be converted to Smart Motorways. The RIS announced that a scheme would be developed for the A3 in Guildford between the A320 to the A31 Hog's Back Junction for the next Road Period.

7.5.4 A substantial number of schemes are being brought forward for the local road

network in the study area; however these tend to be addressing more localised issues and are not considered to be of a scale which will substantially influence the way in which the M25 is used. Almost all of TfL's road schemes in the Roads Modernisation Plan's timeline are situated in inner London and none are considered to impact on the M25 (Transport for London, 2014).

Wider area of influence

7.5.5 Across the wider area of influence there is a number of major road schemes in the pipeline and many of these are located on routes which some drivers could use instead of the M25SWQ for selected longer-distance journeys. These comprise:

- The Lower Thames Crossing, downstream from Dartford (committed in RIS), which aims to take pressure off the M25 Dartford Crossings;
- New Thames Crossings inside the M25, aimed at providing better connections in East London, providing an alternative to existing crossings, including the M25 Dartford Crossings;
- Schemes on the A14 and A45 through Northamptonshire and Cambridgeshire enabling faster east – west travel;
- Schemes within the Oxford to Cambridge corridor, including those recommended by the Oxford to Cambridge Expressway Strategic Study; and
- Schemes along the A27 South Coast corridor in Hampshire and Sussex.

7.5.6 The degree to which these schemes will ultimately impact on route choice is not yet clear. Factors which may influence it may include:

- Habitual behaviour being modified as new information about the alternative route becomes available;
- Whether the scheme overcomes known bottlenecks which drivers currently choose to avoid;
- Whether the scheme contributes to achieving continuous good quality routes;
- The journey time and journey reliability improvements on alternatives to the M25; and
- The distance from the M25.

Public Transport Investment

7.5.7 Committed public transport investments in the M25SWQ study area of particular significance are:

- Schemes currently under construction:
  - Crossrail 1 (to be known as the Elizabeth Line), which will provide additional east-west capacity through central London, and free up capacity on the GWML; and
  - GWML Electrification.
- Those with Government commitments:
  - High Speed 2, connecting London Euston to Birmingham, Manchester and

Leeds, with implications in the study area in terms of increased demand for interchange to reach the proposed station in west London at Old Oak Common Station;

- Crossrail 2, providing additional capacity across London from Surrey to Hertfordshire, which the National Infrastructure Commission recommended is taken forward as a priority, the funding confirmed in the 2016 budget.
- Western Rail Link to Heathrow T5 from the GWML, enabling direct services to the airport from Reading and Slough and giving improved accessibility from Wales, South Midlands and South-West England;
- East-West Rail Phase 2, enabling new rail connections between Bedford and Oxford, Milton Keynes and Oxford, and Milton Keynes to London Marylebone via Aylesbury.

7.5.8 Network Rail has also engaged in long-term planning to identify options for funding in CP6 and looking beyond to 2043. They acknowledge that, on many lines, committed investment will not keep pace with the demand for rail services. For example, providing sufficient capacity for passengers on the mainline long-distance services into London Waterloo up to 2043 will require an additional 156 passenger carriages in the high peak hour (08:00-09:00) over the current arrangements (Network Rail, 2015). None of the possible interventions they identify are capable of meeting the full capacity gap on their own; a combination of all or some of the interventions will be required to bridge the whole gap.

7.5.9 In broad terms Network Rail has identified long term options to meet the following objectives:

- Increase train capacity into London termini, through:
- train lengthening to maximum permitted lengths
- reconfiguring seating arrangements to 3+2
- permitting an additional 2tph to be used on the fast and/or slow lines
- Infrastructure works, including grade separation, additional platforms
- Providing a minimum of 3-4 tph for stations within 30 miles of London; and
- Increasing speed and/or frequency of service from selected large population centres to in excess of 70mph.

7.5.10 Of particular relevance is the study which the DfT remitted to Network Rail to investigate Southern Rail Access to Heathrow, with connections provided from the Wessex Routes (operated by South West Trains).

7.5.11 A common thread running through the majority of the major investment programmes is emphasis on radial improvements, rather than orbital connections, and on addressing existing capacity issues which will persist into the future. There are relatively few schemes aimed at providing orbital connections. There are, however, notable schemes which will improve orbital journeys, including the Western Rail Link to Heathrow and Metropolitan Line Extension (committed) and the proposed Southern Rail Access to Heathrow.

7.6 Key findings – Future conditions

7.6.1 The LEPs are planning for substantial growth in the economy of the study area which will be achieved by an increase in the number of people in employment and greater productivity. As employment rates are high, to achieve growth in the number of workers there is expected to be an increase in population and consequential growth in the number of households.

7.6.2 Increases in population and economic activity will underpin growth in demand for travel by all modes in the study area. Whilst there are a number of committed and planned investments in the transport infrastructure and services in the study area these may not be sufficient to facilitate the planned growth.

7.6.3 The gap between the current planned transport provision and the need for further investment to enable growth needs to be addressed as without a greater level of intervention the economy will falter as congestion and crowding stifle growth.

8 Study Objectives

8.1.1 It is evident from the earlier sections of this report that the M25SWQ and the surrounding area experience a wide range of related issues and challenges at the present time, and will continue to do so into the future. Given the complex nature of travel movements which use this area, it is highly unlikely that it will be possible to identify a single scheme or intervention which deals with all these issues to an acceptable level. Indeed, it is more likely that the preferred option to be identified at the end of this study will comprise a package of complementary interventions, working together to address the wide range of issues involved.

8.1.2 It follows that it is not appropriate to develop a set of narrow and tightly defined objectives for the study. It is more appropriate to develop a set of broader objectives with a set of accompanying 'indicators' which reflect the most pressing issues to be addressed. This approach recognises that not all interventions will address all indicators; the challenge is to find the optimum set of interventions which combine to address most, if not all, of the issues.

8.1.3 As a consequence, and based on the evidence collected and presented in this report, the transport objectives presented in Chapter 1 have been revisited. The overall objective of this Strategic Study is to identify transport-related interventions which will have a positive impact in the M25SWQ and surrounding area. The Study specific objectives have been agreed to be:

- Boost Economic Growth and Prosperity
  - Facilitate growth and investment, support "business connectivity" and widen labour markets
  - Improve access to international ports and airports
  - Enhance access to leisure attractions and social activities
- Improve Transport Conditions
  - Reduce traffic congestion on M25 between J10 to 16
  - Make journey times more predictable on M25 between J10 to 16
  - Improving road safety for all, including road users, non-motorised users, road workers and local residents
  - Improving public transport and local highway networks to reduce trips and the need to use the M25 for short distance trips
  - Widen travel choice
  - Facilitate the efficient movement of freight
- Improve Environmental Conditions
  - Improve air quality and reduce the impact of traffic noise on the M25 J10 to 16 and make sure no further air quality management areas or additional noise priority areas are created
  - Protect sensitive habitats and ecosystems
  - Protect the settings and appearance of cultural and heritage features
  - Respect important landscapes and minimise visual intrusion of proposed interventions.

9 References

- Airports Commission. (2013). *Airports Commission: interim report.* Retrieved from https://www.gov.uk/government/publications/airports-commission-interim-report
- Airports Commission. (2015). *Airports Commission Final Report.* Retrieved from https://www.gov.uk/government/publications/airports-commission-final-report
- Athey Consulting Limited. (2014). *Building Local Advantage - Review of Local Enterprise Partnership area economies in 2014.* Retrieved from http://www.mylocaleconomy.org/wp-content/uploads/2014/03/REVIEW-OF-LEP-AREA-ECONOMIES-2014.pdf
- Atkins. (2016). *SM-ALR Monitoring M25 J23-27 Twelve Month Evaluation Report* http://assets.highways.gov.uk/specialist-information/knowledge-compendium/2014-2015/M25+J23-27+SM+ALR+Monitoring+12+Month+Evaluation+Report_v2.0_Final.pdf
- Denvil Coombe Practice. (2007, November). *Surface Access.* Retrieved April 2016, from Project for the Sustainable Development of Heathrow: http://collections.europarchive.org/tna/20080808100646/http:/www.dft.gov.uk/consultations/closed/heathrowconsultation/technicalreports/surfaceaccess.pdf
- Department for Communities and Local Government. (2015). *Live Tables on Household Projections - Table 414 Latest update Dec 2015* https://www.gov.uk/government/statistical-data-sets/live-tables-on-household-projections
- Department for Transport. (2012). *High level Output Specification for Control Period 5.* Retrieved from https://www.gov.uk/government/publications/high-level-output-specification-2012
- Department for Transport. (2013). *Aviation Policy Framework.* Retrieved from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/153776/aviation-policy-framework.pdf
- Department for Transport. (2013a). *COBALT User Guide, Version 2013.02.* DfT.
- Department for Transport. (2014). *National Networks National Policy Statement.* Retrieved from https://www.gov.uk/government/publications/national-policy-statement-for-national-networks
- Department for Transport. (2015). *Aviation Statistics (AVI0102) Last updated July 2015.* Retrieved from https://www.gov.uk/government/collections/aviation-statistics
- Department for Transport. (2015a). Aviation Statitics - Mode of transport to selected UK airports: time series (AVI0107). Last updated July 2015. Retrieved from https://www.gov.uk/government/statistical-data-sets/avi01-traffic-passenger-numbers-mode-of-travel-to-airport#table-avi0107
- Department for Transport. (2015b). *Rail passenger numbers and crowding on weekdays in major cities in England and Wales: 2014.* Retrieved from https://www.gov.uk/government/publications/top-10-overcrowded-train-services-england-and-wales-2014
- Department for Transport. (2015c). *Road Investment Strategy: for the 2015/16 – 2019/20 Road Period.* Retrieved from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/408514/ris-for-2015-16-road-period-web-version.pdf

- Department for Transport. (2015d). *Road Traffic Forecasts 2015.* Retrieved from https://www.gov.uk/government/publications/road-traffic-forecasts-2015
- Department for Transport. (2016). *Corporate report: Single departmental plan 2015 to 2020 Published 19 February 2016.* Retrieved from https://www.gov.uk/government/publications/dft-single-departmental-plan-2015-to-2020/single-departmental-plan-2015-to-2020
- Department for Transport. (2016a). *Government Decides on New Runway at Heathrow (News Story).* Retrieved November 02, 2016, from Department for Transport: https://www.gov.uk/government/news/government-decides-on-new-runway-at-heathrow
- Department for Transport. (2016b). *Local bus passenger journeys Table BUS0110a Passenger journeys on local bus services per head by local authority: England, from 2009/10.* Retrieved from https://www.gov.uk/government/statistical-data-sets/bus01-local-bus-passenger-journeys#table-bus0110
- Department for Transport. (2016c). *National Travel Survey Statistics Last updated 2016.* Retrieved from https://www.gov.uk/government/collections/national-travel-survey-statistics
- Heathrow Airport Limited. (2014). *Sustainable Transport Plan 2014-2019.* Retrieved from http://www.heathrow.com/file_source/Company/Static/PDF/Heathrow_STP_inter.pdf
- Highways Agency. (2014). *London Orbital and M23 to Gatwick Route Strategy Evidence Report April 2014.* Retrieved from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/364210/London_Orbital_and_M23_to_Gatwick.pdf
- Highways England. (2015). *London Orbital & M23 to Gatwick Airport Route Strategy April 2015.* Retrieved from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/416747/London_Orbital_and_M23_to_Gatwick.pdf
- HM Treasury. (2015). *Fixing the Foundations: Creating a more prosperous nation (Cm9098).* Retrieved from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/443898/Productivity_Plan_web.pdf
- London Gatwick Airport. (2009). *London Gatwick Airport: Surface Access Supplementary Report.* Retrieved March 23, 2016, from Surface Access Action Plan 2009: http://www.gatwickairport.com/globalassets/publicationfiles/business_and_community/all_public_publications/2009/draft_surface_access_plan.pdf
- Mayor of London. (2010). *Mayor's Transport Strategy.* Retrieved from https://www.london.gov.uk/what-we-do/transport/transport-publications/mayors-transport-strategy
- Mayor of London. (2014). *London Infrastructure Plan 2050: Transport Supporting Paper.* Retrieved from https://www.london.gov.uk/sites/default/files/Transport%20Supporting%20Paper_3.pdf
- Mian, Coombe, D., Thompson, Hardcastle, & Stankalis, E. (2002). *The Orbit Multi-Modal Study: Developing a Long Term Sustainable Management Strategy for the M25.*
- National Rail. (2016). *Station services and facilities Retrieved March 23 2016.* Retrieved from http://www.nationalrail.co.uk/stations_destinations/default.aspx
- Network Rail. (2011). *West Coast Main Line Route Utilisation Strategy July 2011.* Retrieved from http://www.networkrail.co.uk/browse%20documents/rus%20documents/route%20utilisation%20strategies/west%20coast%20main%20line/westcoastmainlinerus.pdf

- Network Rail. (2015). *Long Term Planning Process - Wessex Route Study August 2015.* Retrieved from https://www.networkrail.co.uk/long-term-planning-process/wessex-route-study/
- Office for National Statistics. (2014). *Method of Travel to Work (2001 specification) (QS703EW).* Retrieved February 20, 2016, from Nomis: https://www.nomisweb.co.uk/census/2011/qs703ew
- Office for National Statistics. (2013). *Census 2011: Method of travel to work Last updated 20 Jan 2013.* Retrieved from https://www.nomisweb.co.uk/census/2011/qs701ew
- Office for National Statistics. (2014a). *Census 2011: Method of travel to work (2001 specification) by distance travelled to work (DC7701EWLA).* Retrieved February 20, 2016, from Nomis: https://www.nomisweb.co.uk/census/2011/dc7701ewla
- Office for National Statistics. (2014b). *Census 2011: Location of where people live when working and place of work (RF04AEW).* Retrieved March 7, 2016, from Nomis: https://www.nomisweb.co.uk/census/2011/rf04aew
- Office of Rail and Road. (2015). *Estimates of Station Usage 2014-15.* Retrieved from http://orr.gov.uk/statistics/published-stats/station-usage-estimates
- R Thompson, D. H., & D Coombe, T. D. (2003). *The Orbit Multi-Modal Study: Developing a Long Term Sustainable Management Strategy for the M25.* Retrieved from abstracts.aetransport.org/paper/download/id/1591
- Regeneris Consulting. (2013). *London Heathrow Economic Impact Study.* Retrieved from http://www.buckstvlep.co.uk/uploads/downloads%5CHeathrow%20Economic%20Impact%20Assessment%20%20-%20Regeneris%20-%20Final%20Report%2024%20Sep.pdf
- Transport for London. (2014). *London's Road Modernisation Plan October 2014.* Retrieved from https://www.london.gov.uk/sites/default/files/londons-road-modernisation-plan.pdf

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