national highways

A11 Fiveways to Thetford dualling

Five-year post-opening project evaluation

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Foreword

National Highways – previously known as Highways England when the A11 Fiveways to Thetford dualling project was delivered – is the government-owned company that operates, maintains, and improves England's motorway and long-distance trunk road network. We work to a five-year funding cycle, a radical new approach to road investment first introduced in 2015, which saw the government committing £15.2 billion in the period from 2015 to 2021. This project was delivered under Highways England's remit to make our roads safer and more reliable for the millions who depend on them daily.

We carried out the enhancement project in 2013 to complete the upgrade of the A11 to dual-lane all-purpose standard from the M11 to Norwich. It opened to traffic in December 2014. Before the project, the design and limited capacity between Fiveways Roundabout and Thetford led to congestion and significantly longer journeys times. These issues were most noticeable during holiday times and peak periods, particularly at junctions and in Elveden. A high number of accidents were also recorded.[1]

To address these issues, we provided more capacity on the A11 and at Fiveways Roundabout, we realigned the road to bypass Elveden, and implemented other infrastructure changes to benefit users of the local road network and the local community.

Our post-opening project evaluations provide us with opportunities to understand how effective we are in delivering improvements in our portfolio of major projects. This report provides a follow-up to the one-year after post-opening project evaluation report which was published in August 2017.

At five years after we found road users' journey times and reliability were improved on the A11 mainline. We found smaller improvements at Fiveways Roundabout, with delays on Center Parcs holiday village changeover days. After this evaluation, a recalibration of the signalling to optimise traffic flow was carried out.[2]

We found the project continued to achieve its safety objective at five years after. There were on average 21 fewer personal injury collisions per year on the project extent compared with before, and 14 fewer per year on the surrounding road network.[3] The average collision rate was much improved too.[4]

The project's impacts on environment at five-years after were as predicted overall, apart from landscape and biodiversity which were both considered to be worse than expected. We are currently developing plans to undertake post-establishment maintenance of a range of assets, including those identified in this report, to ensure they meet the standards required.

[1] Between 2004 and 2011 200 accidents were recorded, of which 18 were serious and three fatal. Source: Highways Agency (2013) *A11 Fiveways to Thetford improvement Client Scheme Requirements.*

[2] The recalibration occurred in 2021 after data for this evaluation had been collected. We were therefore unable to assess the impact of this recalibration.

[3] Based on an average of eight personal injury collisions per year after the project compared with an average of 29 per year before.

[4] The rate measures collisions per hundred million vehicle miles.

The various improvements mean the project is as predicted likely to deliver very high value for money over 60 years.

Elliot Shaw

Chief Customer and Strategy Officer

December 2023

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1. Executive summary

This report presents the five-years after (5YA) post-opening project evaluation (POPE) of the A11 Fiveways to Thetford project, which opened to traffic in December 2014. The purpose of this evaluation, which builds on the emerging findings reported at one-year after[5], is to determine the extent to which the project's objectives had been achieved and to compare its forecast impacts against those observed.

The project involved the upgrade of a nine-mile section of the A11 between Fiveways and Thetford from single carriageway to dual carriageway standard. It also included a new section of carriageway to bypass the village of Elveden, along with a new junction allowing access to the village and the Center Parcs holiday village nearby. The completion of the project meant that the A11 was now dual carriageway from the M11 all the way to Norwich.

This single carriageway section of the A11 had adversely affected the quality of journeys for both local and long-distance road users and had contributed to adverse environmental effects on the village of Elveden. The project therefore was designed to address these issues by adding capacity to reduce congestion and improve journey times particularly during holiday periods and to reduce accidents. It was also designed to reduce the environmental effects on the village of Elveden by providing a bypass whilst at the same time minimising the impacts on The Brecks, which is an area of outstanding beauty and of national importance.

Our evaluation confirmed that the project had added capacity and had improved journeys for road users even though traffic volumes, including journeys to and from Center Parcs, had increased. Journey times along the route had improved including during the period of greatest congestion, where times reduced from between 14 and 16 minutes before the project to around eight minutes at five years after. Journey time reliability had also improved, with journeys more consistent across the day.

The project had increased capacity at the Fiveways junction and average journey times showed improvements of up to 35 seconds in most periods assessed. However, we saw falls of up to two minutes in the evening peak and during changeover days at Center Parcs where higher traffic flows were experienced. The reliability of their journeys through the roundabout had declined too, more so in the aforementioned periods. An assessment after the project's completion found that un-optimised signals at the junction had contributed to delays. In 2020 the signals were re-calibrated.[6]

Our analysis of the impacts on road user safety showed that the project had delivered improvements. At five years after, we found 21 fewer personal injury collisions occurred per year on average on the project extent compared with before.[7] There were 14 fewer personal injury collisions per year on average on the

[5] https://www.gov.uk/government/publications/pope-of-major-schemes-a11-fiveways-to-thetford-improvement

[6] The recalibration occurred after work on this evaluation had begun. We were therefore unable to assess the impact of this recalibration.

[7] Based on an average of eight personal injury collisions per year after the project compared with an average of 29 per year before.

surrounding network too.[8] The numbers of personal injury collisions were lower than the ranges that we estimated would have occurred had the project not been implemented and so the improvements were considered significant. The average collision rate[9] of personal injury collisions over distance travelled on the project extent had fallen, despite the A11 carrying more road users and the severity of casualties had reduced too.

Mitigation measures were implemented to reduce the environmental impact of the project on the surrounding area including the Brecks. The new bypass had also removed strategic traffic from the village of Elveden, contributing to improvements to the local environment. The establishment of mitigation planting along parts of the project however was variable and many plants showed slower than expected growth rates. These slower growth rates may compromise our achievement of all the environmental outcomes without further maintenance and management.

The project was designed to deliver value for money and although the trajectory of the project's benefits at five years after was lower than expected, it was still on track to deliver very high value for money.

[8] Based on an average of 62 personal injury collisions per year after the project compared with an average of 76 before the project.
[9] Collisions per hundred million vehicle miles.

2. Introduction

What was the project?

The A11 Fiveways to Thetford project was a major enhancement project which opened in December 2014. Construction began in January 2013 and involved the upgrade of 9.1 miles of the A11 between Fiveways roundabout and Thetford to dual carriageway standard. Previously, it had been the sole remaining section of single carriageway along the M11/A11 route.

As part of the project, we re-routed the A11 to bypass the village of Elveden. We provided a split-level junction to enable to the A11 to pass under the B1106. The junction provided a new access to the Center Parcs holiday village too. We closed several accesses onto the previous A11 route and provided overbridges for farming operations. In addition, we provided a route for pedestrian and cyclists which passes under the A11 at approximately 1.5 miles west of Elveden. We also made improvements to Fiveways roundabout, including widening of the circulatory carriageway lanes by using land from the centre of the roundabout. This was to increase capacity and improve safety.

A new service station with a petrol garage, fast food restaurant and coffee shop was built to the northwest of Fiveways roundabout. It had direct accesses onto the A1101 and A1065. This development, which opened in October 2014, was not part of the project. Traffic volumes on the roads assessed may have been impacted by traffic using these services. The impact cannot be separated from the overall impact of the dualling project.

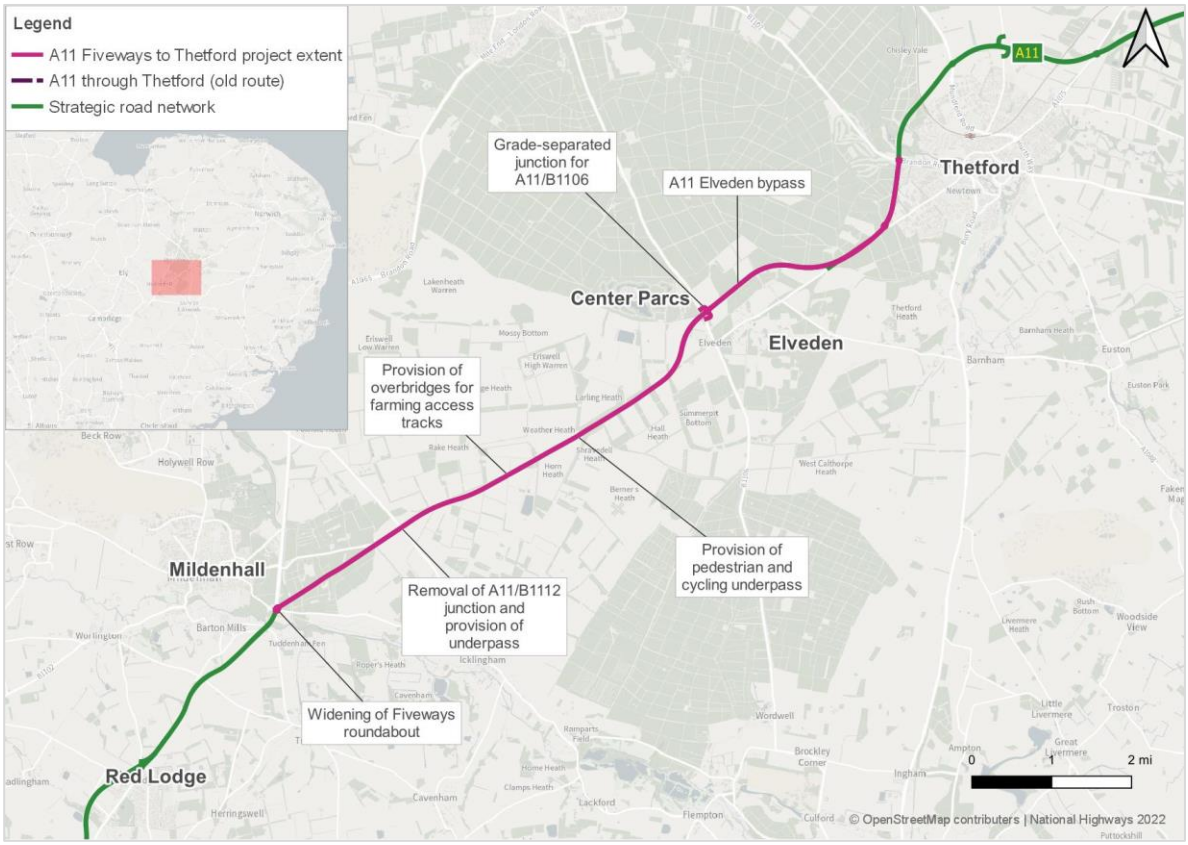
Also, in December 2018, we installed traffic lights on both A11 entries and the A1101 south-eastbound entry to Fiveways roundabout. At the same time, the roundabout was resurfaced, and road markings were refreshed. These improvements were not part of the A11 Fiveways to Thetford project.

Project location

The A11 provides a strategic link between Norwich and Cambridgeshire. It connects to the A14 providing access to Cambridge, and to the M11 which links to London and the south. The project extended from the A11/A1065 Fiveways roundabout at Barton Mills to the A11/A134 roundabout at the southern end of the Thetford Bypass. The project's location is shown in Figure 1 while Fiveways roundabout is shown in Figure 2.

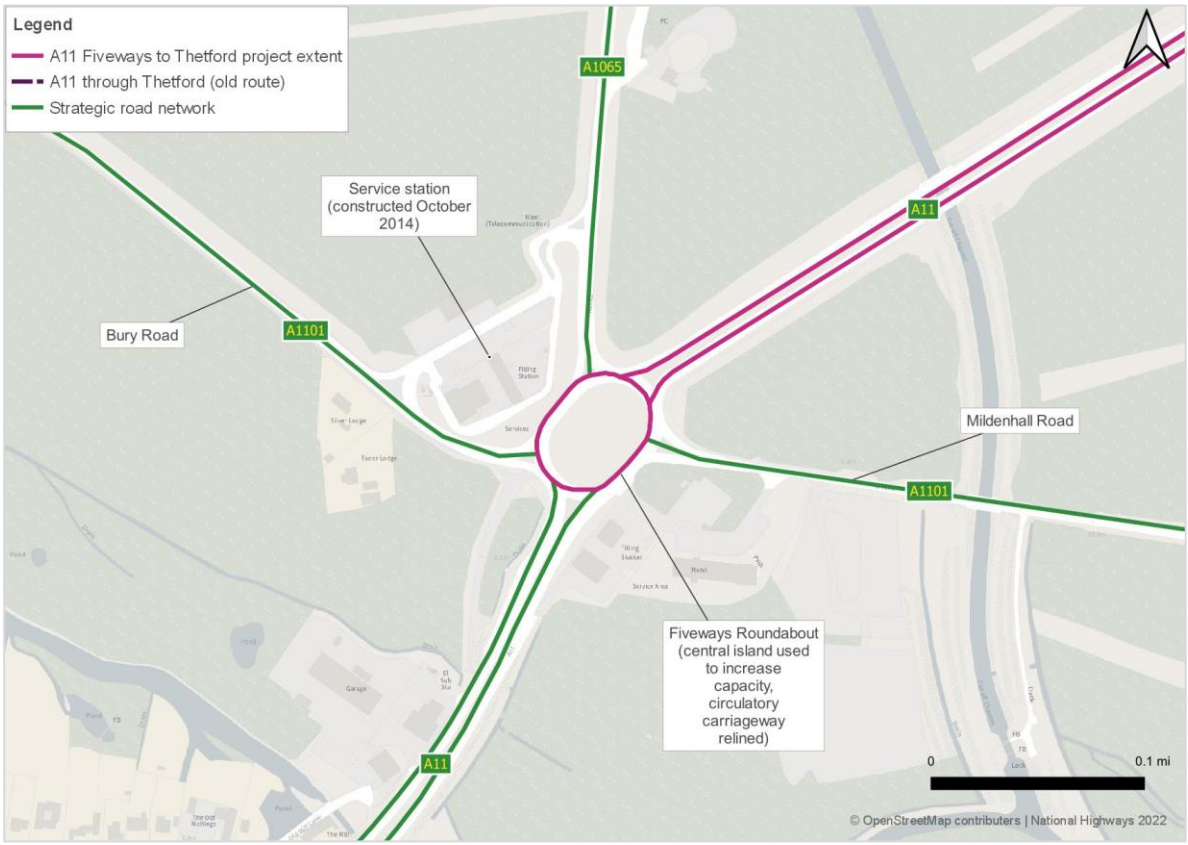
The village of Elveden is located midway along the project extent. Before the project was implemented the A11 passed through the village. The project subsequently routed the A11 to the north of the village. Center Parcs holiday village is an important tourist destination and located near to Elveden off the B1106. It is accessed from the A11.

Figure 1 Project location and measures



Source: National Highways and OpenStreetMap contributors

Figure 2 Fiveways roundabout



Source: National Highways and OpenStreetMap contributors

What was the project designed to achieve?

The project's Forecasting and Economic Report (2007) highlighted several issues on the A11, which affected road users and the surrounding communities. This included:

- Congestion, particularly during holiday periods.
- Conflict between fast moving trunk road traffic and slow-moving agricultural traffic, particularly at crossing points. This created conflicting movements and contributed to congestion.
- Overtaking difficulties.
- Difficulties joining the trunk road from side roads.
- Adverse environmental effects in the village of Elveden.

The project implemented measures that were designed to improve these issues.

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[10] 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.

This five-years after evaluation builds on the emerging findings reported in the one-year after evaluation. The one-year after evaluation can be found on the GOV.UK website[11].

For more details of the evaluation methods used in this five-years after study please refer to the POPE methodology manual. This can be found on our website.[12]

[10] Key impact areas include safety, journey reliability and environmental impacts.
[11] https://www.gov.uk/government/publications/pope-of-major-schemes-a11-fiveways-to-thetford-improvement
[12] https://nationalhighways.co.uk/publications/

3. Delivering against objectives

How has the scheme performed against objectives?

All our major projects have specific objectives which are defined in the business case[13] when project options are being identified. The A11 Fiveways to Thetford project objectives were established within the Client Scheme Requirements[14] (last updated June 2014). These objectives, along with a summary of our five-years after evaluation are shown in Table 1.

Table 1 Project objectives and evaluation summary

Objective	Five-years after evaluation
Complete the upgrade of the A11 to dual two-lane all-purpose standard (D2AP) from the M11 to Norwich.	We upgraded 9.1 miles of the A11 between Fiveways roundabout and Thetford from single carriageway to dual carriageway. The A11 is now D2AP from the M11 to Norwich.
Reduce congestion and provide adequate capacity.	Journey times were on average eight minutes quicker while supporting more road users. This was attributed to higher speed, additional capacity and reduced conflicting movements from side roads.
Minimise private means of access and side road connections to the trunk road consistent with making other satisfactory arrangements for traffic.	Accesses onto the previous A11 route were closed off and overbridges were provided for farming operations.
Reduce the incident rate of accidents that occur on both the main carriageway and the junctions.	The annual average number and rate of personal injury collisions had fallen significantly from 29 per year to eight per year. The safety of the road had improved compared with the prediction of what would have occurred if the road had remained a single lane carriageway. We observed no change in the number of personal injury collisions on the roundabout.
Provide a bypass for the village of Elveden.	The A11 now routes to the north of the village of Elveden, reducing traffic passing through the village.
Improve journey time reliability.	Journey time reliability on the A11 route assessed had improved considerably. Road

[13] Highways Agency (October 2015) *A11 Fiveways to Thetford Improvement Business Case Stage 6 Construction*.
[14] Highways Agency (2013) *A11 Fiveways to Thetford improvement Client Scheme Requirements*

Objective	Five-years after evaluation
	users' slowest journey times were faster than the average journey time before the project. The biggest improvements were seen on the Center Parcs 'changeover' days (Mondays and Fridays). Journey time reliability through Fiveways roundabout had declined in most periods assessed. Suboptimal signal timings were a potential cause.
Minimise the impact the road will have on the surrounding area of The Brecks, an area of outstanding beauty and national importance.	Mitigation measures were implemented to reduce the impact of the project on the surrounding area. The establishment of planting was variable; many plants showed slower than expected growth rates. These factors may compromise our achievement of this objective without further maintenance and improved management.
Develop a project that is economically viable.	The trajectory of the project's benefits at five years after was lower than expected but it was on track to deliver very high value for money.

4. Customer journeys

Summary

At five years after, the A11 had become a more attractive route for road users due to the improvements. Traffic volumes on the A11 between Fiveways roundabout and Elveden had increased by 32% (See Figure 5). This was above the increases seen in the background (16-18%) and outside the project extent (around 25%). Holidaymakers using the Center Parcs Elveden Forest holiday village generated a lot of traffic on the A11 on Mondays and Fridays – the changeover days.

The provision of the B1112 underpass and the grade-separated junction had provided better routes for road users and improved connectivity for Center Parcs and for road users travelling to Brandon and areas to the north. Traffic volumes on the B1112 had also increased substantially by 550% (an increase of 500 vehicles per day). However, traffic on roads intersecting the junction had fallen, by on average 21% (2,800 vehicles) on the A1065 and by 14% (600 vehicles) on the A1101.

At the small number of locations assessed we found the appraisal forecasts had expected higher volumes of traffic than were observed.

Road users were expected to save around six or seven minutes on their journeys on the upgraded A11. At five-years after road users' savings were in line with expectations (Figure 11). The dualling and the closures of the accesses onto the A11 had improved the reliability of road users' journeys on the upgraded A11. Their worst journey times[15] on the bypass at five-years after were better than average journey times observed before the project (Figure 12 and Figure 13).

The project had met its objective to increase the capacity of Fiveways roundabout and road users' average journey times showed improvements of up to 35 seconds in most periods assessed. However, we saw falls of up to two minutes in the Center Parcs peak (changeover days) and evening peak. The reliability of their journeys through the roundabout had declined too, more so in the aforementioned peaks. An assessment after the project's completion found that un-optimised signals at the junction had contributed to delays. In 2020 the signals were re-calibrated.[16]

How did traffic levels change?

The A11 provides a strategic link between Norwich and Cambridgeshire. It also provides access to the M11 which links to London and to the south. The following sections examine whether traffic volumes changed over the evaluation period and to what extent the forecast traffic levels were realised.

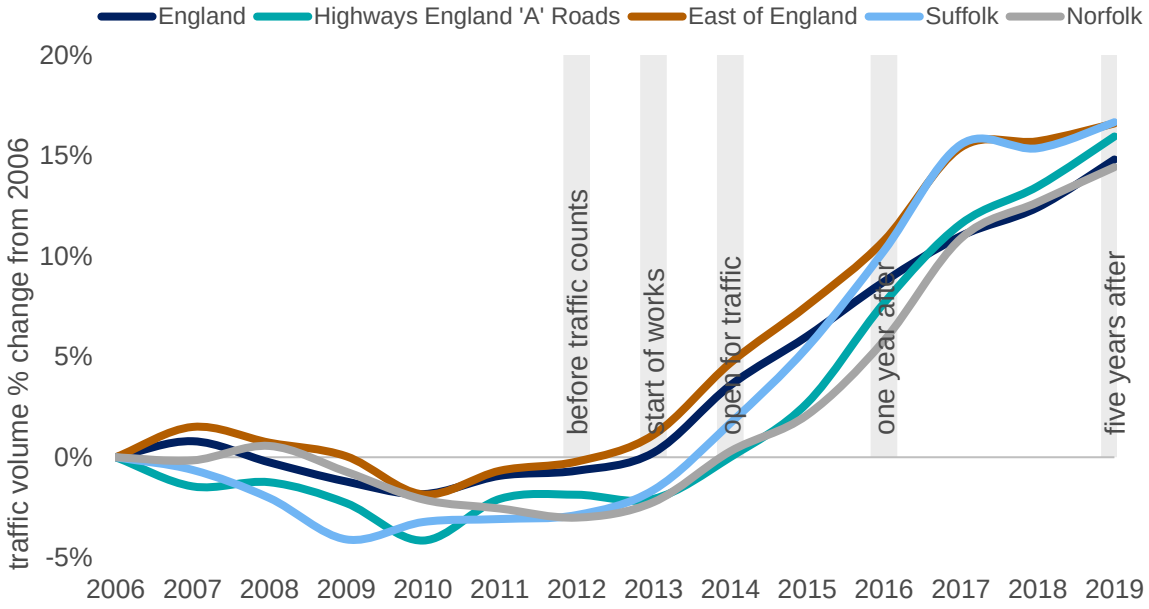
[15] By 'worst journey times' we mean the relatively rare very long journey times observed in the whole sample of journey times. More technically, they are those journey times falling above the 95th percentile of the sample.

[16] The recalibration occurred after work on this evaluation had begun. We were therefore unable to assess the impact of this recalibration.

National and regional traffic

The Department for Transport produces annual statistics for all observed traffic by local authority and road type, recording the total number of million vehicle kilometres (mvkm) travelled.[17] We assessed background changes over the period from 2006, the project's model base year, to 2019, five-years after the project opened. The results are shown in Figure 3.

Figure 3 National, regional, and local traffic trends



Source: Department for Transport Road traffic statistics[18]

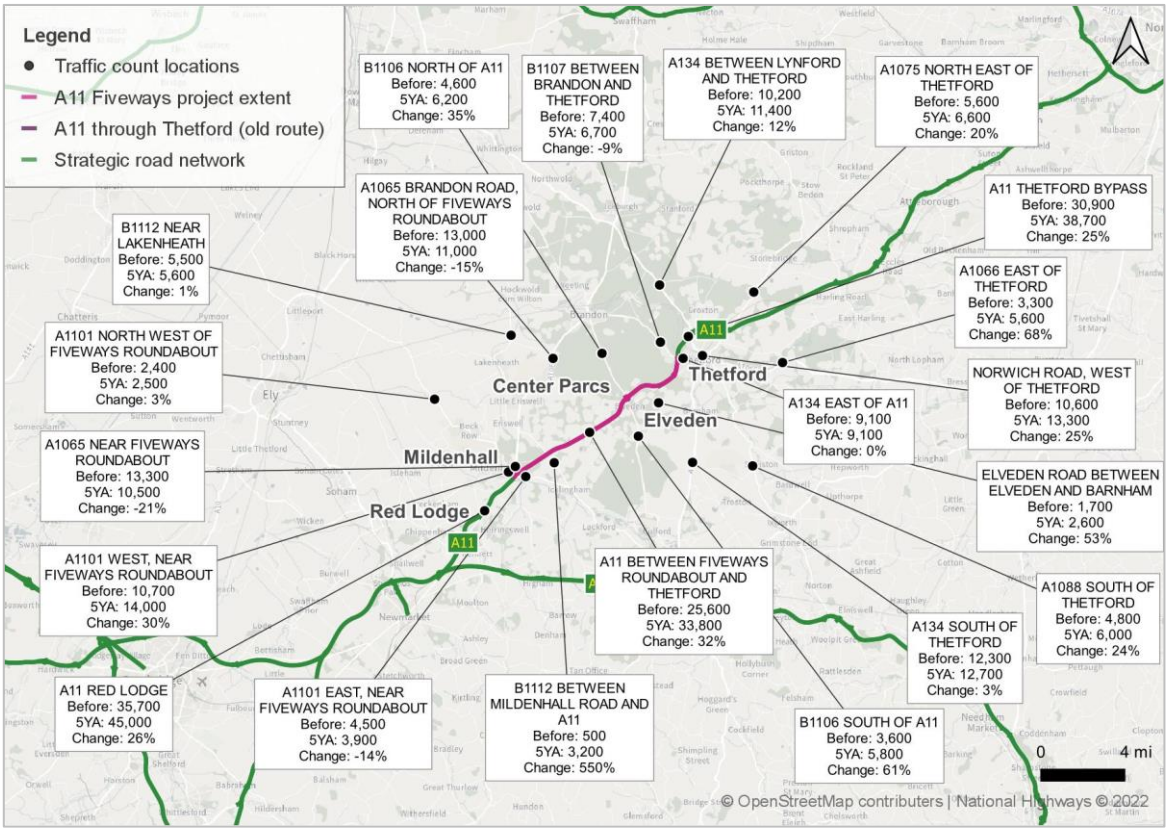
There was little growth in the amount of distance travelled by road users at local, regional, and national levels over the period before the project's construction. After 2012 it began to grow. By 2019, the amount of distance travelled had grown by between 16-20%. We inferred that traffic volumes on the project section would have grown by similar proportions had the project not been implemented, and that anything above could potentially be attributed to the project.

How did traffic volumes change around the project?

To understand the changes in traffic volumes within the study area we compared average weekly traffic (AWT) volumes from 2012, before the project began construction, with those observed in 2019, five-years after its opening. The results and count locations are shown in Figure 4 and are summarised with the one-year after counts in Table 5 in Appendix A.

[17] Department for Transport data table TRA8904.
[18] https://www.gov.uk/government/statistical-data-sets/road-traffic-statistics-tra

Figure 4 Changes in traffic at 5YA on road within the study extent

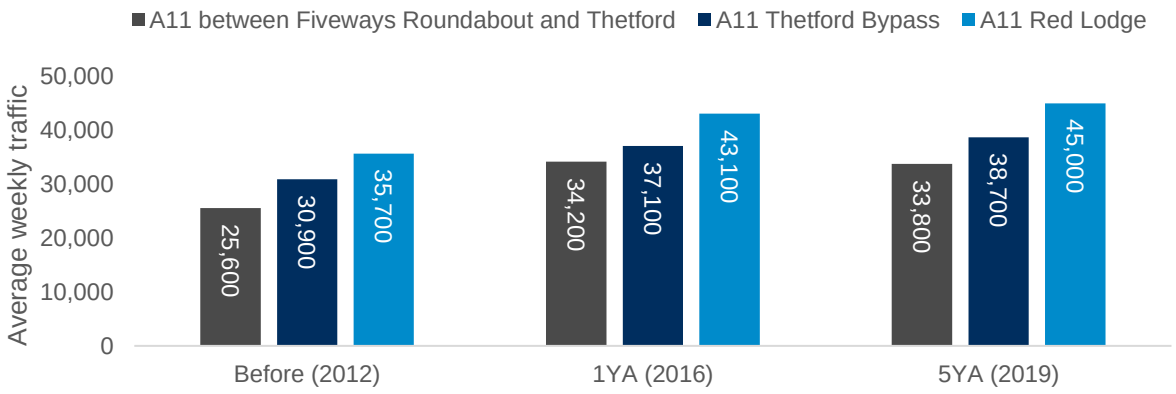


Note: Traffic volumes are two-way totals. Before: 2012; 5YA: 2019. Source: SRN: WebTRIS; Local roads: Intelligent Data Collection Ltd (2012); National Data Collection Ltd (2019)

A11 mainline

At five-years after, we found evidence to suggest the A11 had become a more attractive route for road users due to the improvements. Traffic on the A11 between Fiveways roundabout and Elveden had increased by 32% (around 8,200 vehicles) since 2012. This was a proportionately larger increase than the increases observed outside project extent of 25% (by 7,800 and 9,300 vehicles, respectively). Overall, the growth seen on the A11 was higher than regional and local background increases. Figure 5 shows the changes.

Figure 5 Changes in average weekly traffic on the A11 between 2012-2019



Source: SRN: WebTRIS

Wider area

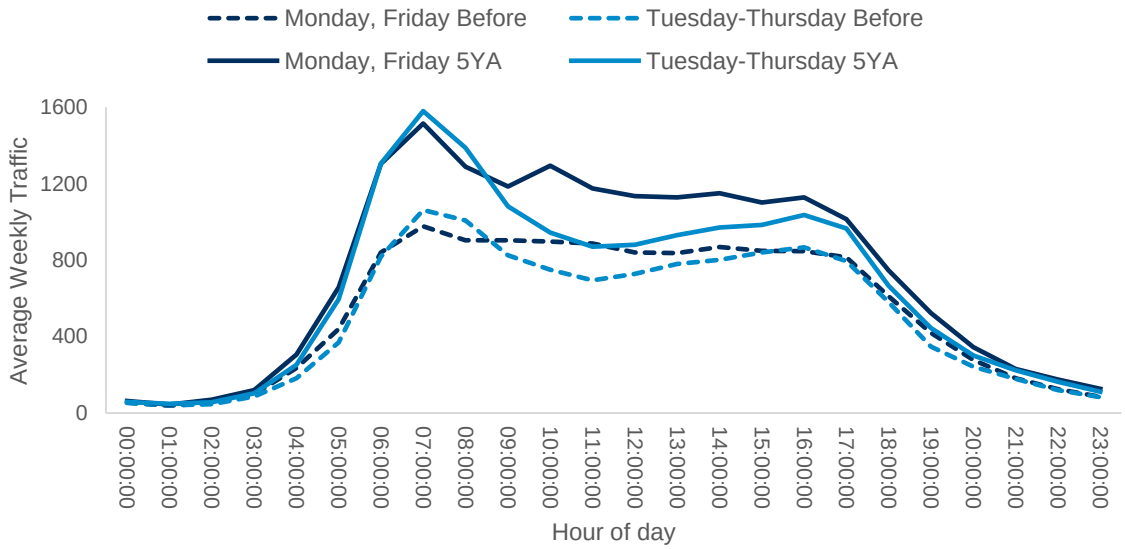
The provision of the B1112 underpass gave road users a more attractive north-south route by reducing the need to travel through the Fiveways roundabout (see Figure 2). At five-years after an average of 3,200 vehicles per day used the B1112 between Mildenhall road and the A11, an increase of 550% on the number using it before the project (around 500 vehicles per day).

Before the provision of the underpass, road users travelling between Eriswell and Icklingham via the B1112 would have negotiated a staggered crossroads at the A1101 and A1065 junction. At five-years after, vehicle numbers on the two roads had fallen, by on average 21% (down to 2,800 vehicles) on the A1065 and by 14% (down to 600 vehicles) on the A1101.[19]

The new grade-separated junction at Elveden had improved access for holidaymakers at Center Parcs and for road users travelling to Brandon and areas to the north. Greater volumes of traffic were observed using it at five-years after. On the B1106 north of the A11 average numbers of vehicles per day had increased by 35% (to 1,600 vehicles per day). While on the B1106 south of the A11 linking to Bury St Edmunds, there was a 61% increase in traffic (an average of 2,200 vehicles per day). There was also evidence to indicate the A11 upgrade had provided a better and quicker route for road users travelling to Brandon from the 15% fall in traffic (by around 2,000 vehicles per day) on the A1065.

How did daily patterns of traffic change?

Figure 6 Changes in daily volume profiles on the upgraded A11 southbound carriageway (before and five-years after)



Note: The northbound A11 carriageway has been omitted from this analysis as information not available for the period before the project. Source: WebTRIS[20]

The extra capacity provided by the project facilitated the observed traffic growth on the A11. Some of this growth was driven by tourism. Center Parcs is located next to the A11 and is accessed via the B1106 (see Figure 1). The impact of the changeover of holidaymakers at Center Parcs on Mondays and Fridays was

[19] Desktop research of online journey planners suggested that going to Brandon via the A11 was quicker than using the A1065 to Brandon.
[20] https://webtris.highwaysengland.co.uk/

evident in the daily traffic patterns. We saw traffic on A11 southbound peak on the morning and remain high throughout the day.[21] On the other weekdays daily traffic patterns were more typical of roads around the country. These differences informed our analytical approach to journey times.

How accurate were the traffic volume forecasts?

The project's appraisal[22] produced traffic forecasts for many locations surrounding the project extent. It expected traffic volumes would increase most on the A11 following the project's implementation, with smaller increases on the A1101 West, and falls on the A1065 and A1101 East. At five-years after we assessed a sample of these locations.[23]

More traffic was expected than was observed (see Table 6 in Appendix A). The percentage differences between the forecast and observed volumes exceeded the accepted threshold of model accuracy.[24] The Do Nothing forecasts for the locations assessed were higher than the volumes observed before the project's construction. This suggested the baseline volumes at these locations would have subsequently produced incorrect Do Something forecasts. Comparisons with the respective post-project observations seemed to confirm this.

The forecasts for the A11 mainline were more accurate in most time periods than those for the local roads. The changes on the local roads involved smaller numbers of vehicles.

Relieving congestion and making journeys more reliable

One of the project's key aims was to reduce congestion. This section evaluates the project's impacts on congestion by looking at the related aspects of road users' journey times and the reliability of their journeys.

Did the scheme deliver journey time savings?

Upgraded A11 and new bypass

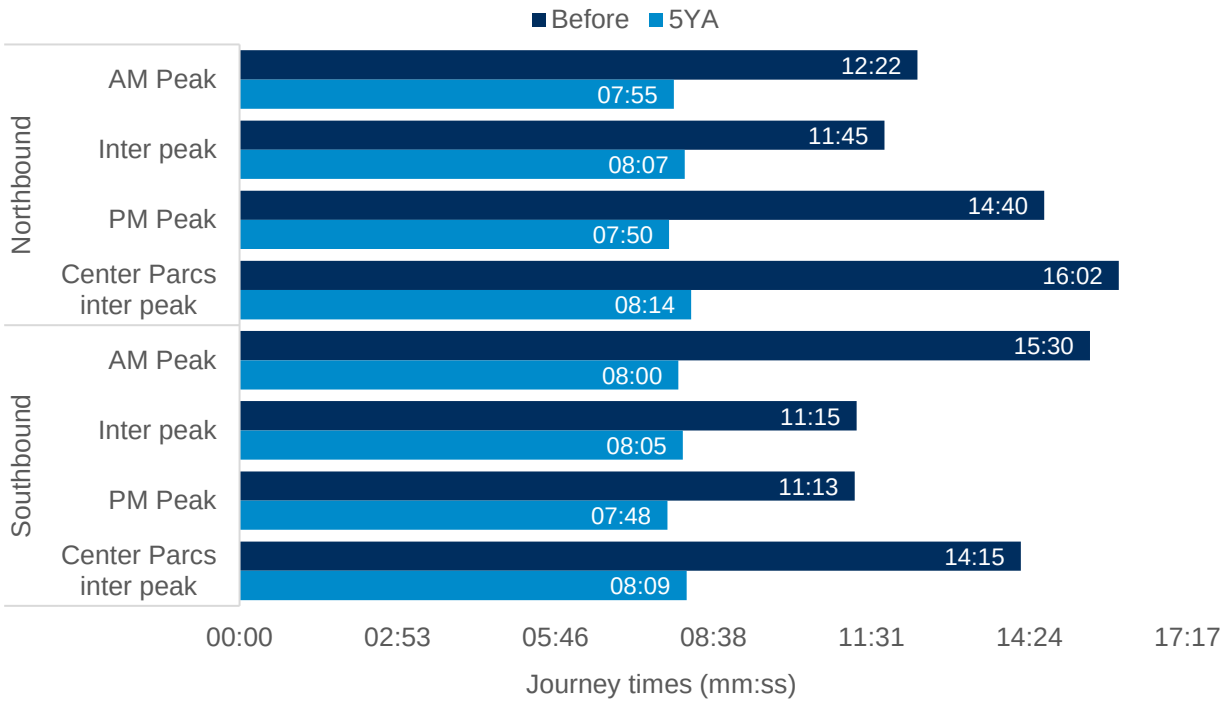
At five-years after, road users' journeys between Mildenhall and Thetford via the upgraded A11 and new bypass were at least a third faster compared to before. They were able to make savings of at least three minutes or more. Notably, road users' journey times in the period of greatest congestion, the Center Parcs inter peak were halved, improving from between 14 and 16 minutes before to around eight minutes at five-years after.[25]

The improvements on the bypass were made against a backdrop of increased traffic volumes. We attributed the improvements to the dualling of carriageway, the

[21] Center Parcs designate Mondays and Fridays as changeover days. Historically, on these days' holidaymakers finishing their holidays must leave at 10am while those arriving to start theirs can enter at 2pm.
[22] See Annex A.3 A11 Fiveways to Thetford appraisal history for more detail and a summary of the different forecast scenarios.
[23] The evaluation took a proportional approach to assessing the accuracy of the appraisal forecasts, making comparisons where the largest changes were expected.
[24] Traffic models are usually deemed acceptably accurate if the forecast flows are within 85% of the observed flows used to valid the model.
[25] The findings are positive but should be interpreted with some caution due to the differences in data sources for the before (Trafficmaster) and five-year after (TomTom) periods.

closure of the farm accesses which helped reduce conflicting movements along the route, and the removal of the need to stop at the crossroads in Elveden village. Road users were able to travel at higher speeds and their journeys were more reliable. Their journeys were more consistent irrespective of the time of day they travelled, whereas before the bypass road users' journeys could vary by over four minutes depending on the time of day.

Figure 7 Average journey times on the upgraded A11 and bypass (mm:ss)



Note: Time periods assessed: Morning peak (08:00 – 09:00, Mon-Fri), Inter peak (09:00-17:00, Tues-Thurs), Center Parcs inter peak (09:00-17:00, Mon and Fri), Evening peak (17:00-18:00, Mon-Fri). It should be noted that the weekday morning and evening peaks included Mondays and Fridays, the days when higher volumes occurred due to changeover at Center Parcs. The inter peak periods have been split to include the Center Parc changeover days separately. Source: Trafficmaster data 2012 (before) and TomTom 2019 (5YA)

Figure 8 Upgraded A11 with bypass journey time route

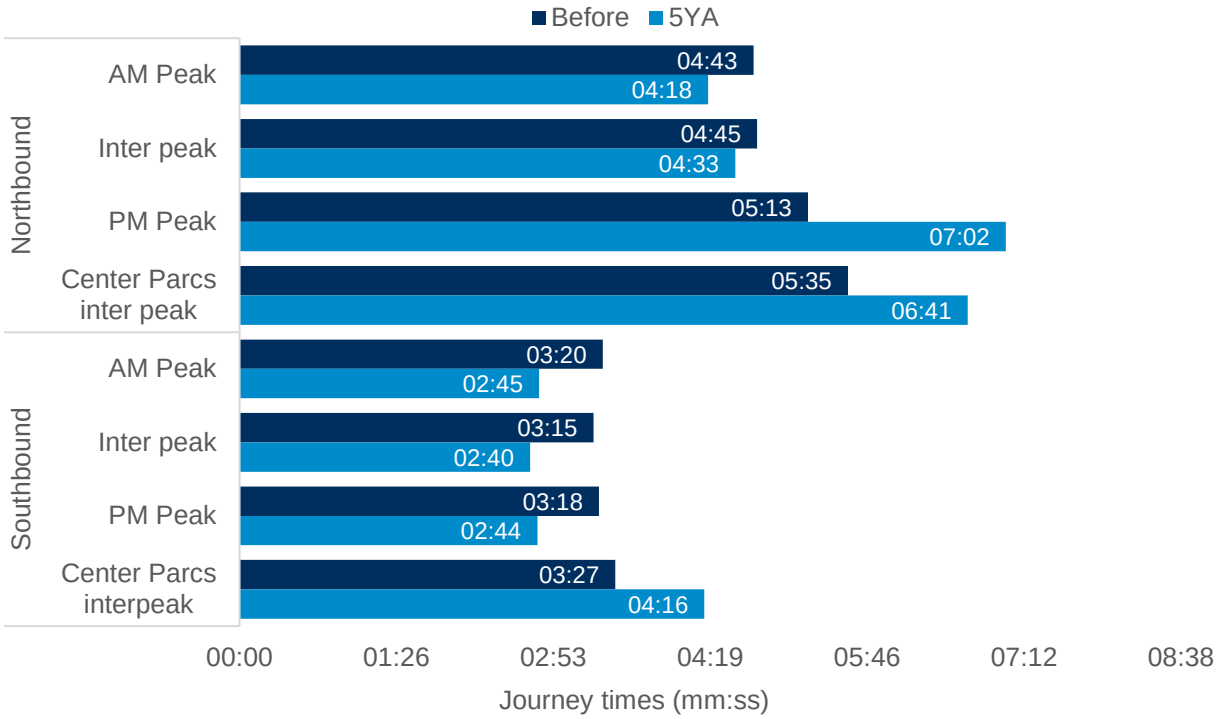
Note: For the A11 bypass analysis we defined the before routes as the original alignment where it passed through Elveden, and the 5YA route as the alignment bypassing Elveden implemented by the project.

A11 through Fiveways roundabout

Road users' journey times through the roundabout five-years after the widening were mostly faster compared to before. Their journey time savings averaged around half a minute, smaller than those seen on the bypass section. However, in the period of greatest congestion, the Center Parcs inter peak, road users' journey times were longer by between 50 seconds and a minute. And their journeys in the evening peak were slower too, by around a minute and 50 seconds, compared to before. Figure 9 shows the results.

As we noted earlier, the added signalisation of the Fiveways roundabout in October 2014 may have contributed to increased delays. Signal timings were re-calibrated in 2020 with the aim of improving journey times through the junction. We were unable to evaluate the impact of these changes.

Figure 9 Average journey times through the A11 roundabout (mm:ss)



Note: Time periods assessed: Morning peak (08:00 – 09:00, Mon-Fri), Inter peak (09:00-17:00, Tues-Thurs), Center Parcs inter peak (09:00-17:00, Mon and Fri), Evening peak (17:00-18:00, Mon-Fri). It should be noted that the weekday morning and evening peaks included Mondays and Fridays, the days when higher volumes occurred due to changeover at Center Parcs. The inter peak periods have been split to include the Center Parcs changeover days separately. Source: TomTom satnav data.

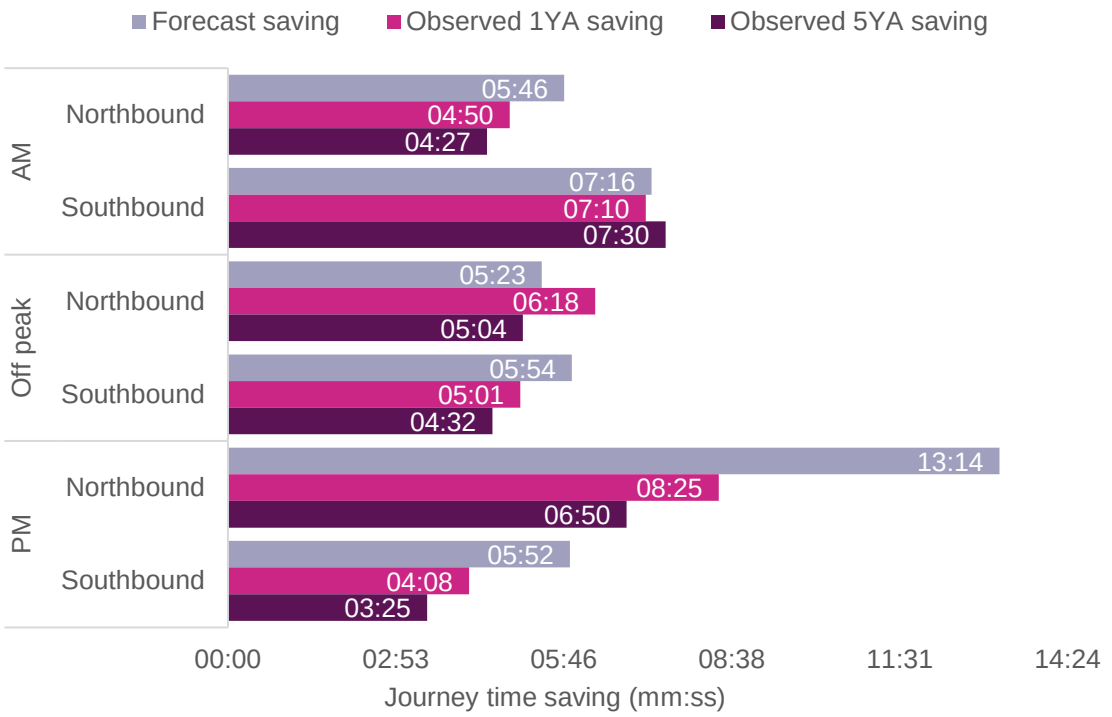
Figure 10 A11 through Fiveways roundabout journey time route

Note: For the Fiveways roundabout analysis we defined the northbound route as starting around two miles south of the roundabout and ending where the A11 bypass section begins, to ensure the A11 project extent was fully captured. We defined the southbound route through the junction as the reverse of the above but ending immediately on the southbound exit from the roundabout. This is because we could not confidently attribute journey time changes beyond this point to the junction changes.

Were journey time savings in line with the forecasts?

We compared the forecasts for the opening year against the observed one-year after and five-years after journey time savings. We would expect some deterioration in journey time savings over time. We found that the forecast journey time savings for 2013 were higher than those observed at five-years after.

Figure 11 Forecast vs observed journey time savings on the upgraded A11 with bypass (mm:ss)



Note: No forecast comparable to the inter-peak period used in earlier analysis was made. A forecast was provided for an off-peak period comprising the average of 07:00 – 08:00, 09:00 – 17:00 and 18:00 – 19:00. We compared the off-peak savings against the observed off-peak savings derived from the 5YA TomTom off-peak (07:00-08:00, 18:00-19:00) and the before Trafficmaster off-peak (07:00-08:00, 0:900-17:00, 18:00-19:00). Source: Forecasts - Statement of Case (2009); Observed - Trafficmaster 2012 (before) and TomTom 2019 (5YA).

The differences in forecast journey time savings ranged between 14 seconds less to six and a half minutes more than was observed. This last figure was for the northbound carriageway in the evening peak. We could not determine the reason, as the 'Do Nothing' forecast journey time information was not available. It is likely that the work underpinning the Statement of Case overestimated the level of delay in the evening peak northbound direction, as the forecast savings were significantly higher than the other peaks.

Did journeys on the project become more reliable?

Improving journey time reliability was one of the key objectives of the project. By improving reliability, we can make customers' journeys less variable and more predictable. This in turn gives them greater confidence when planning their journeys. To understand the project's impact on journey time reliability we

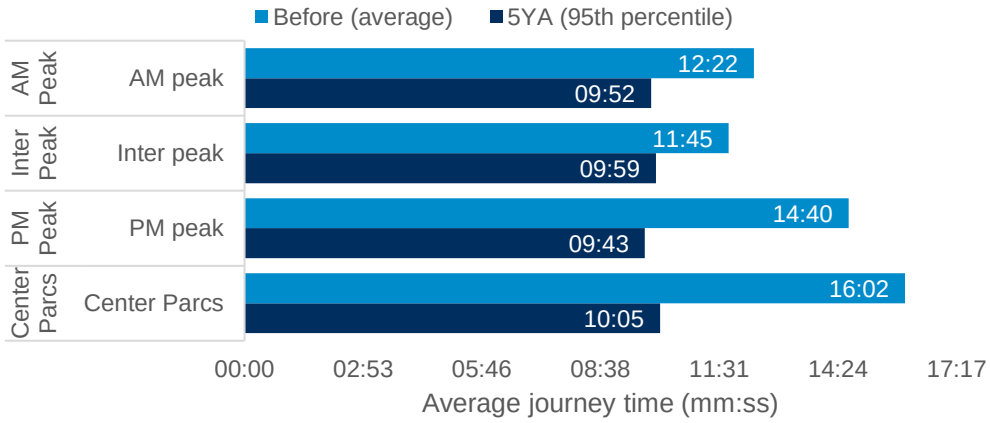
assessed the journey time variability[26] within the time periods in the notes beneath Figure 12 and Figure 13.

Similar to earlier analysis, we looked at the impacts of the A11 bypass route (Figure 8) and the A11 through Fiveways roundabout route separately. For the A11 bypass, due to the data limitations[27] in 2012, we compared the typical journey times observed before to the slowest journey times observed at five-years after opening.[28] For the route through the roundabout, data was available to permit comparisons.

Upgraded A11 and new bypass

We found the worst-case journey times on the A11 bypass at five-years after were all faster than the average before-project journey times, in both directions. They were also of similar durations across the four time periods, indicating that road users' journeys were much more reliable after the project (Figure 12 and Figure 13).

Figure 12 A11 bypass northbound journey time reliability



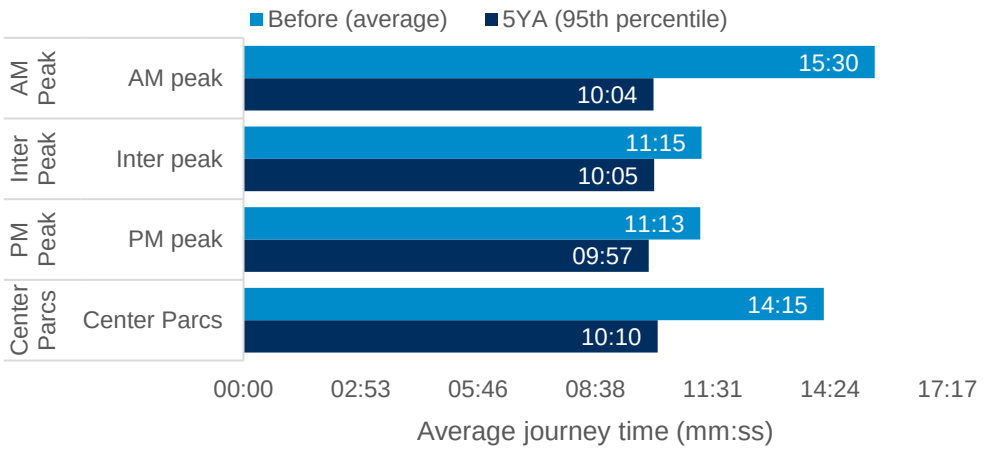
Note: Time periods assessed: Morning peak (08:00 – 09:00, Mon-Fri), Inter peak (09:00-17:00, Tues-Thurs), Center Parcs inter peak (09:00-17:00, Mon and Fri), Evening peak (17:00-18:00, Mon-Fri). It should be noted that the weekday morning and evening peaks included Mondays and Fridays, the days when higher volumes occurred due to changeover at Center Parcs. The inter peak periods have been split to include the Center Parcs changeover days separately. Source: Trafficmaster data 2012 (before) and TomTom 2019 (5YA). Source: Trafficmaster (2012, before) and TomTom (2019, 5YA)

[26] To understand a scheme's impact on reliability, we usually compare the changes in the percentile ranges of a large sample of journey times, relative to the median journey time. A percentile represents the value below which a given percentage of data points in a sample lie. For example, the 20th percentile is the value below which 20% of the data points lie. It follows that 80% of the data points lie above the 20th percentile value. As Trafficmaster doesn't provide data formatted into percentiles we could not undertake such comparisons for the A11 bypass.

[27] We would usually use information obtained from TomTom to assess reliability, however due to the lack of TomTom satnav data for 2012 on the A11 bypass we have used information from Trafficmaster instead.

[28] Trafficmaster only provides an average journey time, not journey times by percentile. As such, the graphs for the A11 bypass show the five-years after 95th percentile against the average before project journey time.

Figure 13 A11 bypass southbound journey time reliability

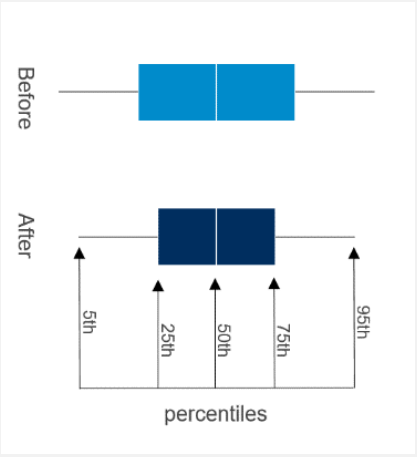


Note: Time periods assessed: Morning peak (08:00 – 09:00, Mon-Fri), Inter peak (09:00-17:00, Tues-Thurs), Center Parcs inter peak (09:00-17:00, Mon and Fri), Evening peak (17:00-18:00, Mon-Fri). It should be noted that the weekday morning and evening peaks included Mondays and Fridays, the days when higher volumes occurred due to changeover at Center Parcs. The inter peak periods have been split to include the Center Parc changeover days separately. Source: Trafficmaster data 2012 (before) and TomTom 2019 (5YA). Source: Trafficmaster (2012, before) and TomTom (2019, 5YA)

A11 through Fiveways roundabout

The results of our analysis are shown in the box plots in Figure 15 and Figure 16. Box plots are explained in Figure 14 below.

Figure 14 What does a box plot show?



The leftmost point marks the 5th percentile of journey times, below which just 5% of journeys in the sample are faster. The rightmost point marks the 95th percentile, below which 95% of journeys are faster. Between the two lies the spread of journey times, disregarding outliers.

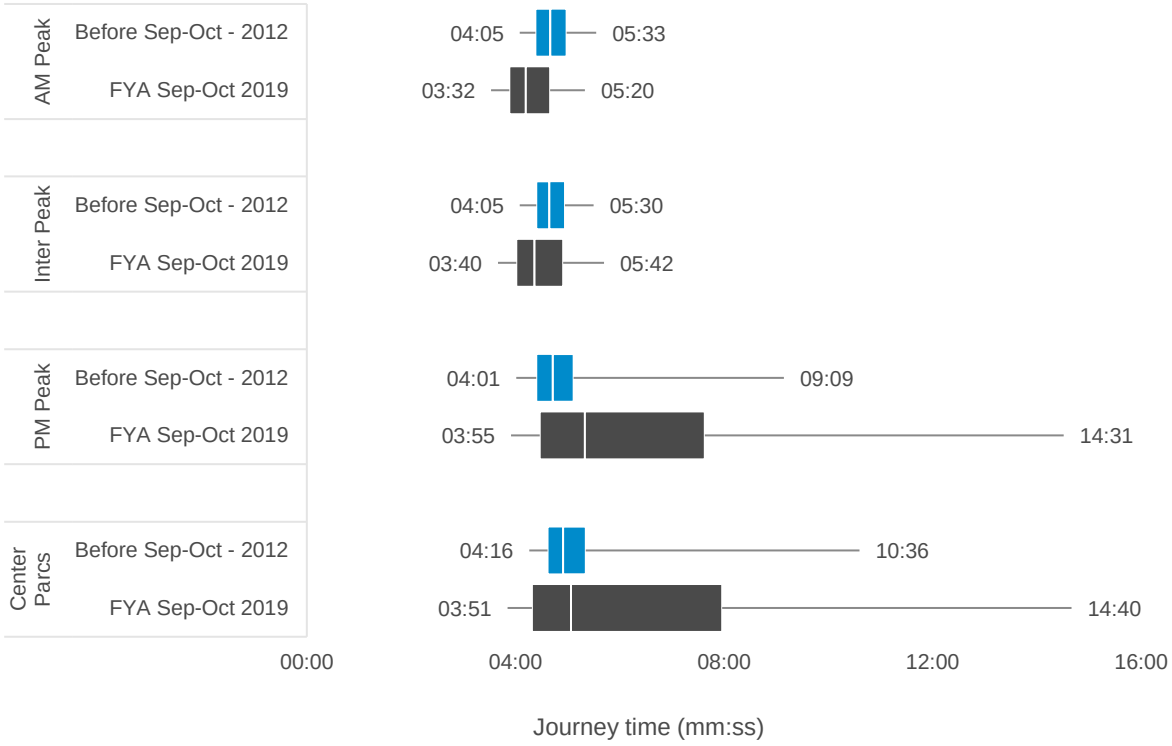
The block in the middle marks the spread of the bulk of journeys, the 50% of journeys lying between the 25th and 75th percentiles. The smaller the block, the less variation in the range of journey times, and the more reliable the journeys.

While road users' average journey times through the roundabout had improved, the reliability of their journeys had declined.

- On the northbound carriageway the reliability of most road users' journeys had declined, more so in the evening across the week and during the daytime on days impacted by the Center Parcs changeover. The longest journeys in these periods were longer too.
- For southbound journey, the reliability of most road users' journeys had declined too, more so substantial in the daytime on days impacted by the Center Parcs changeover.

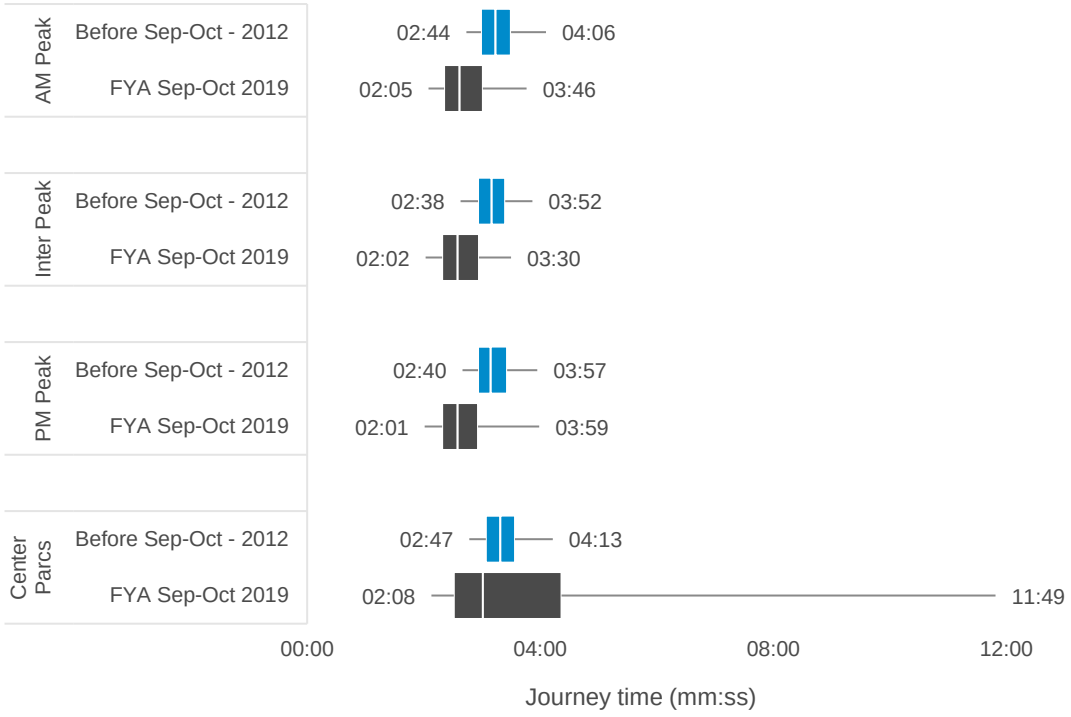
The declines observed may have been influenced by the un-optimised signal timings, as discussed earlier.

Figure 15 A11 through Fiveways roundabout northbound journey time reliability



Note: Time periods assessed: Morning peak (08:00 – 09:00, Mon-Fri), Inter peak (09:00-17:00, Tues-Thurs), Center Parcs inter peak (09:00-17:00, Mon and Fri), Evening peak (17:00-18:00, Mon-Fri). It should be noted that the weekday morning and evening peaks included Mondays and Fridays, the days when higher volumes occurred due to changeover at Center Parcs. The inter peak periods have been split to include the Center Parcs changeover days separately. Source: TomTom satnav data.

Figure 16 A11 through Fiveways roundabout southbound journey time reliability



Note: Time periods assessed: Morning peak (08:00 – 09:00, Mon-Fri), Inter peak (09:00-17:00, Tues-Thurs), Center Parcs inter peak (09:00-17:00, Mon and Fri), Evening peak (17:00-18:00, Mon-Fri). It should be noted that the weekday morning and evening peaks included Mondays and Fridays, the days when higher volumes occurred due to changeover at Center Parcs. The inter peak periods have been split to include the Center Parcs changeover days separately. Source: TomTom satnav data.

5. Safety evaluation

Summary

The project's safety objective was to improve safety performance by reducing the incident rate of accidents that occurred on both the main carriageway and the junctions. The increased capacity provided by the upgrade was expected to produce a reduction in the rate and number of personal injury collisions on the project extent.

At five-years after we found that 21 fewer personal injury collisions occurred per year on average on the project extent since it had opened to traffic.[29] And on the surrounding network 14 fewer personal injury collisions occurred per year on average compared with before.[30] We observed no change in the number of personal injury collisions on the roundabout.

The above numbers were lower than the respective ranges of personal injury collisions that would have occurred had the project not been implemented. For the project extent we estimated the range of personal injury collisions would have been between 23 and 36 per year.[31] And for wider area, the estimated range would have been between 71 to 93 per year. The project was found to have made a statistically significant positive impact on the number of collisions for the project extent and wider area.

The average collision rate[32] of personal injury collisions over distance travelled on the project extent had fallen too, while supporting more road users. Before the project, an average of 52 personal injury collisions occurred per year for every hundred million vehicle miles travelled on the route. After, the rate fell to 13 personal injury collisions per year for every hundred million vehicle miles travelled.

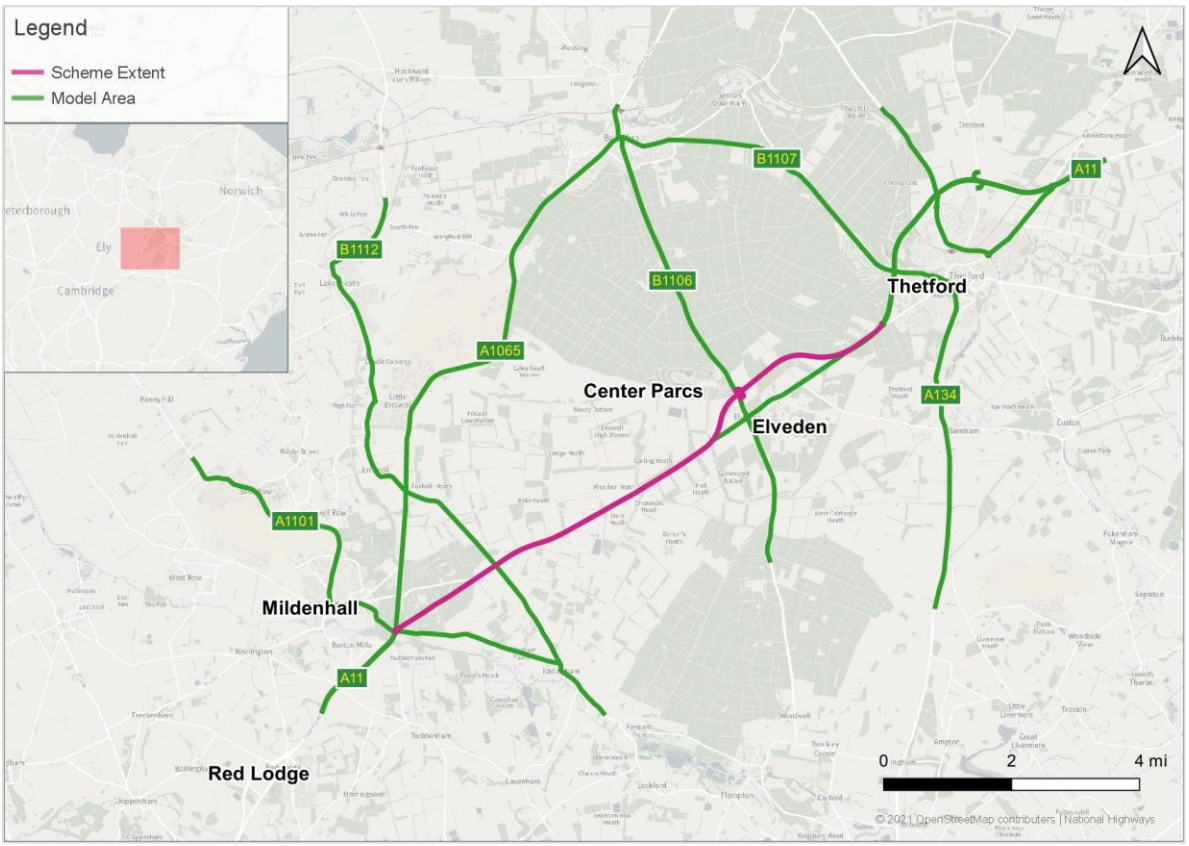
For collisions weighted by casualty severity,[33] before the project we observed an annual average of 1.1 Fatal and Weighted Injuries (FWI). After the project this fell to an annual average of 0.2 FWI and we also saw a fall in the rate of fatality equivalents.[34] Before the project it stood at 3.3 FWI per hundred million vehicle miles. After the project it had fallen to 0.5 FWI per hundred million vehicle miles.

[29] Based on an average of eight personal injury collisions per year after the project compared with an average of 29 per year before.
[30] Based on an average of 62 personal injury collisions per year after the project compared with an average of 76 before the project.
[31] Based on a counterfactual test to understand what would likely have occurred in the five years after the project's opening had it not been implemented. It provided a range for the likely number of personal injury collisions.
[32] Collisions per hundred million vehicle miles.
[33] Collisions weighted by casualty severity is expressed by the Fatal and Weighted Injuries (FWI) metric. 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.
[34] The FWI rate take into consideration the traffic flows in which collisions occur and is expressed as the FWI score per hundred million vehicle miles.

Safety study area

The safety study area, shown in Figure 17 was defined as the project extent on the A11 between Fiveways and Thetford, and a wider area including adjacent roads. This area allowed us to determine the impacts on safety that the project has had on both the project extent and the wider area.

Figure 17 Safety study area



Source: National Highways and OpenStreetMap contributors

What impact did the project have on road user safety?

Information on road safety was obtained from the Department for Transport road safety data.[35] This is a record of incidents on public roads that are reported to the police. This evaluation considers only collisions that resulted in personal injury recorded in this dataset.

The safety analysis was undertaken to assess changes over time looking at the trends in the five-years before the project was operational to provide an annual average. We then assessed the trends five-years after.

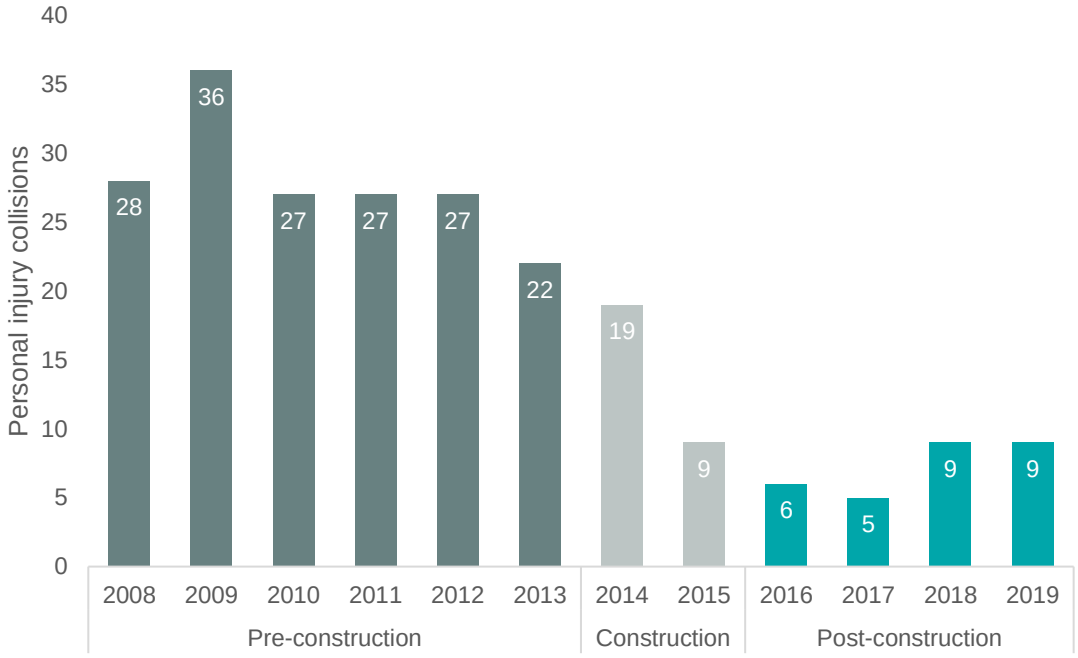
The analysis draws on the following data collection periods:

- Pre-construction: 1 March 2008 to 28 February 2013.
- Construction: 1 March 2013 to 31 December 2014.
- Post-opening: 1 January 2015 to 31 December 2019.

[35] https://data.gov.uk/dataset/cb7ae6f0-4be6-4935-9277-47e5ce24a11f/road-safety-data

On the project extent we found that there were 21 fewer personal injury collisions per year on average after the project compared with before. There was an average of 29 personal injury collisions per year in the five-years before the project and an average of eight per year in the five-years after. Figure 18 shows the numbers of personal injury collisions per year in the period assessed.

Figure 18 Annual personal injury collisions on project extent over evaluation period



Source: STATS19: 1 March 2008 to 31 December 2019

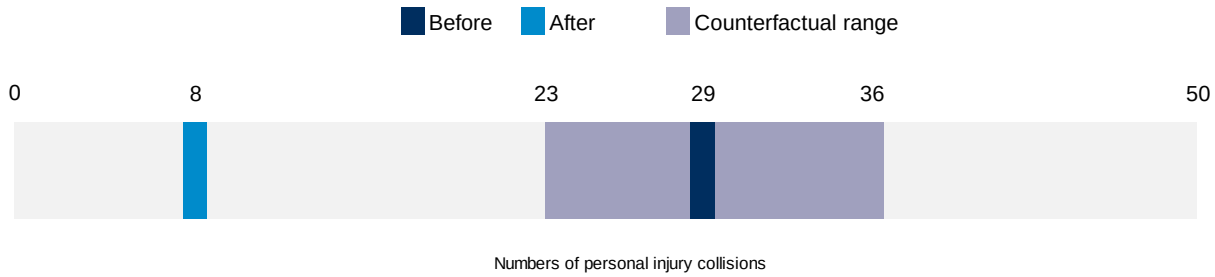
For the roundabout we observed no change in the average number of personal injury collisions per year after the project became operational. Both before and after the project, an average of three personal injury collisions per year was observed.

The numbers of personal injury collisions on UK roads have fallen over the past decade despite traffic volumes increasing. To establish whether the change in personal injury collision numbers was due to the project or influenced by wider regional trends we estimated the trend if the road had remained a single carriageway. This trend ranged from 23-36 personal injury collisions on average each year. See Appendix B: Safety counterfactual methodology for further information.[36]

As shown in Figure 19, the observed average of eight personal injury collisions per year in the five-years after period is below this range. Therefore, there had been a statistically significant improvement in safety beyond what we predict would have happened had the road remained a single carriageway.

[36] The safety methodology used for this evaluation differs from that used at one-year after as several improvements have since been introduced. The one-year after results however are still accepted as accurate.

Figure 19 Change in the number of personal injury collisions (average per year) compared with the estimated trend without the project.



Source: STATS19: 1 March 2008 to 31 December 2019

How have traffic volumes impacted collision rates?

We found the rate of personal injury collisions had reduced over time. Before the project, the collision rate stood at an average of 52 personal injury collisions for every hundred million vehicle miles travelled on the route per year. Following the construction of the dual carriageway, this had reduced to 13 for every hundred million vehicle miles travelled on the route per year.

What changes were seen in the severity of collisions?

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. 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[37]. Therefore, the Department for Transport have developed a severity adjustment methodology[38] to enable robust comparisons to be made.

For this evaluation, one reporting mechanism was used prior to the project and another afterwards. 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.[39]

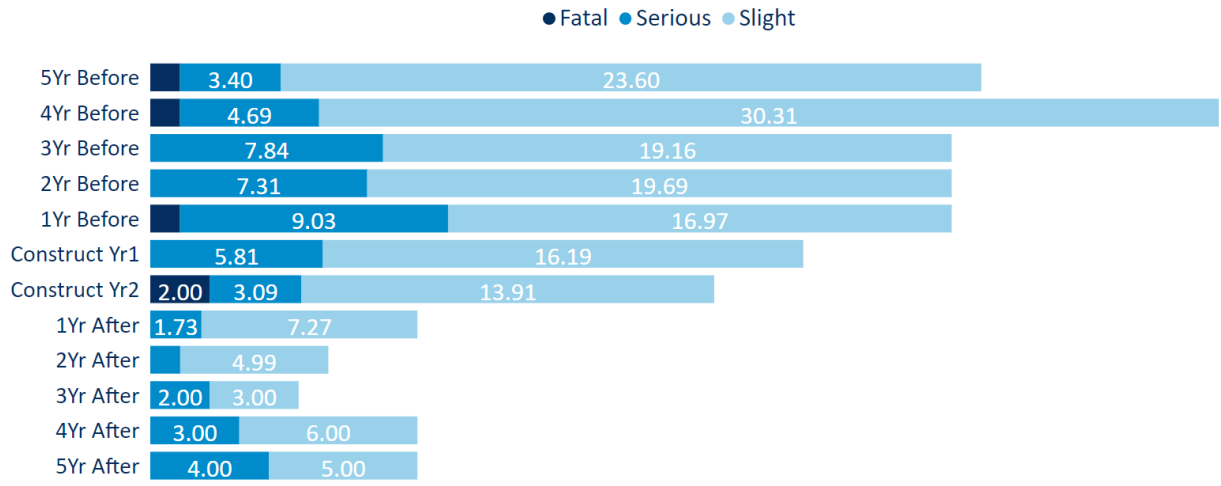
Before the project we observed a total of three fatal collisions. During the first five years of operation there had been no fatal collisions observed. There had been a reduction of four personal injury collisions that resulted in serious injuries. Before the project, an annual average of 6 was observed and this had reduced to 2 after the project became operational. We observed an average reduction of 17 personal injury collisions that result in slight injuries. Before the project, the average was 22, after the project this had reduced to five. Figure 20 shows collisions by severity.

37 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/820588/severity-reporting-methodology-final-report.odt

38 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

39 Collision Severities within this report use the 2020 adjustment factor

Figure 20 Collisions by severity on project extent over evaluation period



Source: STATS19: 1 March 2008 to 31 December 2019

How did traffic volumes impact collision severity?

Like other transport authorities across the UK, the key measure we use to assess the safety of roads is the Fatal and Weighted Injuries (FWI) metric. It gives a fatality 10 times the weight of a serious casualty, and a serious casualty 10 times the weight of a slight casualty.[40] This enables us to take account of all injury collisions in one figure.

A reduction of 1.6 fatality equivalents per year was observed. Before the project, an average of two fatality equivalents per year were observed, while after, this had fallen to an average of 0.4 per year.

The combined measure showed an extra 146 million vehicle miles were travelled by road users on the project before a fatality. Before the scheme, 28 million vehicle miles needed to be travelled before a fatality (3.6 fatalities per hmvm).[41] After the project this had increased to 176 million vehicle miles (0.6 fatalities per hmvm).

What were the changes in safety in the wider area?

To determine whether the project had broader safety impacts we looked at personal injury collisions on local roads in the wider impact area.[42]

Before the project, there were an average of 76 personal injury collisions per year on roads in the wider impact area. After the project, this number had fallen to an average of 62 per year, a reduction of 14. If the project had not been undertaken, we estimate that the number of personal injury collisions would have ranged between 71 to 93. This is a statistically significant reduction in personal injury collisions on the wider road network following the project.

[40] 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.
[41] Hundred million vehicle miles.
[42] Derived from project's safety appraisal.

How had traffic flow impacted collision rates in the wider area?

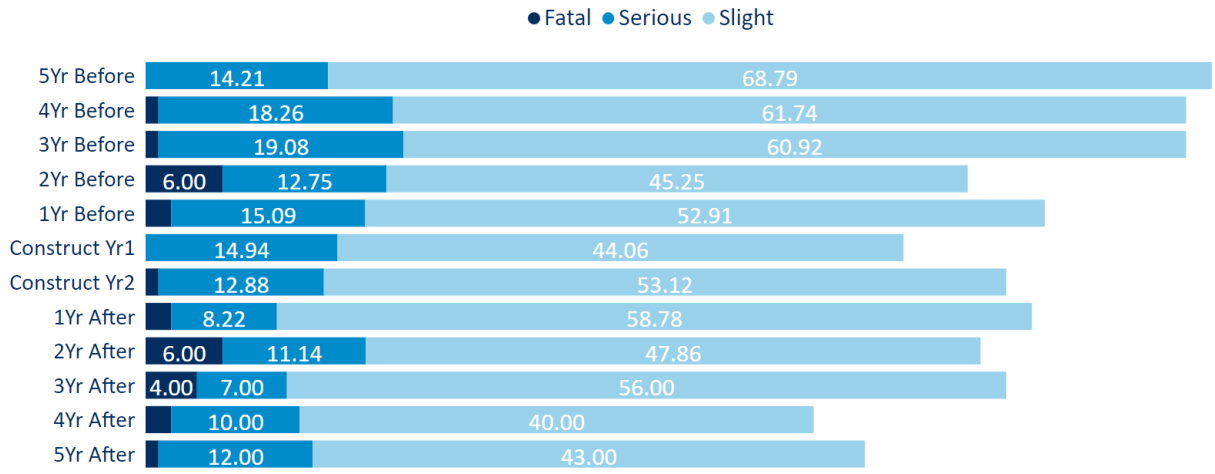
We found the average collision rate had reduced from 34 personal injury collisions per hundred million vehicle miles before the project to 24 after. Had the road not been converted to a dual carriageway, the trend would have remained broadly the same over time with an estimated rate of 33 personal injury collisions per hundred million vehicle miles.

How did the severity of collisions change in the wider area?

We have observed an increase of five fatal collisions in the wider area. Before the project, a total of 10 fatal collisions was observed. After the project, this had increased to a total of 15.

We have observed a reduction in the number of serious collisions. Before the project there was an annual average of 79, this had reduced to an average of 48. We have also observed a reduction in the number of slight collisions. Before the project there was an average of 290, this had reduced to an average of 246 after the project. Figure 21 shows the changes.

Figure 21 Numbers of fatal collisions in the wider study area in different evaluation periods



Source: STATS19: 1 March 2008 to 31 December 2019

Did the project achieve its safety objectives?

The project had a key objective to reduce the rates of personal injury collisions that occurred on both the main carriageway and at the junctions. The results indicate that the project has had a positive impact on personal injury collision numbers and on rates.

Safety on the surrounding road network in terms of collision numbers rate had improved significantly. We were confident the changes seen on the wider road network were attributable to the project.

How did the project perform compared to expectations?

It was expected that replacing a single carriageway with limited overtaking opportunities with a dual carriageway would cause a reduction in the number of collisions.

It was predicted that collision numbers would fall by 1,119 over the 60-year appraisal period (or by an average of 19 per year). It also predicted that there would be an associated fall in the numbers of all casualties over the same period, by 1,874 (or by an average of 31 per year). Our analysis indicated that at the five-years after stage the project was performing better than expected.

6. Environmental Evaluation

Summary

The environmental evaluation considered the predicted effects of the project described in the Environmental Statement and the findings of the one-year after opening evaluation. It then compared them with the findings obtained five-years after the project opened for traffic to determine if the predicted outcomes were likely to be achieved.

Observed impacts were determined during a site visit in September 2020 and supported by desktop research. The results of the evaluation are recorded against each of the Transport Appraisal Guidance[43] environmental sub-objectives and presented in Table 2.

The five-years after evaluation highlighted that most sub-objectives scored 'as expected' overall. However, both landscape and biodiversity were worse than expected.

- Landscape mitigation had been implemented but in some locations at five-years after, establishment growth was variable and slower than expected. Maintenance appeared to have been limited. Ongoing maintenance and management will be required to ensure that the landscape design mitigation measures reach their potential and satisfy their landscape objectives in the long-term.
- Biodiversity - it was not possible to confirm the post-construction status of many of the nature conservation mitigation measures and habitat management was poor in places. Long-term management will be required to ensure they deliver their expected benefits.
- There were no significant outstanding issues following the one-year after evaluation of physical activity, severance and journey quality and so no further evaluation was undertaken on these topics. However, during the site visit some maintenance issues were identified along footpaths provided by the project and these were raised with the appropriate maintenance teams.

Noise

It was expected that properties near the former A11 in Elveden would experience an overall significant decrease in noise due to the reduction in traffic passing through the village. However, seven properties facing the new bypass route north of Elveden would experience noise increases.

For properties along the existing route where there was to be no significant realignment, decreases in noise were expected. This was due to the use of low noise surfacing and environmental screens (earth mounding and a wall) which would compensate for any increase in noise due to increased speed. These had been installed as expected.

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

A comparison of traffic volume data indicated that the observed volumes were around 15% lower than forecast on the A11. This is within the +/-20% threshold used to evaluate the impacts and so suggested impacts were broadly as expected. Traffic forecasts for HGVs and speeds were only available for 2014 in the appraisal documentation. Therefore, it was not possible to consider what effect differences in forecast and observed HGVs or speeds may have had.

Based on the available information, it was likely that the effects of the project on the noise climate along the A11 were as expected. Traffic levels through Elveden had reduced which is likely to have resulted in a decrease in noise for properties near the former A11. However, additional traffic data would be required to quantify this.

Air quality

The project was predicted to have an overall beneficial impact on local air quality, primarily due to realignment of the A11 around Elveden. The bypass had been provided and so the evaluation findings indicated that the impacts were likely to be as expected.

There were no air quality management[44] areas nearby, and no new air quality management areas were expected to be declared as a result of the project. This remained the case at five-years after.

Observed traffic volumes for the A11 were lower than forecast by more than 1,000[45] annual average daily traffic, suggesting that local air quality might be better than expected. However, it was not possible to consider what effect differences in forecast and observed HGVs or speeds may have had as not all the required data was available. Therefore overall, we considered that the impacts were likely to be broadly as expected. Traffic levels through Elveden had reduced and this was where the benefits to local air quality were expected to be greatest.

Greenhouse gases

The projected was forecasted to lead to a reduction in carbon of 387 tonnes in the opening year. Without the project, carbon emissions were forecast at 83,269 tonnes compared to 82,882 with the project.

It was not possible to effectively evaluate greenhouse gas emissions of the project because to replicate the extent of the original appraisal we would require forecast and observed traffic data for all the road links used in the appraisal study area. This data was not available and so we focussed just on the project extent[46].

Observed traffic volumes were lower than forecast along the project extent. This suggested that greenhouse gas emissions were likely to be lower than forecast along this section of the project. However, we did not have sufficient speed and

44 Locations where a local authority considers that air quality objectives are not likely to be achieved. https://uk-air.defra.gov.uk/aqma/

45 The criteria used in our evaluations. https://nationalhighways.co.uk/media/exypgk11/pope-methodology-note-jan-2022.pdf

46 We don't normally have observed data for the whole appraisal area, so we would usually recalculate a forecast and a new observed emission along a section of the project where we do have data, usually just the project extent. We would then comment on its accuracy. For this project we didn't have the necessary speed and HGV data to enable us to do this.

HGV data to be able to quantify or measure the effect of these changes or what impact this might have had on our conclusion.

Landscape

The project is located within an area of East Anglia known as The Brecks or Breckland. It is described as an area of considerable ecological, archaeological and landscape value with a unique character and a strong sense of place. Overall, the project was expected to initially have a large adverse impact. This was due to the removal of vegetation, the alteration to landform, the introduction of some large structures and the increased size of the road corridor. The impact was expected to reduce to moderate adverse 15 years after project opening as the mitigation planting proposals matured. The mitigation entailed new planting and seeding including:

- Replacing woodland edge where the route severed existing forests and plantations.
- Providing linear belts of shrubs and trees to complement the existing pattern of vegetation in the area.
- Planting new areas of woodland with glades where existing forests and plantations were removed.
- The planting of Deal Rows[47] to form a buffer between the A11 and adjacent ecologically sensitive heath areas.
- Species-rich verges to form a unifying element along the route and help to mitigate the drainage measures.

At the war memorial impacts would remain large adverse due to the A11 and associated traffic being moved closer.

Our evaluation at five-years after confirmed that the landscape mitigation design had been implemented although it was observed that the areas of planting showed varied establishment throughout the project extent. Plant growth rates for many plants were slower than might typically be expected for highway planting at the five-years after stage. Some planting plots were not fully stocked, with dead and missing plants evident. There was also evidence of damage caused by animals browsing above the height of the individual tree protection shelters.

Smooth-flowing contours were proposed for all earthworks to give a more natural, softer, appearance appropriate to the Breckland landscape and this was observed to be the case.

One of the objectives of the landscape design was to provide a structurally diverse broadleaved woodland edge, with small 'glades' and grassland mosaics to soften the edges. However, it is recognised that it will take many years of ongoing maintenance and management before these objectives can be achieved. At five-years after, planting was still immature with little canopy closure, and a long way off providing a new ‘edge’ to the retained existing woodland. Some of the new characteristic rows of Scots pine trees were found to be in poor condition and required remedial measures. This would include full restocking of failed and

[47] A local reference to the single rows of Scots pine trees which exhibit varying degrees of twisting and contortion that are a distinctive feature of the Breckland landscape.

missing trees. There was also evidence of a lack of grassland management. These issues had the potential to compromise the effectiveness of the new planting to support the landscape objectives. These were to reinforce the unique Breckland character, provide visual screening and integrate the project into the local landscape.

At five-years after landscape was evaluated to be worse than expected as illustrated in Figure 22 and Figure 23. Without a commitment to deliver the long-term maintenance and management requirements of the Handover Environmental Management Plan ("*that all establishment of planting has been achieved, required monitoring has been delivered and reported and the objectives of the mitigation measures have been delivered and the residual effects of the project realised"*) there was a risk that the landscape design mitigation measures may not reach their potential by the design year (15 years after opening).

Figure 22 Example of unmaintained plot

Note: Example of un-maintained plot area with numerous failed plants. It is unlikely to meet its landscape objectives unless the plot is fully restocked with appropriate aftercare and ongoing maintenance and management put in place.
Source: site visit 2020.

Figure 23 Planting plot on B1106 overbridge embankment at FYA

Note: Example of plot with variable plant growth, with some plants difficult to see amongst the vigorous weed growth. Certain species e.g., Pine and Willow are establishing more readily than others at five years after. It is important that all species within designated mixes become established. The red HGV is using the A11 and about to pass below the B1106.
Source: site visit 2020.

Townscape

Before the project opened, the busy A11 trunk road passed through the village of Elveden. It was expected that the new bypass around Elveden and consequent removal of traffic from the village would have a moderate beneficial impact on the character of the village in the opening year. This impact was expected to remain as moderate beneficial in year 15. The project was not expected to change the townscape character of the Center Parcs holiday village. Overall, it was concluded that the Townscape impact of the project would be slight beneficial.

It was observed at five-years after that as expected the A11 had been moved away from the village of Elveden bypassing the village to the north. This introduced a degree of separation between the bypass and settlement and allowed easier access between the two distinct settlement areas of the village. The new junction with the B1106 just to the south of the Center Parcs holiday village provided access onto the new A11 from the village, and to the existing facilities within Elveden from the new A11. It was considered that the removal of busy traffic from Elveden had had the expected beneficial effects for the village and had not noticeably affected the character of Center Parcs. Overall, the outcome was as expected.

Heritage of historic resources

The appraisal predicted that the project would have a moderate adverse impact on two heritage assets. The Landscape setting of the Grade II listed war memorial would be impacted by the inclusion of a non-motorised user[48] underpass, and the Romano-British farmstead which was expected to be directly impacted by topsoil stripping. In total 31 sites were expected to receive slight adverse impacts.

[48] The term ‘non-motorised users’ refer to cyclists, pedestrians and equestrians.

Moderate beneficial impacts were predicted for the How Hill tumulus (Scheduled Monument), and a large beneficial impact to the Elveden Conservation Area because of moving the road away from these heritage assets.

Overall, the impact of the project on the heritage resource was predicted to be slight adverse.

Our observations at five-years after suggested that the indirect effects of the project on the built heritage were likely to be as expected. This included the beneficial effects for Elveden conservation area and listed / historic buildings. However, it should be noted that:

- The effects of providing the underpass on the setting of the war memorial were evaluated to be as expected. However, it will take many years before the Pine trees (planted to replace trees removed to construct the underpass) are sufficiently mature in the parkland landscape to replace those that were a feature of the immediate setting of the war memorial.
- An environmental mound had been provided to screen the historic buildings at Chalk Hall and thereby minimise impacts of the road on their setting. The mitigation woodland planting on the mound was establishing slowly, and successful ongoing growth will be required for this planting to meet its screening objectives by the design year.
- The project's drainage design was changed, and this had affected the predicted moderate beneficial impacts on the landscape setting of How Hill scheduled monument. The benefits may not be fully realised and therefore maybe slightly worse than expected.

Archaeological reporting[49] confirmed that the mitigation strategy was implemented and detailed the findings of the archaeological field work[50] on site. The report highlighted that further work and analysis was required before it could be published. It noted that '*the results of this work will represent a significant addition to the corpus of archaeological information relating to the emergent picture of the exploitation and habitation of the Brecklands over time.'*

The final publication of archaeological analysis is a project requirement, and it was understood that this analysis was still ongoing. Subject to its successful completion, it was considered that overall, the effects of the project on archaeology were likely to be as expected.

Biodiversity

The A11 passes through areas of international and national nature conservation status. The project was expected to impact on important habitats and species and so mitigation measures were included in the design to reduce these impacts. These measures included habitat creation and enhancement along the project along with offsite mitigation designed to address the loss of important habitats and species.

For species, with mitigation in place, the project was expected to have:

[49] A11 Fiveways to Thetford Post Excavation Assessment of Archaeological Excavations Report 2012 – 2013.
[50] Pre-construct Archaeology https://www.pre-construct.com/a11/

- neutral impacts on Annex 1 bird species[51] and invertebrates.
- slight adverse impacts on bats (caused by severance of foraging routes) and deer (due to the interruption of deer movement patterns and potential deer mortality); and
- slight beneficial impacts on reptiles (resulting from the provision of habitat in the new deer visibility zones), and moderate to large beneficial impacts on Great Crested Newts because of improvements to their breeding ponds near to the project.

In terms of habitat, with mitigation in place, the project was expected to have:

- a neutral impact on the Breckland Special Area of Conservation & Special Protection Area habitats and associated Site of Special Scientific Interest.
- neutral impacts on the Protected Road Verges, the River Lark cut-off channel (a watercourse) and Mildenhall Woods.
- slight adverse impacts on the habitats in the area of the bypass; and
- a moderate to large beneficial impact on the Rex Graham Reserve Special Area of Conservation / Site of Special Scientific Interest due to the road moving further away from the site.

Overall, the impact of the project on biodiversity was predicted to be neutral.

At five-years after National Highway's Environmental Information System database (EnvIS) had not yet been updated by the project. This meant that environmental assets such as the biodiversity mitigation measures had not been added. If these records are not updated this could impact the long-term asset management of the network.

Based on the information available at five-years after, the evaluation concluded that:

- the results of surveys and monitoring for Great Crested Newts and badgers suggested that the project impacts were in line with expectations for these species. However, as records outlined in the Handover Environmental Management Plan had not been kept regarding recording badger deaths on the A11, the long-term success could not be confirmed.
- results of the 2018 bat monitoring[52] indicated that the innovative use of bat wires was showing some use with over 43% of monitored bats crossing the A11 using them as a guide to safely cross the carriageway; at five-years it was not possible to confirm whether all the recommended remedial measures had been implemented or if the annual monitoring in 2019 had been undertaken. There was also insufficient data to confirm that the commitment to provide bat boxes and monitoring for five years had been delivered.

[51] Annex I of the EU Wild Birds Directive – noted to be Woodlark, Nightjar and Stone curlew.
[52] The most recent data provided for evaluation.

- it was understood that works had been completed at Hockwold Heath and Wangford Warren[53] and the areas were now subject to a 99-year monitoring and management phase.
- the Handover Environmental Management Plan (HEMP)[54] included post-construction nature conservation commitments to manage and monitor habitats including Species Rich Grasslands, Protected Road Verges and Forest Edge Management Zones. No results of any establishment reporting had been provided to confirm the post-construction biodiversity status of any of these nature conservation mitigation areas; and
- it was observed at five-years that there was little evidence of woodland management taking place. This may affect the delivery of the biodiversity outcomes. It was considered that it will take many years for the intended structurally diverse new broad-leaved woodland edge with glades and grassland mosaics to develop as intended by the Forest Edge mitigation proposals (Figure 24 below).
- There was no evidence of recent species-rich grassland management or maintenance having been undertaken. Some species diversity was evident, but there were instances of noxious and other weed growth (Figure 25). This management was expected to help maintain ideal conditions for the rarer plant species within the verges to thrive. The environmental benefits of the mitigation may not be fully realised if habitat maintenance is not improved.

Overall, Ecology and Nature Conservation was evaluated to be worse than expected.

Figure 24 Forest Edge Management zone at five-years after

Note: View illustrating one of the 20m wide Forest Edge Management zones (looking west at Mildenhall Woods, established where the road passes through coniferous / mixed forest plantations to prevent wind throw damage.
Source: Site visit 2020

[53] The two essential offsite habitat creation areas are Hockwold Heath Extension and Wangford Warren.
[54] A National Highways project document designed to provide environmental information to support the ongoing maintenance of environmental mitigation.

Figure 25 View east along A11 from edge of Mildenhall Wood at five-years after

Note: Grasslands in the foreground are identified to be maintained as species rich on the landscape design. Currently there is no management beyond a swathe cut of the verge, where some species diversity was noted. Beyond that grassland is more rank, with noxious weed and gorse present.
Source: site visit 2020

Water environment

The appraisal reported that surface water runoff from the widened A11 could impact on the local watercourse (the River Lark cut-off channel) and a major aquifer that were present within the project extent. However, with sensitive design and the inclusion of new pollution control measures, the impacts were expected to reduce to neutral. Mitigation measures would also ensure that the two private water supplies, expected to be affected by the project, would not be left without a viable source or water.

Our site visit confirmed that the drainage network had been implemented as expected and included a new drainage system, soakaways, and pollution containment devices. Most soakaways and pollution containment devices observed at five-years were clear of vegetation, litter and detritus and appeared to be functioning as expected. However, our site visit did identify examples of drainage and water attenuation features that required maintenance to ensure that the drainage design remains effective in the long-term. For example, it was observed that several of the pollution control gates appeared to have slipped to one side[55]. This could affect their use during a pollution incident. An inspection chamber cover at the southbound carriageway soakaway adjacent to Horn Heath was not securely fixed and there were instances of weed growth / vegetation encroachment in the gravel filter drains[56] which, unless managed, might over time impede the effectiveness of the surface water drainage features.

Although maintenance issued were identified, it was considered that the overall direct effect of the project on water quality and drainage was likely to be as expected.

[55] Link to Google Streetview image June 2019. Pollution control gate https://goo.gl/maps/XCRZnM88sDmS9tGM9
[56] Link to Google streetview image June 2019 Vegetation encroachment in gravel filter drains: https://goo.gl/maps/L8MdxHZjuwnn74WaA

Overview

The results of the evaluation are summarised against each of the Transport Appraisal Guidance[57] environmental sub-objectives and presented in Table 2

Table 2 Environmental impacts

Sub-objective	Appraisal Summary Table score	Five-years after evaluation	Summary
Noise	Change in population annoyed (year 15) = -4. NPV of noise proposal = £148k.	Likely to be as expected (based on the information available).	Noise mitigation appeared to have been implemented as expected. The available traffic data suggested that the effects of the project on the noise climate along the A11 were likely to be as expected.
Air Quality	PM_{10} = -40.63. NO_2 = -184.32.	Likely to be as expected (based on the information available).	Comparison of available traffic data suggested that local air quality was likely to be broadly as expected although further study would be required to be certain
Greenhouse Gases	NPV = -£2.573m.	Likely to be better than expected	Lower than forecast traffic flow data suggested that emissions were likely to be better than expected.
Landscape	Moderate adverse.	Worse than expected.	Landscape mitigation had been implemented. However, long-term maintenance needs to be improved to ensure design year outcomes are met.
Townscape	Slight beneficial.	As expected.	The removal of busy traffic from the former A11 through Elveden has had the expected beneficial effects for the village.
Heritage of Historic Resource	Slight adverse.	Generally, as expected; Slightly worse than expected for the setting of	An archaeological mitigation strategy was implemented, and the outcome of the analysis is to be published.

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

Sub-objective	Appraisal Summary Table score	Five-years after evaluation	Summary
		Bowl Barrow / How Hill scheduled monument.	The indirect effects of the project on built heritage were likely to be as expected, provided mitigation planting establishes successfully.
Biodiversity	Neutral.	Worse than expected.	Not all the expected species and habitat monitoring reports were available and examples of poor maintenance were seen. There was a risk that long term biodiversity outcomes may not be met.
Water Environment	Neutral.	Likely to be as expected.	Mitigation measures had been implemented broadly as expected although examples of poor maintenance were seen that if not addressed may affect design year outcomes.

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 £109m, close to the forecast cost of £108m[58]. In the first five years, the road provided additional capacity to support more road users (an increase of around 32%), whilst improving the safety of those journeys. If this trend continues, the project is reforecast to deliver £206million of safety and £168million of journey time benefits over the 60-year period[59].

Overall, although the trajectory of the project's benefits at five years after was lower than expected, it was still on track to deliver very high value for money over the 60-year period[60].

Forecast value for money

An economic assessment is undertaken prior to construction to determine a project's value for money and inform the business case. The assessment is based on an estimation of costs and benefits. The impacts of 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[61] are summed together and compared against the investment cost to produce a benefit cost ratio (BCR). The monetised impacts are considered alongside additional impacts which are not able to be monetised, to allocate the project a 'value for money' category.

The monetised benefits forecast by the appraisal which supported A11 Fiveways to Thetford business case are set out in Table 3. 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.

[58] Present value of costs in 2010 prices and values.
[59] Based on impacts on the Strategic Road Network.
[60] The value for money categories referenced are defined by the Department for Transport https://www.gov.uk/government/publications/dft-value-for-money-framework
[61] Typically scheme life is taken to be 60 years.

Table 3 - Monetised benefits of the project (£ million)

	Forecast (£m)	% of forecast monetised benefits	Evaluation approach
Journey times	1,600	82%	Re-forecast using observed and forecast traffic flow and journey time data for the A11 project extent only
Vehicle operating costs	108	6%	Re-forecast using observed and forecast traffic flow and journey time data
Journey time & VOC during construction and maintenance	76	4%	Monetised benefits assumed as forecast
Journey time reliability	0	0%	Not evaluated (assumed as forecast)
Safety	179	9%	Re-forecast using observed and counterfactual safety data
Carbon	-4	0%	Monetised benefits assumed as forecast
Air quality	0	0%	Monetised benefits assumed as forecast
Noise	0	0%	Monetised benefits assumed as forecast
Indirect tax revenues	-16	-1%	Monetised benefits assumed as forecast
Total present value benefits	**1,943**	**100%**	

Note: 2010 prices discounted to 2010

The costs anticipated in the appraisal are set out in Table 4. Based on this information, the scheme was anticipated to give very high value for money over the 60-year appraisal period.

Evaluation of costs

The project was delivered at a cost of £109 million[62], close to the anticipated cost of £108 million (see

Table 4).

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.

[62] 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.

Table 4 - Cost of the project (£ million)

	Forecast (£M)	% of forecast costs	Evaluation approach
Construction costs	108	101%	Current estimate of project cost
Maintenance costs	-1	-1%	Not evaluated (assumed as forecast)
Total present value costs			

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 reforecast 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 undertake 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 3, journey time benefits made up most of the justification for investing in A11 Fiveways to Thetford project.

If the trends observed at the fifth year continue over the 60-year period, without any further action to optimise benefits, the monetised impact on journey times, for those using the road, would be £168 million[63]. This figure only reflects journey time trends observed on the project extent, not the surrounding road network which would have been considered in the appraisal.

The appraisal assumed the project would deliver journey time savings for both those using the A11 and those using the surrounding road network, where congestion would be eased by the additional capacity. The evaluation has not monitored the journey time impact on the surrounding roads and can only directly quantify a proportion of the journey times. Our findings relating to the project area are very different from those forecast for that area. We therefore did not feel we had sufficient confidence in the forecasts to use them as the basis of an estimate of the outturn impact in the wider area.

The value we are presenting only monetises the benefits to traffic on the A11. This is a conservative approach to reflect our uncertainty, as the project section only represented around 26% of the total journey time benefits forecast for the 5th year.

[63] This is against a counterfactual where we have estimated what the journey time is likely to have been if the road had remained a single carriageway.

Other reforecast impacts

We reforecast total safety benefits to be £206 million. This figure relates to the benefit on the strategic road network over 60-years (Figure 17). The reforecast is slightly higher than the appraisal forecast. The observed personal injury collision savings are slightly greater than those forecast in the appraisal.

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 negative. Although more vehicles were forecast and they were forecast to be travelling at higher speeds, this expected reduction in tax revenues is likely to be due to the vehicles being forecast to travel at a more fuel-efficient speed and therefore using less fuel and paying less tax[64]. We were unable to reforecast indirect tax revenue because there was insufficient speed data to allow it to be calculated. It was assumed to be as forecast.

Vehicle operating costs refer to the fuel and other costs borne by the user (such as the wear and tear on vehicles). This increases with increased distance travelled. The appraisal forecast a benefit. Based off the changes we have seen in our estimate of fuel consumption and indirect tax revenue, we estimate the outturn impact to be a benefit of £107m compared to a forecast of £108m.

Impacts assumed as forecast

The evaluation has not been able to consider the monetary value of journey time reliability as would usually be the case with our projects. This was because journey time reliability was not monetised or reported in the appraisal. We have also been unable to reforecast noise and carbon benefits[65], and instead these were reported as forecast. For carbon impacts, this assumption is conservative because lower than forecast traffic flows are likely to mean that these impacts are better than forecast[66].

Journey times and vehicle operating costs during future construction and maintenance have been assumed as forecast. As most of this maintenance is still in the future, the evaluation uses the impacts forecast within the business case.

Overall value for money

The economic impacts show that the journey time benefits, which were forecast to comprise 82% of the predicted benefits, were lower than forecast. However, the value we have presented only monetises the benefits to traffic on the A11. This is a conservative approach to reflect our uncertainty, as the project section only represented around 26% of the total journey time benefits forecast for the 5th year. The benefits were however still high. Our evaluation also identified that the reforecast safety benefits were higher than the original forecast. Combined journey times savings and safety comprised over 90% or the predicted benefits.

[64] Refer to Transport Analysis Guidance (TAG) unit A1.3
[65] We do not have a method for reforecasting the monetised impact of noise or carbon impacts. These generally have a small contribution to the monetised benefits of schemes and therefore the impact of assuming as forecast is unlikely to impact on the value for money rating of the project.
[66] Refer to section 6 for further detail on noise and greenhouse gas impacts.

When considering an investment's value for money we also consider benefits which we are not able to monetise. For this project landscape, biodiversity and journey quality might be relevant considerations.

Landscape was forecast to be moderate adverse, and our evaluation concluded it was likely to be 'worse than expected'. This was because the new landscape plots were in poor condition and so there was a risk that unless improvements were made, they may not mitigate the landscape impacts to the level predicted. Biodiversity was forecast to be neutral. However, our evaluation concluded that the impact was worse than forecast for the same reasons as for landscape. Unless improvements are made the predicted impacts may not be mitigated as expected. Journey quality was appraised to be large beneficial principally due to improvements to congestion and safety. Journey quality is not normally evaluated at five-years after but at one-year after it was found to be as expected. We have not encountered any information to suggested that the outcome had changed. The remaining environmental impacts were broadly as expected.

Therefore, although the trajectory of the project's journey time benefits at five-years after was lower than expected, we do not consider that the landscape and biodiversity impacts in themselves would change the value for money rating for the project.

Overall, we calculated at the five-year evaluation that, as forecast, the A11 Fiveways to Thetford project was still likely to be very high value for money according to the Department for Transport criteria.

Appendix A

Changes in two-way average weekly traffic volumes

Table 5 Changes in two-way average weekly traffic volumes

ID	Description	Before	1YA	5YA	Before-1YA Change	Before-5YA Change
1	A1101 north west of Fiveways roundabout	2,400	2,700	2,500	13%	3%
2	A1101 West, near Fiveways roundabout	10,700	12,000	14,000	12%	30%
3	B1112 near Lakenheath	5,500	6,000	5,600	9%	1%
4	A1065 near Fiveways roundabout	13,300	13,800	10,500	3%	-21%
5	A1101 East, near Fiveways roundabout	4,500	3,700	3,900	-17%	-14%
6	B1112 between Mildenhall Road and A11	500	2,300	3,200	378%	550%
7	B1106 north of A11	4,600	5,300	6,200	14%	35%
8	B1106 south of A11	3,600	5,000	5,800	40%	61%
9	A134 between Lynford and Thetford	10,200	12,400	11,400	21%	12%
10	Elveden Road between Elveden and Barnham	1,700	1,900	2,600	11%	53%
11	Norwich Road, west of Thetford	10,600	12,900	13,300	21%	25%
12	A134 south of Thetford	12,300	12,700	12,700	3%	3%
13	A1088 south of Thetford	4,800	5,400	6,000	11%	24%
14	A1075 north east of Thetford	5,600	6,600	6,600	20%	20%
15	A1066 east of Thetford	3,300	5,300	5,600	58%	68%
16	A1065 Brandon Road, north of Fiveways roundabout	13,000	11,300	11,000	-13%	-15%
17	A134 east of A11	9,100	9,600	9,100	5%	0%
18	B1107 between Brandon and Thetford	7,400	7,000	6,700	-6%	-9%
19	A11 between Fiveways roundabout and Thetford	25,600	34,200	33,800	34%	32%
20	A11 Thetford Bypass	30,900	37,100	38,700	20%	25%
21	A11 Red Lodge	35,700	43,100	45,000	21%	26%

Note: Volumes are shown for five years after opening (5YA) and, for reference, for one year after (1YA). Figures are rounded to the nearest 100 which may lead to inconsistencies with the percentage figures. Some WebTRIS traffic count information was factored to allow comparison. Information was not available for the northbound carriageway of the A11 bypass until March 2017. Northbound volumes for 2012 were derived by applying the 2019 directional split to the 2012 southbound data. Source: National Highways WebTRIS and Suffolk County Council.

A11 Fiveways to Thetford appraisal history

The project had an extended design and development cycle. The original traffic modelling work for the project was undertaken by Parsons Brinckerhoff in 2007. Their work on the base year models helped to prepare Do Nothing, Do Minimum and two Do Something forecasts, referred to as Do Something 1 (DS1) and Do Something 2 (DS2). The Do Minimum scenario included the signalisation of Fiveways roundabout. The DS1 scenario represented the project, while the DS2 scenario represented the project with signalisation of Fiveways roundabout.

A Public Enquiry (PI) into the project was held in 2009-end of Jan 2010. Jacobs were appointed by the Highways Agency (HA) to update and revalidate the SATURN model originally used for the project's appraisal and undertake traffic modelling for the PI. They documented their work in two volumes of the A11 Fiveways to Thetford Improvement Report on Traffic Modelling (May 2010).

The remodelling for the PI only modelled the Core Central growth scenario. Within this only the DS1 scenario was presented to the PI by the HA. Several amendments to the modelling were made on the advice from Counsel. The opening year was updated to 2013 and the design year was updated to 2028. TEMPRO 5.3 was used for growth in car trips, and National Road Traffic Forecasts (NRTF) for goods vehicle growth.

The forecast flows for the PI modelling, 2013 and 2028 by time period, were presented in Table 5.7 and Table 5.8 respectively of Jacobs' report, both for DN and DS1 scenarios. For the five-years after evaluation we interpolated Jacob's forecast flows to produce flows by time period for 2019. The PI modelling produced forecasts for 51 locations. Of those, 12 locations were assessed for evaluation. Due to the choices of traffic count locations at five years after, comparisons between forecast and observed volumes proceeded at only four locations across three time periods: morning, inter peak and evening peak.

Forecast versus observed hourly volumes

Table 6 Forecast vs observed hourly traffic volumes

Time Period	Location		Forecast		Observed		DN Accuracy	DS Accuracy
			DN 2012	DS 2019	Before (2012)	5YA (2019)		
Morning peak	A1065 near Fiveways roundabout (Site 4)	NB	520	540	320	280	38%	47%
		SB	590	560	570	360	5%	35%
	A11 North of Fiveways roundabout (Site 19)	NB	850	1120	660	920	23%	17%
		SB	1020	1710	970	1300	5%	24%
	A1101 Mildenhall Road (Site 5)	EB	280	160	160	140	43%	11%
		WB	440	250	230	200	47%	22%
	A1065 North of B1112 (Site 16)	NB	490	460	280	300	44%	36%
		SB	540	560	430	400	21%	29%
Off peak	A1065 near Fiveways roundabout (Site 4)	NB	340	320	410	340	-20%	-8%
		SB	550	480	440	320	19%	34%
	A11 North of Fiveways roundabout (Site 19)	NB	940	1240	840	1090	10%	12%
		SB	870	1180	820	1060	6%	10%
	A1101 Mildenhall Road (Site 5)	EB	250	210	140	110	42%	49%
		WB	240	230	150	140	36%	38%
	A1065 North of B1112 (Site 16)	NB	360	340	430	360	-18%	-6%
		SB	510	520	420	350	18%	33%
Evening peak	A1065 near Fiveways roundabout (Site 4)	NB	430	430	580	450	-33%	-6%
		SB	530	440	610	380	-14%	14%
	A11 North of Fiveways roundabout (Site 19)	NB	1270	1720	1290	1580	-1%	8%
		SB	920	1210	800	990	12%	18%
	A1101 Mildenhall Road (Site 5)	EB	210	60	230	110	-10%	-74%
		WB	290	350	220	190	26%	44%
	A1065 North of B1112 (Site 16)	NB	520	420	590	540	-12%	-28%
		SB	600	570	410	430	32%	25%

Note: The 2012 observed northbound volume on the A11 derived from directional split of the 2019 traffic volumes then applied to the 2012 southbound traffic volumes. Observed volumes obtained from relevant traffic count sites detailed earlier. Change in volumes between before and five-years after periods represented as a percentage calculated on the raw observed figures not rounded figures presented. Source: Observed traffic volumes taken from WebTRIS and Suffolk County Council – 2012 (before) and 2019 (5YA) and uses Sites 4, 5, 16, 17 and 19. Forecast traffic volumes obtained from Traffic Modelling Report (2010). Uses Sites 4, 5, 16, 17 and 19.

Appendix B.

Safety counterfactual methodology

Personal injury collisions (hereafter referred to as collisions) on the strategic road network are rare and can be caused by many factors. Due to their unpredictable nature, we monitor trends over many years before we can be confident that a real change has occurred as result of the scheme.

To establish whether any change in collision numbers is due to the scheme or part of wider regional trends we have established a test we call the Counterfactual. The Counterfactual answers the question: What would have likely occurred without the scheme being implemented? To answer this question, we estimate the range of collisions that could have occurred without the scheme in place. Previous Post Opening Project Evaluations answered this question by looking at national trends in collisions. Adjustments have been made to the methodology for estimating the Counterfactual. These have been made to address the following areas:

Amended Data Collection Method

Revised method for identifying collisions that occurred on the network.

Only validated STATS19 information is used for reporting purposes.

Adjusting for Traffic Flows

Baseline traffic flows are an important factor when determining the counterfactual. We now assume that without the changes made to the network, the trends would follow regional background traffic growth patterns.

We can now calculate the collision rate for the busiest stretches of conventional motorways.

Better Differentiation between different types of Motorway

The existing methodology only had one definition of motorway.

The new method allows us to differentiate between conventional motorways, conventional motorways with high traffic flows and smart motorways.

Assessing Regional Trends

The new method uses regional rather than national trends for collision rates and background traffic growth, which provides greater granularity and makes the hypotheses more realistic.

We have found that the adjustments have resulted in a slight change from the previous methodology. We still have confidence in the accuracy of the previous methodology but believe we have made suitable changes that will ensure a methodology fit for purpose for the future.

Since this scheme, smart motorways have evolved. More recent all lane running schemes have demonstrated that they are making journeys more reliable for those travelling during congested periods, enabling us to operate the road at a higher speed limit for longer periods, whilst maintaining safety.

Incident reporting methodology

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 do not. 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.

Unadjusted Collision Severities

The project extent is covered by Norfolk police constabulary who transferred from Stats19 to CRASH in February 2016.

Figure 26 show the unadjusted collision severities on the project extent:

Figure 26 Unadjusted collisions by severity for project extent

Year Order	Fatal	Serious	Slight
5Yr Before	1	2	25
4Yr Before	1	3	32
3Yr Before		7	20
2Yr Before		6	21
1Yr Before	1	8	18
1Yr Construct		5	17
2Yr Construct	2	2	15
1Yr After		1	8
2Yr After		1	5
3Yr After		2	3
4Yr After		3	6
5Yr After		4	5

Source: STATS19: 1st March 2008 to 31st December 2019

The wider safety area is also covered by Norfolk policy constabulary.Figure 27 shows the unadjusted collision severities on the wider safety area:

Figure 27 Unadjusted collisions by severity for wider area

Year Order	Fatal	Serious	Slight
5Yr Before		11	72
4Yr Before	1	14	66
3Yr Before	1	16	64
2Yr Before	6	10	48
1Yr Before	2	12	56
1Yr Construct		12	47
2Yr Construct	1	9	57
1Yr After	2	5	62
2Yr After	5	11	49
3Yr After	4	7	56
4Yr After	2	10	40
5Yr After	1	13	42

Source: STATS19: 1st February 2008 to 29th November 2019

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