HIGHWAYS AGENCY

Safe roads, reliable journeys, informed travellers

London Orbital and M23 to Gatwick Route Strategy Evidence Report

April 2014

An executive agency of the Department for Transport

Document History

London Orbital and M23 to Gatwick route-based strategy evidence report

Highways Agency

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1	6/12/13	Final draft for Agency review	Stephen Hall	
2	14/01/14	Final draft for Programme Board review	Stephen Hall	Simon Jones
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Introduction

1.1 Background

1.1.1 The Highways Agency is responsible for planning the long term future and development of the strategic road network (SRN).

1.1.2 Route-based strategies (RBSs) represent a fresh approach to identifying investment needs on the strategic road network. Through adopting the RBS approach, we aim to identify network needs relating to operations, maintenance and where appropriate, improvements to proactively facilitate economic growth.

1.1.3 The development of RBSs is based on one of the recommendations included in Alan Cook's report *A Fresh Start for the Strategic Road Network*, published in November 2011. He recommended that the Agency, working with local authorities (LA) and local enterprise partnerships (LEPs), should initiate and develop route-based strategies for the strategic road network.

1.1.4 The then Secretary of State accepted the recommendation in the Government's response (May 2012), stating that it would enable a smarter approach to investment planning and support greater participation in planning for the strategic road network from local and regional stakeholders.

1.1.5 The Agency completed the following three pilot strategies which have been published on the Agency website:

- A1 West of Newcastle
- A12 from the M25 to Harwich (including the A120 to Harwich)
- M62 between Leeds and Manchester.

1.1.6 Building on the learning from those pilot strategies, we have divided the strategic road network into 18 routes. A map illustrating the routes is provided in Appendix A. The London Orbital and M23 to Gatwick route is one of that number.

1.1.7 RBS are being delivered in two stages. Stage 1 establishes the necessary evidence base to help identify performance issues on routes and anticipated future challenges, takes account of asset condition and operational requirements, whilst gaining a better understanding of the local growth priorities.

1.1.8 In the second stage we will use the evidence to take forward a programme of work to identify possible solutions for a prioritised set of challenges and opportunities. It is only then that potential interventions are likely to come forward, covering operation, maintenance and if appropriate, road improvement schemes.

1.1.9 The RBS process will be used to bring together national and local priorities to inform what is needed for a route, while delivering the outcomes in the performance specification.

1.1.10 Using the evidence base and solutions identification studies, we will establish outline operational and investment priorities for all routes in the strategic road network for the period April 2015 – March 2021. This will in turn feed into the Roads Investment Strategy, announced by the Department for Transport in Action for Roads.

1.2 The scope of the Stage 1 RBS evidence report

1.2.1 During the first stage of RBS, information from both within the Agency and from our partners and stakeholders outside the Agency has been collected to gain an understanding of the key operational, maintenance and capacity challenges for the route. These challenges take account of the possible changes that likely local growth aspirations, or wider transport network alterations will have on the routes.

1.2.2 The evidence reports:

- Describe the capability, condition and constraints along the route
- Identify local growth aspirations
- Identify planned network improvements and operational changes
- Describe the key challenges and opportunities facing the route over the five year period
- Give a forward view to challenges and opportunities that might arise beyond the five year period.

1.2.3 The 18 evidence reports across the strategic road network will be used to:

- Inform the selection of priority challenges and opportunities for further investigation during stage 2 of route-based strategies
- Inform the development of future performance specifications for the Agency.

1.2.4 A selection of the issues and opportunities identified across the route are contained within this report, with a more comprehensive list provided within the technical annex. This is for presentational reasons and is not intended to suggest a weighting or view on the priority of the issues.

1.2.5 The evidence reports do not suggest or promote solutions, or guarantee further investigation or future investment.

1.3 Route description

1.3.1 The route covers approximately 315km of the strategic road network that comprises the following, as shown in Figure 1:

- London Orbital – the M25 and A282 Dartford Crossing - 187km
- M23 to Gatwick from the M25 to junction 9a and Airport Way to Gatwick - 26km (Note: M23 section between junctions 9 and 11 forms part of the South Coast Central RBS).
- A13 and A1089 from M25 junction 30 to Tilbury Docks – 17 km
- All motorway and trunk road spurs within the M25 except M40 junction 1 to 1a (which is in the London to Scotland West RBS).

1.3.2 This route connects with a number of other routes for which RBS are also being developed. These are:

- Kent Corridor to M25
- South Coast Central
- M25 to Solent
- London to Wales
- London to Scotland West
- London to Scotland East
- London to Leeds (East)
- East of England

1.3.3 Apart from the M23 to Gatwick, the route, including all spurs, is managed, maintained and operated as part of a privately financed design, build, finance and operate contract which runs for thirty years until 2039. The M23 is managed and maintained under the Area 4 Managing Agent Contract (MAC).

1.3.4 The London Orbital passes through five counties: Kent, Surrey, Buckinghamshire, Hertfordshire and Essex (including the unitary area of Thurrock); through the unitary area of Slough; and along the boundaries of the following London Boroughs: Hillingdon, Enfield and Havering.

1.3.5 The London Orbital is also on the Trans-European Transport Network (TEN-T), and connects with other routes which also form part of the TEN-T: A2, M20, M26, M3, M4, M40, M1, A1(M), M11 and A12.

1.3.6 The London Orbital runs through different types of environmental designations and urban areas. From relatively rural settings (eg parts of Surrey), to suburban environments (eg near Waltham Cross). It acts as a main interchange between strategic, radial routes into and out of London, as well as serving as a route to bypass the capital.

1.3.7 The London Orbital serves Heathrow Airport, with Terminals 4 and 5 accessed directly off junction 14. Shopping centres at Lakeside, Bluewater and Brent Cross attract traffic every day. Venues hosting major events near the route include Wembley Stadium, Twickenham,

Queen Elizabeth Olympic Park, O2 arena, Brands Hatch, Epsom Downs Race Course and Kempton Park.

1.3.8 M25 junctions 10 to 16 has some of the highest traffic flows in England, with a two-way flow of around 200,000 vehicles per day from junctions 12 to 16. Elsewhere a typical two-way flow is around 120,000 to 140,000 vehicles per day.

1.3.9 The M23 passes through Surrey and West Sussex, and connects with the London Orbital at M23 junction 8. Its primary function is to serve Gatwick Airport (M23 junction 9), and the towns of Horley and Crawley. South of junction 11, the M23 becomes A23 which connects to the south coast.

1.3.10 Both the M23 and M25 tend to display a seasonal difference in traffic volume. Summer (July and August) flows are about 5% greater than the average and winter (December and January) is about 5% less than the average.

1.3.11 The M23 typically carries a two-way flow of around 115,000 vehicles per day. The section of M23 north of its junction with M25 carries significantly less traffic, however, with a two-way flow of around 30,000 vehicles per day.

1.3.12 The other motorways which form part of the route experience high traffic volumes. The M4 carries a two-way flow of around 145,000 vehicles immediately within the M25, the M1 around 90,000 vehicles, the M11 around 80,000 vehicles and the M3 around 57,000 vehicles. All figures quoted are vehicles per day.

1.3.13 The A13 and A1089 section serves Tilbury docks, Lakeside and London Gateway port and passes through Thurrock and south Essex. Near the M25, the A13 carries around 100,000 vehicles per day. At Tilbury, the A1089 carries around 22,000 vehicles per day.

1.3.14 The London Orbital serves different functions and these have an impact on traffic patterns during the day and year. The south west quadrant is dominated by commuter traffic between Surrey and West London and is characterised by daily congestion in both commuter peaks. The north east quadrant, particularly from junction 21a to 27 has a high proportion of freight traffic travelling on the shorter route between the Midlands and North of England and the access points to the continent.

1.3.15 The M23 tends to have greater traffic volumes in the holiday periods (see paragraph 1.3.10) and on Fridays and Sundays. This is a function of both having a major airport on the route but also connecting the London Orbital to the Sussex coast.

1.3.16 The motorway and trunk road spurs within the London Orbital tend to be dominated by commuter traffic and provide access to different parts of outer London. Outside the London Orbital, the A13 and A1089 trunk roads are dominated by freight traffic.

1.3.17 Carriageway design for the motorways is varied. For example, there have been different standards applied as each section of the London Orbital was initially constructed and subsequently, as different

approaches to widening and different traffic management techniques, such as controlled motorways, have been implemented. At its widest, the M25 between junctions 14 and 15 has six lanes in each direction; by contrast the section at junction 5 is just a two lane slip road. In 2002, the Orbit study recommended that the M25 be widened to a minimum of four lanes wide, and most of this work is now complete. The M23 is three lanes in each direction.

1.3.18 Carriageway design for the trunk roads similarly varies, from a single lane on the A23 and the end of the A1089, to three lanes in most other cases.

1.3.19 The junction designs also vary around the London Orbital. The way that the M25 crosses other motorways is a good example. There are free flowing intersections with all movements possible where it crosses the M4, M3, M23 and M11; but the junctions with the M20, M26 and the M1 do not allow certain movements, or traffic needs to give way. All the junctions are grade separated (with bridges), and most of these are roundabouts formed from two bridges over the motorway, but a number of junctions with lower traffic flows use ‘diamond’, ‘cloverleaf’ or ‘dumb bell’ layouts which use a single bridge and T junctions or small roundabouts on either side.

1.3.20 Junctions on the trunk roads are similarly varied from grade separated junctions (with bridges) on some, such as the A13 and A2; to at level junctions (without bridges) on others, such as the A23 and A30.

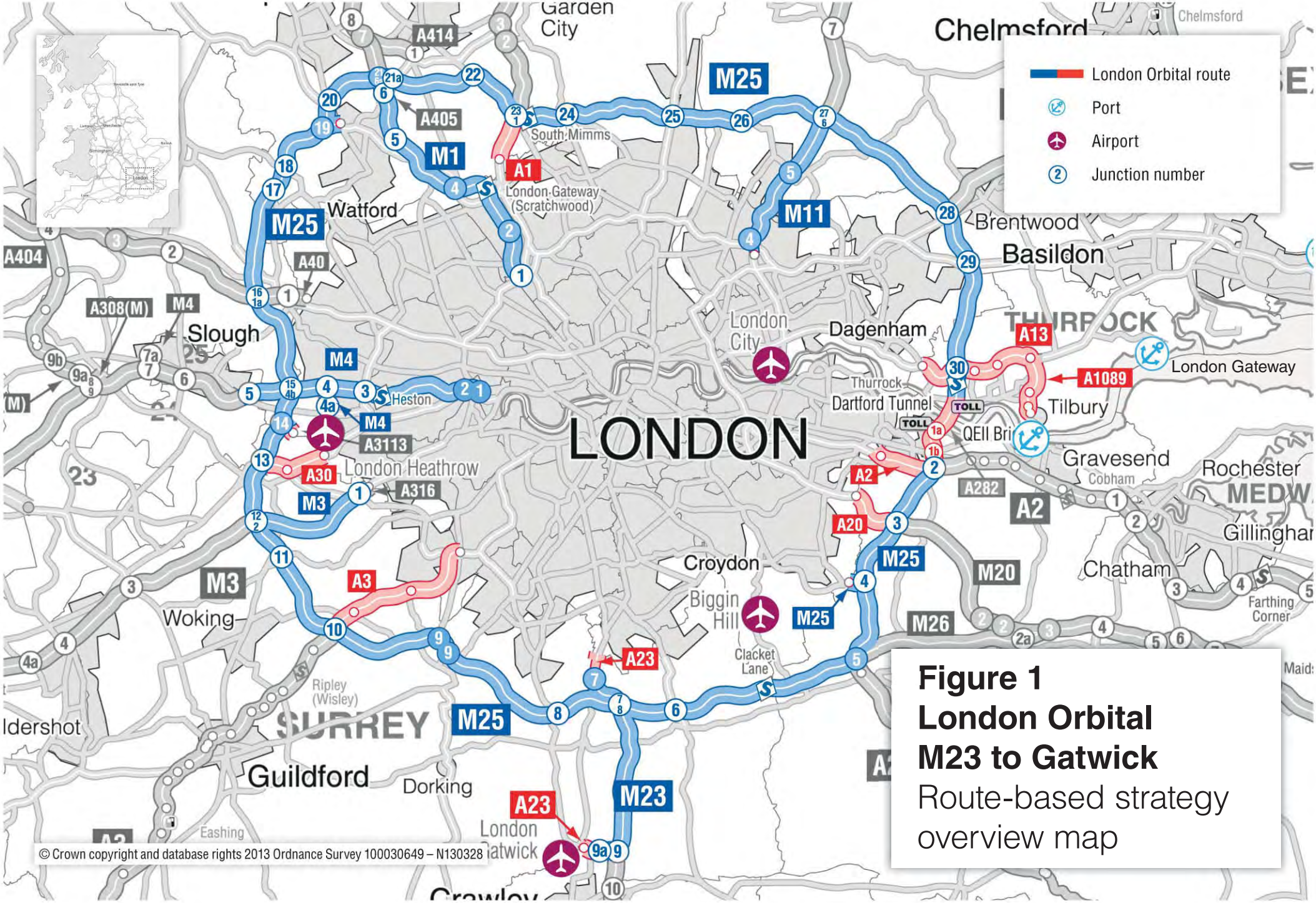


Figure 1
London Orbital
M23 to Gatwick
Route-based strategy overview map

2 Route capability, condition and constraints

2.1 Route performance

2.1.1 The strategic road network comprises only three per cent of England's road network, but it carries one-third of all traffic. Around 80 per cent of all goods travel by road, with two-thirds of large goods vehicle traffic transported on the strategic road network.

2.1.2 The ten most trafficked sections of the route are presented in Table 2.1. This is for the reporting period 1 April 2012 to 31 March 2013. The national rank column indicates how busy the section is compared to all 2,500 strategic road network links. The busiest section of the route is M25 junctions 10 to 16, as already highlighted in Section 1.3.

Table 2.1 Ten busiest sections on the route (1 April 2012 to 31 March 2013)

Rank	Strategic Road Network section	Annual Average Daily Flow AADF (one way)	National Rank
1	M25 between M25 J15 and M25 J14	107,057	1
2	M25 between M25 J14 and M25 J15	106,712	2
3	M25 between M25 J14 and M25 J13	101,772	3
4	M25 between M25 J13 and M25 J14	101,551	4
5	M25 between M25 J15 and M25 J16	96,401	5
6	M25 between M25 J16 and M25 J15	95,144	6
7	M25 between M25 J13 and M25 J12	95,099	7
8	M25 between M25 J12 and M25 J13	94,441	8
9	M25 between M25 J12 and M25 J11	92,028	10
10	M25 between M25 J11 and M25 J12	91,242	11

2.1.3 Some sections of the route carry particularly high levels of Heavy Goods Vehicles (HGVs). The A1089 serves Tilbury port and has the greatest proportion of vehicles over 6.6m, with a maximum of 26% being recorded. Over 20% of the traffic recorded from M25 junction 29 to junction 1b, incorporating the Dartford crossings, is vehicles over 6.6m long. As a comparison, the remainder of the London Orbital has between 10% and 19% of vehicles recorded as greater than 6.6m, and within the London Orbital the general proportion of HGVs on both the motorways and A roads is 7% with the exception of the A3113 (12%), the M11 (10%) and the M1 (10%), which serve many industrial, commercial and freight businesses. The percentage of HGVs on the M23 is 7%.

2.1.4 However, busy roads in themselves do not necessarily represent an issue – our customers' experience of driving on the network is important to us. The *Strategic road network performance specification 2013-15*, sets us high level performance outcomes and outputs under the banner

of an efficiently and effectively operated strategic road network. We currently measure how reliable the network is based on whether the 'journey' time taken to travel between adjacent junctions is within a set reference time for that period, ie 'on time'.

Table 2.2 Ten least reliable journey-time locations on the route (1 April 2012 to 31 March 2013)

Rank	Location	On-time reliability measure	National Rank
1	A23 between A23 and M23 J7	49.6%	11
2	A405 between M25 J21a and M1 J6	50.5%	12
3	A23 between M23 J7 and A23	51.6%	13
4	A282 between A282 J1B and A282 J1A	53.5%	19
5	A282 between M25 J1A and M25 J31	55.5%	29
6	A282 between M25 J31 and M25 J1A	55.6%	32
7	M23 between M23 J8 and M23 J9	55.8%	33
8	M25 between M25 J5 and M25 J6	57.3%	42
9	M25 between M25 J6 and M25 J5	59.2%	60
10	A282 between M25 J2 and M25 J1B	59.3%	62

2.1.5 Table 2.2 shows sections of the route where road users are most likely to be unexpectedly delayed. More than 40% of journeys on these ten sections are considered not to be 'on time'. The cause of the variability differs by section. It is possible that traffic signals along the A23 and the A405, and toll collection plaza at the A282 Dartford Crossings may have contributed to reducing journey time reliability on these sections. Road works as part of the M25 smart motorway scheme have affected reliability between junctions 5 and 6.

2.1.6 Figure 2.1 illustrates the average speeds during weekday peak periods between 1 April 2012 and 31 March 2013. The peak periods are generally the busiest periods on the network and help us to understand the impact of the worst congestion on customers' journey times. Figure 2.1 also shows any known performance or capacity issues where the local road network interfaces with the route.

2.1.7 The worst performing sections of the London Orbital are the approaches to the Dartford crossings which, as discussed above are also some of the most unreliable sections of the route. Average speeds in the peak period fall below 30 mph, well below the 50 mph speed limit.

2.1.8 In the south west quadrant of the M25, particularly between junctions 10 and 16, average peak time speeds are typically between 40 mph and 50 mph in both directions. The poor link performance may be caused by weaving due to traffic diverging from and merging onto the M25. For example, the six-lane northbound section from junction 14 to 15 – three lanes for diverges and three for through movements – caters for a high

volume of traffic diverging onto the M4. The reverse is possible for M25 southbound upstream of junction 15, where through movements are joined by traffic merging from the M4. A similar reason may also explain the poor performance between junctions 12 and 13, where the M25 intersects with the M3 at junction 12. A variable speed limit also operates in this section – during periods of high traffic flow – which will also impact on the average speed achieved by traffic. This section of the M25 does not appear in Table 2.2 because the congestion is fairly consistent, in other words it is reliably congested.

2.1.9 The M25 from junctions 5 to 6 has an average speed of about 50 mph which in the clockwise direction is likely to be caused by a high merging flow from the M26 and the A21. This section is one of the few sections along the London Orbital remaining as a dual three lane during the period when data were recorded.

2.1.10 The M11 southbound from junctions 5 to 4 has an average speed of 40mph or less in the morning peak, as it joins the Transport for London Road Network (TLRN). This section has a speed limit of 50 mph and the number of lanes reduces from three to two.

2.1.11 The M4 from junctions 3 to 2 eastbound and junctions 1 to 2 westbound has a recorded peak time speed of less than 20 mph, well below the speed limit of 40mph, and journey time reliability has been worsening during 2013. The eastbound section reduces from three lanes to two lanes along its elevated section, but there is no obvious bottleneck in the westbound section.

2.1.12 Low peak time speeds on the A30 and the A23 might be caused by congestion at traffic signals on these routes. Our data shows that the A23 in particular is not performing efficiently.

2.1.13 The best performing parts of the London Orbital are on the north west and north east quadrants. In many cases, peak period average speeds of more than 60mph are achieved. The M1, A1 and A20 also perform well. All of these sections have grade separated junctions (with bridges) with at least three lanes in each direction.

2.1.14 There are over 60 junctions on the route, and Figure 2.1 highlights that most of these are suffering from congestion. The problem includes junctions designed as free flow, such as the M4 to M25 interchange, as well as conventional roundabouts and T-junctions. We can't easily compare congestion levels between these junctions, but many of them have been regularly cited by stakeholders, including those on the M23 and A23 corridor; those on the Dartford crossing approaches; M25 junctions 5, 25 and 28; most of the junctions in the south west quadrant of the M25; those at either end of the A405; and M4 junction 4.

2.1.15 The strategic road network is key in promoting growth of the UK economy, and alleviating congestion can realise economic benefits. Figure 2.2 highlights the delay on the route when compared with a theoretical free-flowing network and shows that much of the route experiences delay in the peak periods with nearly the whole of the

London Orbital being in the worst two classes along with the M23 being in the highest class of delay.

2.1.16 Within the London Orbital the route sections that are in the highest class for delay include the M4 eastbound, the M11 southbound and the A30 in both directions. These areas of delay are consistent with slow speeds already discussed.

2.1.17 The Agency's National Intelligence Unit records the probability of experiencing congestion in the peak period across the strategic road network. In that analysis the route, where data is available, is characterised in the classes set out below. These sections have either been already discussed above, or fall within sections of the route that have had roadworks in place since late 2012 as part of widening works that are taking place (M25 junctions 23 to 27 and junctions 5 to 7).

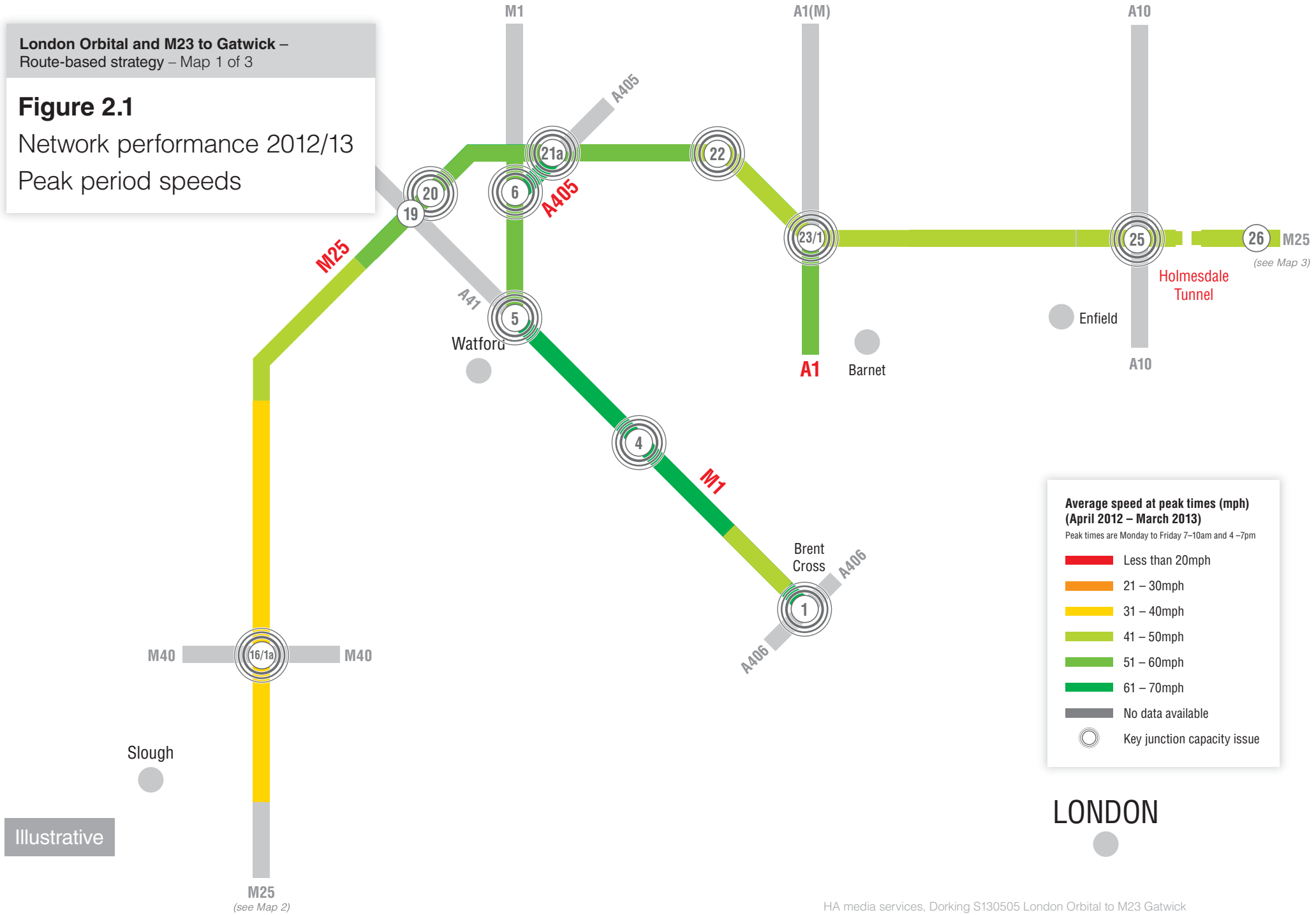
- More than 80% probability: Dartford crossings; most of the south west quadrant; M25 junctions 23 to 24; and the M4.
- Between 50% and 80% probability: M25 junctions 5 to 10; M25 junctions 16 to 19; M25 junctions 24 to 27; M11 junctions 5 to 4; and the A23.
- Less than 50% probability: the rest of the route.

London Orbital and M23 to Gatwick –
Route-based strategy – Map 1 of 3

Figure 2.1

Network performance 2012/13

Peak period speeds

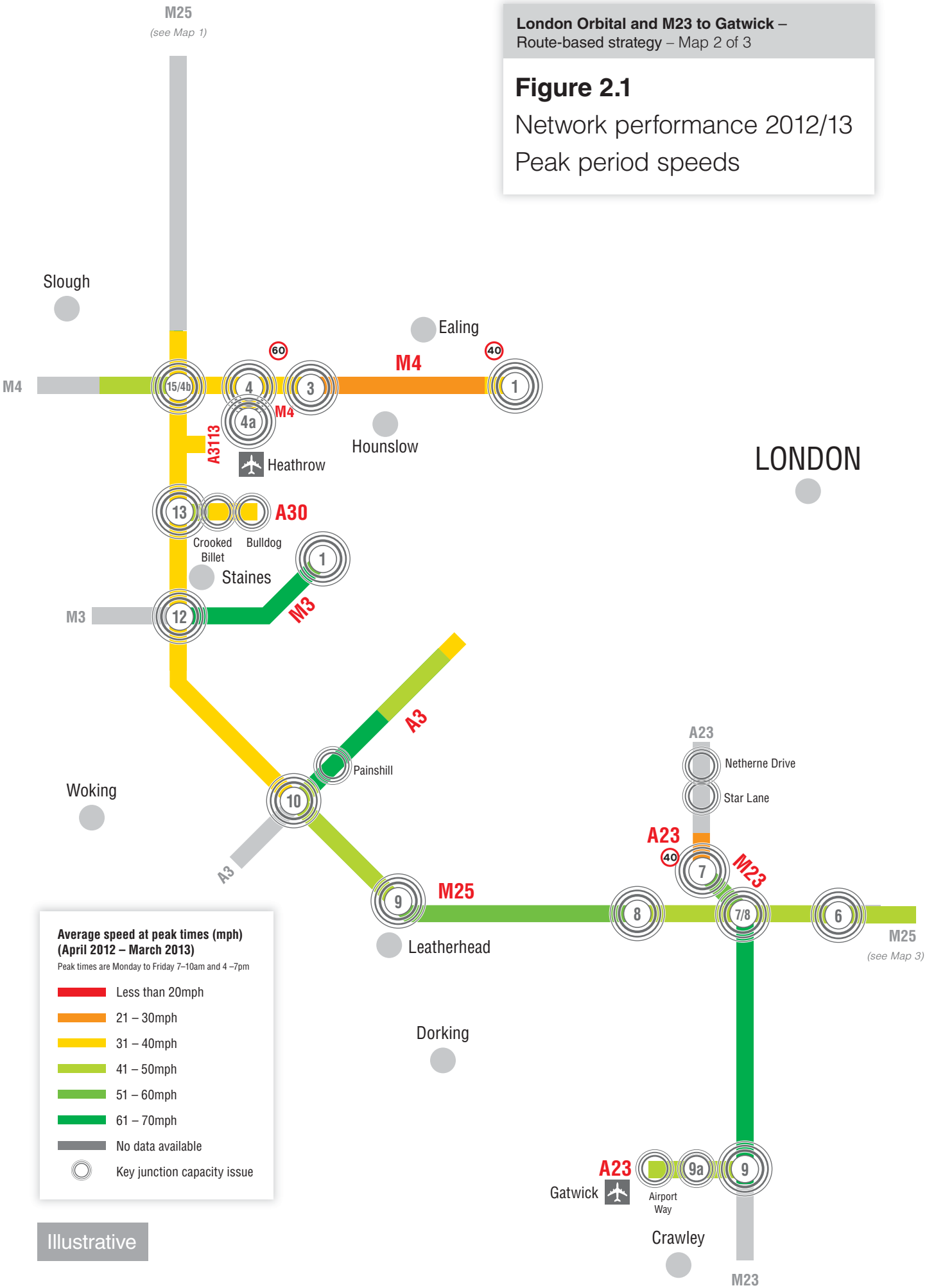


London Orbital and M23 to Gatwick –
Route-based strategy – Map 2 of 3

Figure 2.1

Network performance 2012/13

Peak period speeds

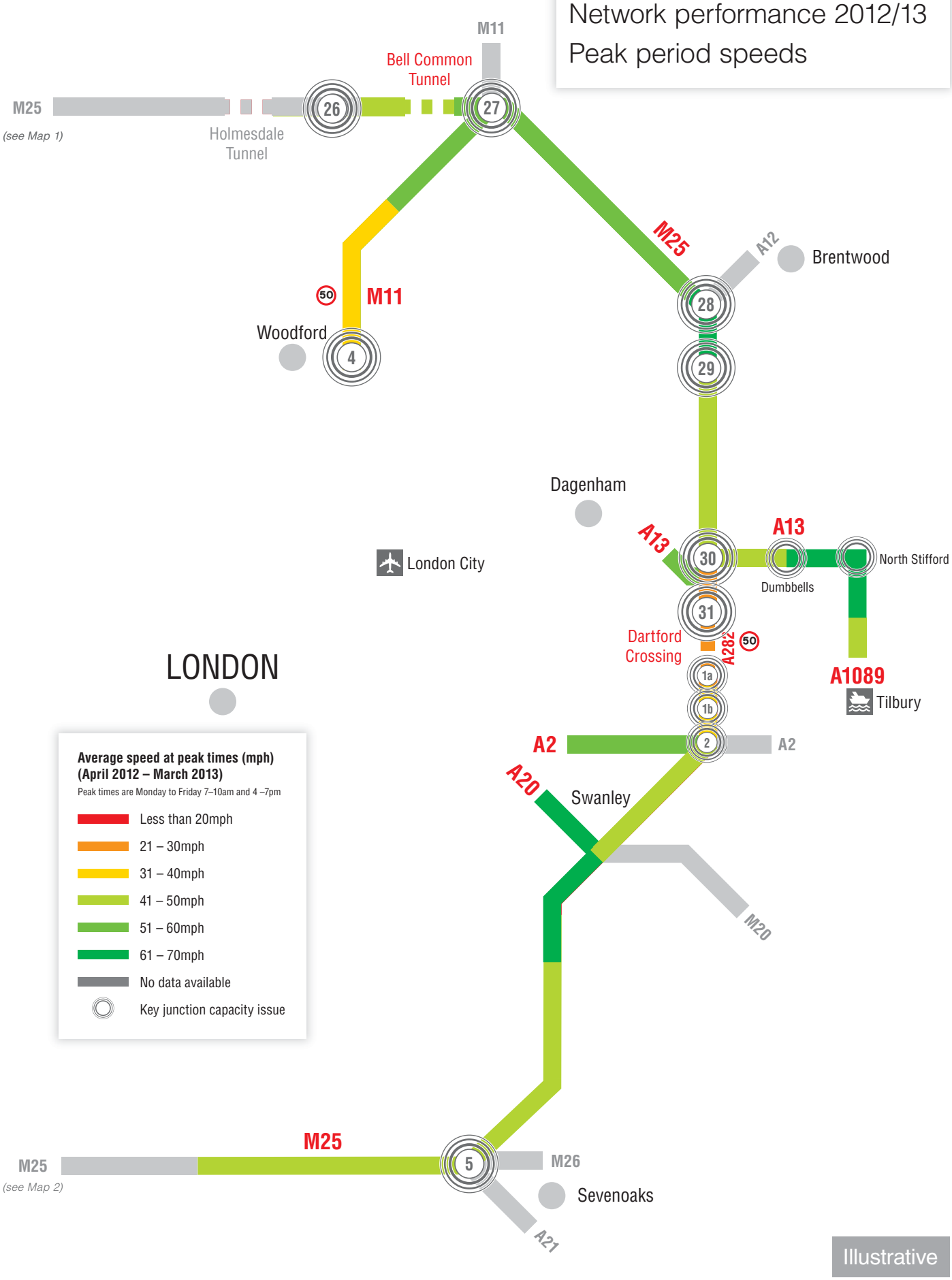


London Orbital and M23 to Gatwick –
Route-based strategy – Map 3 of 3

Figure 2.1

Network performance 2012/13

Peak period speeds

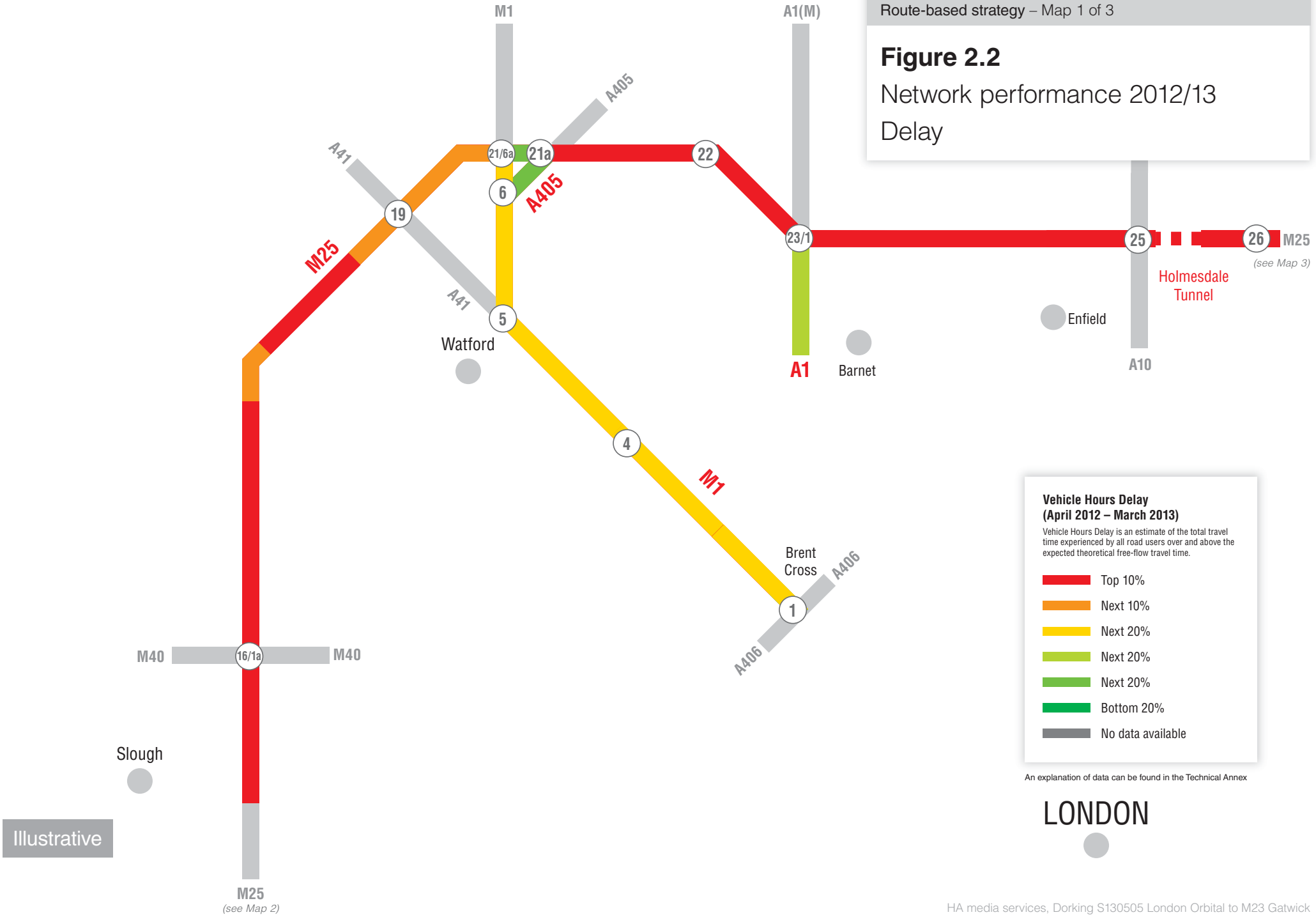


London Orbital and M23 to Gatwick –
Route-based strategy – Map 1 of 3

Figure 2.2

Network performance 2012/13

Delay



Vehicle Hours Delay
(April 2012 – March 2013)

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.

- Top 10%
- Next 10%
- Next 20%
- Next 20%
- Next 20%
- Bottom 20%
- No data available

An explanation of data can be found in the Technical Annex

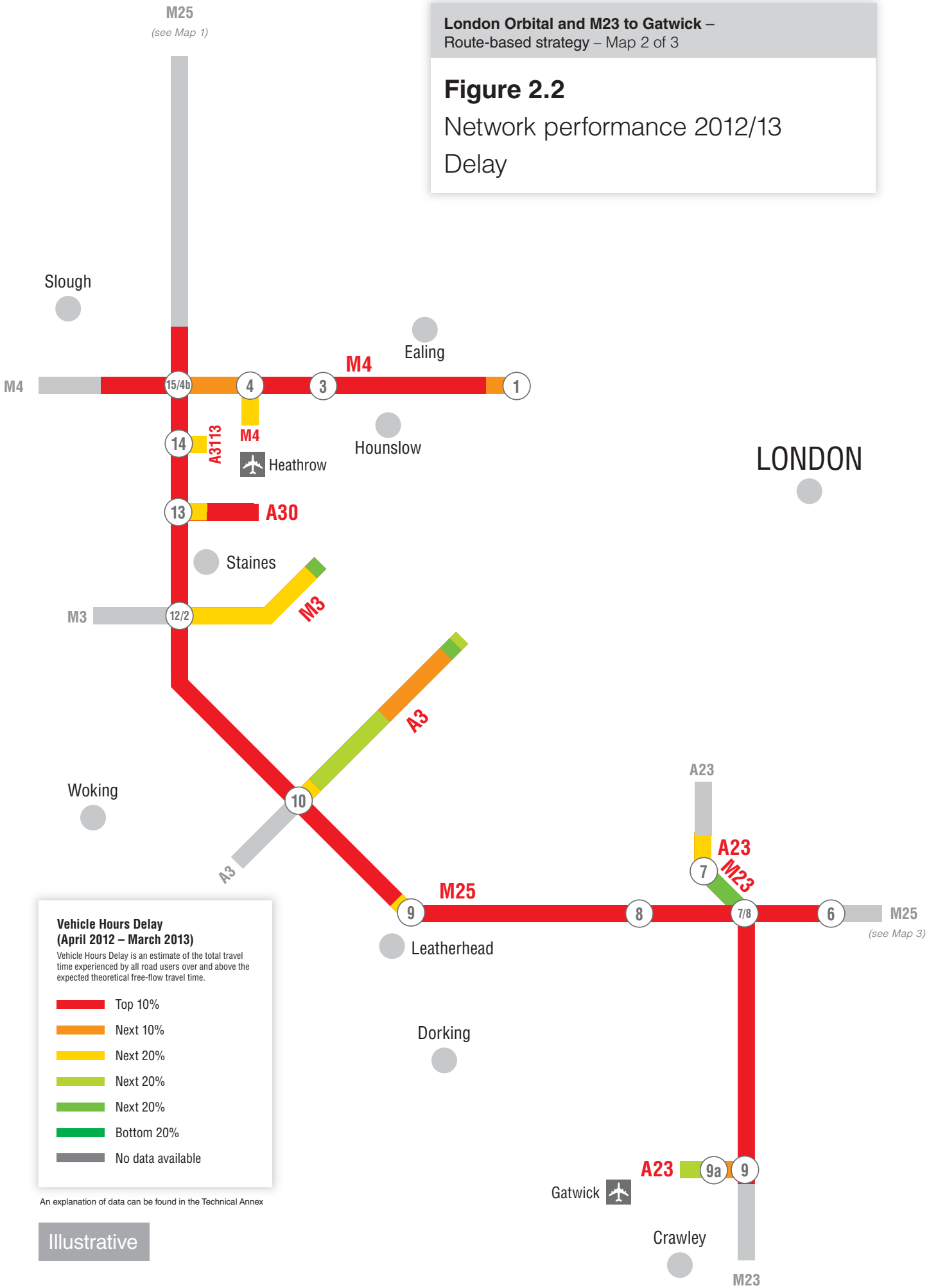
LONDON

London Orbital and M23 to Gatwick –
Route-based strategy – Map 2 of 3

Figure 2.2

Network performance 2012/13

Delay



An explanation of data can be found in the Technical Annex

Illustrative

London Orbital and M23 to Gatwick –
Route-based strategy – Map 3 of 3

Figure 2.2

Network performance 2012/13

Delay

2.2 Road safety

2.2.1 As a responsible network operator and through the *Strategic road network performance specification 2013-15*, the Highways Agency works to ensure the safe operation of the network.

2.2.2 By 2020, *The strategic framework for road safety 2011* forecasts the potential for a 40% reduction of the numbers killed or seriously injured on the roads compared with 2005-2009. We are working toward this aspirational goal.

2.2.3 Figure 2.3 illustrates the rates of injury accidents and any locations on the route that rank in the top 250 for casualties between 2009 and 2011. Injury accidents are collisions where people were injured and their injuries were slight, serious or fatal. Damage only incidents have not been included. The top 250 casualty locations have been calculated nationally, and are based on the number of casualties which occurred within a distance of 100m. Locations with the same number of casualties have been given a "joint" ranking and therefore, there may be some locations with the same rank number.

2.2.4 While we aim to reduce the numbers killed or seriously injured using and working on the strategic road network, we will always identify more safety interventions than our budget allows us to implement. We use a prioritisation process to help us and we review this regularly to ensure we are targeting the locations with the greatest opportunity to save lives and reduce the severity of injury.

2.2.5 Table 2.3 shows the number of traffic collisions and their severity over the three years to 2011.

Table 2.3 Traffic collisions 2009 to 2011

Collisions	Fatal	Serious	Slight	Total	KSI Total
2009	22	136	1254	1412	158
2010	23	142	1311	1476	165
2011	16	115	1251	1382	131
Total	**61**	**393**	**3816**	**4270**	**454**

2.2.6 Overall, the roads on the route have a relatively good safety record. The key points are that:

- The collision rate for the motorways on the route, in accidents per 100 million vehicle miles, is around 8, which is lower than the national average of 11.
- For trunk roads on the route, the collision rate is around 11, which is considerably lower than the national average of around 19.

2.2.7 The roads with the highest rates of collisions and numbers of recorded collisions are:

- The A282 Dartford crossing and its approaches (between M25 junction 30 and junction 3) which has a consistently high rate, with between 11-15 collisions per 100 million vehicle miles.
- M25 junctions 8 to 11, which has the highest number of recorded collisions (between 127 and 141 in three years), but due to the high traffic volumes, the collision rates are below average.
- M23 near the M25.
- M4 eastbound and the M4 spur from Heathrow.
- There are only short stretches of trunk roads on the route, but the A30, A405, A23 and A3 all have above average collision and casualty rates, in the range 10-30 collisions per 100 million vehicle miles, with the A30 and A405 being particularly high.

2.2.8 The number of collisions on the route that result in either an injury or a 'Killed or Seriously Injured' injury (KSI) – 4270 injuries and 454 injuries respectively – are on the decline, by 2% and 17% respectively. However, these overall figures mask an increase on trunk roads – 11% more injury collisions, and 45% increase in KSI injury collisions.

2.2.9 We have safety cameras along most of the London Orbital, except between junctions 3 and 5. Along the other motorways and trunk roads, camera coverage is less dense with only a few sites on the M4 and M11 and a site on the A3.

2.2.10 A number of junctions on the route have high numbers of collisions. Many feature in the national top 250 casualty sites, including three sites in the top 10. Table 2.4 shows the top ten motorway junction 'hotspots.'

Table 2.4 Top ten motorway junction hotspots

Hotspot	Junction type	Collisions per year	National casualty rank	Comments
M25 J23	Signal roundabout	16	Not in top 250	High number of collisions, but few severe, therefore few casualties.
M25 J30	Signal roundabout	14	98, 158	Short term improvements completed. A longer term scheme is planned (Table 3.2).
M25 J10	Signal roundabout	13	1	Accident patterns are being analysed.
M25 J21a	Give-way, restricted turns	12	7, 21	Safety scheme planned (Table 3.3).
M25 J15	Free flow interchange	12	3/ 98/ 202	The highest casualty rank is the eastbound approach. This junction is under study. The M4 smart motorway scheme could address safety issues here (Table 3.2).
M25 J29	Signal roundabout	10	123	Part-time signals.
M25 J3	Signal roundabout	10	52	
M25 J13	Signal roundabout	10	21	
M25 J25	Signal roundabout	8	98	
M25 J2	Signal roundabout	8	3, 52	

2.2.11 Table 2.5 shows the top five trunk road hotspots. Junctions 1a and 1b near the Dartford crossing are part of the A282 rather than the M25.

Table 2.5 Top five trunk road junction hotspots

Hotspot	Junction type	Collisions per year	National casualty rank	Comments
A30 Crooked Billet	Signal roundabout	8	14	
A13 North Stifford	Free flow roundabout	8	98	Improvement scheme planned in partnership with Thurrock (Table 3.4).
A30 Bulldog	Signal crossroads	6	27	Improvement scheme planned which might improve safety (see Table 3.2).
A282 Dartford J1a	Signal roundabouts	5	3, 14	
A282 Dartford J1b	Signal roundabout	5	98	

2.2.12 Our analysis of the types of vehicles and road user involvement in collisions (excluding data from the M23 to Gatwick) shows that:

- 82% involved more than one vehicle.
- 17% of vehicles involved were HGVs.
- Where the age of drivers was known 3% were young drivers aged 16-19 and 15% were young drivers aged 20-25.
- 9% were older drivers (aged 60 or over).

2.2.13 The causation factors for collisions indicate that, in the main, driver error or behaviour is the main cause, accounting for a total of 86% of all recorded factors. 55% of the collisions were recorded as driver or rider "error or reaction", which includes:

- 17% where the driver "failed to look properly."
- 12% where the driver or rider "failed to judge another person's path or speed."
- 8% "sudden braking."
- 7% "loss of control."

2.2.14 Further, 15% of the collisions were recorded as "Injudicious Actions", which includes 8% "following too close" and 5% "travelling too close for conditions;" and under the heading of "Behaviour and Experience" 6% were recorded as "careless, reckless, or in a hurry."

2.2.15 Of the 14% of factors that were not related to driver error or behaviour, the highest proportions were "slippery road due to weather", accounting for 4%, and "vision affected by vehicle blind spot" at 3%.

2.2.16 The three most frequent causes of KSI injuries were: shunts (34%), loss of control (32%) and change of lane (27%).

2.2.17 The Department for Transport advises highway authorities on how to analyse collisions. Having followed this guidance, we have identified some patterns:

- A high number of collisions have involved powered two wheelers.
- Some issues with drivers aged under 25, particularly on the M4, A13 and at M25 junction 5, frequently associated with a loss of control of the vehicle.
- A number of collisions during snowy and icy weather conditions at several key sites - M25 junctions 2, 3, 7, 15 and 21a; A405; A13; North Stifford Interchange; and M4 junction 4. We know from our operations that there are problems at M25 junction 7 to junction 8 during snowy weather, and we also know that the slip roads at M25 junctions 2, 3 and 15 are particularly steep.

2.2.18 We have not found patterns for collisions involving foreign vehicles, commercial vehicles, or children under 16; and apart from two fatalities recorded involving lamp columns on the A2, no pattern of object collisions either.

2.2.19 We have not analysed the data for collisions by gender.

2.2.20 Pedestrian and cyclists on the route have very low casualty rates, and again no patterns have emerged.

2.2.21 Collision rates might be improved by schemes described in Section 3. The Dartford free flow charging scheme, and M4 and M23 smart motorway pipeline schemes could reduce collision rates on the A282 and its approaches, the M4 into London and the M23 respectively. The M1 junction 6 and M25 junction 1a schemes could reduce collision rates on the A405.

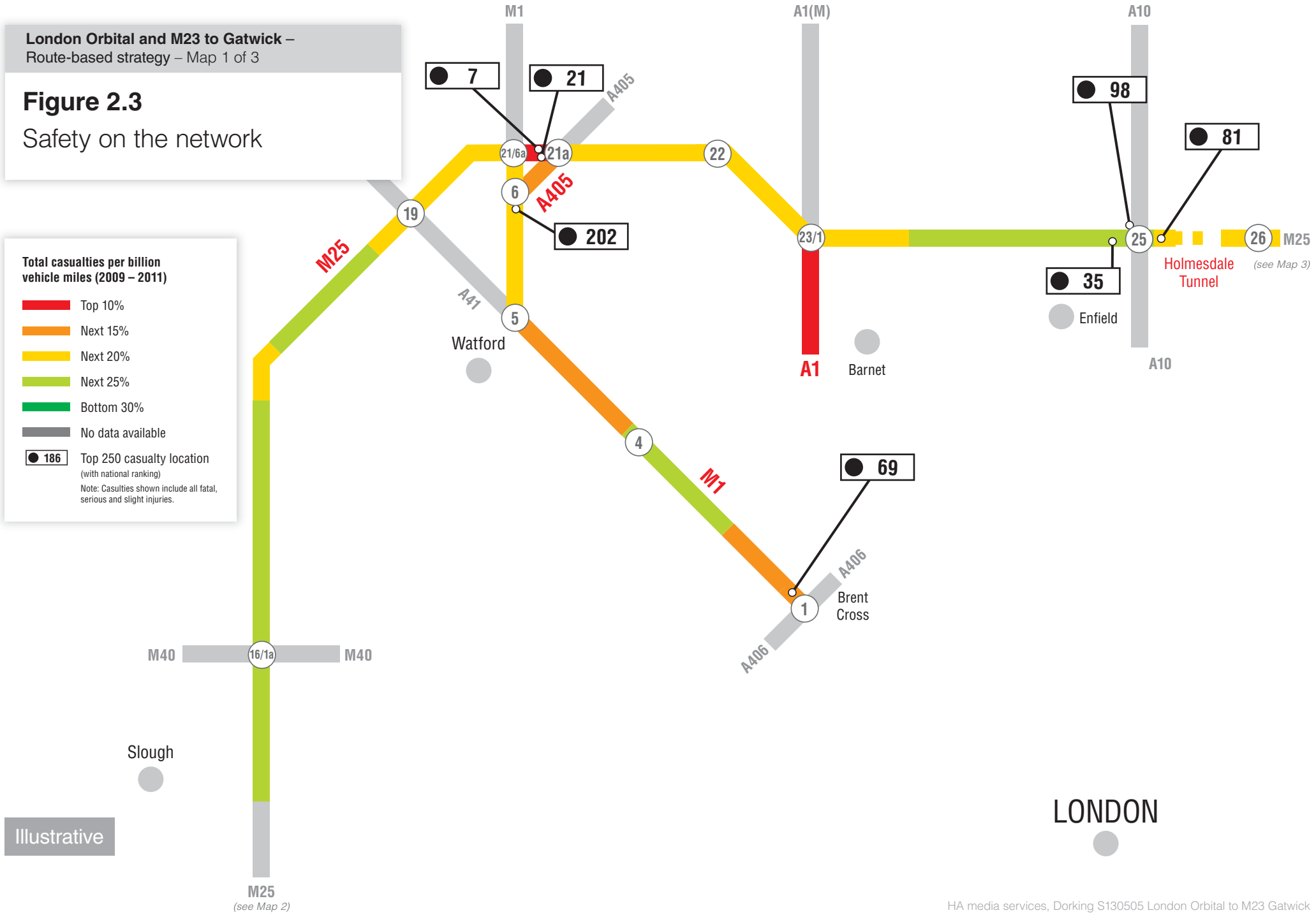
2.2.22 We are running a safety campaign to use variable message signs to display messages such as ‘Keep Your Distance’ and ‘Watch Your Speed’ during times when the signs are not needed for other messages.

2.2.23 There have been five suicides and many more attempted suicides from the QEII Bridge at Dartford during 2013. We are erecting signs which carry the Samaritans helpline, and we are working with local police forces to see what else we can do to tackle the issue. There are other suicide hotspots at M25 junctions 1a and 1b south of Dartford; M25 junction 25 at Enfield; and M25 junction 8 at Reigate.

London Orbital and M23 to Gatwick –
Route-based strategy – Map 1 of 3

Figure 2.3

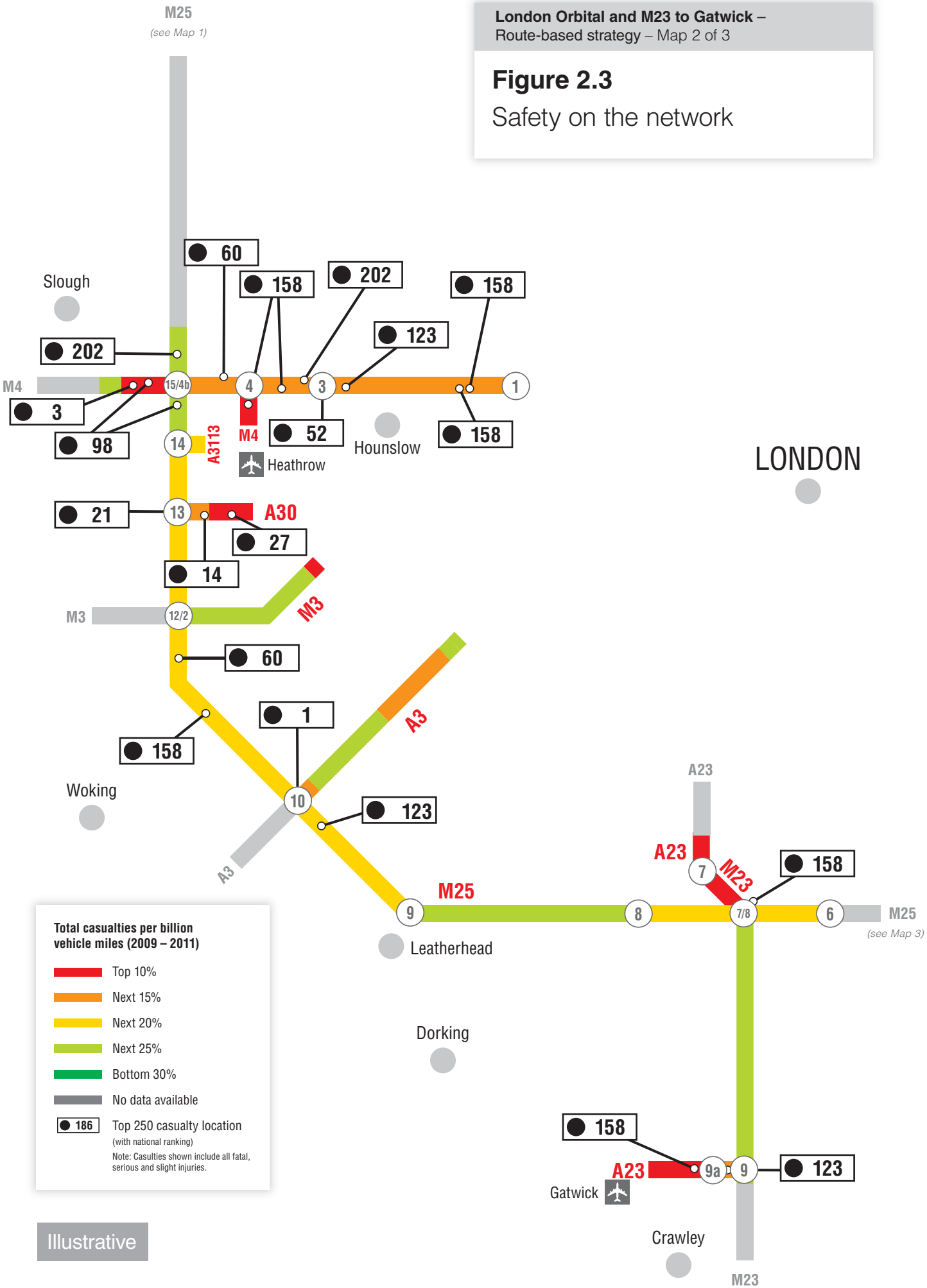
Safety on the network



London Orbital and M23 to Gatwick –
Route-based strategy – Map 2 of 3

Figure 2.3

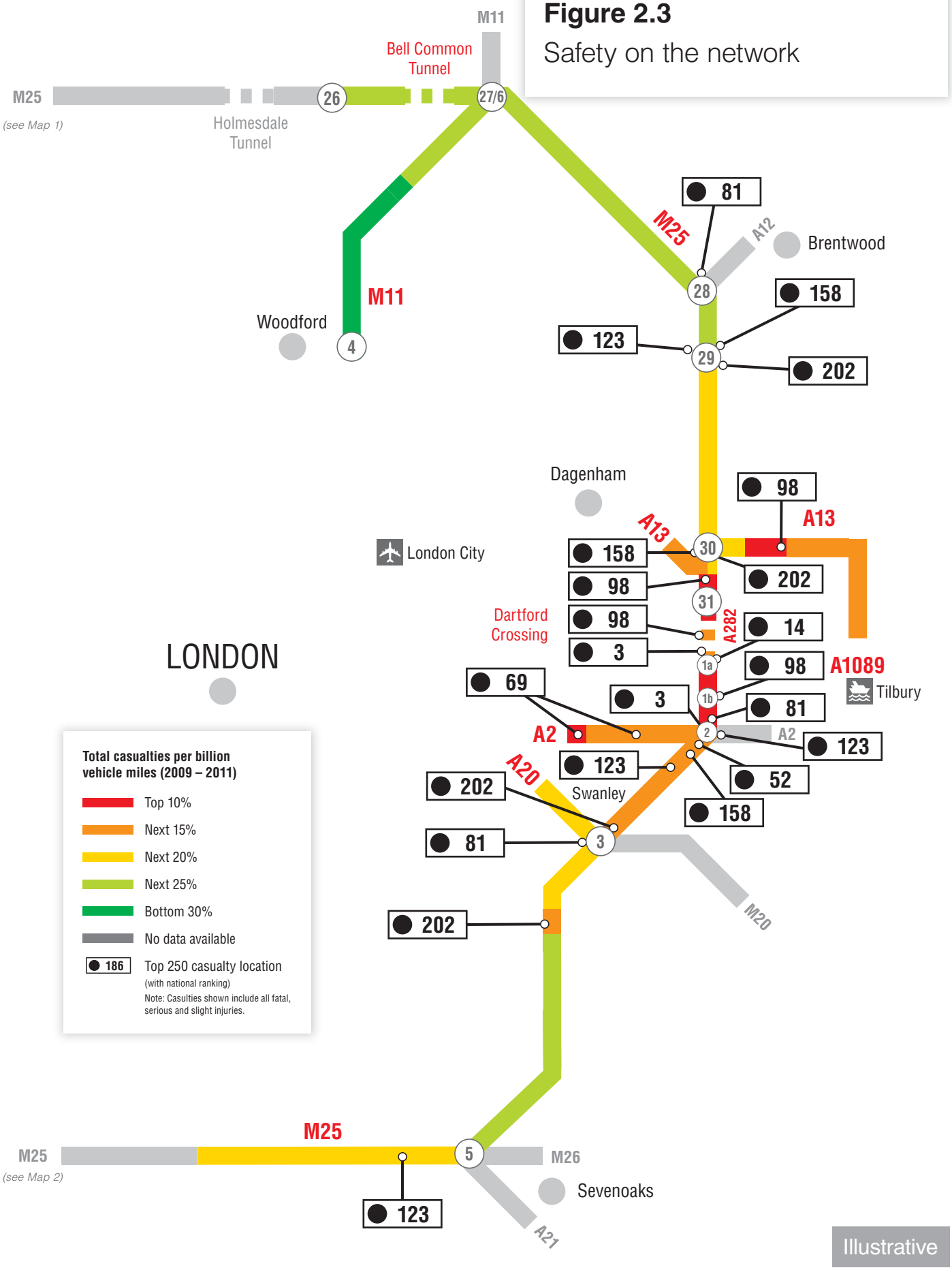
Safety on the network



London Orbital and M23 to Gatwick –
Route-based strategy – Map 3 of 3

Figure 2.3

Safety on the network



Illustrative

2.3 Asset condition

2.3.1 We carry out routine maintenance and renewal of roads, structures and technology to keep the strategic road network safe, serviceable and reliable. We also ensure that our contractors deliver a high level of service on the strategic road network to support operational performance and the long-term integrity of the asset.

2.3.2 From new, assets have an operational 'life' within which, under normal conditions and maintenance, the risk of failure is expected to be low. Beyond this period, the risk of asset failure is expected to increase, although for many types of asset the risk of failure remains low and we do not routinely replace assets solely on the basis that they are older than their expected operational life. We use a combination of more regular maintenance and inspection along with a risk-based approach to ensure that assets remain safe while achieving value for money from our maintenance and renewal activities.

2.3.3 We maintain a National Asset Management Plan as an annual summary of the strategic road network asset inventory and condition. It is aimed at ensuring there is sight of future issues affecting the asset and enabling strategic decision making.

2.3.4 All responsibility and risk for maintaining and renewing assets in the M25 design, build, finance and operate contract area lies with our contractor. Conversely, we have a more active asset management role on the M23 under the Area 4 MAC.

Carriageway Surface

2.3.5 The road surface on the strategic road network is primarily surfaced with two types of flexible bituminous materials, namely hot rolled asphalt (HRA) which has an approximate design life of 25 years and thin surface course system (TSCS) with a lower construction cost and shorter design life of 10-15 years. Large tranches of HRA were laid in the 1990s and TSCS tranches laid in the 2000s resulting in a significant proportion of the network reaching the end of its design life by 2020.

2.3.6 It should be noted that, although carriageway surfacing may be identified as reaching or exceeding its design life, the surfacing will not necessarily require treatment at this point. Carriageway surfacing that is beyond its design life is at a higher risk of failure, with such risk increasing the further that the surfacing exceeds its design life. The increasing age of the surfacing could manifest in an increased frequency of maintenance interventions which, if a renewals scheme is not funded, may result in a higher cost both financially and in terms of disruption to road users to maintain the asset in a safe and serviceable condition.

2.3.7 We are already planning to resurface most of the route by 2020. Only the M23, M11 and A30, which are all in good condition, are likely to be left out. Some of this resurfacing is being carried out before the design life is reached because it will avoid more expensive renewal work later.

2.3.8 The work will be planned to be carried out overnight, with some extended hours at weekends, starting earlier in the evening or finishing later in the morning in some cases. The effects on road users will not be the same everywhere. For example, we are not necessarily closing the whole road. We expect the greatest impacts to be felt:

- on the M4
- on the A282 Dartford crossing (pre-2017)
- between junctions 8 and 11 of the south-west quadrant of the M25.

2.3.9 The M4 and the A282 Dartford crossing are the locations where there is the greatest risk of longer working hours and extensive disruption. The QEII Bridge and M4 elevated structures have no hard shoulder and are difficult to access, being over the Thames and over the A4 respectively. This means that full closures are needed, these need to be planned and co-ordinated with other authorities well in advance, and working hours need to be as long as possible. Unfortunately, the diversion route for the Dartford crossing is the most inconvenient on the entire route (see Section 2.4). Therefore if either of the two tunnels needed to be closed at the same time as the QEII Bridge it would be very inconvenient for drivers, even at night. The diversion route for the elevated M4 is the A4, which passes beneath it – therefore we can't cone off lanes on the A4 to enable maintenance access to the underside of the M4 while it is closed without disrupting the traffic that has been diverted.

2.3.10 Although most of the route has a flexible surface a significant proportion - about a quarter – is of concrete construction, and this is exposed on about 10% of the route, mostly between M25 junctions 8 and 11. Our policy is to replace concrete road surface by flexible material at the end of its serviceable life. On this section, we are planning to use a technique to extend the life of the exposed concrete for a few years. The results of nearby trials on the M27, A20 and M20 showed that a single application of the technique might perform in a manner equivalent to a flexible surface to provide adequate skid resistance in the short term. However, the effect of any further applications is not clear, and therefore there is a particular risk of disruption to road users on this section.

2.3.11 The remainder of the concrete construction is covered with asphalt, such as the M25 junctions 27 to 30. This was used to improve surface performance characteristics (such as skidding resistance) and reduce noise. We do not normally use concrete pavement as a surface material in new carriageway construction on any of the strategic road network.

2.3.12 The structure of the carriageway is important for performance. The London Orbital is a relatively modern motorway and most of it has a deep enough construction to have a long life. Therefore by treating the surface in a timely manner we expect to maximise the life of the deeper pavement layers. There is a risk of disruption to road users if parts of the carriageway are not as deep as we anticipate and substantial repairs need to be carried out at relatively short notice. This might cause daytime lane closures. At the moment, we have not assessed where the risk of this is greatest, and when it could happen.

Structures

2.3.13 We have in the region of 1,700 structures on the route, including tunnels, bridges, large culverts, small span structures, signs or signal gantries and masts. Most critical are:

- Dartford crossings (the two tunnels and the QEII Bridge)
- Other M25 tunnels (Bell Common and Holmsdale)
- Approximately 50 bridges that have been identified as having 'strategic' importance.

2.3.14 Because the London Orbital is a relatively modern motorway, the oldest structures on the route are on the radial motorways and trunk roads.

2.3.15 All the structures have received a full principal inspection and condition rating in the last few years. The average condition of all structures on the route is fair to good, but the average condition of our strategic bridges is only fair.

2.3.16 The Dartford QEII Bridge (opened in 1991) is in good condition overall, but is undergoing major movement joint renewals, which will be completed in the next two years. The next major investment will be painting of the cable stays, followed by the pylons and bridge deck, which are all planned to be completed by 2020.

2.3.17 Since the Dartford tunnels (opened in 1963 and 1980) were rated in poor condition in 2011, we have replaced waterproofing of the road deck in the west tunnel, and this is planned to be replaced in the east tunnel by 2018.

2.3.18 Fourteen of the 'strategic' structures are on the elevated viaduct section to the east of M4 junction 3, but actually there are really three distinct structures: (i) Boston Manor Viaduct, a steel truss structure; (ii) M4 Elevated, a reinforced concrete structure; and (iii) the Chiswick flyover at M4 junction 1. The structures date from the 1960s and are in fair to poor condition. Major renewal works are planned over the next five years, and beyond. The major investment is planned for the M4 Elevated, with strengthening of the reinforcement over the next two years and concrete replacement over the next 25-30 years. These works will affect road users on the M4 and also the A4 beneath, mainly with lane closures and overnight road closures.

2.3.19 We will continue to replace movement joints on the route. As well as the QEII Bridge, we are replacing joints on the Gade Valley viaduct, a large structure between M25 junctions 17 and 18. Once these have finished, we plan to move on to the New Haw viaduct between M25 junctions 10 and 11, and following that, M25 junction 15 from 2015-2017. We will need to carry out overnight closures of these bridges to carry out these replacements.

2.3.20 We are planning a number of smaller projects to renew elements such as expansion joints, bearings, waterproofing and drainage across a number of structures.

2.3.21 We will need to close those parts of the route being renewed during night-time possessions, with some extended hours for working at weekends. The greatest impacts will be felt on the M4 corridor and at the QEII Bridge. We have already described the disruption that would occur from any diversions put in place at these locations.

2.3.22 Unplanned works can be more disruptive for road users than the planned works we have described. By their nature, it is difficult to predict when and where these works will happen. We believe that the M4 elevated corridor has the highest risk of failure and would have the highest impact of failure on the route, specifically the M4 Elevated and Boston Manor viaduct structures. Unplanned works here could result in extended road closures and weight restrictions. We are also investigating issues that we have found at Gade Valley.

2.3.23 Steel tendons in one form of bridge construction - post-tensioning – is at particular risk of corrosion. We have over 100 of these structures in the M25 design build finance and operate area, and although only about a quarter of these are of 'strategic' importance, they all carry the same risk of failure, which could cause unplanned works and disruption to the travelling public. One in particular, the M1 junction 2 'Fiveways junction' is a similar construction to the Hammersmith flyover which caused problems for Transport for London in the build up to the Olympics, and therefore even though we have inspected the structure and haven't found any major problems, it remains a high risk location on the route.

Other key asset issues for routes

2.3.24 Other key issues in relation to the assets on the route can be summarised as followed:

- Geotechnical
- Drainage
- Lighting

Geotechnical

2.3.25 The main risk sites are on the M23 to Gatwick section of the route, particularly two locations:

- Gatwick spur, where cracking is visible and there is a risk of full failure affecting the carriageway.
- M23 west side near South Nutfield, where cracking is visible adjacent to the drainage channel.

2.3.26 The highest risk site on the London Orbital is near Godstone (M25 junctions 6 to 7), where there was a land slip onto the carriageway about twelve years ago. Widening works have stabilised the embankments, but we have still recorded movements here. We also know about issues at A3113, M25 Cobham viaduct and M25 junction 16.

2.3.27 Overall, there are few visible problems with earthworks on the route, and therefore we do not have an extensive programme of renewals.

Instead, we are using the information we collect from our routine inspections to monitor the health of the earthworks and predict when problems are likely to occur. Although most of the inspections are complete, earthworks can fail quickly with little warning, and as a result unplanned road closures could occur.

Drainage

2.3.28 The drainage system comprises piped drains, filter drains, balancing ponds, tanks, mechanical and electrical (M&E) equipment, such as pumps and valves and soakaways under the ground.

2.3.29 We have inspected all the drainage and M&E equipment that is visible at the surface, but we will only fully understand the drainage below ground when a ten year inspection programme is completed by 2019. Therefore there is a risk of failure and unplanned work on the drainage below ground, which could affect road users through lane and road closures.

2.3.30 Much of the drainage and M&E equipment that we have seen at the surface has been in poor condition, reflecting a lack of maintenance in previous years. Where possible, we are taking the opportunity to renew this as part of committed schemes such as the M25 junctions 23 to 27 smart motorway scheme (Table 3.2).

2.3.31 Only small programmes of renewals are planned at the moment, whilst we continue to monitor the sites that we know that have flooded in recent years (see Section 2.4), identifying which of these problems may be drainage related, and then planning renewal and improvement schemes for these, eg M1 junctions 4 to 5. Renewals and improvements will continue to take place by prioritising and rectifying local issues as they arise.

Lighting

2.3.32 We have in the region of 65,000 lighting assets on the route. A large number of these, particularly those that are not part of recently upgraded sections of the M25 (such as junctions 16 to 23 widening) have reached the end of their serviceable life.

2.3.33 In the next two years, life expired columns and lanterns will be replaced on the A2, near the Dartford crossing, on the A1, the M25 junction 12 and the M3 junction 1. Further cabling, column and lantern renewals will be identified for following years, but no large scale programme is planned in the period to 2021. Renewal works will require some night time closures, but there should be no large scale disruption to road users.

2.3.34 To achieve a target to reduce energy use by 20% over four years, some lighting will be upgraded with lower energy units, used for shorter periods, dimmed, switched off or removed altogether. M1 from junctions 4 to 5 is the first trial site for switching off the lights, to be followed by total removal of the lights if the trial is successful.

2.4 Route operation

Incident Management

2.4.1 We work hard to deliver a reliable service to customers and to reduce the number and impacts of incidents on road users.

2.4.2 Across the strategic road network, the Highways Agency Traffic Officer Service responds to around 20,000 incidents each month. We measure how effective we are at managing incidents by looking at the time incidents affect the running lanes.

2.4.3 All the motorways on the route have dedicated patrols, which are based at the locations listed below. Our traffic officers also monitor traffic on the route from CCTV feeds to two Regional Control Centres.

- A282 (Dartford crossing)
- M25 J6 (Godstone Regional Control Centre)
- M23 J9 (Weatherhill)
- M4 J3 (Heston)
- M25 J23 (South Mimms Regional Control Centre).

2.4.4 Apart from the A1 to the London boundary, the trunk roads have no regular patrols, but do provide an incident management response.

2.4.5 We have a good understanding of the types of incidents which are quick to clear up and those which take longer. In general, there are far more incidents which do not affect the running lanes for very long, and mostly these are caused by breakdowns in the live lanes, debris or damage only collisions. The longest duration incidents are mostly caused by infrastructure issues, such as road surface repairs, bridge strikes, barrier collisions and spillages.

2.4.6 We continue to work with our partners in the emergency services to reduce the impacts on our network from serious collisions and long-duration incidents.

2.4.7 Nearly half the route benefits from incidents being cleared on average within 30 minutes and the remainder of the route other than M25 junction 30 and M23 junction 9 Gatwick spur being cleared within an hour. Despite high volumes of traffic on most of the route, there is no evidence that any parts of the route are difficult for traffic officers to access and clear incidents efficiently. We don't have information for incidents on the trunk roads to assess if the lack of patrols there results in a long response time.

2.4.8 Our motorways are well covered with tactical diversion routes which we operate, when necessary, in partnership with other highway authorities. These range from 3km to over 40km in length, and mostly run for a single junction, although some run for two junctions. They can be used for unplanned emergency purposes (incidents), or for planned works (e.g. overnight maintenance), where the local highway authority agrees. We monitor the traffic flow on these routes, and when needed, we set signs and messages to advise the public. Traffic signals are controlled

by the Agency or by our local highway authority partners. However, we do not have diversion routes agreed for trunk roads.

2.4.9 Diversion routes are particularly important for the London Orbital because there are very few good alternative routes and traffic flows are the highest in the country. Most of our diversion routes will result in a moderate to severe impact on road users, therefore it is essential to minimise the time they are in use. Particularly inconvenient are:

- A282 Dartford crossing – the diversion is very long, at 43km, and it is constrained by a 4 m vehicle height restriction, which forces many lorry drivers to drive the opposite way around the M25 instead.
- M25 junction 25 to junction 27 – the diversion is very long, at 30km, it passes through multiple traffic lights and a hospital, and because there is not a suitable route for M25 junctions 25 to 26, or junctions 26 to 27, the diversion has to be used for any closure between the two junctions.

2.4.10 There are also severe problems with many other diversion routes including M1 junctions 4 to 5, M23, M25 junctions 6 to 8, M25 junctions 23 to 25, M25 junctions 27 to 28 and M25 junctions 8 to 10.

2.4.11 Despite investing in cameras and signs, operating these routes is a challenge. We need to liaise closely with other authorities, the diversion route signs need to be maintained and many routes are lacking in variable message signs (VMS) and CCTV. Also, at the moment we are not collecting feedback on how diversion routes have actually been performing, whether they are mainly used by short or long distance traffic, and how they were experienced by road users.

2.4.12 There are a number of day to day challenges that are particularly important to this route and affect its resilience:

- Access to our depots – such as Leatherhead, Swanley and South Mimms – particularly during incidents when the local roads and junctions are congested. This makes it difficult for traffic officers and our service providers to respond to incidents and vehicles such as gritters to access the route.
- A lack of hard shoulders, for instance on viaducts and future smart motorways, making it harder for emergency vehicles and traffic officers to access incidents or imposing the need to cone off the inside lane for off-carriageway repairs.
- A lack of places for vehicles to turn in an emergency.
- The disruption to other traffic caused by high vehicles trying to use tunnels at Dartford and consequently causing other traffic to be held at the payment barriers whilst an over height vehicle is recovered, directed to the correct tunnel or turned round.
- The disruption to other traffic caused by hazardous loads needing to be escorted through the tunnels at Dartford and consequently

causing other traffic to be held at the payment barriers to give way to the convoy.

Flooding

2.4.13 We have a responsibility to reduce flooding. Flooding of the strategic road network impacts upon network performance and the safety of road users. Flooding off the network has an impact on third parties living adjacent to the network.

2.4.14 Based on recorded flooding incidents, we have identified those parts of the strategic road network that are at risk of repeated flooding. Sections of the route may be naturally at risk from flooding, because of the ground conditions and flood catchment, but can also flood due to problems with the drainage infrastructure.

2.4.15 Generally, the route does not have a history of repeated flooding incidents. The main problem section is between junctions 4 and 5 of the M1 (from Hill Field footbridge to A41 Green bridge), which can suffer from water from neighbouring fields flowing onto the carriageway. We also know about a number of subways and localised sites that are prone to flooding, but these affect a smaller number of road users.

2.4.16 Other sections of the route, such as M25 junctions 7 to 8, junctions 9 to 10 and junctions 11 to 12 have suffered from flooding of the carriageway in the past, but not for many years. However, if the climate continues to change and rainfall during the winter increases, the number of high risk sites is likely to increase, and the impact of these events is likely to worsen.

Severe Weather

2.4.17 The Agency aims to minimise where possible the impacts of severe weather, eg strong winds and snow, on network performance and the safety of road users.

2.4.18 Parts of the route are vulnerable to snow fall and ice formation, particularly where the network is undulating and gradients are steep. The most vulnerable locations are shown in Table 2.6. These experience loss of traction during snowfall and ice formation. The most common problem is between junctions 7 and 8 of the M25, when traffic affected on a nearby road, Reigate Hill, tails back onto the route.

Table 2.6 Sections of the route vulnerable to snow fall and ice formation

Location	Comments
M25 J7-J8	Tailbacks occur onto this section when Reigate Hill is affected by snow and ice.
A282 QEII Bridge	Steep gradients and height above the Thames lead to potential for ice to form.
M25 J23-J25 and M25 J27-J28	Altitude can cause significant depths of snow to accumulate. The road layout has many inclines. The area is also heavily used by HGVs.
M25 J4-J5	Altitude and incline cause problems. Slip roads at both junctions have steep gradients.
M25 J3 slips	Evidence of road safety problems caused by snow and ice.

2.4.19 The impact of high winds is usually localised and difficult to predict. The main problem is when the QEII Bridge at Dartford has to be closed for safety reasons, causing disruption to road users who must then use the tunnels. This could be increasingly common with climate change. For example, the QEII Bridge was closed nine times due to high winds during the winter of 2013-2014, when normally this happens about once per year.

2.4.20 High temperatures are a risk that is likely to increase with climate change. Some parts of the route are constructed from concrete bays, and the joints between the bays can fail in the heat. Surface asphalt can melt, for instance the south facing slope of the QEII Bridge is at risk. Bridge bearings and joints across the network are at increased risk of failure.

2.5 Technology

2.5.1 The Agency works hard to deliver a reliable service to customers through effective traffic management and the provision of accurate and timely information. We provide information to our customers before and during their journeys.

2.5.2 We monitor key parts of our network using CCTV and use sensors in the road to monitor traffic conditions. These are used by our National Traffic Operations Centre and seven Regional Control Centres to provide information to customers before their journeys, eg on the Traffic England website or through the hands-free traffic app for smartphones. Whilst on the network, we also inform our customers using variable message signs (VMS).

2.5.3 Technologies such as overhead gantries, lane specific signals and driver information signs also forms part of how we can operate our network efficiently. In some locations we have controlled motorways, which is where we can use variable mandatory speed limits to help keep traffic moving. Smart motorways use both variable mandatory speed limits and the hard shoulder as an additional live traffic lane during periods of congestion. Ramp metering manages traffic accessing the network via slip roads during busy periods to help avoid merging and mainline traffic from bunching together and disrupting mainline traffic flow.

2.5.4 Table 2.7 is a summary of the technology along the roads that form the route. Generally, the busiest roads have the most technology. The London Orbital is rich in technology, but the coverage on the other motorways is patchy, and the coverage on trunk roads is sparse.

2.5.5 The main gap in technology on the London Orbital is junctions 3 to 5. Although this section has no speed cameras and no Controlled Motorway, Section 2.1 showed that it performs relatively well, the main problem being the congestion approaching junction 5.

2.5.6 The A405, A30, A23 and A13 were highlighted in Section 2.1 as suffering from congestion, and these sections have no CCTV coverage, and therefore no surveillance of the problem.

Table 2.7 Summary of technology along the route

Route	System	Existing	Known Gaps
London Orbital	CCTV	Extensive coverage.	A282 Dartford crossing.
	Safety cameras	Gantry mounted, extensive coverage (average speed cameras for A282).	J3-J5.
	VMS	Full coverage.	None.
	MIDAS	Full coverage.	None.
	Controlled	Extensive coverage, and J7-J8 almost completed.	J3-J5, A282 Dartford crossing.
Radial motorways – M1, M3, M4, M11, M23	CCTV	Covered (less extensive than M25)	None.
	Safety cameras	Pole mounted, only a few sites, many of which are obsolete.	M4 and M11 - renewals. M1 and M23.
	VMS	Spot coverage on M1, M3, M4 J4b to elevated and M23.	M11, M4 elevated.
	MIDAS	M3, M4 J4b to elevated.	M1, M4 elevated, M11, M23.
	Controlled	None.	All.
Other trunk roads	CCTV	Spot coverage on A3113 and A3.	A1, A405, A30, A23, A20, A2, A13 and A1089.
	Safety cameras	Pole mounted, only 1 site on the A3.	Everywhere else.
	VMS	Spot coverage on, A1, A3, A20, A2.	A405, A30, A3113, A23, A13 and A1089.
	MIDAS	None.	All.
	Controlled	None.	All.

2.5.7 No safety cameras are operating on the M4, despite the issues raised in Section 2.2. Safety cameras are lacking almost everywhere on the trunk roads, despite the issues raised in Section 2.2, particularly on the A30.

2.5.8 No variable message signs (VMS) or motorway incident and detection signals (MIDAS) are in place on the M11 or the elevated section of the M4, despite the congestion described in Section 2.1. The M23 lacks MIDAS and suffers from delays. A number of trunk roads lacking VMS and MIDAS also suffer from congestion – the A30, A405, A23 and A13.

2.5.9 There is no Controlled Motorway on the radial motorways, which include the M4 and M11 which suffer from congestion. Also, there is no Controlled Motorway on the A282 Dartford crossing, which as discussed in Section 2.1 experiences some of the worst delays on the route; however the A282 is not a motorway so the technology could not be introduced in the usual way.

2.5.10 We are using ramp metering at four sites on the route: at M25 junction 6 (eastbound traffic), M25 junction 8 (eastbound traffic), and at M25 junction 11 (both east and west bound traffic). We have equipment at

two more sites - at M25 junctions 5 and 10 - but are not using it there. This is because ramp metering is most useful when the joining road and junction is not congested. The problem with junctions 5 and 10 is that they are both very congested. Junctions 6, 8 and 11 are less so. With only four sites operating, this leaves extensive lengths of the M25, and other motorways, which are congested at peak times and are not protected by ramp metering.

2.5.11 About half of the junctions on the route are controlled with traffic signals, mostly by computer, but very few are running the most modern control system. Most, but not all of these junctions are suffering from congestion at peak times.

2.5.12 We are using two different technologies to control the display of signals and communicate north and south of the Thames, which are in turn different to those being used by our partners such as Metropolitan Police and Transport for London. This is causing difficulties with day to day performance, for example when we are reporting incidents and communicating messages to the public.

2.6 Vulnerable road users

2.6.1 There are a number of public rights of way that cross or run parallel to the route. The majority of the route has bridges or underpasses for pedestrians, cycle users and equestrians, therefore conflicts between these groups and traffic are rare. Conflicts can occur at slip road entries onto the route, such as at M25 junctions 21a and 25.

2.6.2 Various national cycle network routes cross the route:

- Route 1 passes beneath the M25 between junctions 25 and 26 and over the A282 to the south of junction 1b.
- Route 137 passes underneath the M25 south of junction 30.
- Route 20 passes over the M25 at junction 6.
- Route 21 passes over the M25 between junctions 6 and 7.
- Route 22 passes over the M25 between junctions 8 and 9.
- Route 223 passes beneath the M25 between junctions 11 and 12.
- Route 4 passes beneath the M25 at the A30 south of junction 13.
- Route 61 passes over the M25 between junctions 15 and 16.
- Route 6 passes over the M25 between junctions 21 and 22.

2.6.3 Two long distance walking trails cross the route. Firstly, the Thames Path which follows the River Thames for 184 miles from its source in the Cotswolds to the Thames Barrier. The trail passes over the M25 to the north of junction 14. Secondly, the 153 mile North Downs Way crosses the M25 to the north of junction 5 and then continues in a westerly direction before crossing over the M23 to the north of junction 8 before following a tunnel beneath the M25 to the west of junction 7.

2.6.4 The common issues which have been highlighted by stakeholders are that over-bridge crossings are not suitable for horses as parapets are too low; or that underpass crossings lack sufficient headroom for horses to use.

2.6.5 For pedestrians, stakeholders have indicated that the lack of lighting in underpasses makes these facilities unattractive. Underpasses are also identified as prone to flooding which makes them unattractive to potential users. We are aware of issues at:

- M25 junction 23 - Sustrans has highlighted that flooding regularly occurs on the new foot and cycleway underpass.
- M25 junction 25 - Sustrans has identified that improvements to the foot and cycleway underpass are needed.
- M4 near junction 3 - residents have highlighted concerns with flooding and the attractiveness of subways near Cranford Park.

2.6.6 There are few other locations where stakeholders have identified a need for improved facilities. The A30 scheme highlighted in Table 3.3 will improve this route for cyclists between Surrey and west London. The Cycle Touring Club is investigating the potential to improve cycling on the A23 corridor.

2.7 Environment

2.7.1 As a responsible network operator and through the *Strategic road network performance specification 2013-15*, the Agency works to enhance the road user experience whilst minimising the impacts of the strategic road network on local communities and both the natural and built environment.

Air quality

2.7.2 We recognise that vehicles using the strategic road network are a source of air pollution which can have an effect on human health and the environment. We also appreciate that construction activities on our road network can lead to short-term air quality effects which we also need to manage.

2.7.3 The Agency is committed to delivering the most effective solutions to minimise the air quality impacts resulting from traffic using the strategic road network. We will operate and develop the network in a way that works toward compliance with statutory air quality limits as part of our broader Environmental Strategy.

2.7.4 A simple indicator of poor air quality is where a local authority has declared an Air Quality Management Area. An AQMA is a location – a whole, or a part of a local authority - where air quality strategy objectives have been exceeded. Nitrogen dioxide, and to a lesser extent, particulates, are the main concerns for the route. AQMAs pass through or touch the route along:

- The length of the M4 and A30

- Parts of the M1, M11, M3, A3 and A23
- Parts of the M25: Enfield and Havering in the north and east; and Hillingdon and Spelthorne in the west.
- M25 between junctions 2 and 6

2.7.5 Monitoring sites outside the AQMAs show that there are air quality problems around the Dartford crossing, and several other places along the route, but so far we have not identified any problems on the south and south-east parts of the route.

2.7.6 We know where there are dwellings, schools, hospitals and other sensitive sites near the route. In a few cases, near Woking and Brentwood, they are also sited in areas where we have also recorded air quality problems.

2.7.7 Some of our diversion routes pass through sites that are designated for special protection, such as Epping Forest. This means that when we carry out planned work on the route and need to divert traffic through Epping Forest for a length of time, we need to show that air quality will not suffer.

2.7.8 In summary, nitrogen dioxide is a problem along the parts of the route. The main places of concern are:

- M4 corridor (Hillingdon and Hounslow AQMAs).
- Dartford crossings and approaches.
- Other radial routes through AQMAs: M1 (Barnet), M3 and A30 (Spelthorne), M11 (Redbridge); and A23 (Hooley).
- M25 alongside AQMAs – junctions 13 to 15 (Hillingdon and Spelthorne); junctions 24 to 25 east of Holmesdale tunnel (Enfield); and west of junctions 28 to 30 (Havering).
- M25 non-AQMAs with known exceedances and sensitive receptors –junctions 10 to 11 (Woking); and junctions 27 to 28 (Brentwood).
- Designated sites at risk from activities on the route, particularly Epping Forest.

Cultural heritage

2.7.9 Wherever possible, balanced against other factors, Agency schemes are designed to avoid impacts on cultural heritage assets.

2.7.10 We have identified scheduled monuments, listed buildings and registered parks and gardens within or immediately adjacent to the route. Table 2.8 shows the ten ‘high value’ assets that are most likely to affect the route. (See the technical annex for more details).

2.7.11 Currently, none of these assets feature on the Heritage at Risk register, but they will impact on activities carried out on behalf of the Agency, particularly any that increase air pollution, noise pollution, visual intrusion and physical disturbance. For example:

- Buried monuments – vulnerable to holes for road signs, gantries and utility excavations; erosion; rabbits and badgers.
- Parks and gardens – vulnerable to visual intrusion from gantries and signs; noise intrusion from traffic; loss of tree screens; vehicle damage to boundary walls.
- Listed buildings – vulnerable to air pollution, visual intrusion from gantries and signs.

Table 2.8 Ten 'high value' scheduled monuments, listed buildings and registered parks and gardens most likely to affect the route

Name	Section	Type	Comments
Runnymede Bridge, Egham	M25	Scheduled monument	Bronze Age settlement. Main issue is to avoid impacting buried deposits.
Cropmarks, Orsett	A13	Scheduled monument	Crop marks bisected by the A13. Main issue is to avoid impacting buried deposits.
Earthworks of Surrey Iron Railway	M23/A23	Scheduled monument	19th century feature now dismantled. Main issue is to avoid impacting buried deposits.
Stane Street, Leatherhead	M25	Scheduled monument	Roman road now a pedestrian bridge. Main issue is to avoid impacting buried deposits.
Dovecote at Hawley Manor	A13	Scheduled monument, GII* Listed building	Structure within a private garden outside the highway. Main issue is to protect building setting.
Rowhurst	M25	GII* Listed building	Structure outside the highway. Main issue is to protect building setting.
Painshill Park, Cobham	A3	GI Register of Historic Parks and Gardens	18th century gardens bounded by the A3. Main issue is to protect its setting.
Osterley Park, Hounslow	M4	GII* Register of Historic Parks and Gardens	18th century gardens bisected by the elevated M4. Main issue is to protect its setting.
Coombe Bank Gardens, Sevenoaks	M25	GII* Register of Historic Parks and Gardens	18th century gardens and wood bisected by the M25 in cutting. Main issue is to protect its setting.
RHS Gardens, Wisley	A3	GII* Register of Historic Parks and Gardens	19th century gardens and wood bounded by the A3. Main issue is to protect its setting.

Ecology

2.7.12 The Agency's activities, including road construction projects and maintenance schemes, have the potential to impact on protected sites, habitats and species. We aim to minimise the impact of our activities on the surrounding ecology and wherever possible contribute to the creation of coherent and resilient ecological networks by maximising opportunities for protecting, promoting, conserving and enhancing our diverse natural environment.

2.7.13 Habitats can change frequently, making it difficult to pin down sensitive sites, but designated sites – including Sites of Special Scientific Interest, Special Areas of Conservation, Special Protection Areas, Ramsar sites and Local Nature Reserves - are the starting point. The largest designated sites affecting the route are:

- M25 junctions 26 to 27: Epping Forest: SSSI and SAC. Owned and managed by the Corporation of London, this is one of only a few

remaining large-scale examples of ancient wood-pasture in lowland Britain and has retained habitats of high nature conservation value.

- M25 junction 10 (with A3): Ockham and Wisley Commons SSSIs and Local Nature Reserves. A large tract of heathland lying between the Mole and the Wey rivers, containing a variety of habitats supporting a rich community of heathland plants and animals, including a large number of rare insects.
- M25 junctions 13 to 14 and A30 near Crooked Billet: Staines Moor SSSI; Wraysbury Reservoir SSSI; Wraysbury & Hythe End gravel pits; and South West London Waterbodies RAMSAR. Staines Moor is the largest area of alluvial meadows in Surrey and support a rich flora. The reservoirs support nationally important populations of wintering wildfowl.

2.7.14 We are aware of the protected species along the route. Badgers, water voles, bats and dormice; and lowland heathland and lowland calcareous grassland are the priorities. As a relatively modern motorway, the M25 was always designed with underpasses to allow animals to follow their accustomed routes.

Landscape

2.7.15 Roads and other transport routes have been an integral part of the English landscape for centuries. However, due to large increases in traffic, combined with modern highway requirements, they can be in conflict with their surroundings. We are committed, wherever possible, to minimise the effect of the strategic road network on the landscape.

2.7.16 The M25 passes through three Areas of Outstanding Natural Beauty (AONB):

- Kent Downs (M25 junctions 3 to 6)
- Surrey Hills (M25 junctions 5 to 8; M23/ A23 near M25 junction 7)
- Chilterns (M25 junction 18)

2.7.17 Landscape assets are vulnerable to visual intrusion from gantries and signs; light pollution; noise intrusion from traffic and loss of tree screens. All three AONBs were designated between 1958 and 1968 - well before the M25 was built through them. The M25 was designed to integrate the motorway into the adjoining landscape to make it as unobtrusive as possible. Embankments, cuttings and false cuttings and tree planting were all deployed, for example the long section of cutting between junctions 3 and 5 to hide the M25 as it passes through the Kent Downs. Most noticeable is the short Bell Common cut-and-cover tunnel, deployed to minimise the impact on Epping Forest.

2.7.18 Many landscapes have been defined at a local level as having high value, for instance Epping Forest, Colne Valley, Darenth Valley, Lee Valley, Roding Valley and Mardyke Valley.

Noise

2.7.19 Traffic noise arising from the strategic road network has been recognised as a major source of noise pollution.

2.7.20 We take practical steps to minimise noise and disturbance arising from the road network. This includes providing appropriate highway designs and making more use of noise reducing technologies.

2.7.21 In 2012, Defra completed the first round of noise mapping and action planning which identified the top one per cent of noisiest locations adjacent to major roads. These were based on the conditions in 2006. The locations in this top one per cent are known as Important Areas.

2.7.22 The largest Important Areas are where the route passes close to urban areas:

- Waltham Cross (near M25 junction 25, Holmesdale tunnel)
- North Watford (near M1 junctions 5 to 6)
- Chorleywood and Rickmansworth (near M25 junction 18)
- Egham and Staines (near M25 junctions 12 to 13)
- Ashtead and Leatherhead (near M25 junction 9)
- Dartford (near M25 junctions 1a to 2)

2.7.23 This reflects the fact that Important Areas take account of the presence of dwellings, schools etc, not just the absolute volume of noise.

2.7.24 Parts of the network have had noise barriers installed, particularly between junction 9 and 13 of the south-west quadrant of the M25, where long lengths of barrier were installed in the late 1990s. This part of the route runs close to the urban areas of Ashstead, Leatherhead, Egham and Staines and therefore the barriers help to protect those residents from noise.

2.7.25 The noise problem is not confined to built-up areas. We are developing noise plans in all the Important Area locations, including in open countryside.

Water pollution risk

2.7.26 We have a duty not to pollute water courses and ground water. We have identified those highway discharge locations across the strategic road network where there is an existing potential water pollution risk.

2.7.27 We have identified 19 ‘Very High’ risk and 18 ‘High’ risk locations across the route (see the technical annex for more details) where drains discharge into a water course, such as a river. Six sites have been identified for improvements in the next five years, as shown in Table 2.9. Other sites will come forward when we have more information to check the risk assessments. These locations do not include the discharge direct into the ground, however we do not know of any locations where groundwater is being polluted.

Table 2.9 Sites identified for drainage improvements over the next five years

Name	Year	Comments
Brookhouse Brook, M25 J26-J27 marker post 158/4A	1	Fails environment quality standards limits, soluble and sediment tests
Copped Hall Brook, M25 J26-J27 marker post 154/9A	1	Fails environment quality standards limits
Copped Hall Brook, M25 J26-J27 marker post 156/2A	2	Fails environment quality standards limits and soluble tests. Within Grade II listed garden
Woodhurst Farm, M25 J24-J25 marker post 142/0A	2	Fails environment quality standards limits and soluble tests
Brickfield Copse, J9-J10 marker post 70/2B	3	Fails environment quality standards limits, soluble and sediment tests. Also a priority site identified by the Environment Agency
M1 outfalls, J4 marker post 21/0A	4	Fail environment quality standards limits (when tested in combination) and soluble tests

3 Future considerations

3.1 Overview

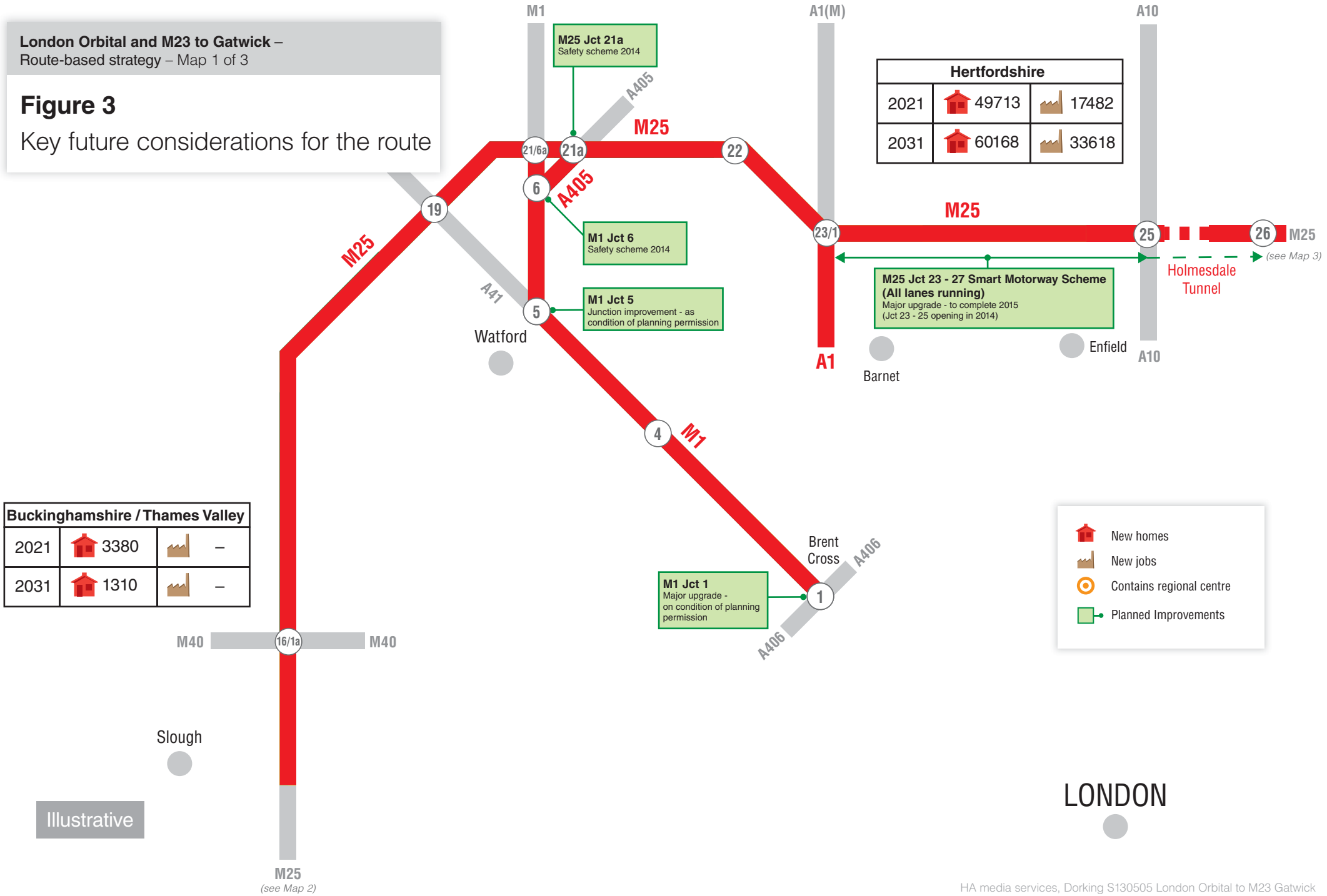
3.1.1 There is already a lot known about the planned changes to and around the route. Local authorities and the development community are already pushing forward the delivery of their housing and economic growth aspirations, as set out in their local plans. The Agency has a large programme of schemes it has to deliver, plus an even larger programme of pipeline measures that could come forward after the general election. Local authorities, together with port and airport operators, are progressing measures to improve the operation and performance of their transport networks and facilities.

3.1.2 All of these issues have the potential to directly influence the ongoing performance and operation of the route. Figure 3 summarises the anticipated key future issues and the following sections summarise those issues in more detail.

London Orbital and M23 to Gatwick –
Route-based strategy – Map 1 of 3

Figure 3

Key future considerations for the route



Hertfordshire		
2021	49713	17482
2031	60168	33618

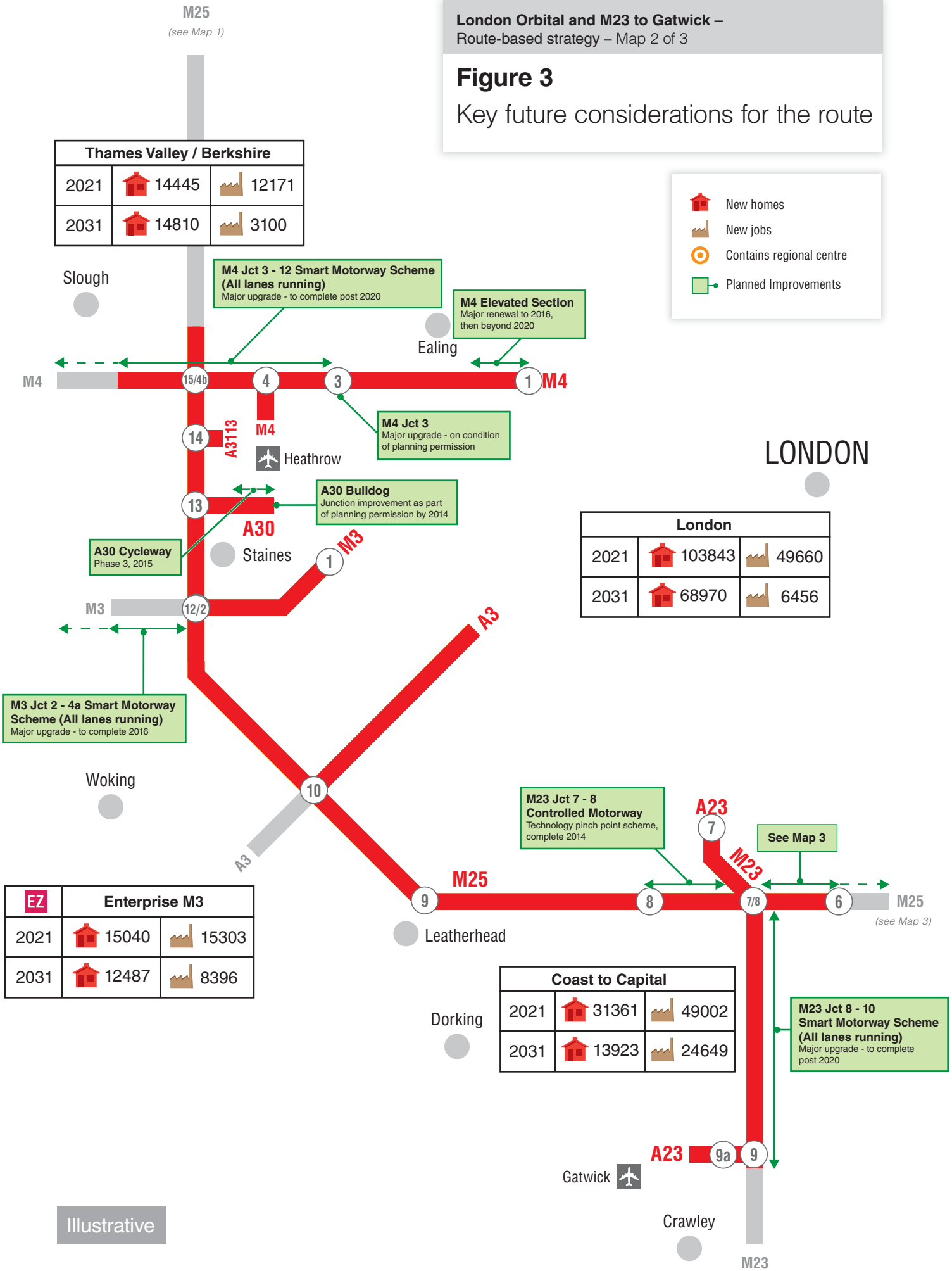
Buckinghamshire / Thames Valley		
2021	3380	–
2031	1310	–

- New homes
- New jobs
- Contains regional centre
- Planned Improvements

London Orbital and M23 to Gatwick –
Route-based strategy – Map 2 of 3

Figure 3

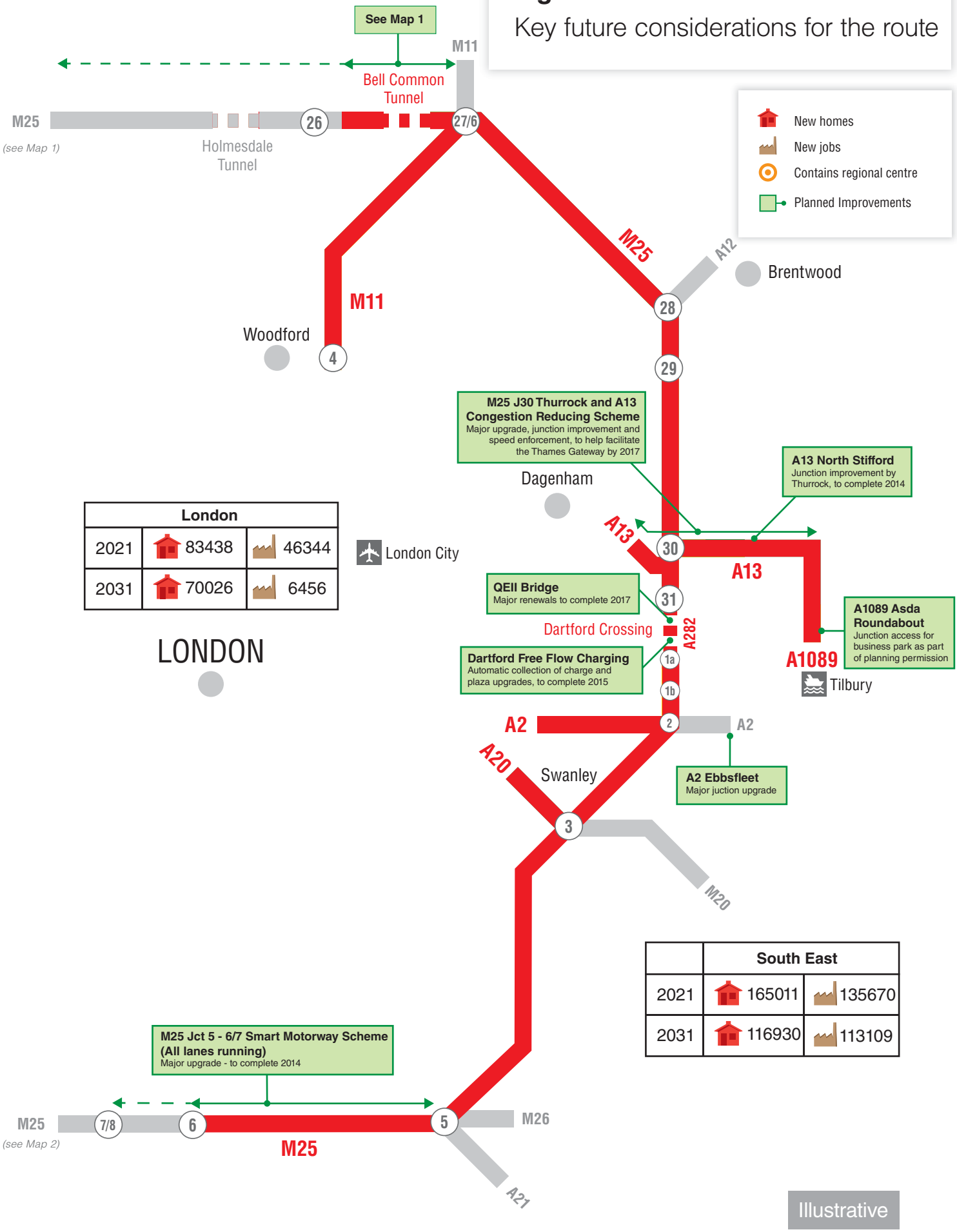
Key future considerations for the route



London Orbital and M23 to Gatwick –
Route-based strategy – Map 3 of 3

Figure 3

Key future considerations for the route



3.2 Economic development and surrounding environment

3.2.1 A key aspect of managing the route effectively will be ensuring that it is capable of supporting future housing and economic growth aspirations. This will involve preparing the route through effective management and public investment to be in the best possible position to cater for the planned demands placed upon it, whilst ensuring that the developments themselves effectively mitigate their local impacts.

3.2.2 Figure 3 summarises the key housing and economic growth aspirations of Local Enterprise Partnerships (LEPs) taken from adopted local development plans that are likely to have an impact on the route, with Table 3.1 below providing more context about some of those key developments, including their nature, scale and timing. Table 3.1 is not an exhaustive list, but does highlight where the likely pressures on the network will occur as a result of future planned local development. A more detailed table containing further information on jobs and housing aspirations from each local planning authority close to or on the route can be found in the technical annex. The cumulative impact of smaller scale developments near the route could also have an impact, as could large scale development further afield.

3.2.3 The Agency works with local planning bodies during their plan making process to advise on the sites that could potentially accommodate development in the future, but as these have less certainty, they are not included in Figure 3 or Table 3.1.

3.2.4 Many of the locations in London are within, or close to, five key growth corridors outlined within the London Plan. They are the:

- London-Luton-Bedford Corridor (relevant to outer London boroughs in the northwest);
- London-Stansted-Cambridge-Peterborough Corridor (northeast London);
- Western Wedge (west London),
- Wandle Valley (south and southwest London), and
- Thames Gateway corridor (east London and Thurrock).

3.2.5 The information available does not generally provide a detailed breakdown of how these developments will evolve between now and 2031 (2026 in the case of developments along the Thames Gateway). However, work on sites such as Brent Cross and Cricklewood are likely to commence from 2014/15, whilst others such as Thames Gateway are already underway. Through previous and ongoing development planning advice provided by us, it is known that many of these developments will add traffic to the route for example, the Thames Gateway will place additional demand on the M25 junctions 30 to 31 and at the A282 Dartford crossings.

Table 3.1 Key housing and economic growth proposals

Location of Development	Development Type	Anticipated growth			Anticipated Location of First Impact on Route
		2011 – 2015	To 2021	To 2031	
Bexley Riverside	Residential and commercial	Not specified	Not specified	7,000 jobs 4,000 residential units	M25 J1A
Cricklewood / Brent Cross	Residential and commercial	Not specified	Not specified	20,000 jobs 10,000 residential units	M1 J1
Heathrow	Residential and commercial	Not specified	Not specified	1,200 jobs 9,000 residential units	M4 J4, J4a
Lower Lee Valley including Stratford	Residential and commercial	Not specified	Not specified	50,000 jobs 32,000 residential units	M11 J4
Southall	Residential and commercial	Not specified	Not specified	2,000 jobs 4,000 residential units	M4 J3
Upper Lee Valley	Residential and commercial	Not specified	Not specified	15,000 jobs 9,000 residential units	M11 J4, M25 J25
Thames Gateway - London Gateway Port	Freight	Not specified	Not specified	32,000 jobs to 2026	A13
Thames Gateway - Tilbury Port	Commercial	Not specified	Not specified	4,000 jobs to 2026	A13, A1089
Thames Gateway – Lakeside	Employment, retail, leisure and residential	Not specified	Not specified	9,000 jobs 3,000 residential units	A13
Thames Gateway – Purfleet	Mixed use, residential	Not specified	Not specified	Unspecified number of jobs 3,000 residential units	A13
Dartford Northern Gateway	Mixed use, residential	Not specified	Not specified	1,200 jobs 2,000 residential units	M25 J1A
Watford Junction	Mixed use, residential	Not specified	Not specified	2,350 jobs 1,500 residential units	M1 J5
Heathrow airport			9 mppa (from 2011)	16 mppa (from 2011) 16,000 jobs	M25 J14 slips, M4 J4, 4a
Gatwick airport			6 mppa (from 2011)	10 mppa (from 2011) 10,000 jobs	M23 J9, J9a,

3.2.6 Stakeholders at London and neighbouring Local Enterprise Partnership (LEP) engagement events have identified growth locations that generally fall within the corridors stated in paragraph 3.2.4. These include i) Harrow, St Albans & Luton, ii) Lee Valley, Enfield, Essex & Stansted, iii) Heathrow, iv) Croydon, and v) Thurrock & Thames Gateway.

3.2.7 Outside London, the LEPs bordering the capital have substantial growth aspirations. However, the development planned is further away from the route, or on smaller sites than those listed in Table 3.1. Taken together, the development proposals are significant, as Figure 3 illustrates.

3.2.8 This route connects with other parts of the strategic road network, and performs an important function for businesses, particularly freight, travelling from one part of the country to another. Stakeholders have identified high demand for freight traffic travelling to and from the Thurrock area, including ports in Tilbury and London Gateway.

3.2.9 Heathrow and Gatwick airports are directly served by this route, and their expansion plans are discussed in section 3.4.

3.3 Network improvements and operational changes

3.3.1 The Agency is already delivering a large capital programme of enhancement schemes nationally. This includes Major Schemes greater than £10m in value, plus smaller enhancement schemes including the current Pinch Point Programme. Table 3.2 below summarises the current committed enhancement schemes proposed along or adjacent to the route, which have also been represented on Figure 3.

3.3.2 Figure 3 also highlights the two largest renewal activities in the period up to 2021 - ie the maintenance of the QEII Bridge and the elevated section of the M4, which were discussed in Section 2.3.

Table 3.2 Committed SRN enhancement schemes

Location	Scheme Type	Completion Year	Anticipated Benefits
M25 J30 and A13 approaches	Improvements to junctions and approaches, and speed enforcement	2017	Increased capacity and improved safety. Further improvements to follow once decision made on Lower Thames Crossing.
M25 J23 - J27	Smart Motorway – all lanes running	2014 (fully open 2015)	Increased capacity and reduced congestion.
M25 J5 - J6/7	Smart Motorway – all lanes running	2014	Increased capacity and reduced congestion.
A282	Dartford Free-Flow Charging	Spring 2015	Reduced congestion, improved traffic flow, reduced delays
M3 J2-4a	Smart Motorway – all lanes running	2015-16	Increased capacity and reduced congestion
M25 J7-J8	Controlled Motorway	Early 2014	Smoother traffic flow
M1 J1	Developer funded scheme	Pre 2020	Major carriageway and bridge widening with signal improvements to improve capacity and access to Brent Cross and improve safety.
M1 J5	Developer funded scheme	Pre 2020	Upgrade of signals to provide additional capacity
M4 J3	Developer funded scheme	Pre 2020	Carriageway widening and signal upgrade to provide additional capacity
A30 Bulldog	Developer funded scheme	2014	Carriageway widening and signal upgrade to provide additional capacity
A1089 Asda roundabout	Developer funded scheme	2013	Modification to access to business park to provide more capacity

3.3.3 The 2013 Spending Review and subsequent report from HM Treasury Investing in Britain's Future referenced a series of potential new pipeline schemes for the strategic road network. Table 3.3 below provides a summary of the pipeline improvement schemes that would impact the route, subject to value for money and deliverability.

Table 3.3 Declared pipeline schemes

Location	Scheme Description
M4 J3 – J12	Smart Motorway – all lanes running. Direct impact between J3 – J4a.
M23 J8 – J10	Smart Motorway – all lanes running. Direct impact between J8 – J9.
A2 Ebbsfleet junction	Improvements to the A2 junction at Ebbsfleet in North Kent between Dartford and Gravesend
M1 J6	LMNS safety scheme complete by 2014
M25 J21a	LMNS safety scheme complete by 2014
A30 cycleway phase 3	LMNS scheme complete by 2014

3.4 Wider transport networks

3.4.1 Table 3.4 below lists the funded local network commitments that will be delivered before 2021. Neither of the rail schemes is in the Investing in Britain's Future report, but they are, however, shown as committed schemes in the London Plan.

Table 3.4 Committed local transport network enhancement schemes

Project	Scheme Type	Completion Year	Anticipated Impacts on the Route
Crossrail 1	Rail	2018	Possible traffic reduction due to new east-west connection between Maidenhead / Heathrow and Shenfield / Abbey Wood
Thameslink programme	Rail	2018	Possible traffic reduction, due to significantly enhanced north-south rail connection across London and the South East
A13 North Stifford Interchange (Thurrock)	Highway	2014	Provide full signal control and additional carriageway width.

3.4.2 There are aspirations for local transport network enhancements (local pipeline schemes) that could affect this route's operation, which are set out in the paragraphs below. The first two are Thames crossing proposals also raised by stakeholders during the stakeholder workshops.

3.4.3 The DfT put forward three Lower Thames Crossing options and one variant for consultation between May and July 2013. Option A was immediately adjacent to the existing Dartford crossings with Option B and both variants of Option C being further east. All the options would relieve congestion on the existing Thames crossings and, depending which option is chosen, could reduce congestion and freight traffic on the London Orbital, albeit potentially increasing traffic demand on other parts of the strategic road network, eg A13, A2, M2 and M20. In December 2013 the DfT explicitly ruled out Option B (the A2 to A1089) and indicated that it was seeking further advice on three issues for each option; the potential scale of further improvements which may be required on the M25 and A13, the potential implications for air quality in terms of compliance with national and European targets and the scale of mitigation for possible impacts on protected habitats.

3.4.4 The existing Woolwich Ferry is due to be replaced. The short to medium term solution is a replacement ferry, and in the longer run a fixed link crossing. The exact location is not yet confirmed but consultation is due early in 2014. Whilst a replacement ferry is unlikely to have significant impacts on the London Orbital operation at Dartford, a fixed link could provide further river crossing capacity to relieve congestion at Dartford. It is envisaged that this scheme could be delivered in the early 2020s.

3.4.5 As part of the government's airports commission to consider ways to boost airport capacity in the South East (the Davies commission),

various expansion plans have been put forward. Heathrow, Gatwick and Stansted have each submitted proposals for an additional runway at their respective airports, whilst a new, four-runway hub airport to replace Heathrow is also presented for consideration (with Heathrow possibly redeveloped as a new London Borough). The commission has submitted a draft report to ministers in December 2013, which has recommended expansion plans at Heathrow and Gatwick airports, with one of the Thames Estuary airport options (Isle or Grain) to undergo additional feasibility analysis during the first half of 2014. A final report is due in summer 2015. How the route could be impacted will depend on the final outcome of the airports commission. In terms of timing, both promoters of Heathrow and Gatwick suggested that their schemes could be delivered in the mid to late 2020s.

3.4.6 The Kent Corridor to M25 RBS highlights that a substantial increase in HGVs are expected through the Channel Tunnel and the ports by 2020, which will create extra pressure on the London Orbital.

4 Key challenges and opportunities

4.1 Introduction

4.1.1 It is not possible to show all the challenges and opportunities identified in this evidence report. This chapter shows a selection based on those where our internal and external stakeholders viewed these as a priority and these are supported by evidence. A full list of all the identified challenges and opportunities are provided in the technical annex.

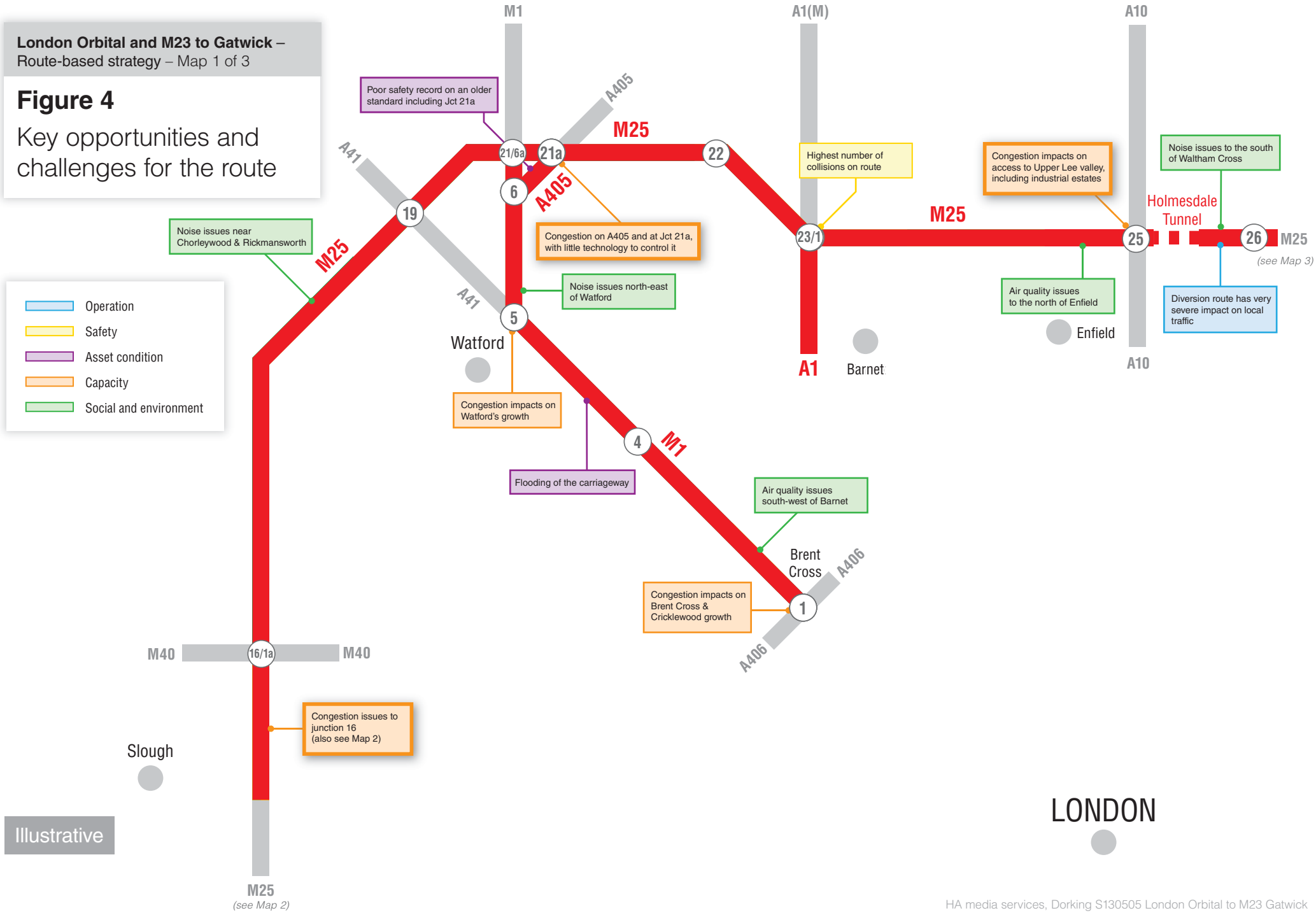
4.1.2 Figure 4 summarises some of the key issues and challenges that the route will experience during the five years from 2015, with the following sections and Table 4.1 explaining these issues and challenges in more detail. The Figure illustrates some of the key themes:

- Safety, capacity, asset condition and environmental challenges on the M4 corridor and Dartford crossings, adjacent to growth areas at Heathrow and Thames Gateway, with Dartford having further operations challenges.
- The route and its junctions are very congested, with access to both the major airports at Heathrow and Gatwick affected.
- Extensive lengths of the route with air quality and noise problems.

London Orbital and M23 to Gatwick –
Route-based strategy – Map 1 of 3

Figure 4

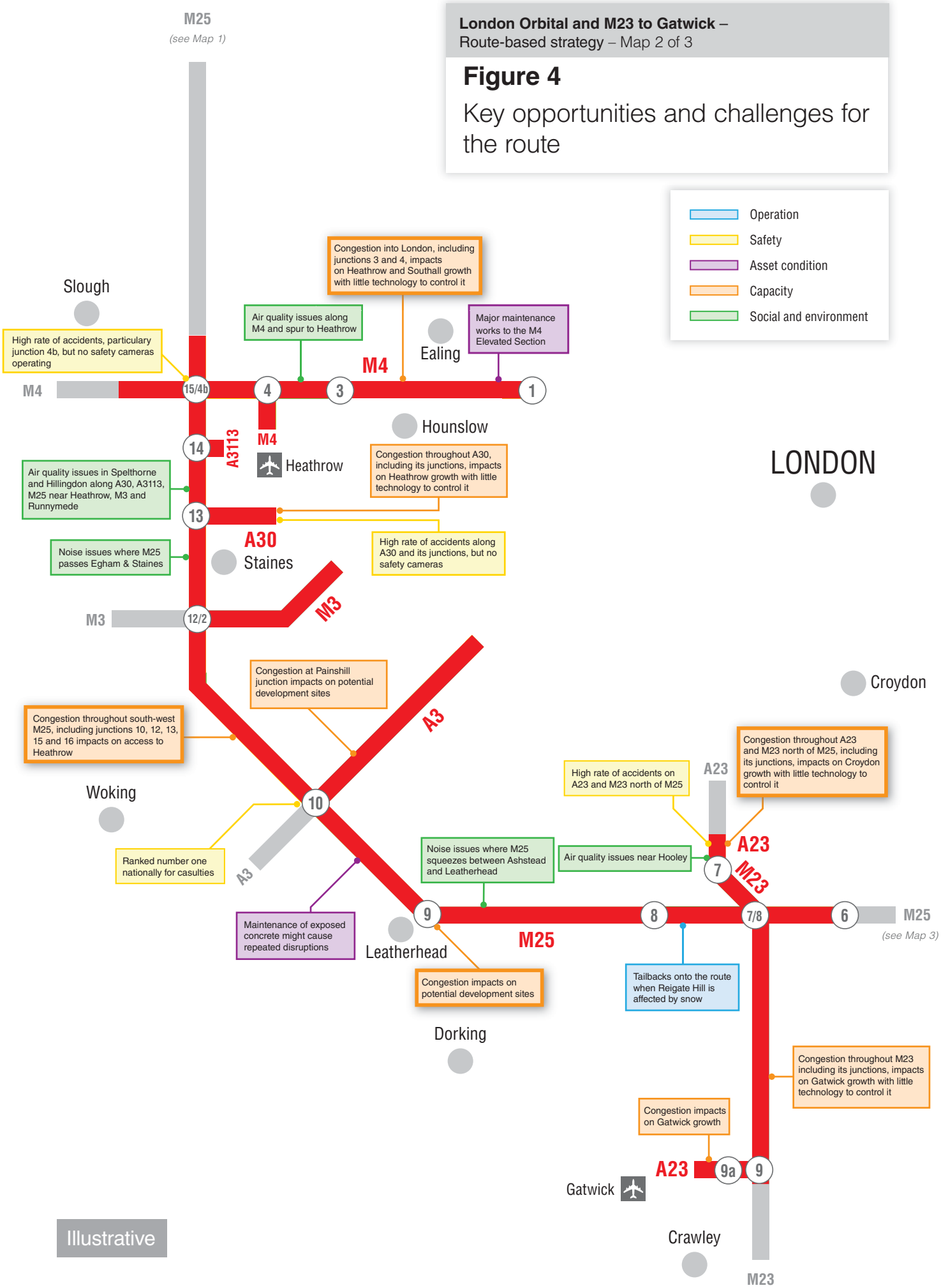
Key opportunities and challenges for the route



London Orbital and M23 to Gatwick –
Route-based strategy – Map 2 of 3

Figure 4

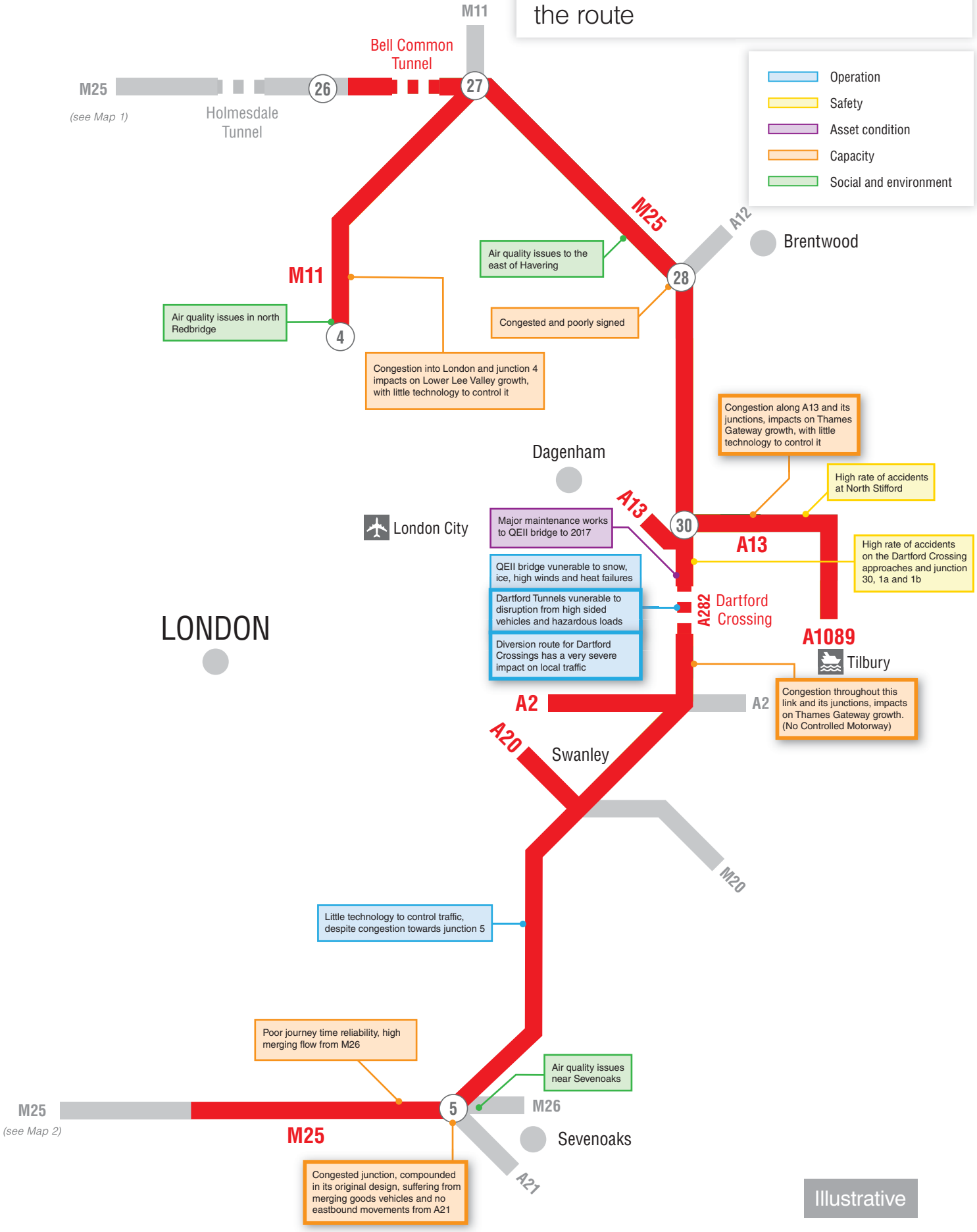
Key opportunities and challenges for the route



London Orbital and M23 to Gatwick –
Route-based strategy – Map 3 of 3

Figure 4

Key opportunities and challenges for the route



Timescales

4.1.3 To understand the timescales of when the key challenges identified become critical and when opportunities on the route could be realised, the following definitions have been made in Table 4.1:

- **Short Term**: current
- **Medium Term**: before March 2021
- **Long Term**: not before 2021

4.1.4 These timescale categories provide a guide for informing when a future intervention may be required to meet the anticipated future operational performance needs, or when interventions may be needed to help facilitate local housing and economic growth aspirations.

Local Stakeholder Priorities

4.1.5 Input from stakeholder and road user groups linked to the route have been used to inform the development of this evidence report. This included getting their views on what they deemed to be the priorities within their area and identifying their "top priorities" locally. This has been collated according to the route to which those views related.

4.1.6 Table 4.1 presents a summary of whether the challenges and opportunities identified were a priority for our stakeholders in their particular area. This exercise does not seek to prioritise the challenges and opportunities along the length of the route by trying to compare one issue against another, but reports the feedback from local discussions.

4.1.7 This picture of stakeholder priorities is subjective and has been informed by discussions regarding the top priorities locally at the stakeholder events, and in conversations with stakeholders who couldn't attend the events.

4.1.8 We recognise that the picture we build through this categorisation will be influenced by the representatives and organisations we have engaged with, and that consequently we may not have achieved a statistically balanced view and certain priorities may not have been identified as a "top priority". We will be conscious of the limitations of the reporting of stakeholder priorities as we move into the second stage of RBS.

4.2 Operational challenges and opportunities

4.2.1 There are two themes that have emerged as the main operational challenges. The first is the challenge of knowing what is happening on the route and the second being able to respond to incidents.

4.2.2 The route has a good level of surveillance on the London Orbital and motorways which is provided by traffic officer patrols and CCTV coverage. However, on the trunk roads, there is little oversight from patrols or technology of traffic; or the opportunity to identify incidents. The inability to manage the traffic speeds and flows or identify incidents quickly leads to congestion and delay. Stakeholders highlighted the A3,

A23 and A30 as examples. Many of these trunk roads, particularly the A13, are also close to growth areas.

4.2.3 The time taken to respond to incidents was a concern and stakeholders felt there was a need to look at ways to reduce the duration of full and partial closures when dealing with incidents, especially to avoid full closures in the first instance, and reopen any full closures sooner. This helps traffic to stay on the London Orbital and minimise impact on local roads.

4.2.4 A related concern of stakeholders was that vehicles attending incidents did not have adequate places to turn on the network which means that response times can be quite long on those sections of the route with long gaps between junctions. Response times were also a concern when stakeholders discussed the committed smart motorways schemes, as this approach takes the hard shoulder away leading to difficulties for recovery and emergency vehicles accessing incidents.

4.2.5 The issue of incidents, and similarly road works, is also closely linked to the issue of diversion routes. Stakeholders expressed concern that when there are problems on the London Orbital, the local roads become inundated with diverting traffic. We highlighted in Section 2.4 that there are very few suitable alternative routes, and most of those that exist have a severe impact on road users. Consequently, it is particularly vital for the route that incidents are recovered as quickly as possible. However, statistics from our Highways Agency Information Line (HAIL) do not indicate that we receive many complaints from road users when diversion routes come into use; instead the main source of complaints has been from road works associated with the widening works. Perhaps road users are more tolerant of occasional disruption than ongoing regular disruption.

4.2.6 Many of the diversion routes for the M25 are quite long – for example, if the Dartford Crossing is to be avoided the diversion route is 43 km in length and cannot accommodate those vehicles which are too high for the Blackwall tunnel. This is a problem that will affect residents and businesses in the Thames Gateway. Furthermore, there is little oversight of these routes once they come into use, and little use of strategic routes to bypass multiple junctions.

4.2.7 The freight industry representatives were especially keen to stress that incident related delays have a substantial impact on the efficient and cost effective movements of goods. They felt that the real economic impacts of delays were not fully recognised and as such the effort to reduce time taken to return the network to ‘normal’ travel conditions was not given sufficient priority.

4.2.8 Stakeholders were keen to discuss the new ‘all lane running’ and ‘hard shoulder running’ operations that are planned for the smart motorways schemes. A number of comments and observations suggested that the full benefit of these initiatives would not be felt as drivers often lacked knowledge of how to approach and use these sections of motorway correctly. This concern was compounded by the fact different initiatives are being introduced around the London Orbital so there is not a

consistent approach so motorists are contending with a range of different rules and restrictions.

4.2.9 A further operational challenge identified was the lack of HGV parking on or near to the London Orbital. With the freight industry looking to move more of their operations overnight the provision of additional facilities is seen as very important. The distribution of existing parking spaces, in combination with the time taken to get to them from the M25 means an element of HGV traffic is on the M25 at times when it does not need to be. Therefore, with a greater number of rest places available, HGV operators could plan their route times away from peak periods on the motorway.

4.2.10 One operational challenge which was identified in conjunction with the maintenance depots is the interaction with the local highway network. Maintenance vehicles, including gritters, are often delayed in local congestion from getting onto the route which reduces their efficiency and impacts on network operations.

4.2.11 Resilience during severe weather is a particular issue for the QEII Bridge. Snow and ice were cited as a challenge to users of this infrastructure, but also high winds causing operational difficulties including closure of the bridge. When this happens, the east tunnel operates as the southbound carriageway, which effectively reduces the capacity of the crossing in half.

4.2.12 Stakeholders highlighted that road users use local roads as well as the strategic road network. With so many different traffic and highway authorities and police forces involved in journeys that pass through the route, co-ordinating between the agencies is particularly important. There are opportunities to improve our joint understanding of the pinch points, the co-ordination of signs, messages to road users and the use of technology to communicate. This includes receiving data from the police to help the Agency to plan the traffic officer service efficiently. There is even a challenge here for the Agency to improve the co-ordination of the traffic control for the London Orbital, which is split between the north and south of the Thames, and therefore can cause some problems with day to day operations.

4.2.13 A complication we have identified is that there is no consistent approach to who owns the junctions and who operates the traffic lights where these are present. In some cases, the Agency owns the road, but the traffic lights are operated by the local highway authority – eg junction 31 on the London Orbital, which impacts on growth in the Thames Gateway. Furthermore, many junctions are using older traffic signal technologies, and the Agency is not systematically collecting performance data. Consequently, there is an opportunity to review the responsibilities and the technology of many junctions together to improve the performance for a relatively modest investment.

4.2.14 Stakeholders asked why ramp metering was not more widely used, given that traffic flows on the London Orbital are very high. There is an opportunity to take another look at potential sites, combining this with a review of junction performance.

4.2.15 An opportunity presented by existing widespread variable message signing (VMS) on the London Orbital was identified in that drivers can be given more information to better influence their decisions which in turn provides better network resilience and smoother operation. Statistics from HAIL show that we receive a significant number of complaints about the information that we show on these signs.

4.3 Asset condition challenges and opportunities

4.3.1 Evidence presented at the stakeholder workshops shows that much of the pavement is reaching end of life status and will need to be replaced during the period to 2021. Although the surfacing is reaching or exceeding its design life, it will not necessarily require treatment at this point.

4.3.2 The most pressing challenges are those associated with the structures – the elevated section of the M4 and the QEII Bridge at Dartford – and the concrete surface in the south west quadrant of the London Orbital. These parts of the route carry high traffic flows and disruption could affect growth areas such as the Thames Gateway and Heathrow.

4.3.3 The Area Road User Satisfaction Survey – an opinion poll conducted for the Agency – suggested that most users considered the road surface to be generally good (87%) although some did indicate that they felt it was generally poor (4%). However, when identifying the noisiest sections of the London Orbital the south west quadrant was identified by 9% of users as having a “noisy” road surface. We identified in Section 2 that between junctions 8 and 11 the road here has an exposed concrete surface, and stakeholders during the consultation events suggested that concrete should be replaced with flexible pavement surfaces.

4.3.4 Given the evidence presented, there was concern expressed by several stakeholders that replacement and resurfacing works would entail widespread roadworks which could cause delays. Stakeholders expressed a keen interest in understanding the planning process for the required works, such that they could assist in developing alternative routes and other traffic management strategies. The freight industry representatives commented that as their members rely on the network through the night any roadworks during those periods should be carefully planned to provide for goods vehicles.

4.3.5 Stakeholders also suggested that asset management and planned maintenance strategies should consider the role alternative modes could play and cited the M11 corridor as an example, where information about rail services into London is provided to travellers.

4.3.6 The technology asset is mixed on the route with some sections being very well provided with variable message signs, CCTV, MIDAS, safety cameras and controlled motorway technologies. Whilst providing the full range of technology throughout the whole route is not necessary there is evidence that some sections of the route with less technology are prone to delay and long incident durations.

4.3.7 An opportunity presented on many parts of the route is to refit aged lighting with lower energy fittings, or selectively switch off or remove altogether.

4.4 Capacity challenges and opportunities

4.4.1 The route normally experiences capacity issues every day and throughout much of the day. Evidence presented to the stakeholders was confirmed as correct from feedback received at and after the events. Some sections of the route were considered by stakeholders to have greater capacity challenges than others, such as the south west quadrant of the London Orbital, around M25 junction 5, the Dartford crossings including the approaches and the M23/A23 corridor.

4.4.2 Locations with capacity issues are closely related to those where low average speeds were observed or travel times are unreliable.

4.4.3 Around the south west quadrant of the London Orbital, the challenges were considered by stakeholders to be associated with getting traffic on and off the motorway efficiently in combination with the highest traffic volumes observed in the country. It was felt that capacity issues were related to the series of busy junctions in close proximity with one another. Stakeholders felt that the problem now goes beyond junctions 12 to 16, and that congestion can extend back to junctions 10 and 17.

4.4.4 This issue ties in with the observation from stakeholders that capacity is reduced as the London Orbital is used for short hops of one or two junctions. Stakeholders felt that as the route was not intended to be used in this way there needed to be some consideration given to discouraging this. The impacts on capacity were considered to be related to additional weaving which caused delays and journey time reliability issues.

4.4.5 M25 junction 5 was considered by many stakeholders to have insufficient capacity for the volume and mix of traffic especially given the high proportion of goods and foreign vehicles.

4.4.6 The Dartford crossings and the approaches have a capacity constraint at the charge collection barriers. The free-flow charging scheme is expected to address this issue in the immediate vicinity of the crossing, though a number of stakeholders expressed concern that the nearby junctions may not have capacity to accommodate more traffic – which could lead to more widespread congestion issues; and that it will not solve the problems dealing with high vehicles and hazardous loads. However, statistics from HAIL show that we receive as many complaints from road users about the Dartford crossing as we do about the rest of the London Orbital put together. The free-flow charging scheme will improve the effectiveness of toll collection and traffic flow and therefore could help to reduce the number of complaints.

4.4.7 The capacity issues already experienced on the London Orbital from junctions 30 to 2 inclusive, along with those that may arise with free-flow charging will become more significant due to the need to accommodate growth in the Thames Gateway. There is an opportunity to study the

junctions and their signal control in more depth. Capacity issues on the A13 will similarly be exacerbated as substantial development in the Thames Gateway and the London Gateway ports comes to fruition. Stakeholders felt that the planned improvements to the A13 and M25 junction 30 did not go far enough to accommodate the growth that is planned in the area.

4.4.8 The M23 has particular issues on Fridays and Sundays and in holiday periods, which are related to it serving Gatwick and the Sussex coast, and all of its junctions have problems with congestion. These issues will become more acute as Gatwick expands, and makes the delivery of the M23 smart motorway pipeline project particularly important.

4.4.9 Trying to accommodate growth was also highlighted as a capacity challenge for growth areas on or near the route. Stakeholders felt that without additional capacity being provided it will become increasingly difficult to deliver employment growth as many activities rely on the strategic road network to move goods in and out efficiently. Without good access, development sites will not be attractive to developers.

4.4.10 The ARUSS results reveal that most travellers did not experience delays due to congestion around the London Orbital. However, those that did tended to be concentrated at the Dartford Crossing (26% of users said they had experienced delay as did 33% of users of the A282), which is consistent with complaints received from HAIL.

4.4.11 Stakeholders felt that the RBS has the opportunity to dovetail with other studies (eg Road Task Force in London) to provide a strong case for action with a common understanding of where the growth areas will be and a coherent approach to addressing them.

4.5 Safety challenges and opportunities

4.5.1 Evidence collated for the stakeholder events showed that there are locations on the route and junctions which have accident rates above the national average for the type of road in question and a number of locations are near the top of the national ranking of all sites on the SRN for casualties.

4.5.2 The evidence though tends to show that most of the M25 is ranked in the medium or low categories for casualties per billion vehicle miles but the approaches to the Dartford crossings, the trunk road sections of the route and the motorways within the urban area of London are in the highest class for casualties.

4.5.3 The ARUSS suggested that the south west quadrant was the section of the London Orbital where users felt least safe with 13% of respondents indicating they felt unsafe to some extent. Most of the observations about safety related to the behaviour of other drivers at merges. This is consistent with our evidence that this part of the M25 has the highest number of recorded collisions.

4.5.4 The increase in the frequency of accidents during snow and ice across the route was raised by stakeholders, including certain slip roads.

Reigate Hill approaching junction 8 of the M25 cited as a particular problem.

4.5.5 Stakeholders discussed the safety at some of locations highlighted on Figure 4, including the M4 corridor, the A405 and at Dartford. There is an opportunity to address some of these problems through the Dartford Free Flow Charging and the M4 smart motorway schemes, and improvements to the A405 junctions with the M1 and M25 may help to reduce accidents there.

4.5.6 Stakeholders identified an opportunity to increase levels of enforcement using safety cameras, which should not only reduce the number of accidents, but also smooth traffic flow and improve journey time reliability. This could have a particular benefit for the south west quadrant of the London Orbital which as discussed is particularly congested and likely to worsen during the next five years. Much of the technology is already in place.

4.6 Social and environmental challenges and opportunities

4.6.1 From the evidence for past studies, we know that there has been a rapid growth in demand for car travel since the M25 was constructed in the 1970s and the 1980s. About half of the travel is making a journey to work, but because many origins and destinations are widely dispersed, public transport is often not a convenient alternative. A number of social factors have been cited in this pattern of car commuting, which will make influencing travel behaviour and achieving a shift to other modes of transport highly challenging:

- People increasingly choosing to live in an environment of their choice, close to good schools or to family, and using the London Orbital to facilitate longer journeys to work.
- People being less willing to move closer to work with jobs becoming less secure, and changing more frequently including many more temporary and short term contracts. Furthermore both partners in a household are likely to work, therefore it is less likely that the household will move home when one partner changes jobs.
- Very high house prices in London, forcing people to live where housing is affordable rather than where they happen to work.
- The costs of obtaining and running a vehicle falling relative to the costs of using public transport.
- Many employment sites moving to sites close to the London Orbital.

4.6.2 We know that commuting traffic particularly impacts the south west quadrant of the M25, especially junctions 12 to 16 which have very high traffic flows and short journeys. By contrast, the longest vehicle journeys are on the Dartford crossings. This suggests that focussing investments on public transport and cycle links between Surrey and south-west London might be more successful at reducing car use than elsewhere

on the route. There is an opportunity here to work with local authorities to improve cycle connections. Stakeholders have highlighted other corridors, such as the M11 and the M23, which might achieve a shift from car to rail.

4.6.3 It is possible that continuing improvements to technology could help to facilitate increased working away from the office and this might reduce the need to drive during peak periods or at all on certain days.

4.6.4 Connectivity between junctions and development areas was identified by stakeholders as a key issue to resolve. There is a direct relationship with local economy objectives in that sites with good access are considered to be attractive. However, there are social and environmental challenges on the basis that poor access implies more congestion on local roads which has undesirable social and environmental impacts.

4.6.5 Air quality is an issue which requires monitoring as nitrogen dioxide emissions are above statutory limits along extensive lengths of the route. Although this issue was not identified as a primary environmental concern by stakeholders that have provided evidence to date, the Agency will endeavour to reduce the impact of these emissions, and they affect the planning and delivery of any schemes that come forward in the affected areas.

4.6.6 Many of the largest noise affected parts of the route are close to houses and businesses. However there are opportunities to address the problem by using low noise solutions as part of the extensive carriageway surfacing that has to take place along the route by 2021.

4.6.7 Opportunities might arise to improve and enhance the environment as part of schemes or asset renewals. For example, where sites are prone to flood, trees, plants and other landscaping could be introduced that both reduces flood risk and improves habitats for wildlife.

Table 4.1 Schedule of challenges and opportunities

	Location	Description	Is there supporting evidence?	Timescales			Was this Identified through stakeholder engagement?	Stakeholder Priorities		
				Short-term	Medium-term	Long-term		Low	Medium	High
Route Operation	M25 junction 23-27 M25 junction 5-7 Other M25 Controlled Motorways	Better education is required to get the full operational benefits of Smart motorways	No	X			Yes		X	
Route Operation	As above, and route-wide	A lack of hard shoulders, for instance on viaducts, and particularly in new Smart motorways, making it harder to access incidents or needing to cone off the inside lane to make repairs	No	X			Yes		X	
Route Operation	Route-wide	A lack of vehicle turnaround places for use in an emergency.	No	X			Yes	X		
Route Operation	A282 Dartford Crossing	Disruption to traffic caused by high vehicles and hazardous loads.	No	X			Yes	X		
Route Operation	M25 J3, J9, J23	Congestion on local roads makes it difficult to access M25 DBFO contractor's depots.	No		X		Yes	X		

	Location	Description	Is there supporting evidence?	Timescales			Was this Identified through stakeholder engagement?	Stakeholder Priorities		
				Short-term	Medium-term	Long-term		Low	Medium	High
Route Operation	Route-wide	Better coordination of capacity information needed with Transport for London, eg for A406, to use to help road users make the best route choices.	No		X		Yes	X		
Route Operation - Diversions	A282 Dartford crossing M25 J25-J27	Very severe traffic impacts from diversion routes.	Yes	X			Yes	X		
Route Operation - Diversions	M1 J4-J5, J8-J9, J6-J8, J23-J25, J27-J28, J8-J10	Severe local traffic impacts from diversion routes.	Yes	X			Yes	X		
Route Operation - Diversions	Diversion routes – various	Lack of VMS and CCTV, and lack of maintenance of diversion signs.	No		X		No	X		
Route Operation - Diversions	Particularly M25 north eastern quadrant	Lack of multiple junction diversion routes designed for longer distance traffic.	No		X		No	X		
Route Operation - Technology	A405, A23	No CCTV despite congestion and safety issues on the route.	Yes		X		No	X		
Route Operation - Technology	A30, A13	No CCTV, VMS, or safety cameras despite congestion and safety issues on the route	Yes				No	X		

	Location	Description	Is there supporting evidence?	Timescales			Was this Identified through stakeholder engagement?	Stakeholder Priorities		
				Short-term	Medium-term	Long-term		Low	Medium	High
Route Operation - Technology	Route-wide	Control of the M25 is split between two RCCs, with different technology, and different to external agencies, causing problems with communications.	No		X		No	X		
Route Operation - Technology	M25 J31, M4 J3	Traffic signals are not controlled by the Agency, even though the Agency owns the junctions.	Yes		X		No	X		
Route Operation - Technology	Route-wide	Only a few of the approx 30 traffic signals are running the most modern control system.	Yes		X		No	X		
Route Operation - Technology	M25 J6, J8, J11 (x2)	Only these 4 sites operate ramp metering, therefore lengths of the M25 are not controlled.	Yes		X		Yes	X		
Route Operation - Technology	M4 J4b-J1	No safety cameras operating, despite safety issues.	Yes		X		No	X		
Route Operation - Technology	M25 J3-J5	No Controlled Motorway, MIDAS or safety cameras, despite congestion J4-J5.	Yes		X		No	X		
Route Operation - Technology	A282 Dartford crossing	No Controlled Motorway, despite congestion (although A282 is not a motorway).	Yes		X		No	X		

	Location	Description	Is there supporting evidence?	Timescales			Was this Identified through stakeholder engagement?	Stakeholder Priorities		
				Short-term	Medium-term	Long-term		Low	Medium	High
Route Operation - Technology	M4 J4b – J1, M11 J4-J6	No VMS, MIDAS (M4 true for elevated section) or Controlled Motorway, despite congestion.	Yes		X		No	X		
Route Operation - Technology	M23 J8-J9	No MIDAS or Controlled Motorway, despite congestion.	Yes		X		No	X		
Asset - Pavement	M4 J3-J1 (elevated), A282 (QEII Bridge)	Surfacing reaching end of design life and requires renewal, particular issues with access to each.	Yes		X		Yes		X	
Asset - Pavement	M25 J8-J11	Exposed concrete surfacing reaching end of design life and requires renewal, and proposed treatment might require additional visits.	Yes		X		Yes		X	
Asset - Structures	A282	QEII Bridge movement joints to be replaced, and painting of cable stays, pylons and bridge deck.	Yes		X		Yes	X		
Asset - Structures	M4 J3 – J1	Elevated concrete structures require steelwork strengthening and concrete renewals.	Yes	X	X	X	Yes		X	
Asset - Structures	M25 J20–J21, J10-J11, J15	Gade Valley and New Haw viaduct, and M4/M25 interchange movement joints to be replaced.	Yes		X		Yes	X		

	Location	Description	Is there supporting evidence?	Timescales			Was this Identified through stakeholder engagement?	Stakeholder Priorities		
				Short-term	Medium-term	Long-term		Low	Medium	High
Asset - Geotechnical	M23 junction 9 - junction 9a	Cracking is visible and there is a risk of full failure affecting the carriageway.	Yes	X			No			X
Asset - Geotechnical	M23 junction 8 - junction 9 (near South Nutfield)	Cracking is visible on the west side adjacent to the drainage channel	Yes	X			No			X
Asset - Drainage	M1 J4–J5	Flooding of the carriageway, drainage problems are believed to be a factor.	Yes		X		Yes		X	
Capacity - Link	A23, A405, A282 Dartford crossing, A30 M25 J5-6, J10-16, M23 J8-9, M11 J5-4, M4 J3-1	Unreliable journeys due to congestion.	Yes		X		Yes in some cases			X
Capacity - Link	A282 Dartford crossing	Free flow, whilst helps relieving congestion / providing additional capacity, may worsen traffic impacts on other local roads.	No		X		Yes		X	

	Location	Description	Is there supporting evidence?	Timescales			Was this Identified through stakeholder engagement?	Stakeholder Priorities		
				Short-term	Medium-term	Long-term		Low	Medium	High
Capacity - Junction	A282 J1a, 1b M25 J2, J5, J6, J7, J8, J9, J10, J12, J13, J15, J16, J20, J21a, J22, J23, J25, J26, J27, J28, J29, J30, J31 M4 J1, J3, J4, J4a, (J4b); M1 J1, J4, J5, J6; M3 J1, (J2); M23 J7, (J8), J9, J9a; M11 J4, (J6)	Over capacity, leading to local congestion. Some of these junctions might facilitate nearby growth areas – see Fig. 4.	Yes in some cases		X		Yes in some cases			X
Capacity - Junction	A30 Crooked Billet & Bulldog, A3 Painshill, A23 Netherdene Drive & Star Lane, A13 Dumbbells & North Stifford, Airport Way	Over capacity, leading to local congestion. Some of these junctions might facilitate nearby growth areas – see Fig. 4.	Yes in some cases		X		Yes in some cases			X
Safety - Junction	M25 J23, J30, J10, J21a, J15, J29, J3, J13, J25, J2	Highest ranked motorway junctions for safety issues, based on the number of collisions or the number of casualties.	Yes	X			Yes			X
Safety - Junction	A30 Crooked Billet, A13 North Stifford, A30 Bulldog, A282 J1a, A282 1b	Highest ranked A road junctions for safety issues, based on the number of collisions or the number of casualties.	Yes	X			Yes			X

	Location	Description	Is there supporting evidence?	Timescales			Was this Identified through stakeholder engagement?	Stakeholder Priorities		
				Short-term	Medium-term	Long-term		Low	Medium	High
Safety - Junction	M25 J7, J4	Highest ranked motorway junctions for collisions during snowy and icy conditions.	Yes		X		Yes	X		
Safety – Link	M25 J8-J11, M4 J4b-J1, M4 spur, M23 J8-J9	Highest ranked motorway links for accident rates	Yes		X		Yes			X
Safety – Link	A282, A30, A405, A23	Highest ranked A road links for accident rates	Yes		X		Yes			X
Social	M25 J25 – J26	Need for better access to from industrial areas in Upper Lee Valley	Yes		X		Yes			X
Social	Route-wide	Lack of HGV parking.	No		X		Yes			X
Environment – air quality	M4 J4b – J1, A282, M1 J1-J6, M3 J1-J2, M11 J4-J5, A30, A23, M25 J10-J15, M25 J24-J25, M25 J28-J30	Nitrogen dioxide is above strategy objectives, within AQMAs, and close to sensitive receptors such as houses, schools etc.	Yes	X			Yes	X		
Environment - Noise	M25 J25 - J26, M25 J2-6, M1 J5-J6, M25 J18, M25 J12-J13, M25 J9, A282	Noise Important Area identified by DEFRA, requiring implementation of action plans to be carried out.	Yes		X		No	X		
Environment – Severe Weather	A282 QEII Bridge	Vulnerable to snow fall and ice formation, high winds and heat failure on southern slope.	Yes		X		Yes	X		

	Location	Description	Is there supporting evidence?	Timescales			Was this Identified through stakeholder engagement?	Stakeholder Priorities		
				Short-term	Medium-term	Long-term		Low	Medium	High
Environment – Severe Weather	M25 J7-J8	Vulnerable to snow fall and ice formation.	Yes		X		Yes	X		

4.7 Conclusion

4.7.1 The evidence compiled about the route has shown that it has a strong relationship with major growth corridors in London and several adjacent Local Enterprise Partnership areas. Key areas for growth are the Thames Gateway near the Dartford crossings, the Lee Valley in the north-east and around Heathrow and Gatwick airports.

4.7.2 It is unlikely that the committed and pipeline schemes will have tackled the anticipated capacity problems that can be expected for the route before 2021. For instance:

- Nothing is planned for the south west quadrant of the M25 which has the highest traffic flows in the country and some of the most severe congestion. In fact, the smart motorway schemes planned for the M3, M4 and M23 corridors could actually encourage more traffic onto this section of the route.
- About three quarters of the junctions are congested, but only a few junction upgrades are planned.
- The Dartford crossings are suffering from congestion, which is unlikely to be fully mitigated by the Dartford Free Flow Charging scheme, and a new Lower Thames Crossing is very unlikely to be in place until the mid-2020s.

4.7.3 Most of the route is closely monitored by a combination of technology and traffic officer patrols with the exception being the all purpose trunk road sections.

4.7.4 Resurfacing and structural renewals will be a challenge along the route, with most of the surfacing needing to be replacing in the next five years and some major structural work planned for the QEII Bridge at Dartford and the elevated section of the M4.

4.7.5 Parts of the north west and north east quadrants of the London Orbital are performing reasonably well, along with some radial sections such as the M1, and the committed smart motorway M25 junctions 23 to 27 will add further capacity. This may help to accommodate some of the substantial developments planned in north-west and north-east London and many of the Hertfordshire and Essex towns close to the route, but the capacity of many junctions, the lack of diversion routes and environmental constraints including air quality and noise are still major challenges to overcome.

4.7.6 We have found evidence which leads us to conclude that the most challenging locations will be:

- The M4 corridor, where route performance is already poor, there are aspirations for growth (including at Heathrow airport), there is a major programme of asset renewals and air pollution and noise are already problems for local residents and businesses.
- The Dartford crossings, for similar reasons, with the added problems of operating the tunnels and the inconvenient diversion

routes; the scale of economic development planned for the Thames Gateway; and the forecast increase in HGVs from the ports and the Channel Tunnel. This section of the route was highlighted by many stakeholders as the highest priority to address.

- The south west quadrant of the London Orbital due to the severe congestion, together with the challenges of maintaining the concrete road surface and the air pollution and noise problems along parts of the section. It is also vital for access to Heathrow airport.

4.7.7 The attendance at the stakeholder events may not have been representative of the wider stakeholder community, and therefore there may not yet be a balanced view on what the priority locations should be. When casting their votes at the events, the locations of greatest concern to stakeholders were congestion at M25 junction 25, on the A13 link (A1089 to the London boundary), the A405, M25 junctions 30 to 31 and the A13/A126 'Dumbbells' junction (lack of east-facing slips). These locations are skewed towards the north east quadrant of the London Orbital, although the scale of development in the Thames Gateway supports the view that the area near the Dartford crossings is the priority. We have some evidence of problems at these locations, but the evidence is of variable quality (particularly at junctions) and the locations are not necessarily the most congested or those with the most acute problems. We would highlight the congestion at M25 between junctions 11 and 16; M25 junctions 5 and 9; M23 junction 7 leading to A23; M4 corridor and M25 junction 10 (with its particular safety issues) as pressing and worthy of particular consideration alongside the locations voted as the priorities.

4.7.8 Two general issues of particular concern to stakeholders have not yet been supported with much evidence. These are firstly a lack of HGV parking around the network; and secondly a risk of problems operating the smart motorways (with hard shoulder running). On the second point, we are working hard to mitigate the issues faced by our traffic officers and partners operating the smart motorways before they come into use; and to educate drivers so that they will be confident to use the hard shoulder as a running lane.

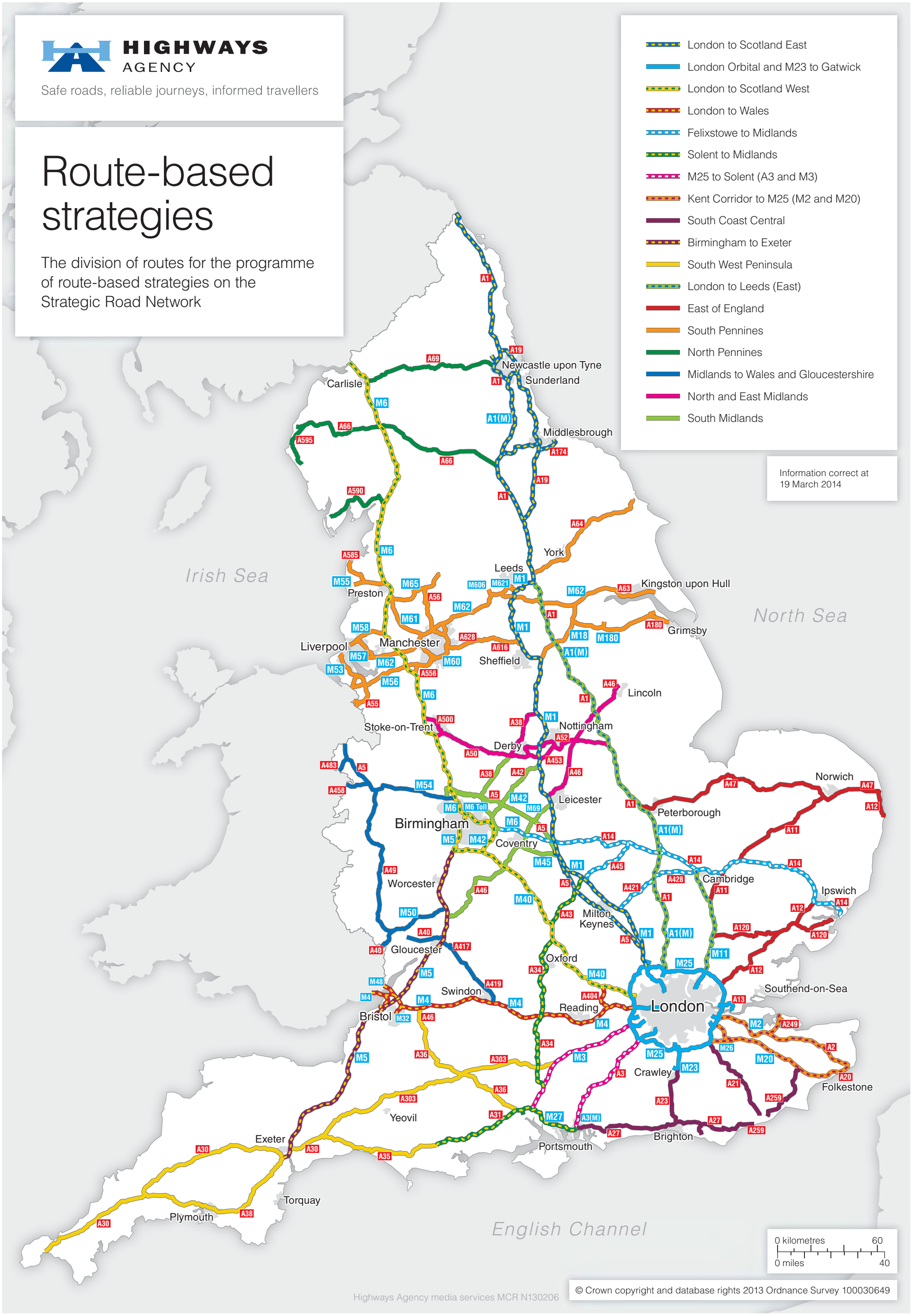
4.7.9 On the other hand, there are a number of improvements that could be made to route operations that we think should be priorities, but were not necessarily highlighted by stakeholders. These include looking at our junctions to ensure that we are getting the best out of these, including the right technology and control of this; improving our surveillance of trunk roads, particularly those that are congested or close to growth areas; reviewing our messaging to drivers both on and accessing our network, both in normal conditions and during diversions; and increasing the levels of enforcement using safety cameras.

HIGHWAYS AGENCY

Safe roads, reliable journeys, informed travellers

Route-based strategies

The division of routes for the programme of route-based strategies on the Strategic Road Network



Highways Agency media services MCR N130206

Appendix B Glossary

Abbreviation	Description
AONB	Area of Outstanding Natural Beauty
AQMA	Air Quality Management Area
ARUSS	Area Road Users Satisfaction Survey
CCTV	Closed Circuit Television
DBFO	Design, Build, Finance and Operate
DfT	Department for Transport
HAIL	Highways Agency Information Line
HGV	Heavy Goods Vehicle
KSI	Killed or Seriously Injured
LEP	Local Enterprise Partnership
LNR	Local Nature Reserve
London Orbital	This means the M25 and the A282 Dartford crossings
MAC	Managing Agent Contract
M&E	Mechanical and Electrical
MIDAS	Motorway Incident and Detection System
QEII	Queen Elizabeth the Second
RBS	Route Based Strategy
Route	This means the London Orbital and M23 to Gatwick
SAC	Special Area of Conservation
Section	This means a part of the route
SEP	Strategic Economic Plan
SPA	Special Area of Protection
SSSI	Site of Special Scientific Interest
TEN-T	Trans-European Transport Network
TLRN	Transport for London Road Network
VMS	Variable Message Signs

Appendix C Stakeholder involvement

Organisation	Contact Name	Provided Input
Amey	Steve Clarke	Yes
Amey	Stuart Carpenter	Yes
Balfour Beatty	Daniel Cavaliere	Yes
Balfour Beatty	Michael Tandy	Yes
Bracknell Forest Borough Council	Stuart Jefferies	Yes
Broxbourne Borough Council	Colin Haigh	Yes
Buckinghamshire County Council	Tony Blackmore	Yes
Bucks Thames Valley LEP	Richard Harrington	Yes
Campaign to Protect Rural England South East	Christine Drury	Yes
Chelmsford City Council	Derek Stebbing	Yes
Connect Plus	Andy Mack	Yes
Connect Plus	Alan Dunne	Yes
Connect Plus	Barry Nothard	Yes
Connect Plus	Bob Bird	Yes
Connect Plus	Catriona Cliffe	Yes
Connect Plus	Gill Cappocciama	Yes
Connect Plus	Graham Lee	Yes
Connect Plus	Ian Kennard (lead)	Yes
Connect Plus	James Burdall	Yes
Connect Plus	Kiran Desai	Yes
Connect Plus	Mark Peers	Yes
Connect Plus	Neil Johnson	Yes
Connect Plus	Richard Mould	Yes
Connect Plus	Sulman Hasan	Yes
Connect Plus	Tony Nicholls	Yes
Dacorum Borough Council	Kevin Langley	Yes
East Herts District Council	Martin Paine	Yes
Epping Forest District Council	John Rowley	Yes
Essex County Council	Chris Stevenson	Yes
Essex Highways	Gary White	Yes
Freight Haulage Association	Natalie Chapman	Yes
Gatwick Airport	Julia Gregory	Yes
Guildford Borough Council	J Palmer	Yes
Heathrow Airport Limited	Victoria Sutton	Yes
Hertfordshire LEP	Joan Hancock	Yes
Hertfordshire County Council	Sanjay Patel	Yes
Hertfordshire County Council	Jameel Hayat	Yes

Organisation	Contact Name	Provided Input
Kent County Council	Graham Rusling	Yes
Kent County Council	Mary Gillett	Yes
London Borough of Bexley	James Frost	Yes
London Borough of Croydon	Rowland Gordon	Yes
London Borough of Croydon	Luke Meechan	Yes
London Borough of Enfield	Ranjith Chandrasena	Yes
London Borough of Harrow	Hanif Islam	Yes
London Borough of Havering	Alex Stone	Yes
London Borough of Havering	Emma Cockburn	Yes
London Borough of Hillingdon	Bob Castelijn	Yes
London Borough of Redbridge	Glen Richards	Yes
London Borough of Waltham Forest	Tom Wright	Yes
London First	David Leam	Yes
London LEP TfL	Andrew Mak	Yes
Maldon District Council	Gary Sung	Yes
North Hertfordshire District Council	Chris Carter	Yes
Reading Borough Council	Ruth Leuillette	Yes
Road Haulage Association	Chyrs Rampley	Yes
Runnymede District Council	G Pacey	Yes
South Basildon and East Thurrock	Stephen Metcalfe MP	Yes
Southend-on-Sea Borough Council	Karen Gearing	Yes
St Albans District Council	Chris Briggs	Yes
Surrey County Council	I Reeve	Yes
Surrey County Council	L Mendes	Yes
Sustrans	Nigel Brigham	Yes
Swale Borough Council	Gill Harris	Yes
Thames Valley Berkshire LEP	Steve Capil-Davies	Yes
Three Rivers District Council	Steve Farrell	Yes
Thurrock Council	Les Burns	Yes
Transport for London	Andrew Ulph	Yes
Watford Borough Council	Philip Bylo	Yes
Welwyn Hatfield District Council	Sue Tiley	Yes
West Sussex County Council	Pieter Montyn	Yes
Wycombe District Council	Rosie Brake	Yes

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