highways england

Lower Thames Crossing

Traffic forecast non-technical summary

Statutory Consultation 2018

Lower Thames Crossing

Traffic Forecasts Non-Technical Summary

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1 Introduction

This Traffic Forecasts Non-Technical Summary gives an overview of the work carried out by Highways England to assess the need for, and impact of, the Lower Thames Crossing project on the road network. It presents the key findings of the differences in the performance of the road network in the future if the Lower Thames Crossing (the 'new crossing') is built or not.

We have assessed the need for additional road capacity across the River Thames, east of London, and the impact that the new crossing would have by developing a simulation of the transport system in the Lower Thames Area, called the Lower Thames Area Model (LTAM).

The model contains a detailed representation of the road network in the area and information on where people travelled to and from in an average month (March 2016). It uses an industry-recognised method of predicting future traffic flows and conditions, both with and without the new crossing.

The transport model shows the number of people choosing to travel by road and rail and the route they use now, and the route they are forecast to use. This enables us to predict how many vehicles will be using each part of the road network in the future and how long it would take to complete a journey.

Background

The new crossing is a proposed new motorway and tunnel connecting Kent, Thurrock and Essex through a tunnel beneath the River Thames. The new crossing would provide over 90% additional road capacity across the River Thames east of London.

It is classified as a Nationally Significant Infrastructure Project (NSIP), as defined by the Planning Act 2008 and was identified by HM Treasury as one of the top 40 priority investments in its National Infrastructure Plan 2013.

The Lower Thames Crossing project is being developed as part of the Government's £15 billion Road Investment Strategy over the period 2015-2020.

The new crossing will comprise:

- approximately 14.5 miles (23km) of new motorway connecting to the existing road network from the A2/M2 to the M25
- two 2.5-mile (4km) tunnels, one southbound and one northbound
- three lanes in both directions with a maximum speed limit of 70mph
- improvements to the M25, A2 and A13, where the Lower Thames Crossing connects to the road network
- new structures and changes to existing ones (including bridges, buildings, tunnel entrances, viaducts, and utilities such as electricity pylons) along the length of the new road
- a free-flow charging system, where drivers don't need to stop but pay remotely, similar to that at the Dartford Crossing

Consultation

We are currently in statutory consultation where we present our proposals for the Project and listen to your feedback. The next stage is applying for a Development Consent Order (DCO).

This report forms part of a suite of documents that we have published as part of the statutory consultation we are carrying out to support the DCO application process.

Highways England

Highways England is responsible for the delivery of the Lower Thames Crossing.

We are a government-owned company who work with the Department for Transport (DfT). We operate, maintain and improve England's motorways and major A-roads, also known as the strategic road network. Our aim is to ensure that road users have safer and more reliable journeys and that businesses have the effective road links they need to prosper.

Where to go for further information

The full technical report on how the transport model was built, called the *Local Model Validation Report*, is available at www.lowerthamescrossing.co.uk/publications. There is also an accompanying report, the *Traffic Forecasting Report*, which describes in more detail how the model predicts future traffic levels and information on the traffic forecasts. It presents more details on the expected changes in traffic flows and journey times in the area. This is also available online at www.lowerthamescrossing.co.uk/haveyoursay and printed copies of this will be available at our consultation events and at all deposit locations.

Glossary

You can find explanations of terms and abbreviations used here in the glossary at the back of this document.

2 How we modelled current conditions

This section sets out how we developed our transport model to reflect current conditions.

The transport model was created to represent the transport system in the Lower Thames Area as it was in March 2016. This month was chosen to represent an average month in the Lower Thames Area. The model covers the whole of the UK in order to capture the actual start and end of every trip, but more comprehensively in Dartford, Thurrock, Kent, Essex and London.

The hours modelled in the transport model are from 07:00–08:00 in the morning (the morning peak) and 17:00–18:00 in the evening (the evening peak) as these are the busiest times of day on the main roads in the area. A typical hour in the middle of the day is also modelled (the inter-peak).

Details of the current transport network are taken from digital maps and from other recent transport models of the area. The road network is represented in great detail, for example, it includes the amount of red and green time at traffic signals and the number of lanes along each stretch of road and at junctions.

The information on where people are travelling to and from has been taken from analysis of the movement of a vast number of mobile phones in the UK in 2015. The mobile phone data is completely anonymous but provides details of the travel patterns of millions of phones around the country. This information is then scaled to match traffic counts in the area and merged with other data sources to provide the travel patterns of cars, vans and heavy goods vehicles (HGVs).

The transport model is tested by getting the model to predict on which routes vehicles will travel, taking into account:

- where people want to travel to
- people's preference between journey time and journey distance
- the actual speeds of vehicles on the road network

The amount of traffic predicted by the model using the road network is compared to actual counts (where available) of the number of vehicles on the road network, collected from traffic counters laid out on the road or specially commissioned video surveys. The time that journeys are predicted to take are compared with observations from in-vehicle GPS devices which provide actual travel times recorded during the modelled hours in March 2016. This process is known as model calibration and validation.

DfT has issued guidelines on how transport models such as this should be built, and the extent to which the predictions of traffic flows and times made by the model compare with real life. These guidelines are called WebTAG (Web based Transport Analysis Guidance). LTAM has been accepted by Highways England as suitable to assess the Lower Thames Crossing project.

3 Forecasts without the Lower Thames Crossing

This section sets out how we used the transport model to forecast without the new crossing.

This is called the Do Minimum situation, which is where the new crossing is not built, but where changes to the road network and planned development that is forecast to go ahead (whether the new crossing is built or not) are included.

The transport model is used to predict the conditions on the road network in 2026, 2031, 2041 and 2051. These years have been chosen to align to DfT published forecasts of the growth in traffic levels from its National Transport Model which extends to 2051.

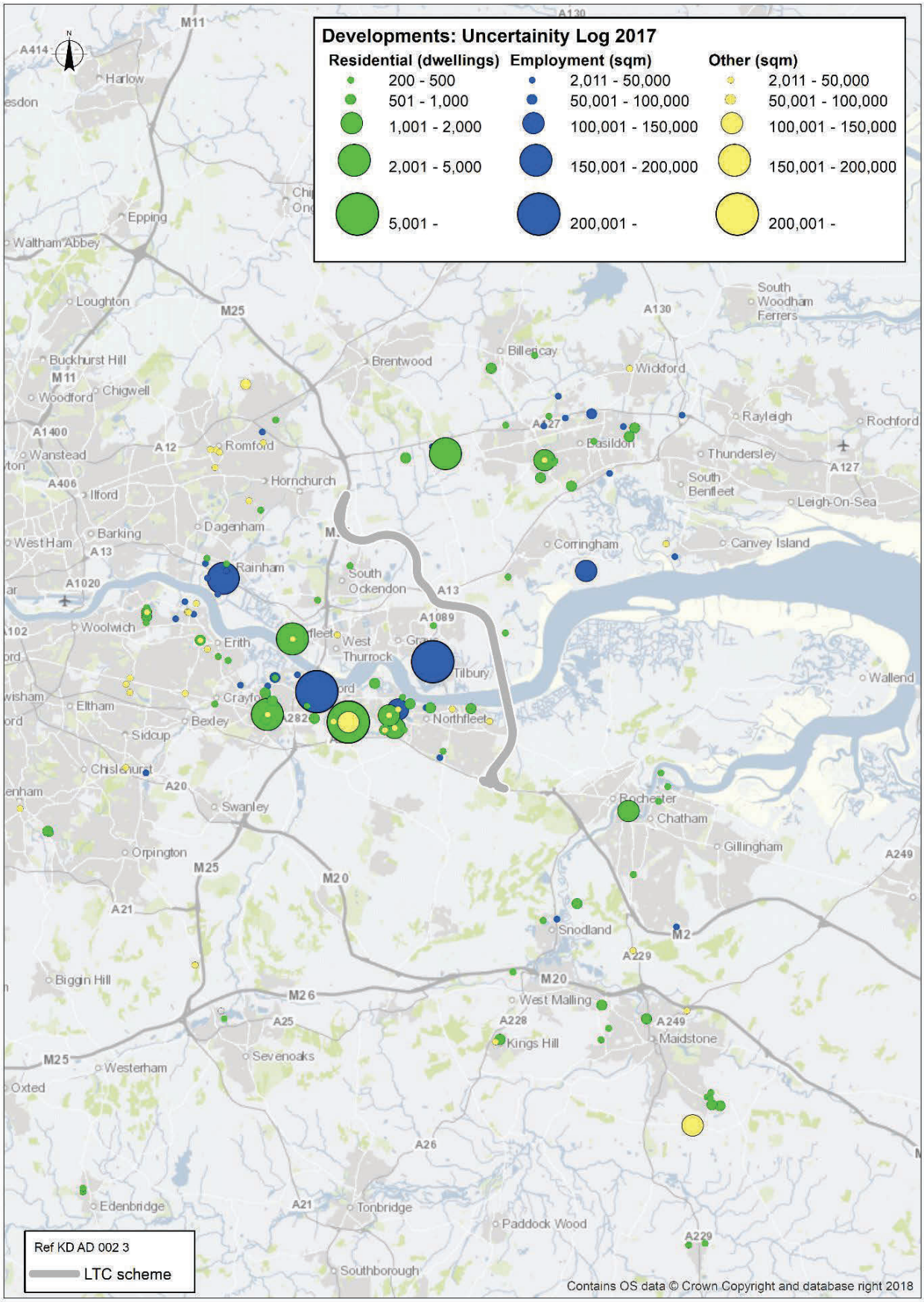
The growth in the number of trips made by vans and HGVs is taken from DfT Road Traffic Forecasts and adjusted to allow for trips made to and from new developments in the area.

The overall level of growth in car trips is taken from the most recent DfT National Trip End Model forecasts, published in February 2017.

These forecasts are based on estimates from the Office of National Statistics (ONS) on the number of people living in each area. The number of car trips made per person varies according to factors such as age, employment status, car ownership and household size. This is then applied to the number of people forecast in the future for these categories. This produces a forecast of the future number of car trips.

Local adjustments are made to the model to provide more detailed geographic information on the proposed location of new housing and other developments (such as employment, retail and leisure sites). The main future development areas, either with planning permission or considered by the local planning authorities as likely to happen, are included in the model and are shown in Figure 3.1. However, growth associated with government housing targets which has not yet fully progressed through the planning system is not included.

Figure 3.1 Main future development areas included in the transport model



The road network in the transport model is updated for the future years to include road schemes that are likely to be built, regardless of whether the Lower Thames Crossing is built or not. This information has been provided by Highways England and by local authorities in the area (see Table 3.1).

Table 3.1 Road schemes likely to be built

Scheme name	Scheme overview
A127/A132 Nevendon interchange improvement scheme	Junction improvement
A13 North Stifford improvement	Junction improvement
A13 Stanford-le-Hope bypass widening	Carriageway widening
A20 access to Dover	Junction improvement
A21 Tonbridge to Pembury	Carriageway widening
A28 Chart Road improvement scheme	Carriageway widening and junction improvement
A289 Four Elms Roundabout to Medway Tunnel (Medway)	New link
Improvements to the A2/Bean and A2/Ebbsfleet junctions	Junction improvements
M2 junction 5 improvement	Junction improvement
M3 junctions 2-4a smart motorway	Motorway widening
M4 junctions 3-12 smart motorway	Motorway widening
M11 junction 7A	New junction on the M11 north of junction 7
M20 junctions 3-5 smart motorway	Motorway widening
M20 junction 4 Eastern overbridge widening	Carriageway widening
M20 junction 10a	New junction
M23 junctions 8-10 smart motorway	Motorway widening
M25 junction 2 improvements	Junction improvement
M25 junction 10/A3 Wisley interchange improvement	Junction improvement
M25 junctions 10-16 smart motorway	Motorway widening
M25 junction 25 improvement	Junction improvement
M25 junction 28 improvement	Junction improvement
M25 junction 30/A13 corridor improvement scheme	Junction improvement

Scheme name	Scheme overview
Maidstone bridges improvement scheme	Carriageway widening and junction improvement
Olympic Park improvements	Junction improvements
Rathmore Road Link, Gravesend	Carriageway and junction widening
Silvertown Tunnel scheme	New twin bore tunnel east of the Blackwall Tunnel
St. Clements Way, Greenhithe improvement scheme	Carriageway and junction widening

Our 2016 model, which represents the current situation, shows where people are travelling to and how long their journeys take. In the future, for many people these journeys will take longer (because there are more cars on the roads) but the real cost of making these journeys will decrease. This is because, although fuel prices will rise, vehicles are forecast to become more fuel efficient and as people's incomes rise, journeys by car will seem more affordable.

The model predicts how people will react to these changes in the time and cost of their journeys. The possible changes include how often they make the same trip, a change in the time of day they travel, a switch to or from public transport, where they travel to/from or what route they choose to take.

Evidence suggests that, in the main, people will continue to travel by car but may change where they travel to. As traffic speeds fall, or trips become more expensive, people tend to respond by making shorter journeys and where journeys become quicker or cheaper, some people choose to travel to places further away, for example, they choose employment further away from home.

The transport model shows how many vehicles are expected to use each part of the road network. This information is then used to predict the environmental impacts of traffic (on noise and air quality). The speed on each section of the network and the length of journeys is calculated in the model. This is used to measure the performance of the road network and to provide details on the location and level of congestion.

4 Forecasts with the Lower Thames Crossing

This section sets out how we used the transport model to predict the use of both the new crossing and other parts of the road network if the new crossing is built.

The model is used to predict:

- how people will react to the changes in the time and cost of their journeys
- the routes they will use as a result of the new crossing

The changes in journey times and costs for all traffic in the area, including for those who do not use the new crossing but have their journey times affected by changes in traffic patterns, form the basis of the assessment of the economic impact of building the new crossing.

The model provides the data on traffic flows and speeds. This data is used to look at the environmental impacts of traffic, accident levels and changes in journey time reliability. Additional assessment demonstrates the benefits to the national economy of traffic being able to travel more freely across the Thames.

What the model predicts

The key findings as a result of using the model are shown here. Further detail and results from the model is contained within the *Traffic Forecasting Report* (www.lowerthamescrossing.co.uk/haveyoursay).

The model predicts that the biggest change as a result of the new crossing will be the number of people who choose to travel to the other side of the Thames.

Change in flow

In the transport model and the *Traffic Forecasting Report*, the capacity of each part of the road network is given as the number of passenger car units (PCUs) that can use each road link in the model each hour, which is an industry standard approach:

- Cars and vans are defined as 1 PCU
- HGVs are considered to be equivalent to 2.5 PCUs, because they take up more road space

The capacity of a road depends on the type of road, the speed limit, the number of lanes and the road layout. The capacity is reduced if, for example, on a motorway where traffic changes lane to leave or join the road at the next junction.

Table 4.1 below shows the forecast traffic flows in both directions on the Dartford Crossing and at the new crossing during the morning and evening peak hours, and an average inter-peak hour. This shows the benefits that the new crossing would bring to the Dartford Crossing, with flows lower than they are today on the Dartford Crossing in the morning and evening peak hours in 2026 and 2041 with the new crossing.

Table 4.1 Predicted peak and inter-peak two-way hourly flows at the Dartford Crossing and the Lower Thames Crossing (PCUs)

Period	Year	Without new crossing	With new crossing	
		Dartford	Dartford	New crossing
AM peak hour	2016	14,290		
	2026	15,920	12,180	7,620
	2041	16,220	13,960	8,710
Inter-peak hour	2016	11,340		
	2026	13,750	9,820	5,850
	2041	15,400	11,700	7,060
PM peak hour	2016	13,220		
	2026	15,130	11,450	6,970
	2041	16,020	12,970	7,920

Source: Lower Thames Area Model (CM6, C8E)

On a daily basis, the transport model shows that 176,600 PCUs (138,000 vehicles) used the Dartford Crossing in 2016. This is predicted to rise to 211,300 PCUs (166,000 vehicles) in 2026 and 228,200 PCUs (179,000 vehicles) in 2041 without the new crossing.

Much of the increase in traffic will come from additional trips travelling in the middle of the day and overnight as the Dartford Crossing is already heavily used in the morning and evening, leaving little space for extra vehicles to use it. The overall growth in traffic is however restricted by the lack of sufficient capacity at the Dartford Crossing and some people are deterred from making a trip across the Thames because of the delays at the Dartford Crossing.

If the new crossing opens, some traffic that currently crosses the Thames using the Dartford Crossing will divert to the new crossing as it is a shorter route. Some of the space this creates at the Dartford Crossing will be taken up by people who were not using it because they were deterred from doing so by the high traffic levels and unpredictable journey times. The transport model predicts that, even with these additional journeys:

- the overall level of traffic using the Dartford Crossing will fall (by up to 24% in 2026 and up to 19% in 2041 in the peak hours) when compared to the situation without the new crossing
- average speeds on that part of the network will rise and journey times will become more reliable

The traffic model estimates future conditions on the road network. The figures (see Figure 4.1, Figure 4.2 and Figure 4.3) show the change in the predicted amount of traffic in 2026, between the Do Minimum situation and the Do Something situation, which differs as it includes the new crossing.

The figures show the road network in varying shades of blue if the traffic levels are forecast to decrease and in yellow to red if they are forecast to increase; the darker the colour, the greater the change. The new crossing is shown in red as it is not present in the Do Minimum situation.

Overall, the impact on traffic is similar during the morning, evening and inter-peak periods, with the changes more pronounced, and covering a wider area, during the morning and evening peaks.

On some roads, such as the A2 west of its junction with the new crossing, the A13 west of its junction with the new crossing, the Dartford Crossing and the M25 in Thurrock, the number of vehicles will fall when the new crossing opens. However, roads on the approach to the new crossing, including the M2, A229, the A13 east of its junction with the new crossing, the A2 east of Gravesend and some sections of the M25 will experience an increase in traffic levels as travel across the Thames becomes easier and more reliable.

Figure 4.1 Change in flows with the new crossing: AM peak (07:00–08:00), 2026

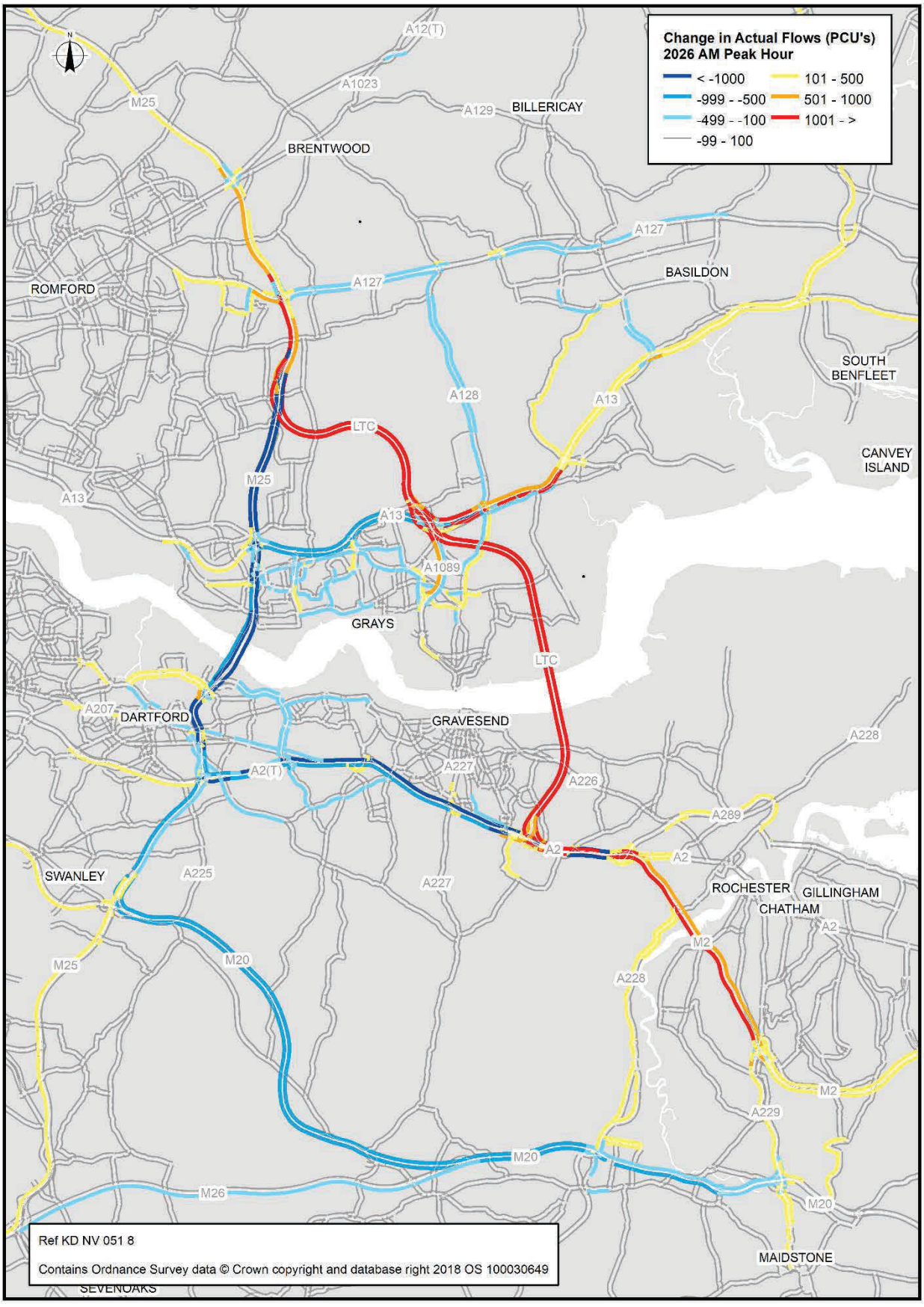


Figure 4.2 Change in flows with the new crossing: Inter-peak, 2026

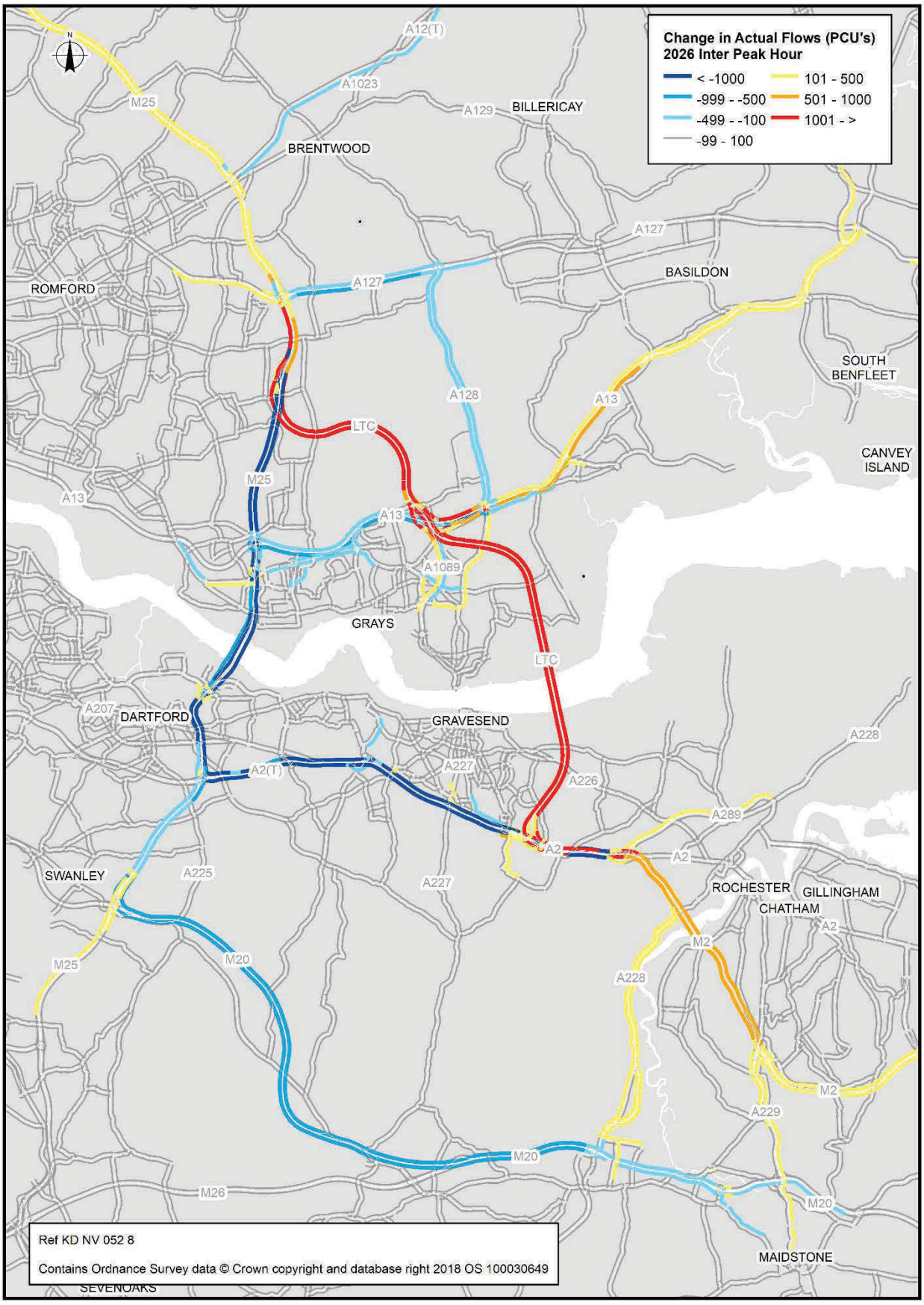
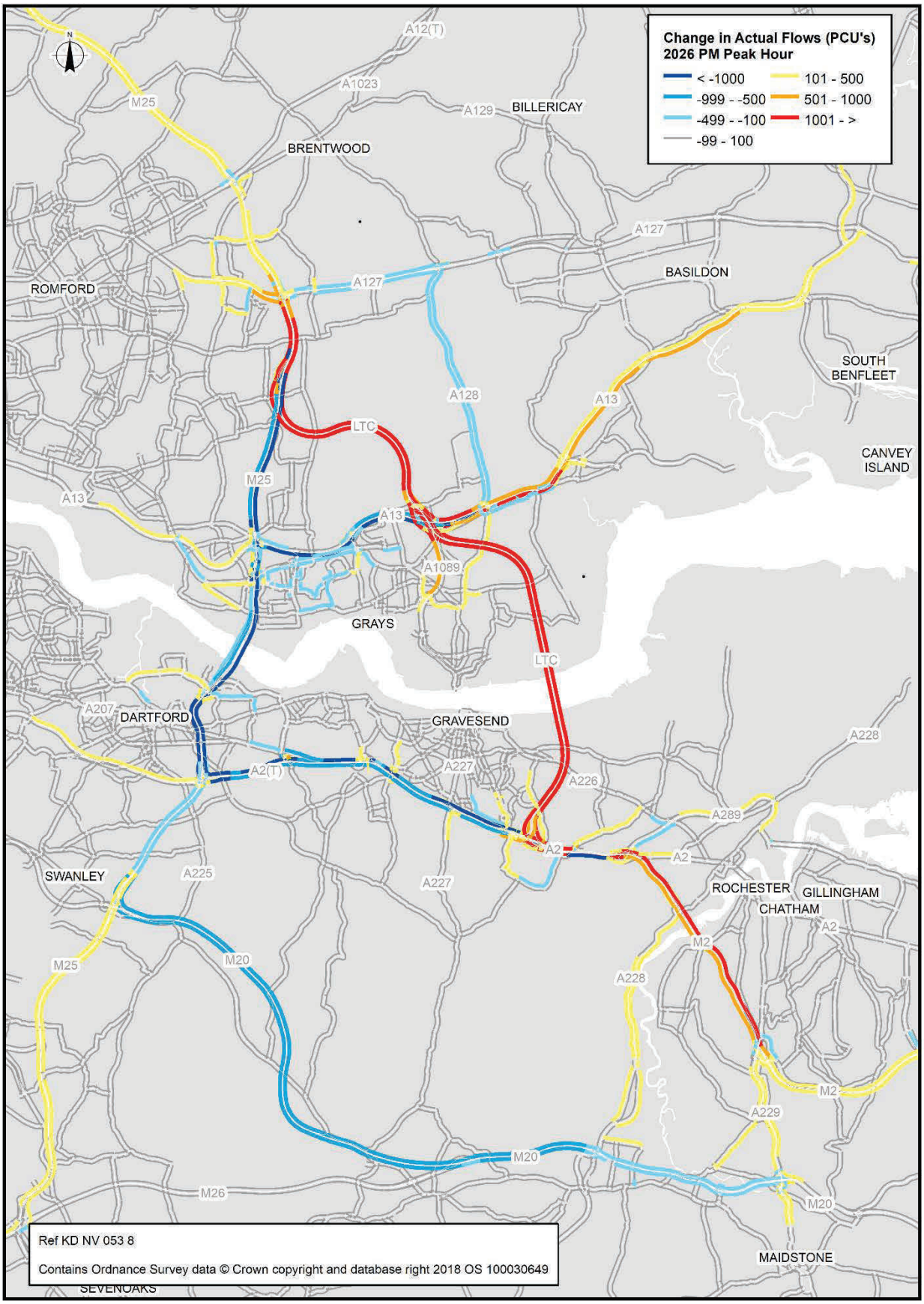


Figure 4.3 Change in flows with the new crossing: PM peak (17:00–18:00), 2026



Heavy goods vehicles

The percentage of vehicles using the Dartford Crossing which are HGVs will fall considerably once the new crossing is built (see Table 4.2) across the morning, evening and inter-peak hours. It also shows that the percentage of HGVs using the new crossing will be the same or often higher than on the Dartford Crossing particularly in the inter-peak and PM peak.

The reason for the change is because the new crossing will be an attractive route for these vehicles travelling to and from the ports and other industrial areas. It will be built to current design standards so that it is able to accommodate all HGVs wishing to use the route, without having to use convoys, which is currently the case for some HGVs at the Dartford Crossing.

Table 4.2 Percentage of vehicles which are HGVs at the Dartford Crossing and the new crossing

Period	Year	Dartford Crossing		New crossing (%)
		Without new crossing (%)	With new crossing (%)	
AM peak hour	2016	18		
	2026	18	14	15
	2041	18	14	14
Inter-peak hour	2016	25		
	2026	24	19	24
	2041	24	18	22
PM peak hour	2016	14		
	2026	14	10	13
	2041	14	10	12

Source: Lower Thames Area Model (CM6, C8E)

Journey times

Predicted average journey times in 2026 between M25 junction 1b (with the A296) south of the Thames and M25 junction 31 (for Lakeside) north of the Thames, are forecast to fall from 9 minutes if the new crossing is not built to just 5 minutes if it is. In 2041 the journey time almost halves from around 12 minutes without the new crossing to 6 minutes with the new crossing.

If the new crossing is not built it is expected that the number of ‘average’ days would fall, as the high levels of traffic using the Dartford Crossing would lead to a higher number of incidents, further increasing journey times.

Change in capacity

When the number of vehicles using a road (volume) becomes closer to the number of vehicles that the road can carry (capacity), then the average speed at which traffic travels falls and journey times become more unreliable. The tipping point is at around 85%, when the volume of traffic (in PCUs) is over 85% of the capacity of the road and as a result queuing or slow-moving traffic is often observed.

In the next set of figures (Figure 4.4–Figure 4.9) we show the volume of traffic as a percentage of capacity for the road network in the transport model without (Do Minimum) and with the new crossing (Do Something), for the AM peak, inter-peak and PM peak hours.

The roads are coloured:

- grey if below 75% capacity
- yellow if between 75% and 85% capacity
- orange if between 85% and 95% capacity
- red if over 95% capacity

The maps demonstrate there will be improvements around the Dartford Crossing and on other roads in Dartford and Thurrock as a result of the new crossing. On the wider road network conditions remain largely unchanged. There are a number of areas where the ratio of volume to capacity on some roads increases, particularly those close to the new crossing.

In the AM peak, without the new crossing (see Figure 4.4) the road network would have a number of sections where the percentage of volume to the road capacity is above 95%, including critical areas like the Dartford Crossing, sections of the M25, A2, A12, A13 and areas around Maidstone.

The new crossing (see Figure 4.5) would improve the operation of the road network in the AM peak around the Dartford Crossing, as well as on the M20 and on some areas of the M25, A13 and A2. However, there would be some increases in the percentage of volume to capacity on the M25 north of the Thames, and on the M2 as traffic switches away from the M20 to use the new crossing.

In the inter-peak (see Figure 4.6 and Figure 4.7) there are fewer places on the strategic road network where the percentage of volume to capacity is forecast to be above 75% without the new crossing. The major exception to this is at the Dartford Crossing, which is over 95% without the new crossing, as shown in red in Figure 4.6. However, the introduction of the new crossing reduces this to below 75%, as shown in Figure 4.7.

The PM peak (see Figure 4.8 and Figure 4.9) shows a similar pattern to that of the AM peak, in that with the introduction of the new crossing the volume over capacity ratio reduces on sections of the network close to the Dartford Crossing.

Figure 4.4 Traffic volumes as percentage of road capacity, Do Minimum: AM peak, 2026

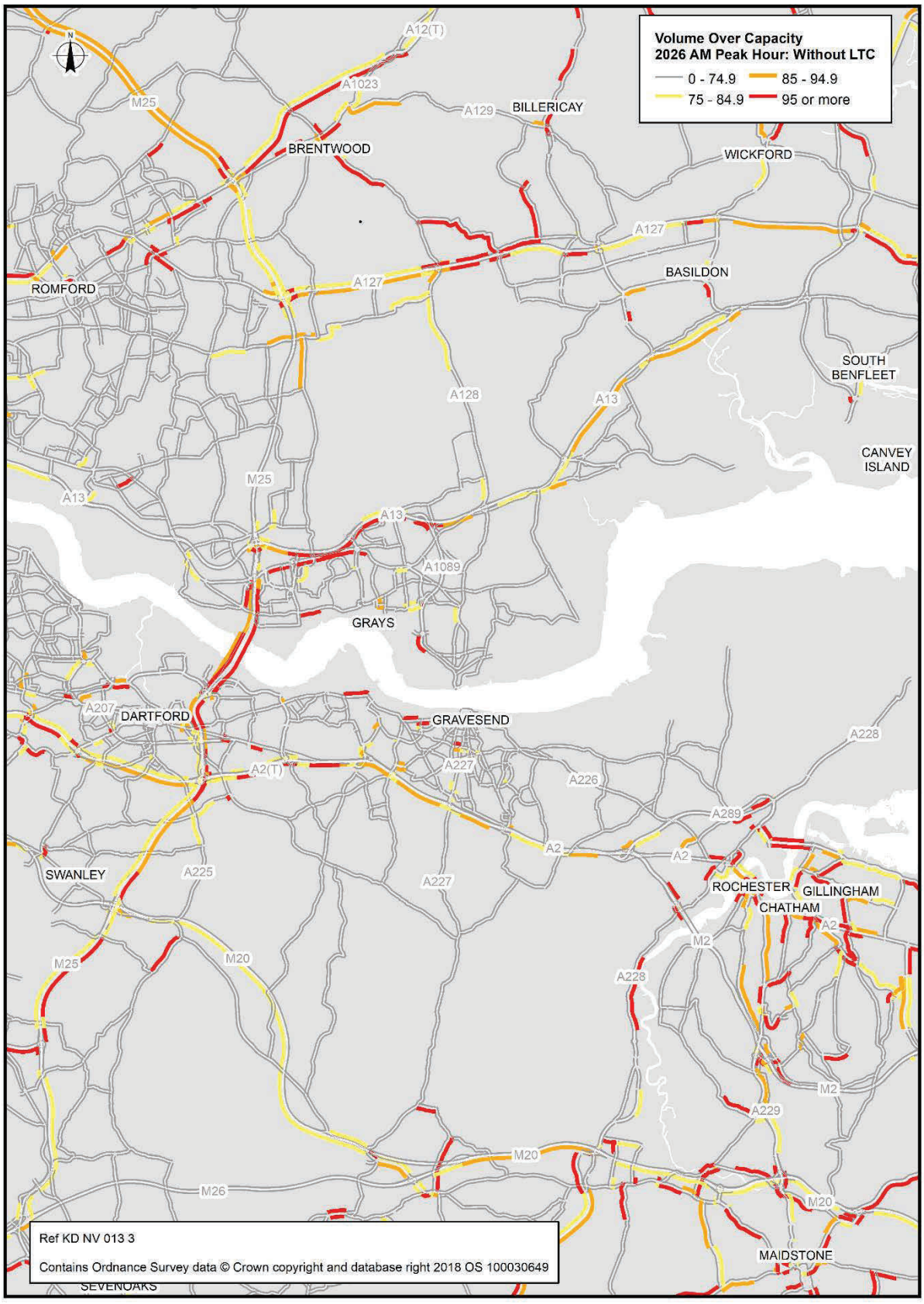


Figure 4.5 Traffic volumes as percentage of road capacity, Do Something: AM peak, 2026

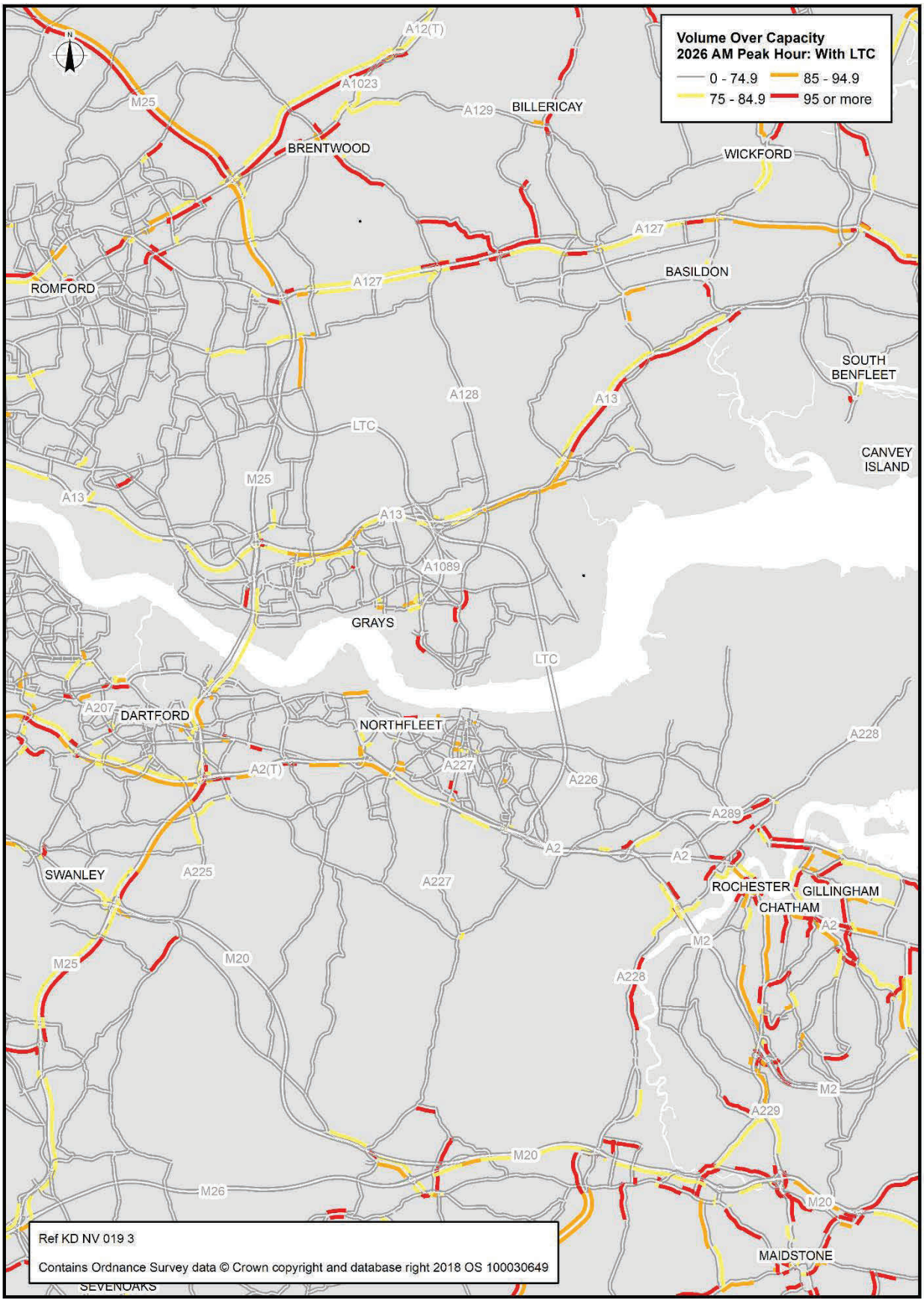


Figure 4.6 Traffic volumes as percentage of road capacity, Do Minimum: Inter-peak, 2026

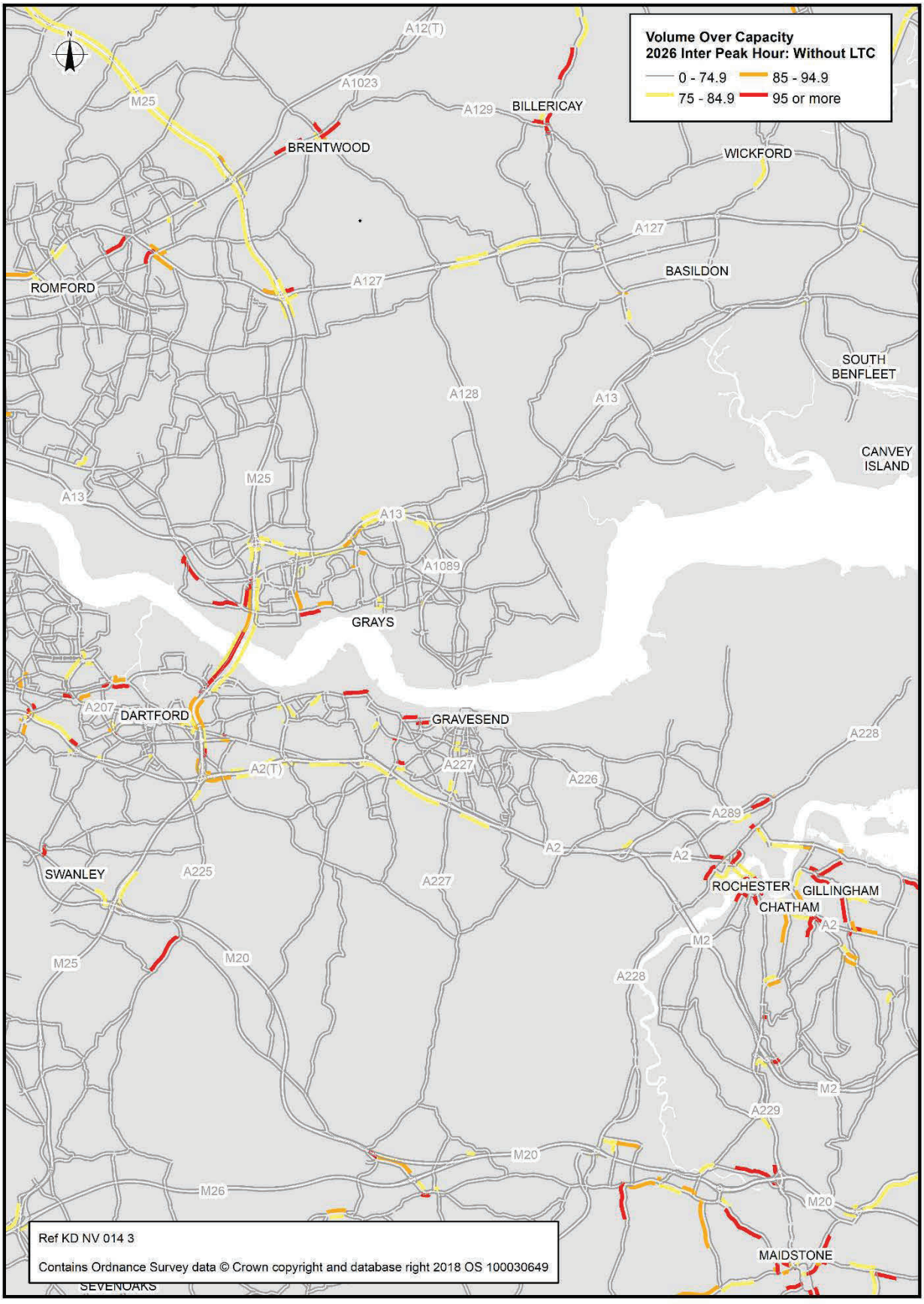


Figure 4.7 Traffic volumes as percentage of road capacity, Do Something: Inter-peak, 2026

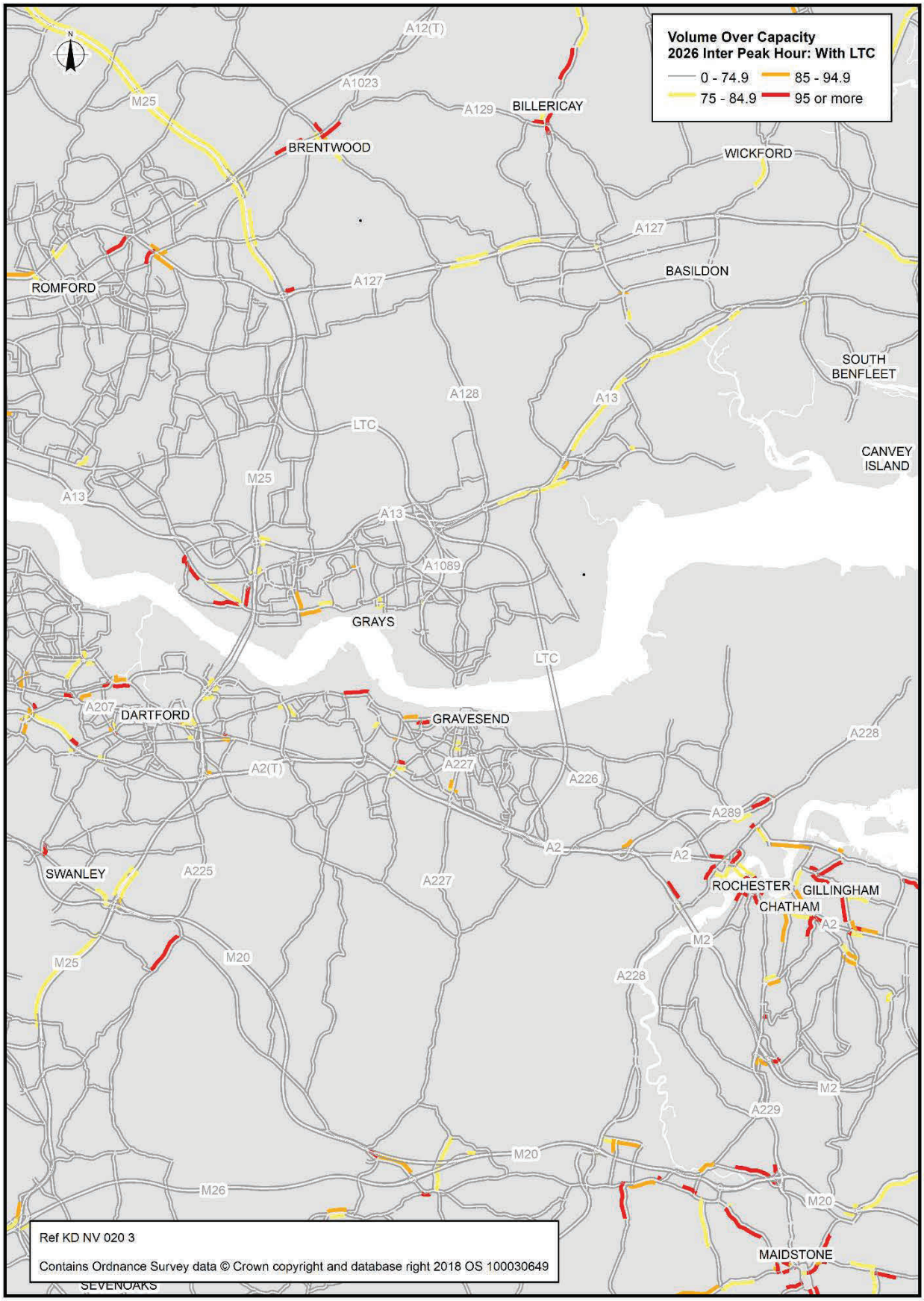


Figure 4.8 Traffic volumes as percentage of road capacity, Do Minimum: PM peak, 2026

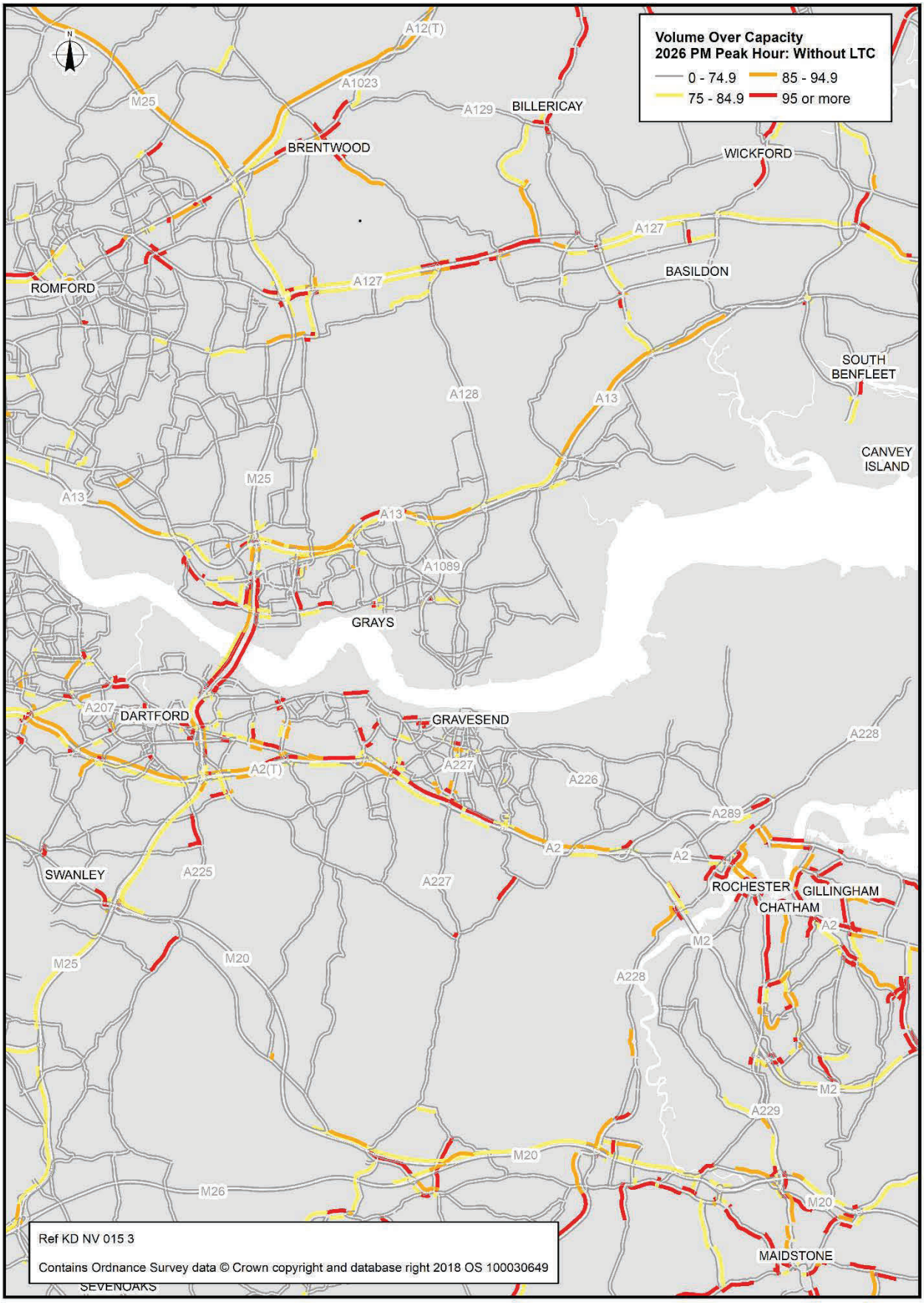
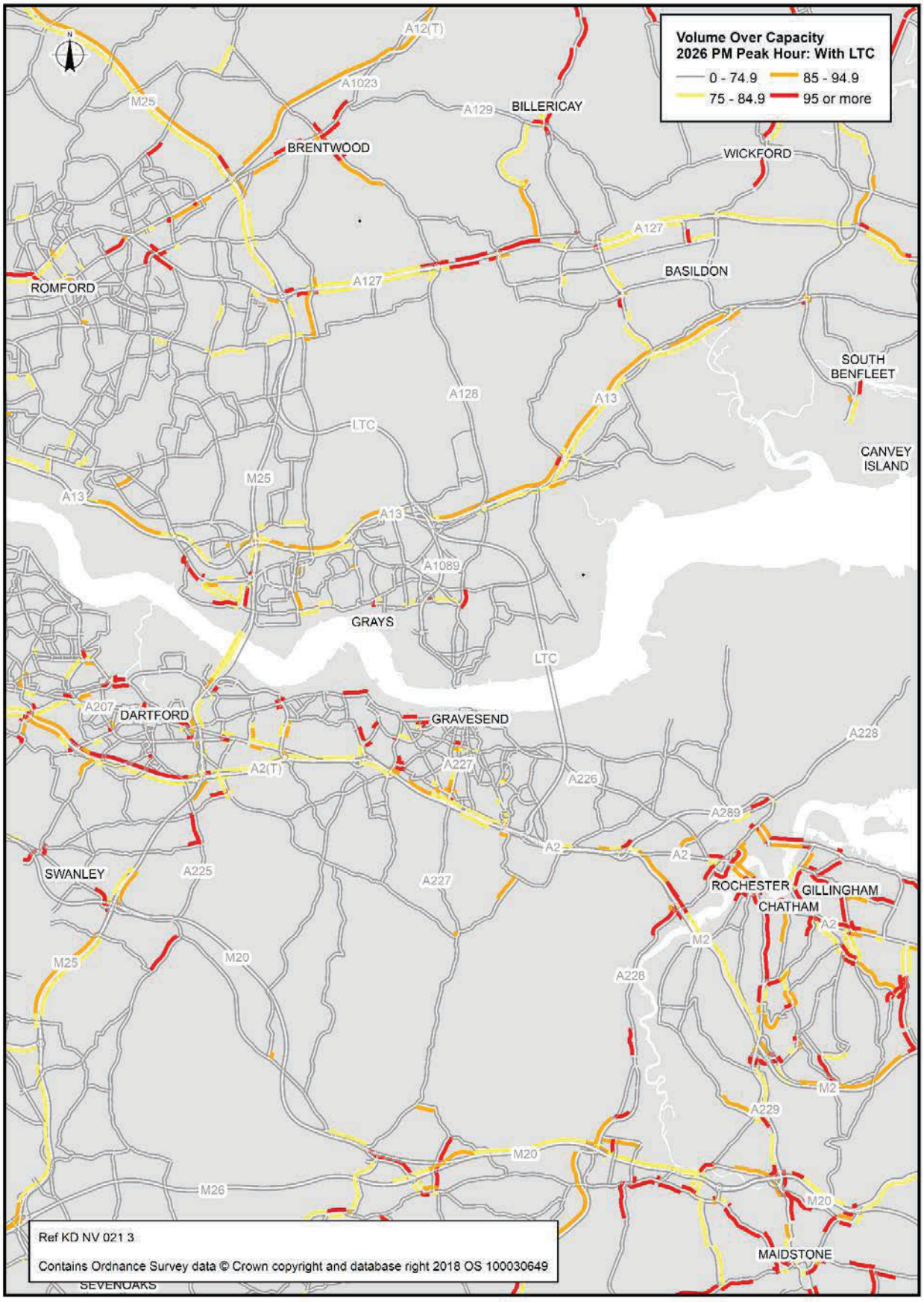


Figure 4.9 Traffic volumes as percentage of road capacity, Do Something: PM peak, 2026



Glossary

Term	Explanation
AM Peak Hour	The hour between 07:00–08:00 within LTAM.
Do Minimum	A future year scenario in LTAM which includes changes to the road network and planned development that is forecast to go ahead, but not the Lower Thames Crossing.
Do Something	A future year scenario in LTAM which includes changes to the road network and planned development that is forecast to go ahead, and the Lower Thames Crossing.
DCO	Development Consent Order: a DCO is similar to planning permission but is designed for NSIPs to make the process clearer, faster and fairer. It does this by allowing many of the consents and permissions needed for a project to be considered at the same time.
DfT	Department for Transport: the government department responsible for the English transport network and a limited number of transport matters in Scotland, Wales and Northern Ireland that have not been devolved.
GPS	Global Positioning System
Inter-peak	An average hour within LTAM to represent an hour within the period 09:00–15:00.
HGV	heavy goods vehicle
LTC	The Lower Thames Crossing
LTAM	Lower Thames Area Model: the strategic highway model produced by Highways England to appraise the impacts of the Lower Thames Crossing.
M25	London's orbital motorway
NSIP	Nationally Significant Infrastructure Project: major infrastructure developments in England and Wales, such as proposals for power plants, large renewable energy projects, new airports and airport extensions, major road projects.
PCU	passenger car units. This is a metric to allow different vehicle types within traffic flows in a traffic model to be assessed in a consistent manner. Typical PCU factors are: 1 for a car or light goods vehicle; 2.5 for a bus or heavy goods vehicle; 0.4 for a motorcycle; and 0.2 for a pedal cycle.
PM Peak Hour	The hour between 17:00–18:00 within LTAM.
Smart motorway	Term for a range of types of actively controlled motorway, using technology to optimise use of the carriageway including the hard shoulder.
Volume over capacity	The volume of traffic as a percentage of capacity of a road.

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