M3 junctions 2 to 4a all lane running

Five-year post-opening project evaluation

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Foreword

As Chief Customer and Strategy Officer, I want to know whether developments on our network are meeting their objectives and making a difference for our customers – the four million people that use the Strategic Road Network every day.

Evaluation is a key function in the safe running of the Strategic Road Network (SRN) and we carry out POPE[1] evaluations at set points during a major enhancement scheme's lifetime to enable us to take stock and make any necessary interventions. POPEs provide an early indication if the scheme is on track to deliver the benefits over 60 years as set out in the business case appraisal.

This report evaluates the M3 junctions 2 to 4a all lane running (ALR) smart motorway scheme within five years of operation following its conversion from a conventional three lane motorway.

An initial study was conducted one year after the M3 junctions 2 to 4a project which opened in 2017, followed by this report after five years which provides more robust data and analysis. The report includes an understanding of the safety and environmental impacts of a scheme, as well as how traffic has changed due to a scheme being in place and how the scheme supports the economy.

There are three types of smart motorway, all lane running (ALR), dynamic hard shoulder (DHS) and controlled motorway. ALR and DHS motorways create more space on some of the most congested sections of the SRN by using hard shoulder as a running lane either permanently or only at busy times. They create extra capacity with less disruption to road users and fewer environmental impacts than physically widening the road, along with reduced carbon emissions associated with construction.

Although the performance of individual scheme is important at a local level, drawing together findings at a programme level helps us to understand patterns and trends across our network.

Safety remains our number one priority and the five-year POPEs published to date (representing approximately a quarter of those in operation) demonstrate that smart motorways are delivering safety benefits in line with or above those originally forecast, with most schemes evaluated having lower collision rates than would have been expected on the conventional motorways they replaced. Where it has been possible to assess changes to the severity of such collisions, the evidence shows those collisions have been less severe.

The published five-year POPEs show that smart motorways are broadly on track to realise their envisaged environmental objectives. With further planned mitigation these will be fully met.

The five-year ALR and DHS POPEs published to date for smart motorways also show that the schemes are delivering much needed capacity with schemes accommodating up to almost a quarter (22%) more traffic than before they were converted into smart motorways. The reports indicate that many of the motorway sections would have been unable to cater for today's traffic (at the busiest times) if they had not been converted into smart motorways.

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[1] Post Opening Project Evaluation (POPE)

According the to the reports, the schemes are currently on course to deliver benefits, but will not deliver all the originally expected benefits within the 60-year appraisal period. There has been lower traffic growth than was expected when these schemes were appraised, due to the 2008 financial crisis and lower population growth than originally forecast (this will impact all transport schemes, built around this time). This means fewer drivers are benefiting today from smart motorway schemes than original anticipated. Five-year POPEs also show that traffic on some smart motorway sections is not travelling as quickly as was forecast at the appraisal stage. Together these factors have resulted in the value for money for all schemes with five-year appraisals, over the 60-year appraisal period, currently being lower than anticipated at this stage when compared with the original appraisal. This is, however, a forecast and there is the opportunity to take further action to improve benefits.

We have therefore examined these results in detail and have identified specific actions to further improve the performance of schemes, including:

- Standardised operating procedures for DHS schemes
- Technology improvements
- Optimisation of the algorithms that set speed limits
- Investigating physical constraints off the network that impact performance

We will continue to monitor schemes in operation, enabling us to track their benefits and take further action if required to ensure these schemes deliver an improved experience for our customers.

Elliot Shaw

Chief Customer and Strategy Officer

September 2025

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1. Executive summary

The M3 junctions 2 to 4a all lane running was a major project to improve a 13 mile stretch of the M3 by providing additional capacity through the implementation of *all lane running*, a type of smart motorway. The project opened in two stages: June 2017 at a reduced speed limit of 60mph, and at national speed limit (70mph) in August 2017.

This scheme aimed to provide additional capacity to reduce congestion, better manage traffic conditions and improve journey time reliability while maintaining safety for road users and minimising adverse environmental effects of the project.

There was an improvement in safety; the number of personal injury collisions decreased compared to before, when accounting for traffic growth the rate of those collisions also decreased. This lower rate still falls within the range of what could have been expected had the road remained a conventional motorway. There was also a positive reduction across all three collision severities (fatal, serous and slight), FWI and KSI measures.[2] If the project extent and wider area continue to perform at the current level, it will meet the predicted reduction.

The evaluation of traffic and congestion found that in all time periods there were improvements in journey times, most notably 7-8am travelling eastbound and 5-6pm westbound. Congestion on the approach to junction 2 travelling east had improved considerably, while small improvements were noted westbound on the approach to junction 3. Journey reliability also improved for all routes at all times, with the slowest journeys becoming much faster, improving reliability for road users at the busiest times of day. This is all within the context of low traffic growth on the project, most likely due to recovery from Covid-19 and national lockdowns as the evaluation was undertaken in 2022. Trends observed on the project at five years after are within what we would expect for traffic growth in the area and for the road type.

This evaluation highlighted that the environmental impacts of the project were largely on track to be realised as expected. The outcomes or impacts of the project were broadly as expected for local noise due to noise mitigations and less traffic flows than expected. Journey quality impacts were also considered better than expected due to better motorway information, higher than forecast journey time benefits, and journey reliability.

Based on the evidence from the first five years, at this stage the M3 junctions 2 to 4a smart motorway project is on track to realising its anticipated ‘high’ value for money over the 60-year life of the project. Most of the benefits contributing to the projects success arise from journey time and journey reliability improvements. It is likely that journey times increase in future years as the project accommodates additional traffic, though this was expected and was considered as part of the appraisal supporting the original business case. The project has continued the trend it set at one year after by evidencing improvements to safety, journeys, the environment, and delivering overall value for money.

[2] Fatal Weighted Injuries (FWI), Killed and Seriously Injured (KSI) – refer to section 5 for more information.

2. Introduction

What is the project and what was it designed to achieve?

The M3 junctions 2 to 4a was identified as one of six highway improvement projects in the government's growth agenda review in 2011. This aimed to tackle areas of congestion and improve the strategic road network. Existing congestion was high on this stretch of road. For example, heading east in the morning, journey times regularly exceeded 40 minutes for the 13 mile stretch. Traffic was set to increase in later years; especially given potential developments around Rushmoor, Basingstoke, Dean and Winchester. Forecasts estimated that effective operation of this section would only be maintained if an additional lane of capacity was provided.

National Highways constructed a smart motorway on the M3 between junctions 2 and 4a, with work starting in 2014 and opening for traffic in June 2017. Although all lanes were open at the end of June, this was at a reduced speed limit. The road was operating at national speed limit at the start of August 2017, which was when the evaluation point was taken from.

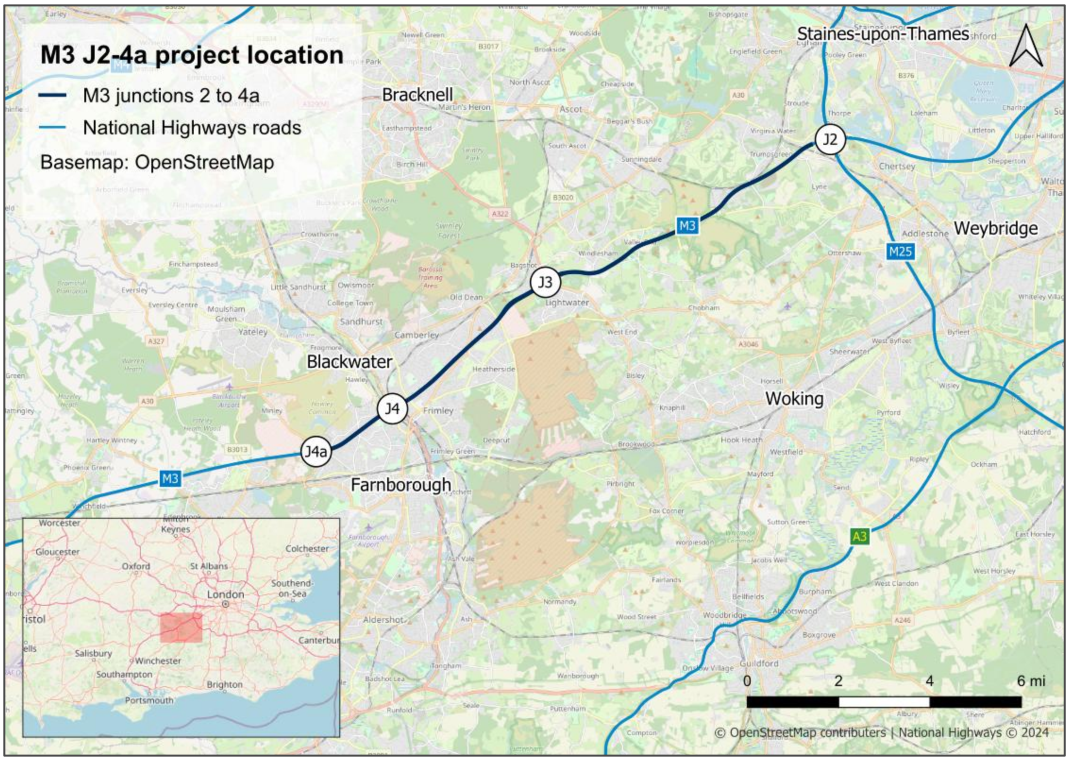
The type of smart motorway built on this section was all lane running. This involves converting the hard shoulder into a lane that is permanently open to road users. To supplement this, variable mandatory speed limit technology is added to manage speed and traffic flow, based on congestion levels, to help keep the road running safety. Other aspects of a smart motorway were also employed such as: speed enforcement cameras, a queue protection system, CCTV and emergency areas.

As well as the smart motorway, works also included improvements to the link roads between the M3 and M25. Capacity was increased between M3 eastbound to M25 northbound and M25 north and southbound to M3 westbound. The 50mph average speed limit section through junction 2 of the M25, to the M3 westbound, was also extended by just over 1km further into the M3. Other works included installing a concrete reserve, low noise surfacing and sound barriers along some sections.

Project location

The project starts on the M3 at junction 2, where a series of link roads join it with the M25 circular motorway around greater London. The smart motorway continues along the M3 westbound to junction 4a, near Farnborough. East of stretch is predominantly rural. Between junctions 2 and 3 there is also a site of special scientific interest: Chobham Common. This area represents one of the few remaining examples of lowland heath, a globally rare and threatened habitat which supports dry and wet heathland, bog, scrub, and woodland.

Figure 1 M3 junctions 2 to 4a project location



Source: National Highways and OpenStreetMap contributors

How has the project been evaluated?

Post-opening project evaluations are carried out for major projects to validate the accuracy of expected project impacts which were agreed as part of the business case for investment. They seek to determine whether the expected project benefits are likely to be realised and are important for providing transparency and accountability for public expenditure, by assessing whether projects are on track to deliver value for money. They also provide opportunities to learn and improve future project appraisals and business cases.

A post-opening project evaluation compares changes in key impact areas[3] by observing trends on a route before a project is constructed (baseline) and tracking these after it has opened to traffic. The outturn impacts are evaluated against the expected impacts (presented in the forecasts made during the appraisal) to review the project's performance. For more details of the evaluation methods used in this study please refer to the post-opening project evaluation (POPE) methodology manual on our website.[4]

[3] Key impact areas include safety, journey reliability and environmental impacts.
[4] https://nationalhighways.co.uk/media/pq2jb142/pope-methodology-note-2024-v2.pdf

3. Delivering against objectives

How has the project performed against objectives?

Our major projects have specific objectives which are defined early in the business case when project options are being identified. The project had seven key objectives, primarily related to improving journey times smoothing traffic flows, and maintaining safety for road users. This project also had program-wide objectives which centred around similar principles. These have been broadly aligned and assessed at project level.

These objectives are appraised to be realised over 60 years, the evaluation provides early indication if the project is on track to deliver the benefits

Table 1 summarises the project's performance against each of the objectives, using evidence gathered for this study.

Table 1 Objectives and Evaluation summary

RIS Objective[5]	Project objective[6]	Five-year evaluation
Improving Safety for All We need to keep our customers, people and supplier safe, above all else.	Maintain and, where possible, improve current safety standards	The number of personal injury collisions has decreased. The rate of personal injury collisions, when considered in the proportion of traffic, has also decreased.
Providing Fast and Reliable Journeys We want to help people and businesses have safe, reliable and efficient journeys.	Improve journey times on the M3 between junctions 2 to 4a	Journey times have improved across all time periods, particularly in the morning heading towards London, when journeys were most congested pre-smart motorway.
	Provide more reliable journey times as measured by the average delay experienced by the worst 10% of journeys	Journeys are more reliable meaning those travelling the stretch repeatedly can be more confident in the consistency of their journey time.
A Well Maintained and Resilient Network Our network is complex and varied and requires careful stewardship to keep it in good condition.	Increase motorway capacity and reduce congestion	An extra lane of capacity has been added to this stretch. This has helped ease congestion, particularly where journeys were the slowest - heading towards London in the morning rush hours.
	Smooth traffic flows	Journeys are smoother at the most congested times but there is queuing to leave some junctions, particularly heading west.

[5] During the first Road Investment Strategy (RIS) from 2015 to 2020, and subsequent RIS2 (2020-2025), universal objectives were created to ensure consistency across the smart motorway programme.

[6] The objectives as part of the original business case when the investment decision was made for the project.

RIS Objective[5]	Project objective[6]	Five-year evaluation
Delivering Better Environmental Outcomes We want our roads to work more harmoniously with the communities that live alongside them, and the environment that surrounds them.	Offset the detrimental environmental impacts through mitigation measures	The environmental outcomes of the project were broadly as expected for most sub-objectives. The outcomes or impacts of the project were better than expected for local noise due to noise mitigations and less traffic flows than expected and similar for journey quality due to better motorway information, higher journey time benefits, and journey reliability.
Meeting the Needs of All Users We want to meet and exceed the expectations of all those who use out network.	Increase and improve the quality of information for the driver and improve journey ambience	The project has installed variable mandatory speed limit (VMSL) signs to regulate traffic flow and speed, providing additional information to road users. Journey quality was expected to be insignificantly impacted and has been evaluated as such.
Delivering Even More Value for Our Customers We are setting out to deliver £2.23bn of efficiencies, which will mean that taxpayers will see even more investment for their money than in the past.	-	The M3 junctions 2 to 4a was expected to deliver 'high' value for money over its lifetime, and based on the first five years after opening this has been achieved. The primary driver of the monetised benefits is journey time savings on the project extent.

4. Customer journeys

Summary

During the first five years since the project opened the route supported up to 70,000 road users, just over 5,000 per hour during the busiest times of day. At one year after traffic had increased modestly, but by five years after this had dissipated and on many sections there were less vehicles compared to before. One of the main contributors to this will have been the Covid-19 pandemic and subsequent national lockdown, restricting travel for users. Since late 2021, road use has gradually increased and matched those levels seen pre-pandemic, however as this evaluation was undertaken in 2022 there was still some uncertainty.

Although traffic volumes were lower than before, journey times have still improved. The busiest times of day have seen the largest improvements, most notably the eastbound carriageway which saw an improvement of 13 minutes compared to what would the journey timer would likely have been had the project not gone ahead. There were smaller improvements during other time periods, and the westbound 5-6pm also saw substantial savings. These journey time savings also translated to speed improvements over the whole route, as noted, especially for the eastbound 7-8am and westbound 5-6pm. Journey reliability also saw great improvements for the same time periods, with the longest journeys taking much less time to complete after opening at five years after.

Overall, congestion has improved greatly compared to before. The approach to junction 2 on the eastbound carriageway still suffers from slower speeds due to heavy traffic. The majority of vehicles leave at junction 2 for the M25 with very few carrying on through the M3 to junction 1. The project sought to address this issue by increasing the number of lanes on the exist slip. There was a large improvement in congestion on the M3 approaching junction 2 as a result of this, however there is still some delay. On the eastbound carriageway a lot of traffic leaves the M3 at junction 3 and combined with traffic signals on and around the junction, there was evidence of blocking back onto the M3 from the exit slip at one year after. There was some work done to improve the timing of the signals which can be seen by small increases in speed at five years after.

How have traffic levels changed?

Smart motorways are built on stretches of motorway which experience high levels of congestion and/or are expected to see traffic levels increase in future years. The following sections examine how the traffic levels changed over the evaluation period and to what extent the forecast traffic levels were realised. We have compared these to observed national, regional and local trends.

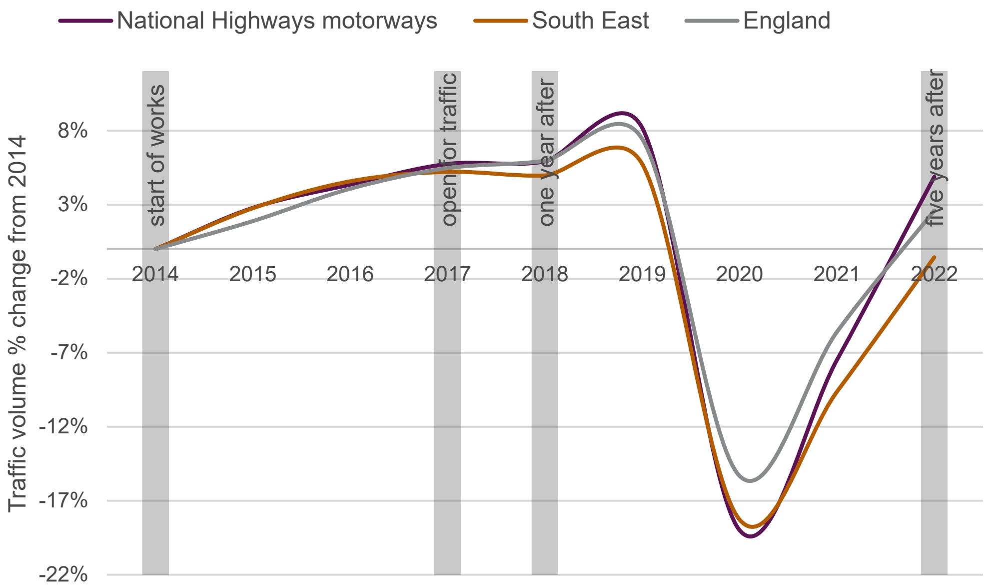
National and regional

To assess the impact of the project on traffic levels, it is useful to understand the changes within the context of national and regional traffic. To do this, we use the Department for Transport annual statistics. The data is reported by local authority and road type, recording the total number of million vehicle kilometres travelled[7].

[7] Motor vehicle traffic (vehicle kilometres) by region in Great Britain, annual from 1993 to 2022, Table TRA 8904, Department for Transport

The analysis in the following sections should be considered in this context as no adjustments have been made to take account of background traffic growth.

Figure 2 Background trends in traffic growth



Source: Department for Transport

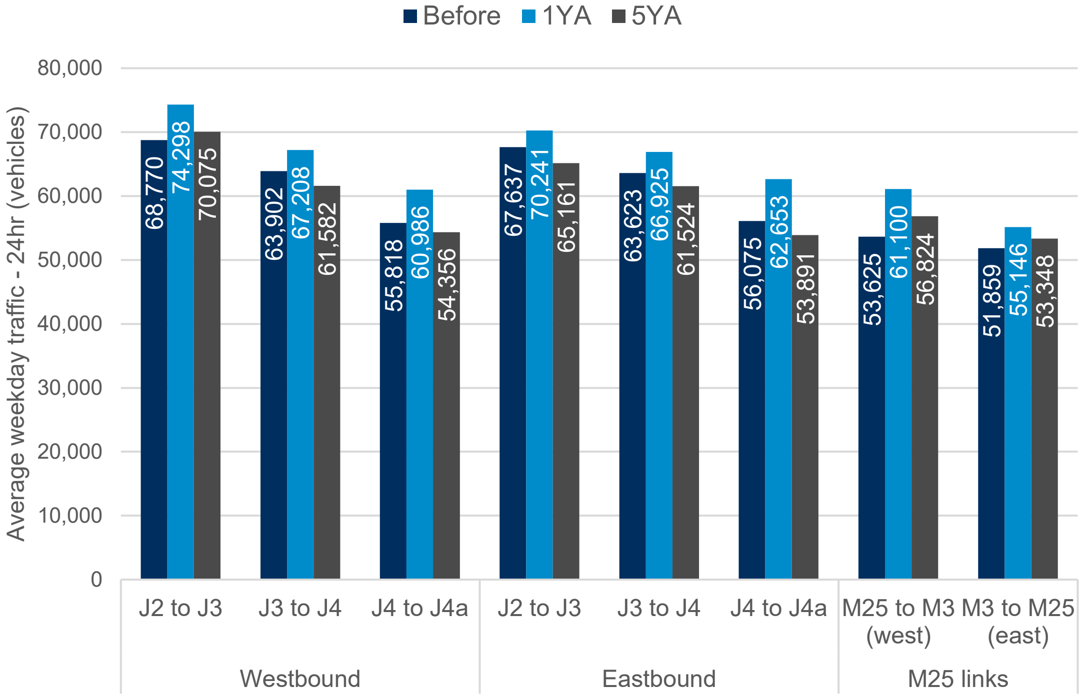
Figure 2 shows the traffic growth which occurred for National Highways motorways, and all roads in the South East and England. Early 2020 saw the introduction of strict lockdown measures in the wake of the Covid-19 pandemic, which heavily impacted traffic levels on the local and strategic road network. By 2022, traffic levels in these areas had mostly increased to what was observed pre-pandemic, though still lower. Motorways still saw a 5% increase in traffic from 2014 (pre-construction of the smart motorway) to 2022 (five years after opening), with roads in the South East at -1%. England's road network as a whole increased by 3%, giving an average growth of 2% across all three measures. This context is useful for understanding the levels of traffic observed on the M3 junctions 2 to 4a in the five years after period.

How did traffic volumes change?

Change in traffic compared to before

Analysis of long-term traffic changes shows the impact of Covid-19 on traffic, with volumes increasing between all junctions and in both directions from before to one year after, then decreasing from one year after to five years after. Traffic levels decreased from before to five years after across the project extent (3-4%), except for junctions 2 to 3 westbound which saw an increase of 2% (Figure 3).

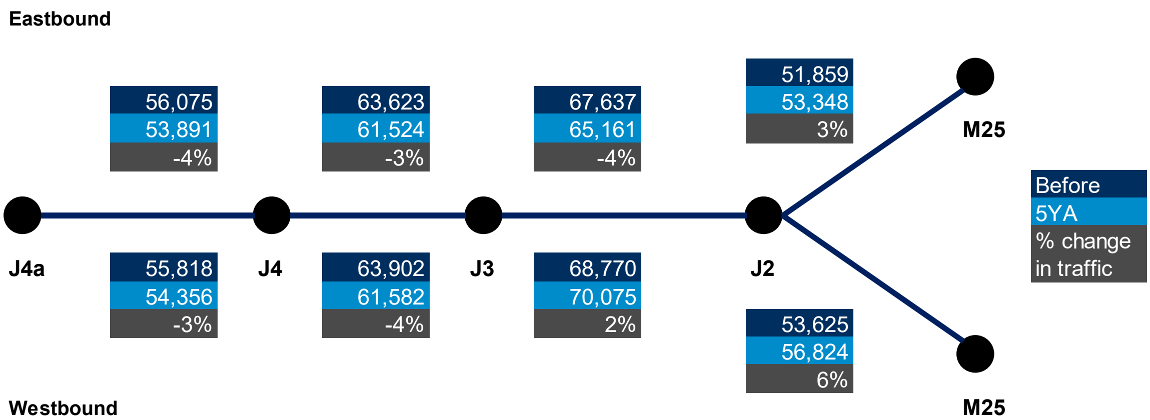
Figure 3 Traffic volumes on the M3 junctions 2 to 4a



Source: National Highways traffic data

The link roads from the M3 at junction 2 onto the M25 at junction 12 did see an increase compared to before. These link roads were improved as part of the project, increasing from one lane to two lanes. These link roads both saw increases in traffic flow from before to five years after, however once the traffic has passed through junction 3 westbound the flows decrease, indicating that the J3 exit westbound is carrying large volumes of vehicles exiting the motorway. This was identified during the one-year evaluation, where there was significant blocking-back on the westbound carriageway from the junction 3 exit slip.

Figure 4 Diagram showing average weekday traffic on the M3 junctions 2 to 4a



Source: National Highways traffic data

Generally, the project is busier at the eastern end, with flows increasing steadily on the eastbound stretch from entry at junction 4a all the way to the M25 at junction 2, indicating more vehicles are entering the motorway at junctions 4 and 3. The westbound carriageway is similar, with a significant amount of traffic joining from the M25, then gradually leaving the motorway until junction 4a.

Comparing the hourly flow patterns across the M3 junctions 2 to 4a, there is not much change since before construction. Peak travels appear to be constrained to the commuting hours of 7-9am and 4-6pm, with traffic reducing during the daytime and evening. The eastbound carriageway, which had significant congestion before construction, has shown some improvement of peak spreading. This is where anticipated congestion leads to road users travelling earlier or later to avoid delays. The peak travel time on the eastbound carriageway has shifted from around 6am to 7am, which combined with quicker journey times, has led to a significant improvement in congestion.

A mix of hybrid working options and lower travel demand may offer a reason for the general decrease in average weekday traffic from before to five years after, however no data collection was undertaken pre and post Covid-19 to consider impact of the shift to hybrid working in this area.

Change in traffic compared to counterfactual

The counterfactual traffic flow represents an estimate of what we think the traffic flow might be in the evaluation year (five years after opening), if the project had not been constructed. This is calculated using average traffic growth based on national, regional and local trends as seen in the section, How have traffic levels changed?

In the eastbound direction, counterfactual flows during inter-peak and the PM peak are largely capped at the before flow (as there was no traffic growth compared to before), meaning that no counterfactual growth has been applied. This is the same for the converse route, the westbound direction during 7-8am and 8-9am.

The morning peaks for the eastbound carriageway had some level of counterfactual growth, where we expect had the project not been implemented, traffic would still have increased. Not as many time periods and sections had counterfactual growth applied on the westbound carriageway. For more information on counterfactual flow analysis, refer to Appendix A.

Was traffic growth as expected?

The investment decision for this project was supported by an appraisal which included forecasts about the likely impact on traffic in a range of scenarios, with and without the project being built[8]. For this evaluation the observed traffic flows have been compared to the with and without project forecasts in 2022[9].

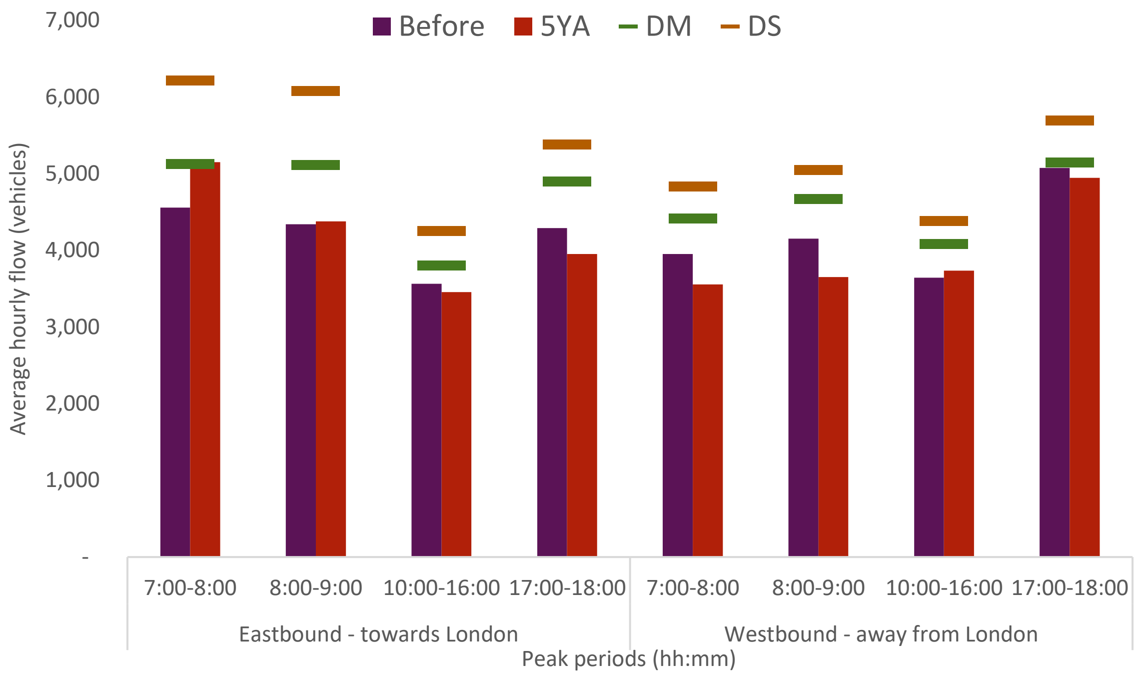
Observed traffic volumes before the project opened were lower than the without project forecast in 2022, in all time periods and both directions, by an average of just under 500 vehicles per hour. The difference was smaller in the evening peak in the westbound direction at less than 100 vehicles per hour. Observed traffic volumes at five years after opening were substantially lower than the with project forecast for the same year, by an average of more than 1000 vehicles an hour (

Figure 5).

[8] Scenarios in the appraisal were 'do something (DS)' which is the *with project* forecast and 'do minimum (DM)' which is the *without project* forecast. The appraisal had a forecasted opening year of 2015, and subsequent forecast years of 2019, 2022 and 2030.

[9] There was a standalone forecast year of 2022 included in the Traffic Forecasting Report which has expected the M4 smart motorway to have been operational. At the time of this evaluation, most of the M4 smart motorway had been constructed so this scenario was used.

Figure 5 Observed versus forecast traffic flows



Source: National Highways traffic data and M3 J2-4a Traffic Forecasting Report (2014)

We also analysed the percentage difference between forecast and observed traffic volumes (Figure 6). Traffic volumes in the without project (DM) scenario were approximately 11% higher than the observed before volumes. The evening peak appears to be more accurate, being only 1% out on the westbound carriageway. The with project (DS) scenario was more optimistic, being over 35% higher than the observed five years after in four out of eight of the time periods over both carriageways. As was the case with the without project scenario, the westbound evening peak was more accurate at 15%.

Figure 6 Percentage difference between observed and forecast traffic flows in 2022

Source: National Highways traffic data and M3 J2-4a Traffic Forecasting Report (2014)

It is worth noting that for this analysis only the core growth scenario was used, however given the stall in growth due to the pandemic and national lockdowns in 2020, it is more than likely that the lower growth scenario had materialised.[10] At the time of this appraisal, it was not known that traffic growth would be substantially constrained in the years after Covid-19, which has only just started to see recovery back to pre-pandemic levels.

Relieving congestion and making journeys more reliable

Smart motorways are applied to the busiest routes to ease congestion and ensure journey times are more predictable. Often these routes are where we anticipate congestion will increase in the future and our actions seek to limit this.

Analysis of journey times and speeds can indicate the impact of the smart motorway on congestion. The extent to which journey times vary from the expected average journey time indicates how reliable a journey is.

Did the project deliver journey time savings?

Journey times have mostly improved across all time periods at five years after comparing to what would likely have happened if the smart motorway wasn't constructed.[11] On the eastbound carriageway, journey times in the morning between 7-8am improved the most, saving customers over 13 minutes (40 minutes in the counterfactual scenario compared to 27 minutes after). Journey times were broadly the same during the daytime (10am-4pm) at five years after, compared to the counterfactual, with a slight decrease of approximately 30 seconds. In the evening peak between 5-6pm, journey times decreased by just over one minute.

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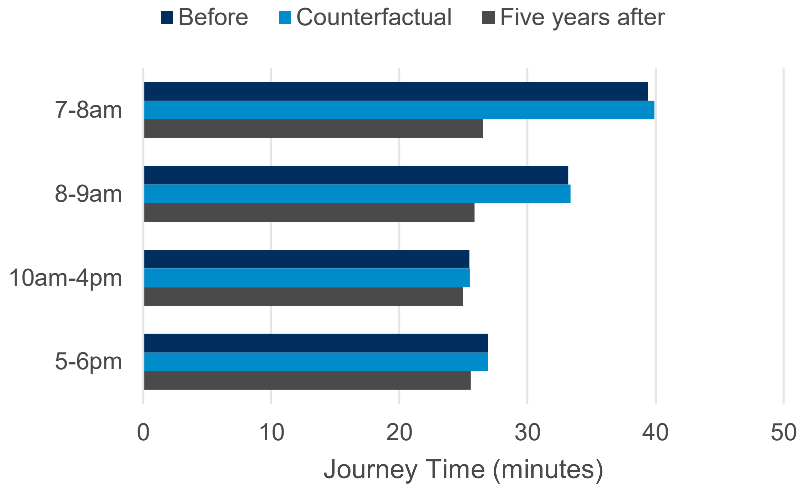
[10]In 2008 Department for Transport guidance was revised to reflect the uncertainties in forecasting future impacts (webTAG unit 3.15.5). It required a more detailed handling of the sources of uncertainty and required a minimum of two additional scenarios to be used to inform the business case. The current version of this guidance can be found in TAG unit M4.
https://www.gov.uk/government/publications/tag-unit-m4-forecasting-and-uncertainty

[11] In this section we are presenting before and after journey times unadjusted. For section 7 (value for money) we have compared outturn journey times against a counterfactual estimate of what journey times are likely to have been without the project. This allows for the deterioration in journey times that we would have expected to have happened due to growth in background traffic levels causing additional congestion. The counterfactual calculation estimated a disbenefit of 748,849 vehicle hours in the fifth year after opening.

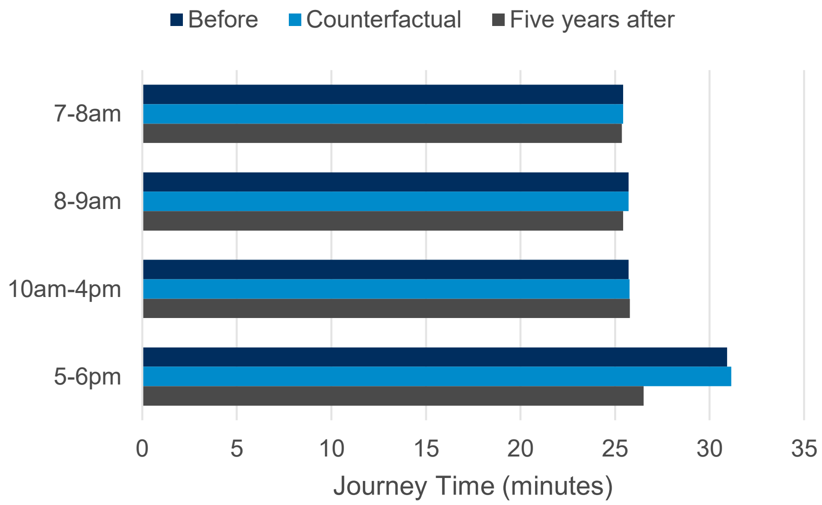
Figure 7 Journey times on the M3 junctions 2 to 4a eastbound



Source: TomTom satellite navigation data (November 2013 to October 2014 and November 2021 to October 2022) and National Highways traffic data

We see similar results on the westbound carriageway at five years after as the travel patterns for the M3 are tidal. This means there are greater improvements to journey times during 5-6pm of around 4 minutes, compared to less than a minute for 7-8am, 8-9am and 10am-4pm.

Figure 8 Journey times on the M3 junctions 2 to 4a westbound



Source: TomTom satellite navigation data (November 2013 to October 2014 and November 2021 to October 2022) and National Highways traffic data

Overall, journey times have improved across the board on the M3 junctions 2 to 4a, with larger improvements in the busiest commuter periods at 7-8am eastbound and 5-6pm westbound.

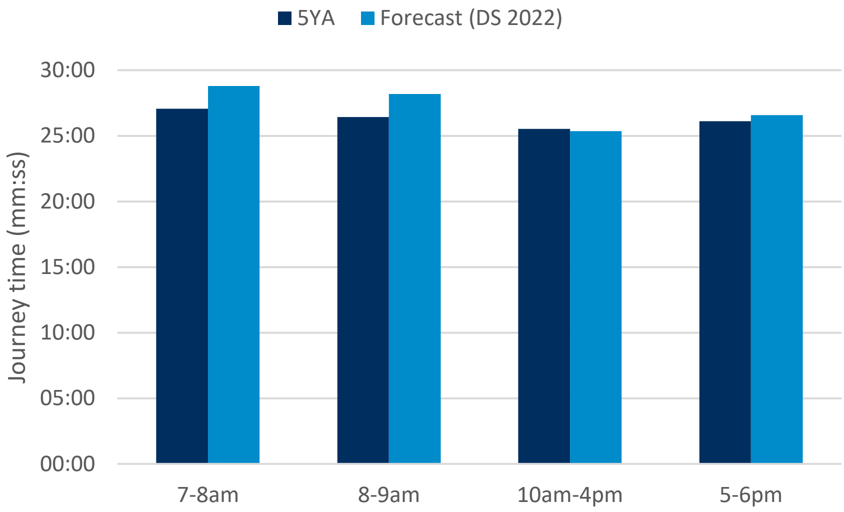
Were journey time savings in line with forecast?

As with traffic volumes[12], we compare observed journey times to forecasts that were undertaken before the project was constructed. There are two scenarios, with and without the project forecasts, referred to as do minimum and do something.

[12] Refer to *Customer journeys – Was traffic growth as expected?* For more information on forecasts.

Journey times observed at five years after (5YA) have been compared to the same forecast scenario in 2022 (DS) in Figure 9. Observed journey times are slightly lower than what we expected, though they are all with in a margin of error of a few minutes. For example, on the eastbound carriageway at 8-9am we expected the journey time to be just over 28 minutes, whereas we observed 26 minutes at five years after. The difference is similar at 7-8am, but smaller (less than one minute) for all other time periods on both the east and westbound directions (refer to Appendix A).

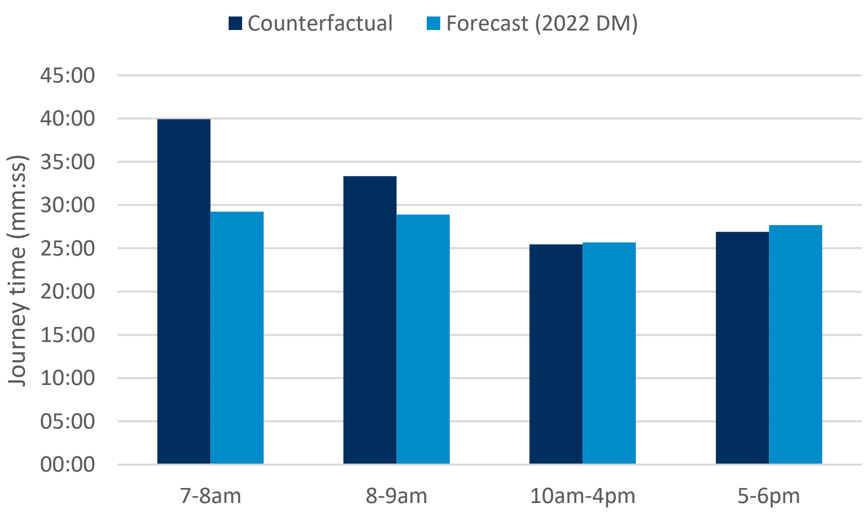
Figure 9 Forecast and observed journey times on the M3 J2-4a eastbound (with project)



Source: Traffic Forecasting Report (2014) and TomTom satellite navigation data

When comparing the without project forecast scenario to the counterfactual (both in 2022), there is a more mixed outcome (Appendix A). On the eastbound carriageway the counterfactual journey time, what would likely have happened if the project had not gone ahead, was higher than what we forecast in both the morning peaks, a 10 minute difference between 7-8 am. This indicates that there was some level of congestion before the project that the forecast did not pick up on. During the daytime (10am-4pm) and between 5-6pm there was a marginal difference.

Figure 10 Forecast and observed journey times on the M3 J2-4a eastbound (without project)



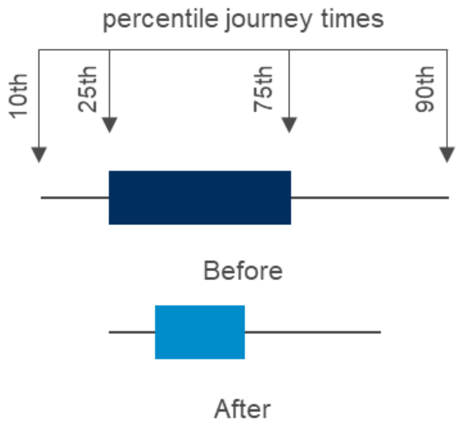
Source: Traffic Forecasting Report (2014) and TomTom satellite navigation data

There is a similar story on the westbound carriageway where the counterfactual in the evening peak (5-6pm) was higher than forecast, but the difference is under 2 minutes. For the other three periods, the observed journey times were lower than forecast.

Did the project make journeys more reliable?

Congestion can make journey times unreliable. If the time taken to travel the same journey each day varies, journey times are unreliable, and the road user is less confident in planning how long their journey will take them. If journey times do not vary, the road user can be more confident in the time their journey will take and allow a smaller window of time to make that journey.

Figure 11 What does a box plot show?



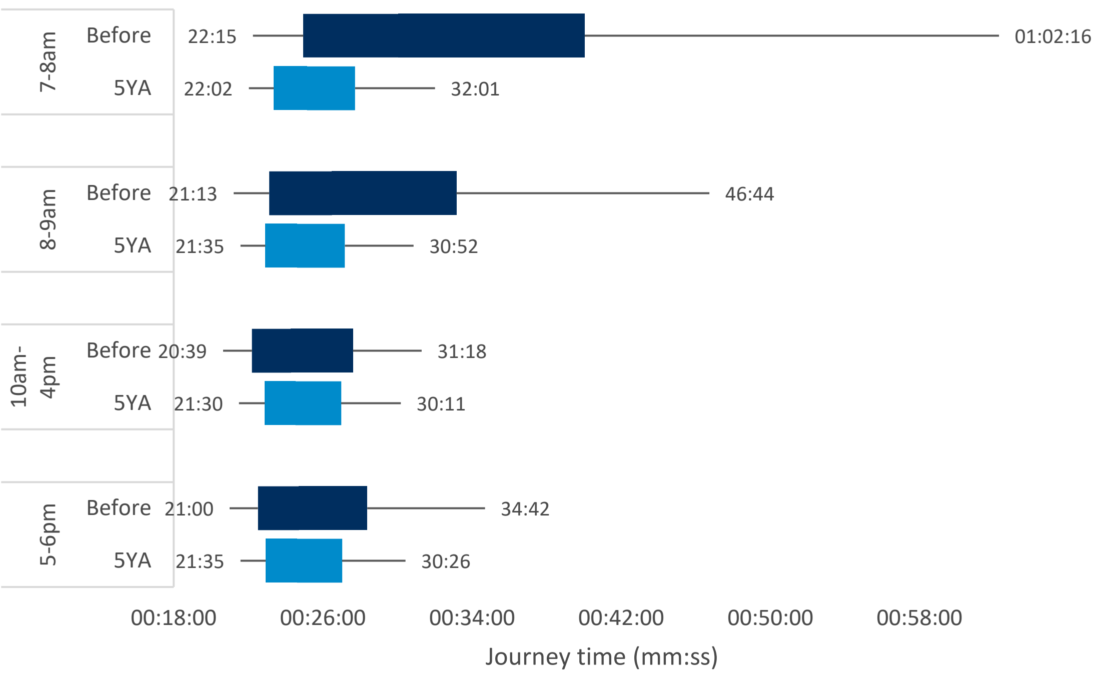
The lowest point is the 10th percentile, this means 10% of journeys take less than this amount of time to complete. The highest point is the 90th percentile, this means 90% of journeys take less time than this to complete.

The length of the box shows how the journey times vary between the 25th and 75th percentile (the journey time 25% and 75% of journeys are faster than). The narrower the box the less variable, and hence more reliable, the journey.

Average journey time reliability has been analysed for the eastbound and westbound routes on the M3 from junctions 1 to 5 to mirror the appraisal, where journey times were forecasted over the route a junction above and below the project extent.

At one year after, the 7-8am period on the eastbound carriageway saw the greatest improvements in journey reliability. At five years after this trend has remained with journeys being much less variable (Figure 12). The most notable improvement is the 90th percentile, representing the slowest journeys, which have reduced by 30 and 15 minutes respectively for the 7-8am and 8-9am peaks. Another measure to look for is the interquartile range, the difference between the 25th and 75th percentile journeys (the blue boxes in Figure 12 and Figure 13). During 7-8am this variability was 15 minutes before the project and has reduced to just over 4 minutes at five years after. For 8-9am this reduced from 10 minutes down to 4 minutes. Half of all journeys made within each time periods are contained within these boxes, if they get shorter then journeys become less variable, meaning road users can be more confident of the time it takes to travel through the route.

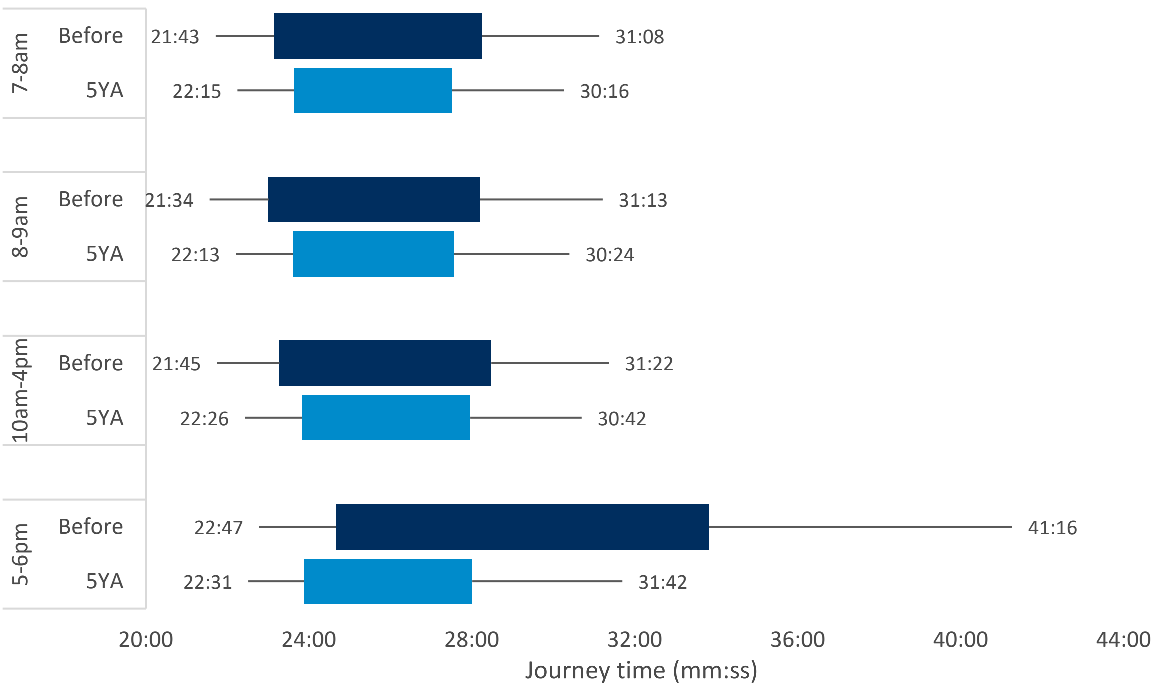
Figure 12 Journey reliability on the M3 J1-5 eastbound



Source: TomTom satellite navigation data (November 2013 to October 2014 and November 2021 to October 2022)

In the westbound direction (Figure 13), the improvement in journey time reliability is less marked than eastbound, but still substantial in each of the four peak periods, especially the evening peak. Between 5-6pm, the slowest journeys improved by 10 minutes, with minor improvements in the other periods. The interquartile range (middle 50% of journeys) also improved for this time period from 9 to 4 minutes, and improvement of 5 minutes.

Figure 13 Journey reliability on the M3 J1-5 westbound

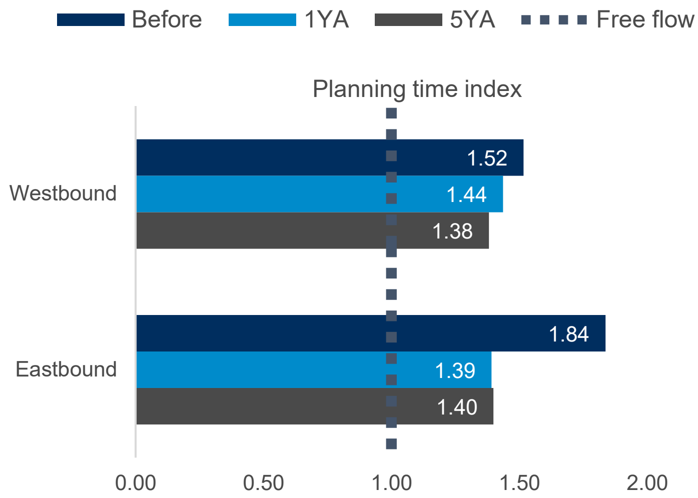


Source: TomTom satellite navigation data (November 2013 to October 2014 and November 2021 to October 2022)

In both directions, the 10th percentile journey times (fastest journeys) mostly went up slightly from before to five years after, indicating that the fastest ten percent of journeys got slower, though the differences were generally small at around 30 seconds.

Another measure of journey reliability is planning time index (PTI). It measures the additional time drivers must allow to ensure they arrive at their destination on time in 95% of cases. Before the project, customers travelling on the eastbound carriageway from junctions 5 to 1 would have needed to allow an additional 84% of time to travel in order to get to their destination on time. At five year after, this has reduced to 40%. The westbound carriageway has continued to get more reliable from before to five years after, though the improvements are less substantial. The extra time needed before was 52% which has reduced to 38% after.

Figure 14 Planning time index for the M3 junctions 1 to 5



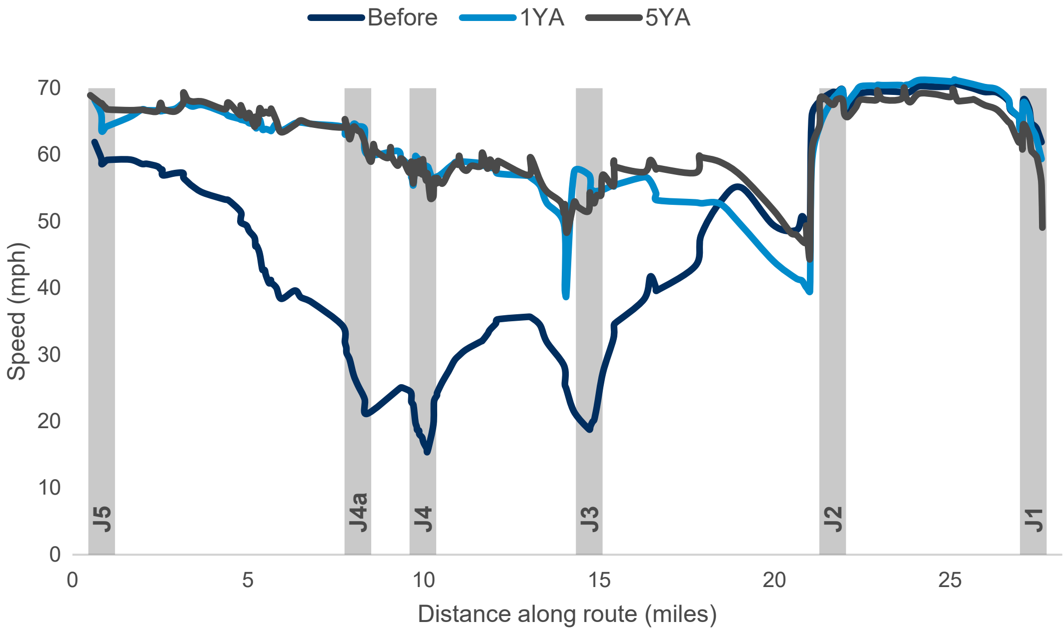
Source: TomTom satellite navigation data (November 2013 to October 2014 and November 2021 to October 2022)

Overall, journey reliability has improved for all time periods and directions. As is the case with average journey times, the biggest improvements are in the commuter peaks – 7-8am eastbound and 5-6pm westbound.

How did the project impact road user’s speeds?

Before the smart motorway was constructed, there was considerable congestion on the eastbound carriageway on the approach to junction 2 for the M25. Traffic often blocked back from junction 2 all the way to junction 5. This was particularly evident during the morning peaks, 7-8am and 8-9am (Figure 15). Both at one year after and five years after, the project appears to have drastically improved this congestion, however with some delays still occurring on the approach to junction 2. This is largely expected as junction 2 forms part of a complex interchange with the M25 with the majority of traffic leaving the motorway here. At five years after, speeds along the route from junction 5 to junction 2 are smoother compared to before, with a small dip in speed at junction 2.

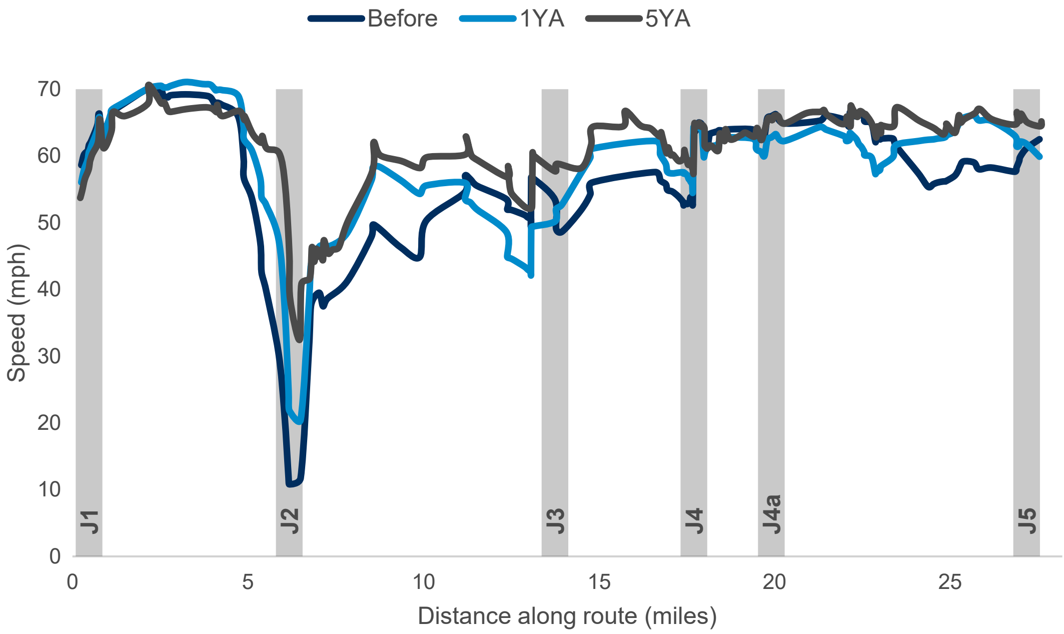
Figure 15 Average speed over distance on the M3 J1-5 eastbound at 7-8am



Source: TomTom satellite navigation data (November 2013 to October 2014 and November 2021 to October 2022)

On the westbound carriageway, traffic often built up at junction 2 as vehicles joined from the M25 (Figure 16). Average speed here was as low as 10mph during 5-6pm before the smart motorway. At five years after, this bottleneck has improved, though there is still some level of congestion art the junction. Average speed gradually increases but does take a dip at junction 3. Feedback from the one-year evaluation found that there was some blocking back from the junction exit slip road, likely to be caused by a series of traffic lights on and around the junction. We understand that work was done to improve the timing of the lights, and the congestion here has seen a small improvement.

Figure 16 Average speed over distance on the M3 J1-5 westbound at 5-6pm



Source: TomTom satellite navigation data (November 2013 to October 2014 and November 2021 to October 2022)

5. Safety evaluation

Summary

The safety objective for this project was to maintain and, where possible, improve current safety standards. Most of the expected safety benefits were related to improvements in journey time and reliability.

The business case forecast a saving of 634 collisions over the 60-year appraisal period across the project extent and wider area. This results in a saving of three fatal, 11 serious and 620 serious collisions. The monetary value of the overall change in collisions would be a benefit of over £17 million. This would demonstrate a 23% reduction in the cost of collisions as measured by Fatal Weighted Injury (FWI) causalities.

Table 2 captures all the key measures for the project extent from before to after construction. The five-year evaluation shows a reduction across all key safety measures except a slight increase in serious collision severity and killed and seriously injured.

Table 2 Summary of project extent key measures

Measure		Before	After	Counterfactual	Change[13]
Personal Injury Collisions		61	39	45	-22
Collision Rates		10	7	7	-3
Measure		**Before**	**After**	**Change**	
Collision Severity	Fatal	4	2	-2	
	Serious (average)	4	5	1	
	Slight (average)	29	19	-10	
Fatal Weighted Injury[14]		2.6	2.1	0	
FWI/hmvm[15]		0.4	0.4	0	
Killed or Seriously Injured[16]		7.9	10.3	2.4	
KSI/hmvm[17]		1.3	1.8	0.5	

Source: STATS19 1 May 2009 – 31 July 2022

The average collision rate in the wider area has reduced by seven personal injury collisions (PIC) per hmvm since the project has been open to traffic. The average PIC has reduced by 920 (annual average of 2,206 before to 1,286 PICs after) in the same period. There has been a positive reduction across all three collision

[13] Rounding has been applied to values. Therefore, independent calculations may not result in the values presented in the table.
[14] The FWI weights collisions based on their severity. A fatal collision is 1, a serious collision is 0.1 and a slight collision is 0.01. The combined measure is added up. A full number is the equivalent to a fatality.
[15] FWI/hmvm = Fatal Weighted Injury per Hundred Million Vehicle Miles.
[16] The number of people killed or seriously injured (KSI) in road traffic collisions. This metric is non-weighted but does not pick up all injuries (slight casualties). KSI rate per hmvm is the rate calculated using the number of people who are killed or seriously injured, and the total miles travelled on a road section or type.
[17] KSI/hmvm = Killed or Serious Injured per Hundred Million Vehicle Miles.

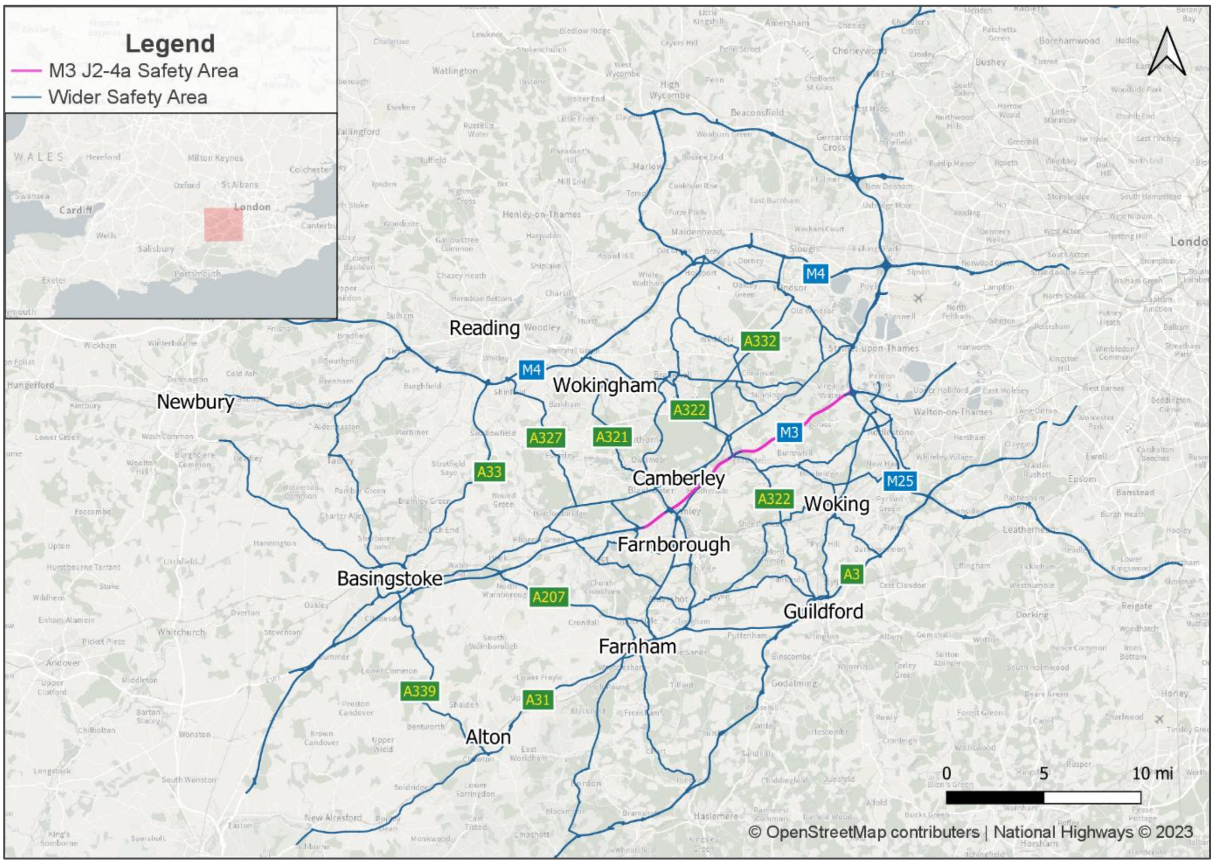
severities, FWI and KSI measures. If the wider area continues to perform at the current level, it will meet the predicted reduction. A full summary of the wider area can be found in Appendix B.

At this five-year evaluation point the project is on track to meet its objective to maintain and, where possible, improve safety standards.[18]

Safety study area

The safety study area is shown in Figure 17. This area is assessed in the appraisal supporting the business case for the project. We have therefore replicated the appraisal study area to understand the emerging safety trends.

Figure 17 Safety study area



Source: National Highways and OpenStreetMap contributors

Road user safety on the project extent

How had traffic flows impacted collision rates?

The Department for Transport release road safety data[19] that records incidents on public roads that are reported to the police. This evaluation considers only collisions that resulted in personal injury.

The safety analysis has been undertaken to assess changes over time looking at the trends in the five years before the project was constructed to provide an annual

[18] Projects are appraised over a 60-year period. This conclusion is based on the findings at five years after the project opened for traffic.
[19] https://data.gov.uk/dataset/cb7ae6f0-4be6-4935-9277-47e5ce24a11f/road-safety-data

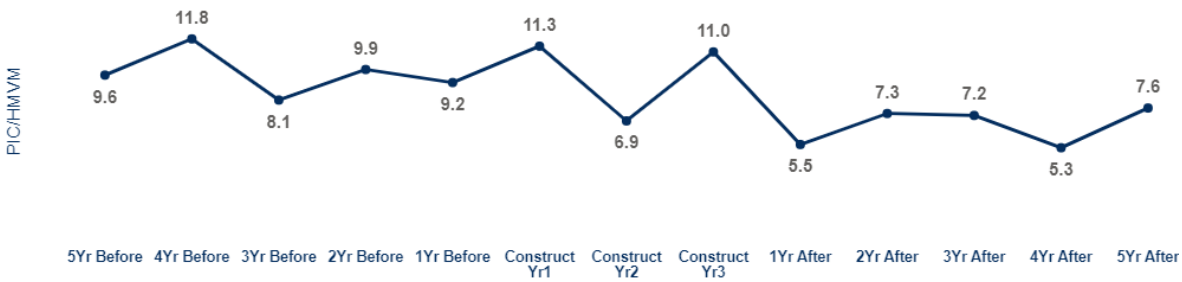
average. We have then assessed the trends from the first five years after the M3 junction 2-4a smart motorway project was operational and open for road users.

- Pre-construction: 1 May 2009 – 30 April 2014
- Construction: 1 May 2014 – 31 July 2017
- Post-opening: 1 August 2017 – 31 July 2022.

To understand potential safety benefits, we consider changes in the volume of traffic and the number of collisions observed. A rate is calculated using the number of personal injury collisions and the total miles travelled on a road section or type. The rate is presented as the number of collisions per hundred million vehicle miles (hmvm).

The average collision rate had decreased to seven personal injury collisions per hmvm, this equates to travelling 16 million vehicle miles before a collision occurs. Five years before the project, the average collision rate was ten personal injury collisions per hmvm, this equates to traveling ten million vehicle miles before a collision occurs (Figure 18).

Figure 18 Annual average of collision rate



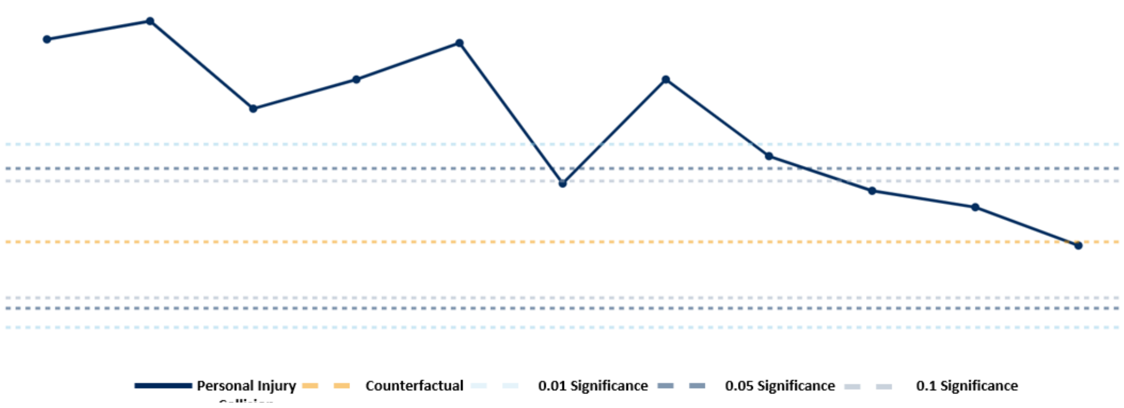
Source: STATS19 1 May 2009 – 31 July 2022

As part of the safety evaluation, we look to assess what changes in collision rates might have occurred due to factors external to the project over this timeframe. To do this we estimate the trend in personal injury collisions which might have occurred if the road had remained in its previous configuration (this is referred to as a counterfactual). This is based on changes in regional safety trends for dual carriageways on the strategic road network with a high volume of road users.

Figure 19 What does the counterfactual show?

The counterfactual is an estimation of what we think would occur without the project taking place. We estimate a range of collisions that follow regional trends. The chart shows:

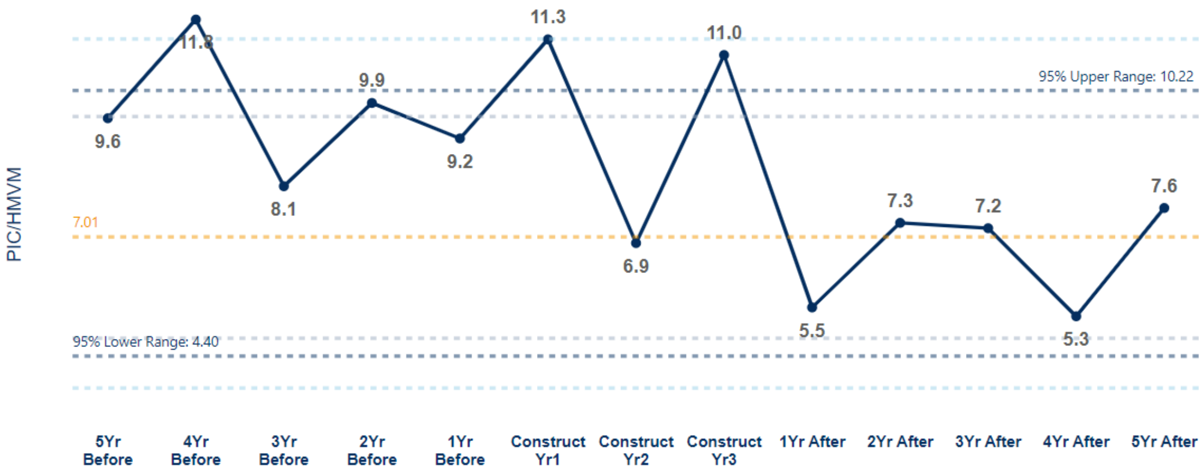
1. Timeseries of personal injury collisions
2. Estimated counterfactual range, which comes from a X^2 hypothesis test on one degree of freedom using a significance level of 0.05. More details can be found in the POPE Methodology Manual.
3. National Highways are developing new statistical methods to compare collision and casualty rates. We anticipate adopting these once the methods are finalised.



Based on this assessment, we estimate that if the M3 junction 2-4a smart motorway project had not occurred, the trend in the number of personal injury collisions and collision rates would likely have reduced, but not to the extent where we can be confident that the project is a cause for this reduction.

The counterfactual test estimated rate would likely reduce to seven personal injury collisions per hmvm (Figure 20). This counterfactual scenario indicates there would be a reduction in the number of collisions without the project, but the frequency of collisions would reduce mainly as a consequence of increased traffic flows. The after annual average collision rate is equal to the counterfactual rate suggesting that the project could be having a neutral impact.

Figure 20 Annual average number of collision rate with counterfactual scenario ranges



Source: STATS19 1 May 2009 – 31 July 2022

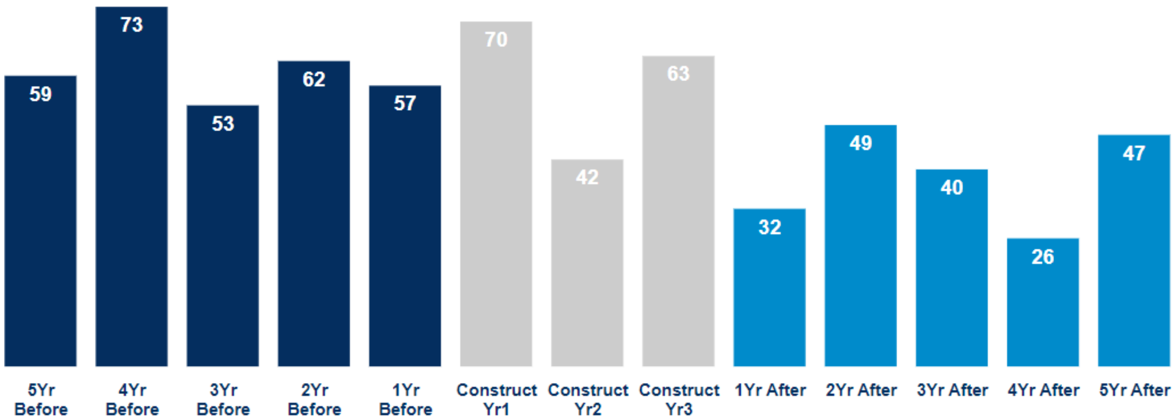
What impact did the project have on road user safety?

The evaluation found the number of personal injury collisions on the project extent had decreased. During the first 60 months the project was operational, there were on average 39 personal injury collisions per year, 22 fewer than the average 61 per year over the five years before the project was constructed (Figure 21).[20]

Average personal injury collisions

61	39	22
Before	After	Fewer

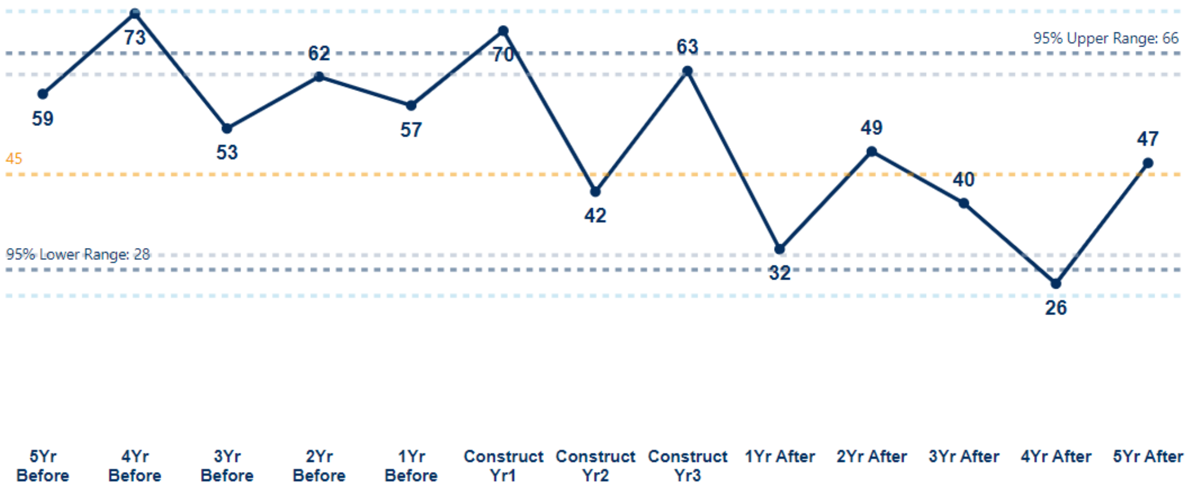
Figure 21 Annual personal injury collisions



Source: STATS19 1 May 2009 – 31 July 2022

A counterfactual test has also been performed which estimates 45 personal injury collisions would be expected as shown in Figure 22.

Figure 22 Annual average number of personal injury collisions with counterfactual scenario ranges



Source: STATS19 1 May 2009 – 31 July 2022

20 Personal injury collisions are presented as averages and have rounding applied to values. Therefore, independent calculations may not result in the values presented.

Dissimilar to collision rates, collision numbers are lower than what we would have expected without the project. This is a positive indication that the project has had a positive impact on safety.

What changes in the severity of collisions did we see?

Collisions which result in injury are recorded by severity as either fatal, serious, or slight. The way the police record the severity of road safety collisions changed within the timeframes of the evaluation, following the introduction of a standardised reporting tool – Collision Recording and SHaring (CRASH, see Appendix B). This is an injury-based reporting system, and as such severity is categorised automatically by the most severe injury. This has led to some disparity when comparing trends with the previous reporting method, where severity was categorised by the attending police officer.[21] As a consequence, the Department for Transport have developed a severity adjustment methodology[22] to enable robust comparisons to be made.

The pre-conversion collision severity has been adjusted, using the Department for Transport's severity adjustment factors, to enable comparability with the post-conversion safety trends.[23]

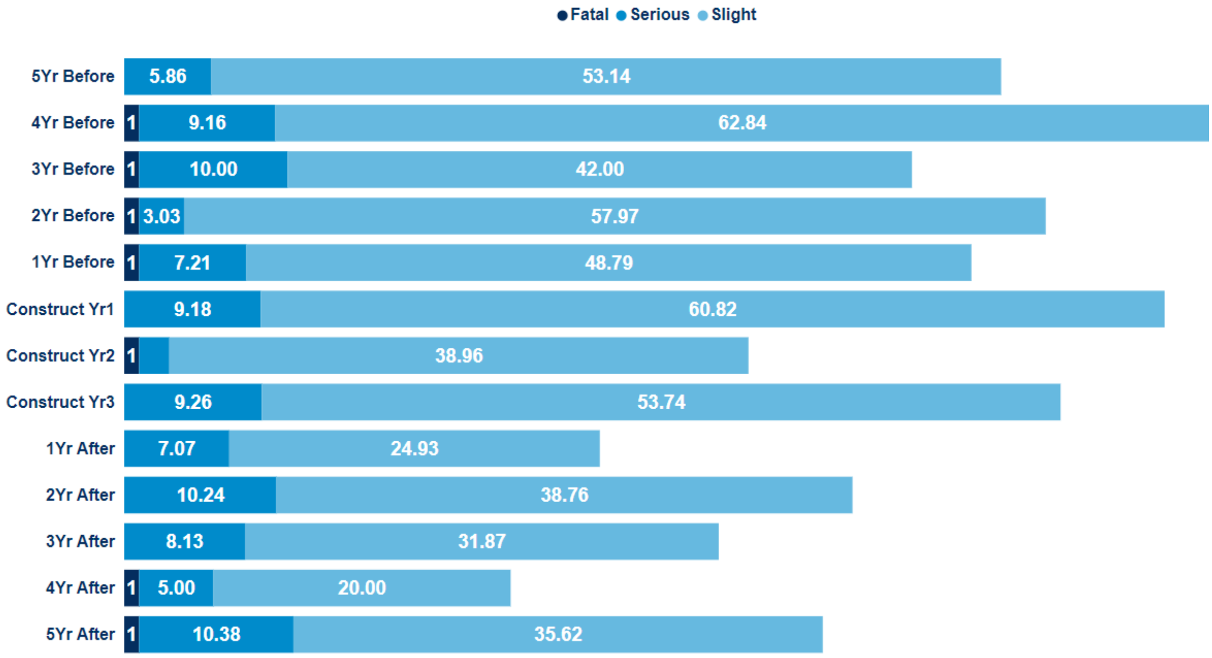
After the project, there has been a reduction in the number of total fatal and average slight collision severities. There has been a slight increase in the number of average serious collisions (Table 3). Figure 1 shows the full breakdown of severity of personal injury collisions by project year.

Table 3 Number of personal injury collisions by severity

Severity	Before	After	Change	Change direction
Fatal	4	2	2	⬇
Serious (average)	4	5	1	⬆
Slight (average)	29	19	10	⬇

21 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/820588/severity-reporting-methodology-final-report.odt
22 https://www.gov.uk/government/publications/guide-to-severity-adjustments-for-reported-road-casualty-statistics/guide-to-severity-adjustments-for-reported-road-casualties-great-britain#guidance-on-severity-adjustment-use
23 Collision Severities within this report use the 2022 adjustment factor.

Figure 23 Severity of personal injury collisions within the project extent



Source: STATS19 1 May 2009 – 31 July 2022

What impact did the project have on casualty severity?

Like other transport authorities across the UK the key measure we use to assess the safety of roads, is Fatal and Weighted Injuries (FWI). This gives a fatality 10 times the weight of a serious casualty, and a serious casualty 10 times the weight of a slight casualty[24]. In effect, it takes all non-fatal injuries and adds them up using a weighting factor to give a total number of fatality equivalents[25]. This is represented by an annual average and a rate that standardise casualty severities against flow to show the likelihood of a fatality equivalent occurring per distance travelled.

There has been no change in the FWI observed annually. The severity of casualties occurring after the project became operational has not reduced in the project extent. After the project, an annual average of 2.1 FWI were observed and 2.6 FWI before the project.

The combined measure showed an increase of 30 million vehicle miles was travelled before a FWI.[26] The rate of FWI per hmvm[27] has reduced. This suggests that taking into account changes in traffic, the project is having a neutral safety impact on the severity of casualties within the project extent.

[24] The FWI weights Collisions based on their severity. A fatal collision is 1, a serious collision is 0.1 and a slight collision is 0.01. So 10 serious collisions, or 100 slight collisions are taken as being statistically equivalent to one fatality.
[25] Casualty severities within this report use the 2022 adjustment factor.
[26] Before the project, 234 million vehicle miles needed to be travelled before a FWI (0.4 FWI per hmvm). After the project this increased to 264 million vehicle miles (0.4 FWI equivalents per hmvm).
[27] hmvm – hundred million vehicle miles

We also assess the impact the project had on casualties using the Killed or Seriously Injured (KSI) measure [28], and consider changes in traffic by calculating an average rate for every hundred million vehicles miles (hmvm) travelled.

An increase of two KSI has been observed annually. Increasing from an average of eight KSI before to ten KSI after. The rate of KSI per hmvm has slightly increased from an average of 1.3 to 1.8 for every hmvm travelled.

The observations for KSI suggests that the project is having a no safety impact on the severity of casualties within the project extent.

Has the project achieved its safety objective?

The safety objective was to maintain and, where possible, improve current safety standards. We have observed a positive reduction in the rate and number of collisions and improvement to the impact on fatal and slight collision severity. However there has been a slight increase in the number of serious casualties and KSI. Observations from the wider safety area suggest a positive impact on all key safety measures. In the wider safety area, the reduction in rate and number of collisions are statistically significant. We believe that the project has met its safety objective.

The business case forecast a saving of 634 collisions over the 60-year appraisal period across the project extent and wider area. This results in a saving of three fatal, 11 serious and 620 serious collisions. Findings at the five years after stage suggest the project is likely to meet the appraisal scenario.

[28] The number of people killed or seriously injured in road traffic collisions. This metric is non-weighted but does not pick up all injuries (slight casualties). KSI rate per hmvm is the rate calculated using the number of people who are killed or seriously injured, and the total miles travelled on a road section or type.

6. Environmental evaluation

Summary

The evaluation of environmental impacts uses information on the predicted impacts gathered from the Department for Transport environmental appraisal[29] and the Environmental Statement (ES) and compares them with findings obtained five-years after the project opened for traffic. The five-years after information was based on observations made during a site visit along with desktop research. The project opened for traffic in June 2017 and the five-years after site visit was undertaken in August 2022.

The results of the evaluation were recorded against each of the environmental appraisal sub-objectives (noise, air quality, greenhouse gas emissions, landscape, heritage of historic resources, biodiversity, and journey quality) and are summarised in the following sections. These findings are based on whether, five years since opening, conditions are: better than; worse than; or as expected. These do not necessarily mean that the overall impact as set out at the appraisal stage will change if the conditions are not as expected, but further aftercare may be required. This assessment is a snapshot in time based on desktop reviews and site visits and reflects progress observed at five-years after, and the effectiveness of any mitigation measures towards achieving the desired design year (15 years after opening) outcomes.

The project was originally designed with a temporary 60mph speed limit between junction 4 and 4a. This was to manage predicted adverse air quality effects caused by changes in traffic flows in the opening year. During the detailed design of the project further assessment work was done which concluded that with a delay in opening year to 2017, and improvements in emissions from vehicles, the speed restriction was no longer required. The outcome of this further assessment work which has been applied to update the prediction of noise and air quality impacts was reported in the Environmental Assessment Addendum June 2015.

The five-years after evaluation highlighted that the environmental outcomes of the project were broadly as expected for most sub-objectives. The noise impacts of the project were as expected. The impacts were also as expected for journey quality due to better motorway information, higher journey time benefits, and journey reliability.

Noise

The environmental assessment addendum predicted that in the short term 99% of residential properties would experience a decrease in noise and 1% an increase. The overall impact of the project on noise receptors was assessed to be negligible/minor beneficial. In the long term 92% would experience a reduction in noise, 7% an increase and 1% no change. Overall, the noise impacts of the project were predicted to be negligible beneficial.

Our one-year after evaluation concluded that low noise surfacing was provided broadly as expected. Noise monitoring undertaken suggested that in the opening year, daytime noise levels were lower than preconstruction levels. A comparison of

[29] https://www.gov.uk/government/publications/tag-unit-a3-environmental-impact-appraisal

forecast traffic data and observed traffic flows along the M3 also showed that impacts were likely to be as expected.

This five-years after evaluation confirmed that noise-reducing mitigations such as noise barriers were provided and likely to function as expected. A comparison between forecast and observed traffic data confirmed that traffic flows were less than forecast by between 3 to 12% (within the threshold) for all road links that were part of the project. Heavy duty vehicles flows and average speeds were also lower and within the thresholds (within 10% for heavy duty vehicles and within 10kph for speeds). This outcome on traffic flows and speeds suggested that the impact of the project on noise was as expected.

Air quality

The environmental assessment addendum reported that there are seven air quality management areas and receptors sensitive to air quality changes within the project study area. This included residential properties and designated ecosystems. The appraisal predicted that with the project, the majority of receptors would experience concentrations of nitrogen dioxide[30] below the UK air quality standards[31]. For those above, the majority of increases would be small or imperceptible. The project was assessed to be at low risk of non-compliance with the national air quality threshold. The overall impact of the project on air quality was considered not significant.

At one-year after opening analysis of traffic flow and speed data indicated that flows and speeds were broadly as expected although between junction 4 and 4a flows were over 1000 lower. However, observed heavy-duty vehicle flows were higher than expected along the project extent so this suggested that there might be a risk that overall emissions could be higher than expected. Local air quality monitoring by the Surrey Heath Borough Council at one-year after (in 2018) indicated that none of the monitoring locations exceeded the national air quality threshold. Overall, this suggested that, despite the increase heavy-duty traffic, no significant effects had as expected arisen due to the implementation of the project.

At five-years after, available monitoring data from Surrey Heath Borough Council[32] and National Highways indicated that air quality complied with the annual air quality standards. There was a decrease in annual mean nitrogen dioxide concentrations and particulate matter concentrations had not increased in 5years. Our evaluation also analysed the five years after traffic data which suggested that traffic flows were still lower than forecast by between 4,300 to 14,000 for road links that were part of the project. Heavy duty vehicle traffic flows were also lower than forecast by more than 1,500 to 5,000 (average daily traffic). This suggested that air quality impacts were likely to be better than expected.

Greenhouse gases

The appraisal reported that the project was expected to have an adverse impact on carbon emissions due to changes in traffic flows following the implementation of the project.

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[30] Nitrogen dioxide is the principal air pollutant associated with vehicle emission.
[31] https://uk-air.defra.gov.uk/air-pollution/uk-limits.php
[32] Surrey Heath air quality website: https://www.surreyheath.gov.uk/environment/air-and-land-quality/air-quality/air-quality-management-surrey-heath

To evaluate the greenhouse gas emissions of the project, forecast and observed traffic data is required for the whole appraised study area. Traffic data is not usually available for the whole study area and typically we only have data for the project extent. This means that the evaluation considers just the emissions for the project extent itself (M3 junction 2-4a). This approach has limitations as it means direct comparisons with the forecast emissions reported in the appraisal which were for the whole study area cannot be made. However, at five years after, it does allow some understanding into the accuracy of the forecast and observed emissions along this section of the project.

The one-year after evaluation reported that whilst total flows were lower than forecast, the total observed emissions in 2018 were 15,221 tonnes higher than forecast. This was likely to be due to the higher than observed heavy-duty vehicles along the project. Our five-years after used the latest Emissions Factor Toolkit 2023 v12.1[33] to calculate greenhouse gas emissions along the project extent. The resulting figures show that whilst total flows were lower than forecast as at one-year after, the total observed emissions in 2022 were still higher than forecast by 11028 tonnes. As at one-year after, this was likely to be due to the increase in the of heavy-duty vehicle traffic.

Table 4 Tonnes of Carbon dioxide at five years after for the M3 J2-4a project

Forecast (tonnes per year in 2022)	Observed (tonnes per year in 2022)	Difference (tonnes per year in 2022)
214229.05	225257.54	11028.49

Landscape

The environmental appraisal reported that the incorporation of the Smart Motorways ALR within the existing motorway corridor would be unlikely to give rise to significant impacts on the existing landscape fabric. Localised adverse visual impacts were expected with the addition of new gantries at some prominent locations along the M3 corridor. With mitigation in place, including minimising site clearance and targeted mitigation planting, the existing framework of screening vegetation, motorway landform and environmental barriers would be able to accommodate the new infrastructure without resulting in significant effects on landscape character. Overall, the impact of the project on landscape character and visual amenity was expected to be slight adverse.

A site visit was undertaken in August 2022 to evaluate the predicted and observed landscape character and visual impacts of the project. The visit focused on a sample of key impacts reported in the environmental assessment and the observations then used to consider the project as a whole. Our evaluation confirmed that the works were online and as the M3 was already a prominent feature in the landscape, the project had not significantly changed the local landscape character. Based on the available information and the evidence gathered as part of the five-year after evaluation site visit, new motorway signs, CCTV, emergency areas, gantries, and the new concrete barrier in the central reservation had led to some slight increases in urbanisation around Camberley,

[33] EFT2023 v12.1 is here: https://lair qualitym.defra.gov.uk/air-quality/air-quality-assessment/emissions-factors-toolkit/

Frimley and Farnborough. These were was expected. The visual amenity was impacted largely as expected. Vegetation clearance was localised and most existing vegetation had been retained broadly as predicted. It was still providing screening in the rural aspects of the project area including (i.e., between junction two and junction 3 - Chobham, Bagshot and Lightwater). There were some locations where impacts were worse. Mitigation planting had failed in a number of locations but remedial works during the aftercare period had been undertaken. Ongoing maintenance particularly at those locations where planting had failed will be required to ensure the planting does meet the intended mitigation targets by the designed year. Overall, provided an appropriate maintenance regime is continued, the impacts of the project should be as expected.

Figure 24 Landscape Character Area B – South Chobham Common heathland[34]

Before the project (Source: Environmental Assessment Report Volume 2, April 2013)

At 5YA (Source: 5YA Evaluation visit, August 2022)

Figure 25 Example of visual impact looking along Waverley Drive towards the M3

Before the project (Source: Environmental Assessment Report Volume 2, April 2013)

At 5YA (Source: 5YA Evaluation visit, August 2022)

Heritage of historic resources

The environmental appraisal reported that the Project would have a slight adverse effect, due to visual impacts on the setting of two Grade II listed buildings (Birch Hall[35] and Church of St John the Baptist[36] in Windlesham). Though there would be

[34] South Chobham Common Heathland,' a Natura 2000 site, a National Nature Reserve (NNR), a Site of Special Scientific Interest (SSSI), a Special Area of Conservation (SAC) and Special Protection Area (SPA)
[35] Birch Hall: https://historicengland.org.uk/listing/the-list/list-entry/1377544
[36] Church of St. John: https://historicengland.org.uk/listing/the-list/list-entry/1030002

small changes in the settings of three archaeological assets (Kiln Fields), the impacts on these and on other heritage resources, was expected to be mitigated by design, particularly the continuation of existing screening and the addition of new landscape screening. No significant effects were expected on Conservation Areas. The effect on other heritage resources was expected to be neutral throughout. Overall, the assessed impact on the heritage resource was predicted to be slight adverse.

A five-years after site visit was undertaken to evaluate the predicted and observed visual impacts of the project reported in the appraisal and environmental assessment. The evidence gathered during the site visit suggested that, works were largely confined within the present highways boundary and were not likely to have impacted on any known archaeological deposits. For historic buildings and historic landscapes (Windlesham Conservation Area and Hawley Park), impacts were likely to be as expected. This was due to the distance between the historic features (e.g., St John's Church in the Windlesham Conservation Area) and the motorway combined with the screening effect of woodlands and trees which minimised visual impacts. At five-years after, the overall impacts of the project on the historic environment were broadly in line with those predicted.

Figure 26 Looking towards the M3 from Rectory Lane, Windlesham

Before the project (Source: Environmental Assessment Report Volume 2, April 2013)

At 5YA (Source: 5YA Evaluation visit, August 2022)

Biodiversity

The environmental appraisal reported that the project would not encroach beyond the highway Boundary. Thus, impacts on sensitive neighbouring habitats would be minimised. It was proposed that any new infrastructure through Chobham Common SSSI, SAC and SPA[37] would be minimised to limit impacts on verge and adjoining habitats. Mitigation measures would be implemented to minimise the impacts on protected species during construction. However, during operation, it was predicted that slight adverse impacts would affect otters, badgers, common reptile species and breeding birds due to a potential increase in mortality caused by traffic being brought closer to verge habitats used by these species. The overall impact of the project on biodiversity was expected to be slight adverse.

Our evaluation considered the impacts of the project on biodiversity by reviewing the available documentary evidence and by observing the impacts during a site

[37] SSSI (Site of Special Scientific Importance), SAC (Special Area of Conservation) and SPA (Species Protection Area).

visit. Safety considerations meant that observations were limited to those possible from overbridges along the route, e.g., at Bridge Lane and at Woodland Lane around Chobham Common (SSSI, SAC and SPA). Based on the observations, our evaluation confirmed that the works were largely online and changes to habitats (impacts to species and habitats) were likely to be very minimal, as expected. Our observations indicated that the amount of new infrastructure within the designated area of Chobham Common had been limited and vegetation had been retained where possible to help safeguard key protected fauna species.

The Handover Environmental Management Plan confirmed that most of the proposed species mitigation was undertaken. This included measures to reduce the risk of construction activities affecting breeding birds within the soft estate such as monitoring nesting birds around Chobham Common. It also included measures to avoid construction activities interfering with badger setts and protecting habitats used by reptiles. Post-construction records indicated that new reptile hibernacular were provided. However, no records were provided to confirm whether the proposed otter monitoring around the Blackwater River was undertaken. Although not all the expected monitoring information was provided, our evaluation confirmed that impacts to biodiversity were minimal and provided habitats along the highway verge re-establish the outcome of the project is likely to be as expected.

Journey quality

The environmental appraisal anticipated that by providing clear and unambiguous information via variable message signs (VMS), the smart motorway project would improve information on road conditions for road users. It was predicted that this would reduce driver frustration and route uncertainty, leading to an overall better outcome on driver stress. As no new facilities for travellers were to be constructed, a neutral impact was expected on traveller care. The project was not expected to lead to a significant change in traveller views (neutral impact) as the motorway was already an existing corridor in the landscape. The overall impact of the project on journey quality was expected to be large beneficial.

During our five-years after site visit, drive throughs were done on both the eastbound and westbound carriageways. Travellers' views were likely to be insignificantly impacted because vegetation clearance had been limited and existing views had been retained. There were no new traveller facilities, thus confirming the neutral impact on traveller care. The new VMS had improved information on traffic conditions for road users and analysis had confirmed that both journey times and reliability had improved. Overall, it was likely that driver stress had reduced as expected. The Value for Money analysis suggests that journey time benefits were higher than forecast. Reliability was also better. Thus, the impact of the project on journey quality was likely to be better than expected.

Overview

The results of the evaluation are summarised against each of the Transport Appraisal Guidance (TAG)[38] environmental sub-objectives and presented in Table 5. In the table we report the evaluation as expected if we believe that the observed impacts at five year after are as predicted in the appraisal. We report them as

[38] TAG provides guidance on appraising transport options against the Government's objective for transport

better or worse than expected if we feel the observed impacts are better or worse than expected.

Table 5 Summary of Environmental findings

Sub objective	AST Score	Five-year evaluation outcome	Five-year evaluation summary
Noise	Negligible beneficial	As expected	Noise mitigations (low noise surfacing and noise barriers) were provided. A comparison between forecast and observed traffic data indicated that traffic flows and speeds were lower than forecast but not by enough to change the outcome.
Air Quality	Insignificant	As expected	Available monitoring data suggested that local air quality satisfied air quality standards. A comparison of traffic data suggested vehicle flows were lower than forecast. The impacts of the project were not likely to be significant.
Greenhouse Gases	Overall value of change: NPV = -£57,640,077	As expected	At five-years after, our evaluation suggested that whilst total flows were lower than forecast as at one-year after, the total observed emissions were higher than forecast. This was likely to be due to the higher proportion of heavy-duty vehicle traffic.
Landscape	Slight Adverse	As expected	There were no significant effects on local landscape as the works were on line and much of the boundary vegetation retained. New infrastructure had led to a slight increase in urbanisation and some localised visual impacts as expected. Provided an appropriate maintenance regime is continued, the designed year outcome should be met.
Heritage of historic resource	Slight Adverse	As expected	The works were confined to within the existing highways boundary far from most heritage assets. New and retained vegetation along the boundary had also minimised the visual impacts of new the infrastructure.
Biodiversity	Slight Adverse	As expected	As smart motorway works were largely online, impacts to species and habitat were likely to be very minimal, as expected. Most species and habitat mitigations were implemented although the expected records were not provided to demonstrate that the construction of

Sub objective	AST Score	Five-year evaluation outcome	Five-year evaluation summary
			the project had not caused any changes to otter mortality.
Journey quality	Large Beneficial	Better than expected	Travellers' views were likely to be insignificantly impacted as expected. There were no new traveller facilities, thus confirming the neutral impact on traveller care as expected. Better information and improvement in signage and gantries was likely to reduce route uncertainty and driver stress as expected. The VfM analysis suggests that journey time benefits are higher than forecast. Reliability is also better.

7. Value for money

Summary

As part of the business case, an economic appraisal was conducted to determine the project's value for money. This assessment was based on an estimation of costs and benefits over a 60-year period.

The project was delivered at a cost of £195 million[39], just under the forecast cost of £199 million. In the first five years, the road provided additional capacity to support more road users, whilst improving the safety and reliability of those journeys. If this trend continues, the project is reforecast to deliver almost £500 million worth of safety, journey time and reliability benefits over the 60-year period[40].

Value for money was forecasted over a range of possible traffic growth scenarios[41], all of which resulted in 'high' value for money. The appraisal forecast significant traffic growth and improving journey times; the observed data at five years after suggested very little growth, and in some instances volumes were lower than before. However, journey times and journey reliability were considerably better than before, with key congestion points improving the most. This has impacted the project's value for money which we have re-forecast to be 'high'. As traffic growth is expected to return to what was forecast when this project was appraised, it is likely that this project is on track to deliver the value for money anticipated over the 60-year life of the project.

Forecast value for money

An economic appraisal is undertaken prior to construction to determine a project's value for money and inform the business case. The appraisal is based on an estimation of costs and benefits. The impacts of a project, such as journey time savings, changes to user costs, safety impacts and some environmental impacts can be monetised. This is undertaken using standard values which are consistent across government. The positive and negative impacts over the life of the project[42] are summed together and compared against the investment cost to produce a BCR, the monetised impacts are considered alongside additional impacts that are not able to be monetised, to allocate the project a 'value for money' category.

Since 2011, we have routinely forecasted benefits over a range of possible traffic growth scenarios.[43]

The monetised benefits forecast by the appraisal which supported the M3 junctions 2 to 4a smart motorway business case are set out in Table 6. These benefits relate to the core traffic growth scenario which we use to re-forecast and provide an

[39] Present value of costs in 2010 prices and values.
[40] Based on impacts on the Strategic Road Network.
[41] See section 7 – *Forecast value for money.*
[42] Typically project life is taken to be 60 years.
[43] For this project we undertook a core scenario, which is intended to provide a consistent basis for decision-making given current evidence, and a 'common comparator' to assess all projects and options against. There are significant uncertainties associated with forecasting travel demand. Therefore, we also undertook scenario testing to check whether the intervention is likely to still provide value for money under low demand assumptions and the likely effects of high demand on the project impacts. Not all the benefits considered would have contained high and low growth forecasts, so a proportionate method was designed to estimate these based on existing evidence.

estimate for outturn value for money based on data from the first five years after opening. During this evaluation, we considered the high and low growth scenarios in response to the lower than forecast traffic levels we have observed. We have also included an indication of what proportion of the monetised benefits each impact accounted for and a summary of how we have treated the monetisation of each impact in this evaluation. We have also included an indication of what proportion of the monetised benefits each impact accounted for and a summary of how we have treated the monetisation of each impact in this evaluation.

Table 6 - Monetised benefits for the core traffic growth scenario (£ million)

	Forecast (£m)	% of forecast monetised benefits	Evaluation approach
Journey times	289	56%	Re-forecast using observed and counterfactual traffic flow and journey time data for the project area only and not those in the wider area
Vehicle operating costs	-22	-4%	Re-forecast using observed and forecast traffic flow and journey time data
Journey time & VOC during construction and maintenance	-70	-14%	Not evaluated (assumed as forecast)
Journey time reliability	278	54%	Monetised benefits assumed as forecast
Safety	17	3%	Re-forecast using observed and counterfactual safety data
Carbon	-58	-11%	Not evaluated (assumed as forecast)
Air quality	-2	0%	Not evaluated (assumed as forecast)
Noise	-3	-1%	Not evaluated (assumed as forecast)
Indirect tax revenues	86	17%	Re-forecast using observed and forecast traffic flow and journey time data
Total present value benefits	**516**	**100%**	

Note: 2010 prices discounted to 2010. Due to rounding the numbers and percentages may not always add up exactly to the presented totals.

Evaluation of costs

The project was delivered at a cost of £195 million[44], just under the anticipated cost of £199 million (see Table 7). This comprised of £170 million in construction costs, and £25 million in maintenance costs.

The appraisal expected that the project would result in an increase in maintenance costs over the life of the project. As most of this maintenance is still in the future, the evaluation uses the maintenance costs forecast within the business case. The

44 This is the PVC (present value cost) of the project. This means it is presented in 2010 prices, discounted to 2010 to be comparable with the other monetary values presented.

present value cost (PVC) also accounted for a reduction to allow for funding for maintenance work which was going to be carried out if the project had not gone ahead with construction. This has been included in the maintenance costs.

Table 7 - Cost of the project (£ million)

	Forecast (£m)	% of forecast costs	Evaluation approach
Construction costs	173	87%	Current estimate of project cost
Maintenance costs	25	13%	Not evaluated (assumed as forecast)
Total present value costs	**199**	**100%**	

Note: 2010 prices discounted to 2010. Due to rounding the numbers and percentages may not always add up exactly to the presented totals.

Evaluation of monetised benefits

Once a project has been operating for five years, the evaluation monitors the construction costs and the trajectory of benefits to re-forecast these for the 60-year project life. It is not proportionate to replicate modelling undertaken at the appraisal of a project or to monitor benefits over the entire lifecycle, so we take an assessment based on the trends observed over the first five years of operation and estimate the trend over the project life, based on these observations. This provides a useful indication and helps to identify opportunities for optimising benefits. In instances where it was not feasible to robustly compare forecast and observed impacts, the findings have been presented with relevant caveats.

Monetised journey time benefits

As can be seen in Table 6, monetised benefits were primarily driven by forecasted reductions in journey times over the modelled period compared to a ‘do minimum’ scenario, what would be expected to happen if the smart motorway were not built. Therefore, in this section of our study, we have compared the ‘after’ journey times to an estimate of the ‘counterfactual’ - what journey times are likely to have been without the project. This allows for the deterioration in journey times that we would have expected to have happened due to growth in background traffic levels causing additional congestion.

We expected journey time benefits to be £289million, which included impacts from both the project extent (M3 junctions 2 to 4a) as well as the wider area (surrounding roads, strategic and local). This represented over half of the total benefits that were expected to be realised over a 60-year period, with the other half comprising of reliability benefits. Our method for reforecasting journey time benefits relies heavily on information from the appraisal, the forecasts undertaken at the time the business case was approved for the project. For this evaluation we were unable to obtain some of that information, so the method used to reforecast these benefits is limited to impacts on the project extent only, rather than the whole modelled area.

The evaluation has found that journey times have improved compared to the counterfactual (as well as before). The eastbound morning and westbound evening routes saw the largest improvements in journey times, a reduction of 13 minutes in the 7-8am eastbound peak. If the trends observed at the fifth year continue over the 60-year period, the monetised impact on journey times, for those using the road, would be £309million. This with the context that it only covers impacts on the project extent suggests that if the wider area were included, benefits would likely be much higher.[45]

Monetised journey reliability benefits

Journey time reliability was a main objective of this project. Our evaluation showed an improvement in reliability in all time periods for both routes, eastbound and westbound, with the slowest journeys seeing the largest improvements (see *Customer journeys*). Variability in the middle 50% of journeys for the eastbound morning and westbound evening peaks improved the most, but there were benefits to all time periods.

Monetisation of journey reliability benefits is calculated differently from those shown in section 4. It uses a programme called Motorway Reliability Incident and Delays (MyRIAD)[46] and is re-run using observed traffic flow data obtained in the evaluation. As we were unable to re-run MyRIAD in this instance, we have assumed the monetised benefits of £278million as forecast for the evaluation. Given the vast improvements to reliability, and the greater than forecast journey time benefits, this estimate is more than likely to be conservative.

Other reforecast impacts

We reforecast total safety benefits to be £17.4 million. This figure relates to the benefit on the strategic road network over 60-years (see *Safety evaluation*), with £41 million on the M3 and -£23.6 in the wider area. We have observed a saving in the number of personal injury collisions over the whole area and on the project event, which has translated to a reforecast monetised benefit of £27.9 million. This comprises of £51.5 million for the M3 and -£23.6 million for the wider area, which was left as forecast.

There are two further impacts associated with the changes in numbers and speeds of vehicles – indirect tax revenues and vehicle operating costs. Indirect tax revenues are the benefit to the government (and therefore society) of the additional tax income from the additional fuel consumed due to increased speeds and distances travelled. This was forecast to be positive because more vehicles were forecast and they were forecast to be travelling at higher speeds, and therefore using more fuel and paying more tax. Vehicle operating costs refer to the fuel and other costs borne by the user (such as the wear and tear on vehicles). This generally increases with increased distance travelled. There was a disbenefit forecast. We have reforecast that the impact on indirect tax revenues would be negative due to changes in the estimated fuel consumption. In the do minimum scenario (without project), fuel consumption was expected to be lower compared to the do something scenario (with project) as there would be more vehicles on the

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[45] Forecasts predicted that traffic growth would be higher in the fifth year post-opening than what we observed, due to a range of factors (see Customer journeys). Despite lower traffic growth, there were still large improvements in journey times. The overall impact on vehicle hours on the project section in the fifth year was estimated to be 343,950, whereas we have observed a saving of around 748,850, over double what was expected at the time the business case was approved.

[46] MyRIAD can be used to estimate the benefits of reduce delay and travel time variability caused by unforeseen incidents that reduce capacity such as breakdowns, accidents and debris on the carriageway and major disruptions such as spillages.

road. Due to a lower number of vehicles on the road at five years after compared to before, fuel consumption is estimated to be lower than before. Due to the way that we reforecast both of these impacts, vehicle operating costs have the opposite effect to indirect tax revenues, so we have reforecast these to be positive. The monetised impact for indirect tax revenues was expected to be £85.9 million, and applying the negative ratio this has resulted in -£14.6 million. Vehicle operating costs were expected to be -£22.5 million, but this is now £3.8 million.

Impacts assumed as forecast

The evaluation has not been able to reforecast the monetary value of noise, air quality and carbon benefits[47], and instead these were reported as forecast. This assumption is conservative because lower than forecast traffic flows are likely to mean that these impacts are better than forecast[48].

Journey times and vehicle operating costs during construction and maintenance are not evaluated and therefore assumed as forecast. As the vast majority of this maintenance is still in the future, we did not have any information with which to update the estimate for this and therefore the forecast from the appraisal remains our best estimate.

Overall value for money

The primary driver for monetised benefits of this project were journey times and journey reliability. Although traffic volumes were lower compared to before, there was still a significant improvement in journey times and reliability for road users. Other positive benefits included safety and indirect tax revenues, with carbon, air quality, noise and vehicle operating costs contributing towards negative benefits. For this evaluation, only journey time reliability was unable to be reforecast outside of our standard methodology. The M3 junctions 2 to 4a smart motorway was expected to deliver ‘high’ value for money over a range of traffic growth scenarios.

When considering an investment’s value for money we also consider benefits which we are not able to monetise. For this project, being in close proximity to Heathrow Airport and Greater London might be relevant considerations.

Based on the evidence from the first five years, at this stage the M3 junctions 2 to 4a smart motorway project is on track to realising its anticipated ‘high’ value for money over the 60-year life of the project. Most of the benefits contributing to the projects success arise from journey time and journey reliability improvements. It is likely that journey times increase in future years as the project accommodates additional traffic, though this was expected and was considered as part of the appraisal supporting the original business case. The project has continued the trend it set at one year after by evidencing improvements to safety, journeys, the environment, and delivering overall value for money.

[47] We do not have a method for reforecasting the monetised impact of noise, air quality or carbon impacts. These generally have a small contribution to the monetised benefits of projects and therefore the impact of assuming as forecast is unlikely to impact on the value for money rating of the project.
[48] Refer to section 6 for further detail on noise, air quality and greenhouse gas impacts.

Appendix A

A.1 Change in flow compared to counterfactual

Table 8 Counterfactual flow key

Before Flow	**One or more** of the following is true: - Growth is 0 or negative - Before Flow is larger than After Flow - Before Flow is larger than Before Capacity
Before Capacity*	Before Flow is less than Before Capacity and **both**: - Before Capacity is less than After Flow - Before Capacity is less than Growthed Before Flow
Growthed Before Flow	Growth is greater than 0 and **both**: - Growthed Before Flow is less than After Flow - Growthed Before Flow is less than Before Realistic Capacity
After Flow	Before Flow is less than After Flow and **both**: - After Flow is less than Growthed Before Flow - After Flow is less than Before Realistic Capacity

Table 9 Counterfactual flows for 7-8am

Section	Eastbound			Westbound		
	Before	C/f	five-years after	Before	C/f	five-years after
J5 to J4a	3,646	3,725	3,905	3,043	3,043	2,187
J4a to J4	3,918	4,003	4,450	4,352	4,352	4,029
J4 to J3	4,491	4,588	5,362	3,872	3,872	3,437
J3 to J2	5,263	5,377	5,638	3,631	3,631	3,202
J2 to J1	3,032	3,032	2,695	3,420	3,420	2,852

Table 10 Counterfactual flows for 8-9am

Section	Eastbound			Westbound		
	Before	C/f	five-years after	Before	C/f	five-years after
J5 to J4a	3,572	3,650	3,681	2,798	2,798	2,164
J4a to J4	4,045	4,053	4,053	4,440	4,440	3,963
J4 to J3	4,368	4,462	4,574	4,157	4,157	3,663
J3 to J2	4,604	4,604	4,503	3,859	3,859	3,330
J2 to J1	2,588	2,588	2,471	3,514	3,514	2,955

Table 11 Counterfactual flows for 10am-4pm

Section	Eastbound			Westbound		
	Before	C/f	five-years after	Before	C/f	five-years after
J5 to J4a	2,882	2,882	2,808	1,586	1,614	1,614
J4a to J4	3,233	3,233	3,139	3,927	4,012	4,174
J4 to J3	3,630	3,630	3,496	3,720	3,720	3,684
J3 to J2	3,835	3,835	3,729	3,278	3,349	3,350
J2 to J1	1,419	1,450	1,525	2,975	3,001	3,001

Table 12 Counterfactual flows for 5-6pm

Section	Eastbound			Westbound		
	Before	C/f	five-years after	Before	C/f	five-years after
J5 to J4a	3,806	3,806	3,341	2,881	2,881	2,576
J4a to J4	4,218	4,218	3,834	5,415	5,532	5,604
J4 to J3	4,471	4,471	4,150	5,102	5,102	4,912
J3 to J2	4,183	4,183	3,877	4,709	4,709	4,321
J2 to J1	2,647	2,647	2,339	4,172	4,172	3,900

A.2 Forecast and observed journey time comparison

Figure 27 Forecast and observed journey times (with project) for M3 J2-4a eastbound

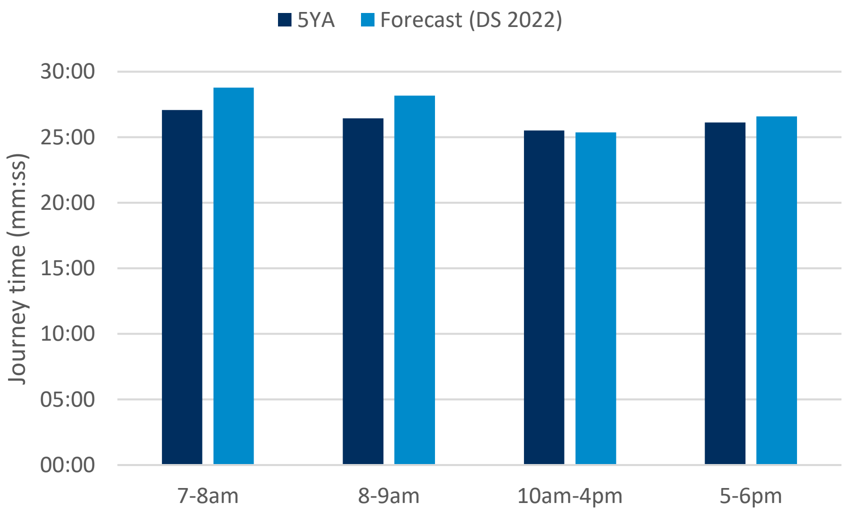


Figure 28 Forecast and observed journey times (with project) for M3 J2-4a westbound

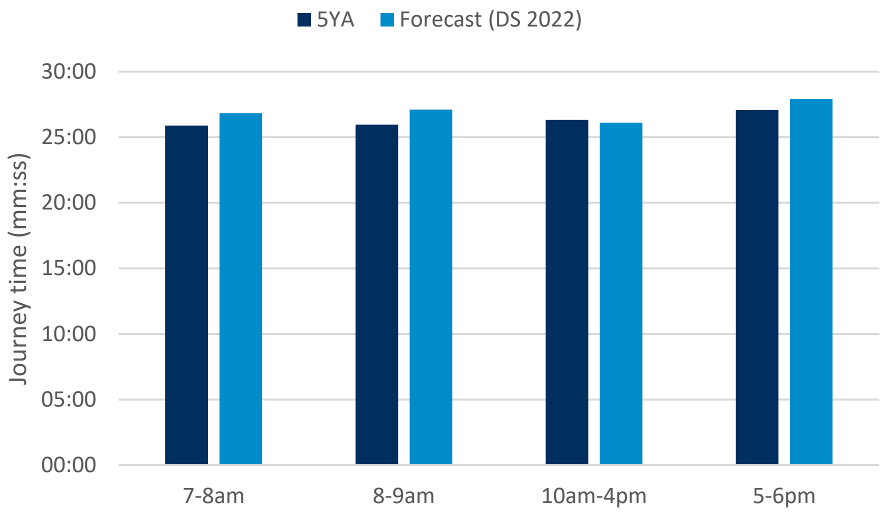


Figure 29 Forecast and observed journey times (without project) for M3 J2-4a eastbound

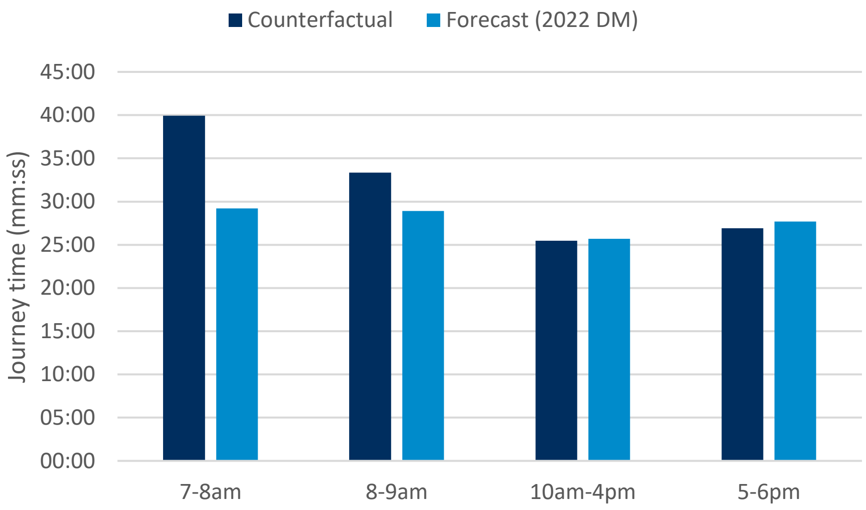
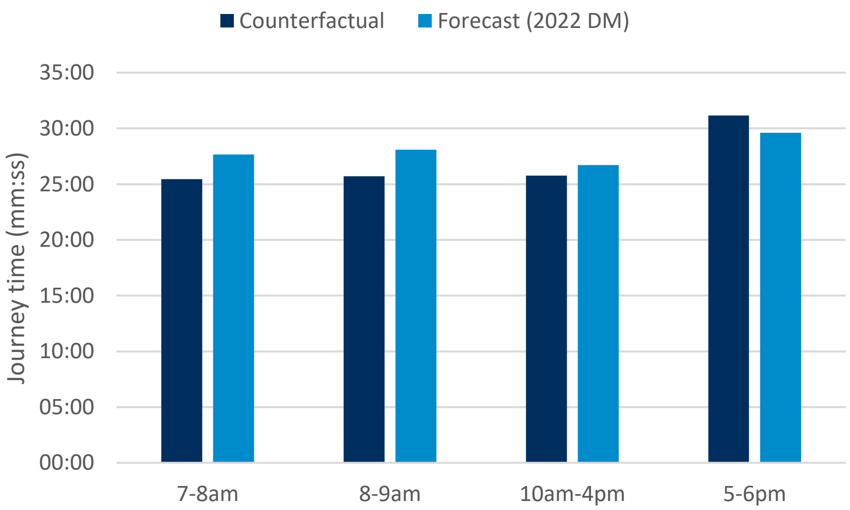
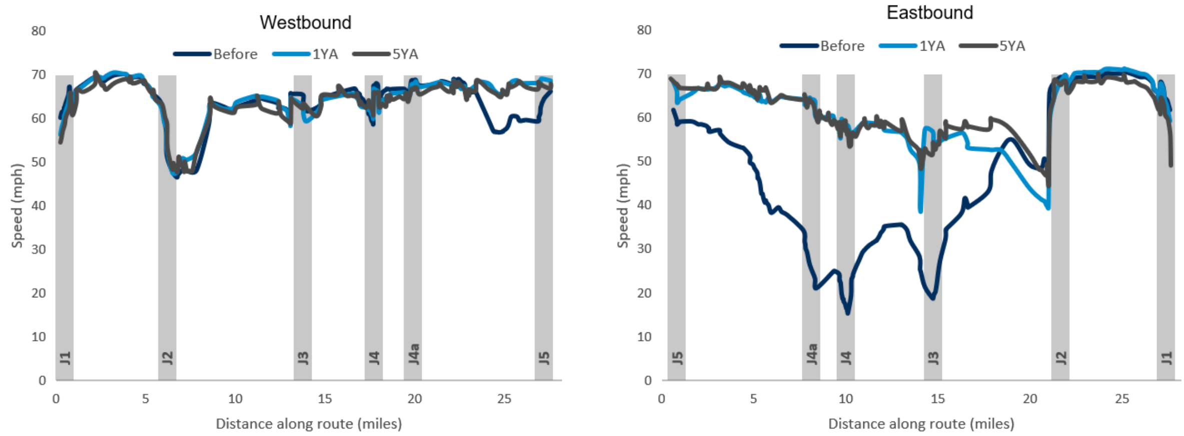


Figure 30 Forecast and observed journey times (without project) for M3 J2-4a westbound



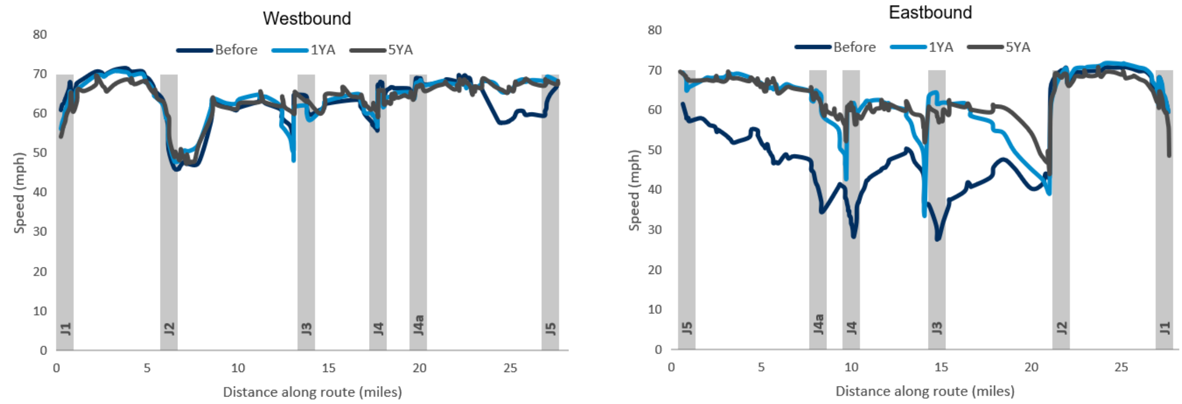
A.3 Average speed over distance

Figure 31 Average speed over distance for 7-8am



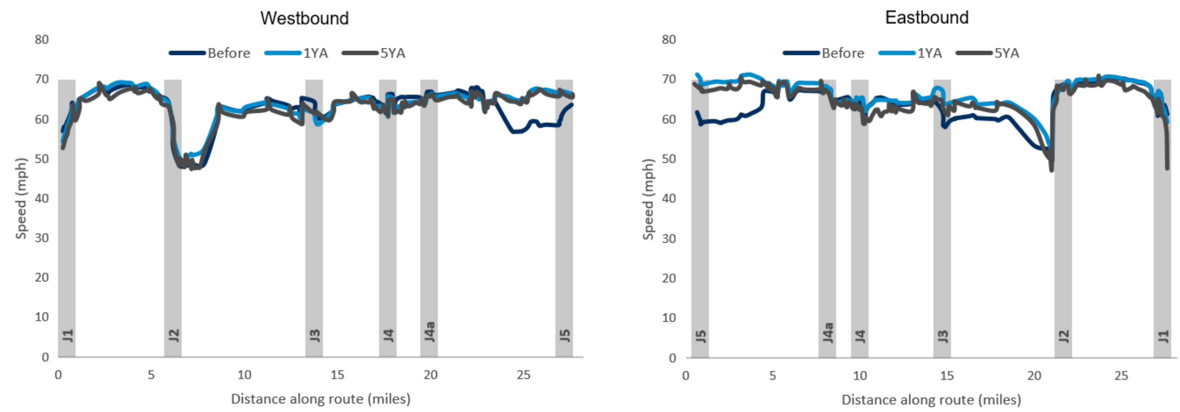
Source: TomTom satellite navigation data (November 2013 to October 2014 and November 2021 to October 2022)

Figure 32 Average speed over distance for 8-9am



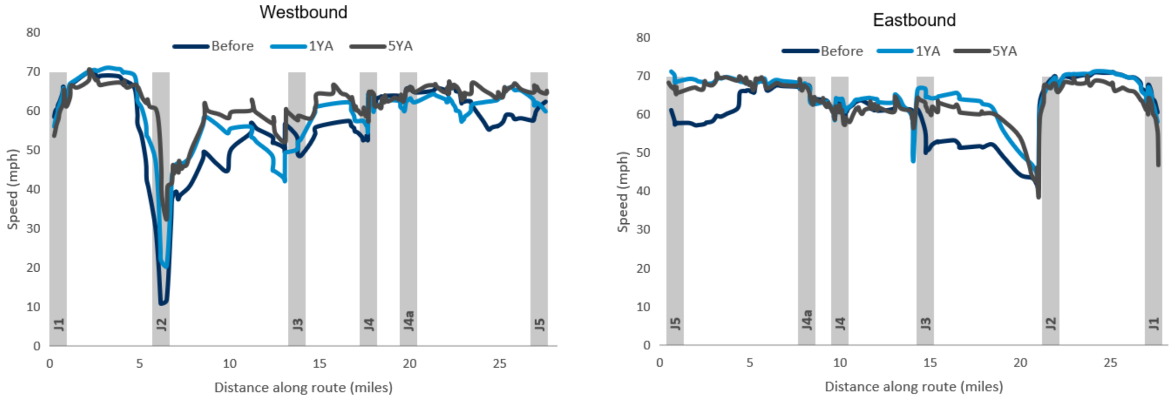
Source: TomTom satellite navigation data (November 2013 to October 2014 and November 2021 to October 2022)

Figure 33 Average speed over distance for 10am-4pm



Source: TomTom satellite navigation data (November 2013 to October 2014 and November 2021 to October 2022)

Figure 34 Average speed over distance for 5-6pm



Source: TomTom satellite navigation data (November 2013 to October 2014 and November 2021 to October 2022)

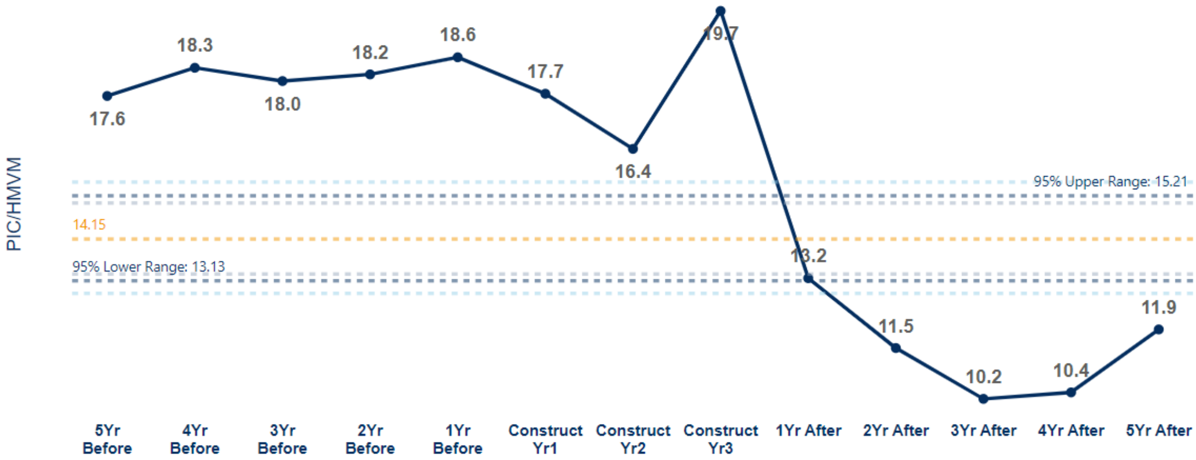
Appendix B

B.1 Road user safety in the wider area

B.1.1 How had traffic flows impacted collision rates in the wider area?

The evaluation has identified a decrease in the rate of collisions per hundred million vehicle miles (hmvm). Five years before there was an annual average of 18 personal injury collisions per hmvm. Five years after, there was a decrease to 11 personal injury collisions per hmvm (Figure 35). The counterfactual test undertaken found that the collision rate would likely have been between 13-15 personal injury collisions per hmvm. The after annual average collision rate falls below the counterfactual range of 13-15 collisions per hmvm.

Figure 35 Annual average number of collision rate with counterfactual scenario ranges in wider area



Source: STATS19 1 May 2009 – 31 July 2022

The collision rate findings are statistically significant, with the after collision rate falling below the 99% confidence range. This indicates we have observed a larger reduction in the rate of personal injury collisions than predicted.

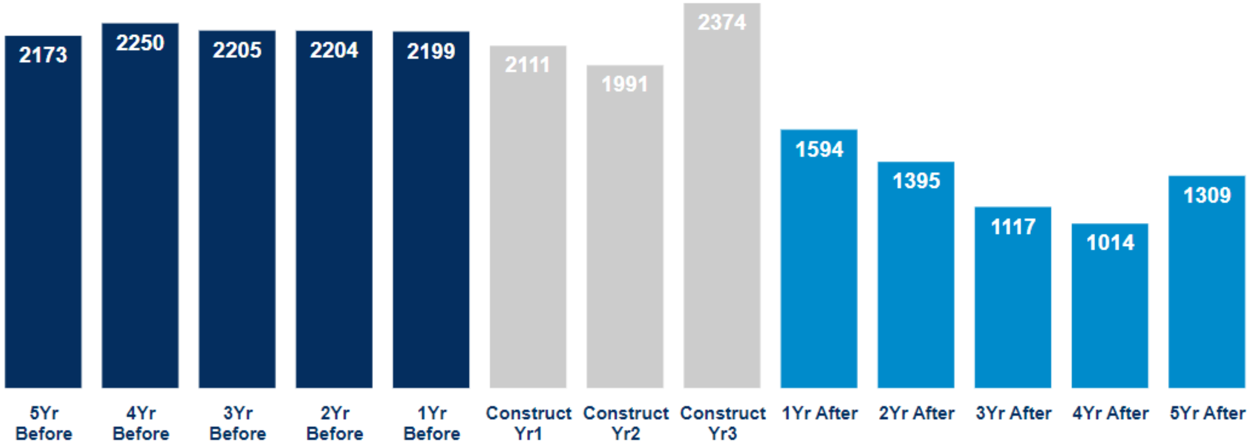
B.1.2 What impact did the project have on road user safety for the wider area?

Before the project an annual average of 2,206 collisions were observed. After the project, this had fallen to 1,286, a decrease of 920 (Figure 36).

Average personal injury collisions

2,206	1,286	920
Before	After	Fewer

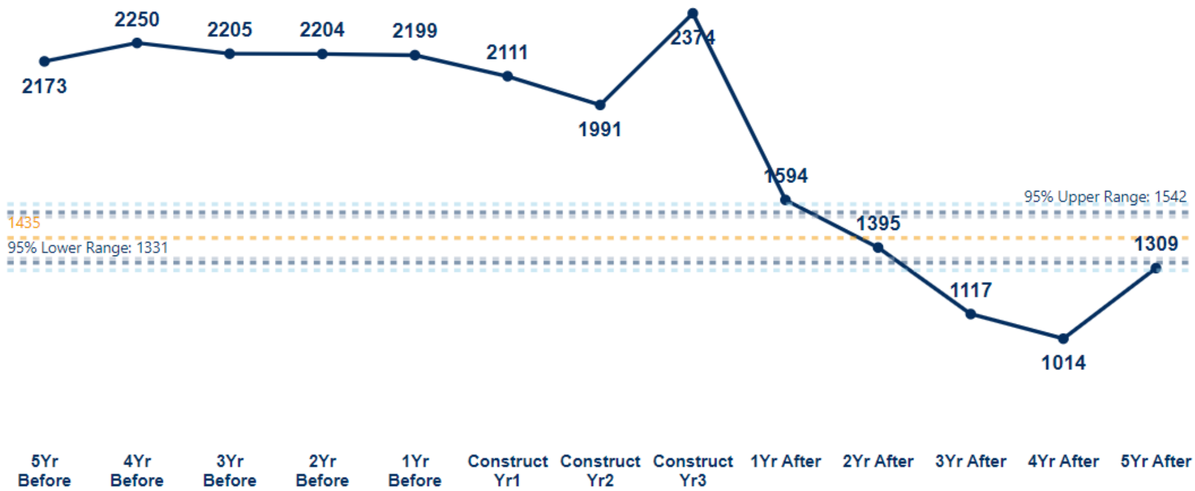
Figure 36 Annual personal injury collisions in wider area



Source: STATS19 1 May 2009 – 31 July 2022

The after annual average is statistically significant as it falls below the counterfactual range of between 1,331-1,542 personal injury collisions per year (Figure 37).[49]

Figure 37 Observed and expected range of personal injury collisions in wider area (annual average)



Source: STATS19 1 May 2009 – 31 July 2022

B.1.3 What changes did we see in the severity of collisions in the wider area?

See Appendix B.2 for information on when police forces transitioned to a new method in how severity of incidents is recorded.

After the project there has been a reduction severity across all three categories (Table 13). Figure 38 the full breakdown of severity of personal injury collisions by project year.

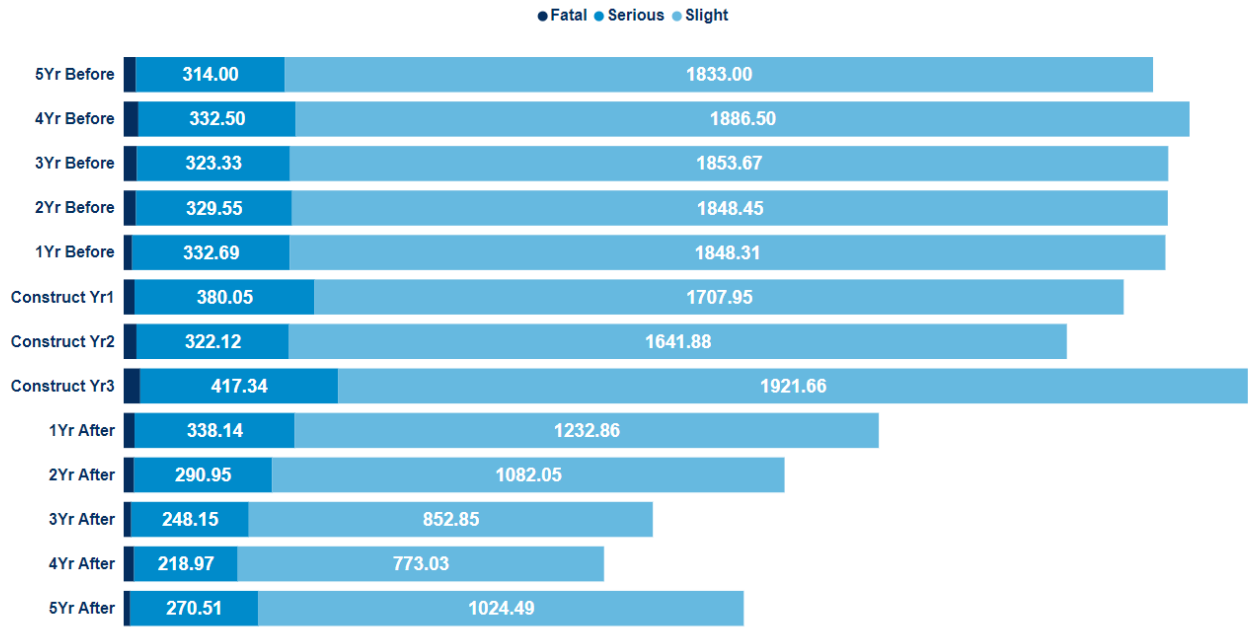
[49] We have tested the results at 95% confidence interval. The critical value at 95% confidence interval is 1,435, the observed collision savings for the wider area are lower than this value of 1,435. We believe that the collisions savings observed for the wider safety area ensure that the project has met its safety objective.

Table 13 Number of personal injury collisions by severity

Severity	Before	After	Change	Change direction
Fatal	129	97	32	↓
Serious (average)	109	91	18	↓
Slight (average)	618	331	44	↓

If the project continues to perform at the currently level, it will achieve the predicted reduction.

Figure 38 Severity of personal injury collisions within the wider area



Source: STATS19 1 May 2009 – 31 July 2022

B.1.4 What impact did the project have on casualties?

There has been a reduction in the FWI observed annually. An annual average of 67 FWI was observed after the project became operational were observed. Annual FWI has decreased by 26 compared to the average 92 FWI observed before.

The combined measure showed an extra 34 million vehicle miles was travelled before an FWI.[50]

A reduction of 64 KSI has been observed annually. Reducing from an average of 391 KSI before to 327 KSI after the project became operational. The rate of KSI per hmvm has reduced from an average of four to three for every hmvm travelled.

The observations for KSI suggests that the project is having a positive safety impact on the severity of casualties within the wider area.

[50] Before the project, 110 million vehicle miles needed to be travelled before a FWI (0.9 FWI per hmvm). After the project this increased to 144 million vehicle miles (0.7 FWI per hmvm).

B.2 Incident reporting mechanisms

Since 2012, many police forces have changed the way they collect STATS19 data (for more information see here). These changes mean casualty severity is now categorised automatically based on the most severe injury, rather than the judgement of an attending police officer.

Police forces using the new systems, called injury-based severity reporting systems, (also known as CRaSH and COPA) report more seriously injured casualties than those which don't. These changes make it particularly difficult to monitor trends in the number of killed and seriously injured casualties over time, or between different police forces. In response to these challenges, DfT and the Office for National Statistics (ONS) have developed an approach to adjust the data collected from those police forces not currently using injury-based reporting systems.

These adjustments are estimates for how casualty severity may have been recorded had the new injury-based reporting system been used. These adjusted estimates apply retrospectively from 2004 and adjust historical data to show casualty severity 'as if' this was recorded under the new injury-based system. Until all police forces have started using the new systems, these historical adjustments will continue to be updated every year. Using these adjusted totals allows for more consistent and comparable reporting when tracking casualty severity over time, across a region, or nationally. While there is no impact on total casualties or collisions, and no impact on total fatalities, these adjustments do impact serious and slight casualties and collisions.

B.3 Unadjusted collision severity

The project extent is covered by Surrey and Hampshire and Isle of Wight police constabulary. Surrey transferred from Stats19 to CRaSH in November 2012. Hampshire and Isle of Wight have not transferred.

Table 14 shows the unadjusted collision severities on the project extent:

Table 14 Unadjusted collisions by severity for project extent

Observation Year	Fatal	Serious	Slight
5Yr Before	0	6	53
4Yr Before	1	9	63
3Yr Before	1	10	42
2Yr Before	1	3	58
1Yr Before	1	7	49
Construct Yr1	0	9	61
Construct Yr2	1	2	39
Construct Yr3	0	9	54
1Yr After	0	7	25
2Yr After	0	10	39
3Yr After	0	8	32
4Yr After	1	5	20
5Yr After	1	10	36

Source: STATS19 1 May 2009 – 31 July 2022

The wider safety area of the M3 junction 2-4a project is covered by Surrey, Metropolitan Police, Hertfordshire, Hampshire and Isle of Wight and Thames Valley police constabulary. The first three police constabulary transferred from Stats19 to CRaSH in November 2012, January 2015 and April 2016 respectfully. The latter two have not transferred.

Table 15 shows the unadjusted collision severities on the wider safety area:

Table 15 Unadjusted collisions by severity for wider area

Observation Year	Fatal	Serious	Slight
5Yr Before	26	255	1892
4Yr Before	31	268	1951
3Yr Before	28	265	1912
2Yr Before	26	267	1911
1Yr Before	18	266	1915
Construct Yr1	23	318	1770
Construct Yr2	27	268	1696
Construct Yr3	35	354	1985
1Yr After	23	296	1275
2Yr After	22	257	1116
3Yr After	16	216	885
4Yr After	22	189	803
5Yr After	14	234	1061

Source: STATS19 1 May 2009 – 31 July 2022

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