national highways

A160/A180 Port of Immingham Improvement

One-year post-opening project evaluation

The methodology used to generate the data in this document should only be considered in the context of this publication. This methodology, and its subsequent outputs may differ to methodologies used in different analyses at different points in time. This is due to continuous improvements of data mapping, capture, and quality. As these factors evolve over time any comparison with earlier data or data from other sources, should be interpreted with caution.

Foreword

National Highways is a government-owned company that operates, maintains, and improves England's motorways and major A roads. Our roads help our customers get to their destination safely – and in the time they expect to. Safety is our top priority, and we are committed to reducing the number of road users killed or seriously injured on the strategic road network by 50% (from the 2005-2009 baseline) by the end of 2025.

As Chief Customer and Strategy Officer, I want to know that developments on our network are meeting their objectives and are putting the needs of drivers first. Post-Opening Project Evaluations (POPEs) are a vital part of that assessment. POPEs are undertaken for all our major projects to understand how traffic changes, due to a project being in place, the environmental and safety impacts and how a project supports the economy.

The Port of Immingham is the largest port in the UK by tonnage and a key element within the extensive network of ports situated along the Humber. The Port of Immingham has experienced a significant growth in activity and investments over the past decade. Additionally, it is expected that the shipping volumes will continue to increase.

The A160/A180 Port of Immingham improvement project opened in March 2017Before the project there had been delays along the A160 during peak hours. One of our main objectives was to reduce existing congestion, providing capacity for future growth at the port. Despite traffic increasing, the project has prevented slower journey times and lower reliability. We always aim to maintain and, where possible, improve safety. Early indications show we on track to meet our safety objective, with a reduction in the rate and number of personal injury collisions since the project’s opening. Safety trends can vary each year and we will continue to monitor this trend over a longer period before drawing conclusions.

The outcome of the environmental impacts at one-year after were mixed. While air quality, noise and greenhouse gases were as expected or could not be evaluated because of insufficient data, early indications were that many of the outcomes for landscape, townscape, heritage of historic resource and biodiversity were worse than expected. This was because mitigation planting observed at the time of the evaluation, had either not established as expected or was in poor condition. This has since improved and we will continue to review again in the follow up evaluation to determine the longer-term environmental impacts.

Elliot Shaw

Chief Customer and Strategy Officer

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1. Executive summary

The A160/A180 Port of Immingham improvement is situated to the northwest of Grimsby and south of Hull. The Port of Immingham is a key element of a wider network of ports situated along the Humber and the A160 corridor connects the Port of Immingham to the wider strategic road network. The improvement project, which opened in March 2017, comprised of several elements along this link road. Including an upgraded junction at the A160/A180 Brocklesby Interchange, a new roundabout arrangement at the intersection between the A160 and Habrough Road, the dualling of the carriageway between Brocklesby Interchange and Habrough roundabout, a new overbridge along the Humber Road section of the A160, and a new gyratory system at the Manby Roundabout.

Before the project, there was evidence of delays during the peak hours along the A160, however the primary concern was the predicted growth in traffic, particularly Heavy Goods Vehicles (HGVs), driven by an expected increase in port activity. The Association of British Ports (ABP) announced a major expansion plan for its key operations at the Port of Immingham in 2017 with shipping customers projecting significant growth in volume handles in the coming years[1]. The project was designed to provide improvements to journey times and reliability along the A160 and, to improve access to the port itself.

The evaluation found there had been a significant increase in traffic volumes along the A180 nearby the project and the A160 itself. In particular, the section of the A160 nearest to the port of Immingham had seen traffic growth over and above that observed elsewhere in the project vicinity. This excess of growth in traffic was attributable to an increase in port activity, especially the increasing number of HGVs accessing and exiting the Port. Within the context of significant traffic growth around the port area, the project had delivered improvements in both journey times and reliability for outbound traffic travelling between the port access at Manby roundabout and Brocklesby Interchange, demonstrating that the network was coping well with this increased demand. The new Habrough Roundabout replaced a previous T-junction with A1077 Ulceby Road and means that vehicles travelling from A1077 towards the port no longer had to give-way to the A160 traffic. However, this introduced the need for A160 traffic to slow down on approach to the junction (rather than flow unopposed), resulting in marginal increases in journey time (of only 32 seconds).

Early indications showed a reduction in number and rate of personal injury collisions since the project's opening. The safety analysis will be revisited in later years to check the change was significant and not just a natural fluctuation.

Our evaluation found that the outcome of the environmental impacts at one-year after were mixed. Some impacts such as air quality, noise and greenhouse gases were as expected or could not be evaluated due to insufficient data. However, early indications were that many of the outcomes for landscape, townscape, heritage of historic resource and biodiversity were worse than expected. This was because mitigation planting had either not established as expected or was in poor condition. We will review this again in the follow up evaluation to determine the longer-term environmental impacts.

[1] https://www.abports.co.uk/news-and-media/latest-news/2018/major-expansion-to-uk-s-biggest-port-announced/

2. Introduction

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

The A160/A180 Port of Immingham improvement is situated to the northwest of Grimsby and south of Hull. The Port of Immingham is a key element of a wider network of ports situated along the Humber.

The Port of Immingham is the largest port by tonnage in the UK and, coupled with several other ports on the Humber, Immingham forms part of the UK's leading port complex. The Port itself supports over 10,500 jobs nationally and contributes over £700m per year to the UK economy as a critical link in the supply chain of businesses throughout Britain. The Port had seen significant growth in activity over the previous decade, with an increase in the number of container units handled from 68,000 to 183,000 between 2013 and 2017. The primary driver of this increase was the addition of distribution centres along the M1/M62 Corridor.

In addition to the significant investment and growth already seen at the Port of Immingham, there was an expectation that growth in shipping volumes would continue. The Association of British Ports also highlighted the need for shipping alternatives to Dover as such traditional routes may experience difficulties in future while the impacts of Brexit are still unfolding.

Before the project, there were delays along the A160 during the peak hours. In addition to the normal morning and evening peaks, there were delays in the outbound direction particularly during the evening peaks when journey times were significantly worse than those seen overnight. The port activity also involves unloading the freight ferries which would result in the increase in the number of HGVs exiting the Port. Shipping volumes were forecast to continue to increase at the port, and consequently, these occurrences of higher demand were expected to become more frequent and the volume of HGVs on the A160 during unloading was expected to increase. The project was designed to provide relief from the existing congestion and to provide capacity for future growth at the port, not only during the morning and evening peaks but also during these periods of additional demand due to unloading. This was fundamentally a forward-looking project, designed to provide capacity for the future, not to simply address an existing issue.

The project was comprised of the following elements:

- Brocklesby Interchange, which connects the A180 to the A160, had been upgraded to a two-bridge grade separated[2] roundabout. The unopposed left turn between the A180 eastbound to the A160 remains in place.
- The carriageway between Brocklesby Interchange and Habrough Roundabout had been widened to a two-lane dual carriageway.
- The A1077 Ulceby Road had been re-aligned to join the A160 at Habrough Roundabout.
- Habrough Roundabout had been moved westwards and upgraded to a five-arm higher capacity layout.

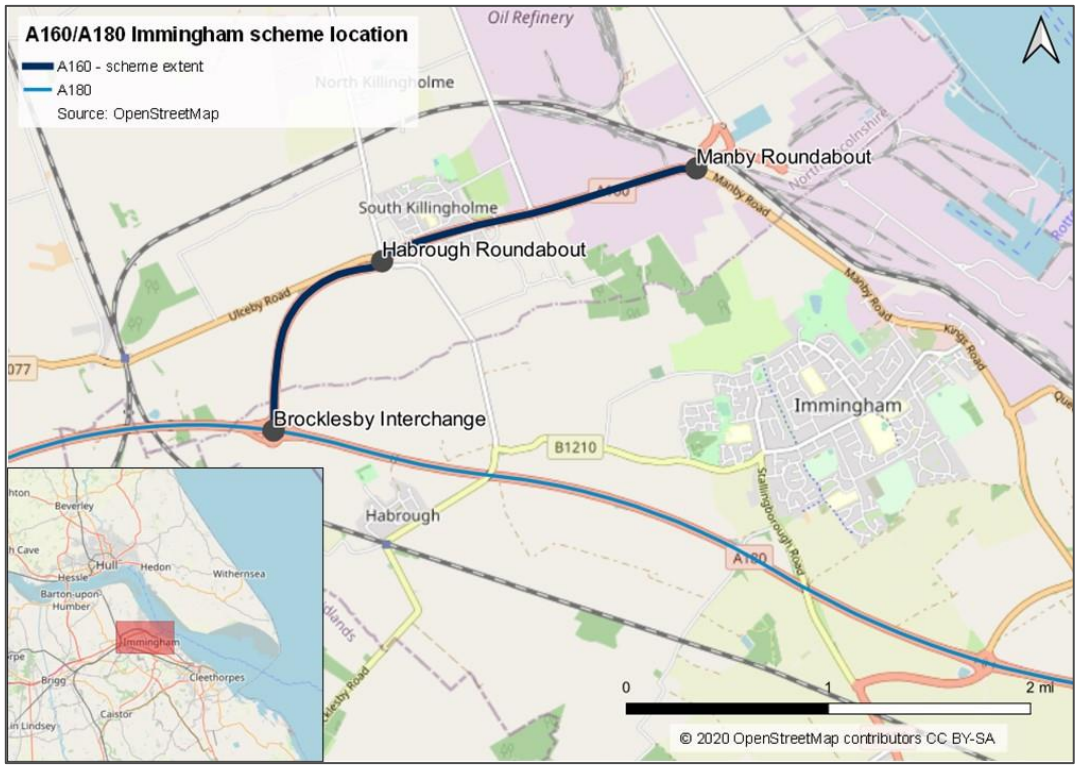
[2] 'Grade-separated' describes junctions where the traffic flows are separated over more than one level.

- A new link road was provided between Habrough Roundabout and Greengate Lane.
- A new overbridge over the A160 had been provided. (Before the project, traffic requiring access to the village of South Killingholme via Town Street was required to cross the A160. The central reservation gap had been closed).
- A new gyratory system between Manby Road roundabout, Rosper Road junction and the Port of Immingham.
- Non-motorised user (NMU) facilities such as dropped kerbs and increased footway width and the provision of shared footpath / cycleway alongside the new Town Street overbridge.

Project Location

The A160 corridor connects the Port of Immingham to the wider strategic road network. The improvement was situated to the west of Immingham, between the A180 which runs east to west and the Manby Roundabout, a short distance from the Humber River. The geographical context of the project is shown in Figure 1.

Figure 1 A160/A180 Port of Immingham Improvement location



Source: National Highways and OpenStreetMap contributors

How has the project been evaluated?

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

accountability for public expenditure, by assessing whether projects are on track to deliver value for money.

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

[3] Key impact areas include safety, journey reliability and environmental impacts.
[4] https://nationalhighways.co.uk/media/exypgk11/pope-methodology-note-jan-2022.pdf

3. Delivering against objectives

How has the project performed against objectives?

Our Major Projects have specific objectives which are defined early in the business case when project options are being identified. These benefits are appraised to be realised over 60 years; a one-year evaluation provides early indication if the project is on track to deliver the benefits.

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

Table 1 Objectives and Evaluation summary

Objective	One-year evaluation
Reduce traffic congestion, especially that seen in peak hours and when freight ferries are arriving and leaving after unloading at the port.	Journey times in the outbound direction (away from the Port) had improved from which we can infer that congestion had reduced. Journey times had increased slightly in the inbound direction, most likely due to the introduction of the new Habrough Roundabout replacing a previous T-junction arrangement that allowed mainline traffic priority.
Improve journey time reliability and reduce journey times on the A160 between A180 Brocklesby Interchange and the Port entrance.	There had been a minimal impact on reliability overall despite a significant increase in traffic volumes. The project had mitigated against any worsening of journey times and reliability that could have resulted from the increased demand along the A160 from additional Port activity.
Improve access to the Port of Immingham and the surrounding area.	The upgrade to Brocklesby Interchange provided a safer, higher capacity junction at the key intersection between the A160 and A180. Likewise, the new roundabout at Habrough Road made accessing the port from Ulceby via the A1077 far easier and safer than before.
Meet the needs of future traffic growth resulting from existing and future developments.	Additional capacity was provided by the dualling of the A160, the new Habrough roundabout and the upgrade to Brocklesby Interchange which mitigated against worsening journey times and reliability despite increasing traffic volumes.
Reduce the number and rate of collisions on the A160 and their severity.	The emerging findings are encouraging. There was a reduction in personal injury collisions along the project and in the surrounding area. However, this will need to be re-visited during the five-years after evaluation.
Improve safety for road users and the local community.	

Objective	One-year evaluation
Improve facilities for non-motorised users (NMUs) where technically feasible and economic to do so.	There had been several improvements to NMU facilities consisting of facilities for pedestrians, cyclists, and horse riders including widened footways, dropped kerbs and improved cycling provision.
Improve journey ambience.	The project had a beneficial impact on journey ambience. Although traveller views were adversely impacted, the improvements to road layout were likely to have reduced driver stress (with reduced driver frustration, fear of collisions and route uncertainty).

4. Customer journeys

Summary

During the first year of the project opening, traffic levels in the vicinity of the project had increased. Growth in traffic volumes along the A160 and nearby A180 of approximately 10% or higher were observed.

The eastern section of the A160 which leads directly into the Port had seen even higher growth, up to 20%, in the four years between the before and after opening, this exceeded that seen in the local area and local trends. The main cause of this increase was from HGV traffic accessing and exiting the port.

Journey times in the outbound direction (away from the Port) had improved from which we can infer that congestion had reduced. This was unsurprising as there was no additional opposing traffic and the A160 had been dualled between Habrough Roundabout and Brocklesby Interchange.

Journey times had increased slightly in the inbound direction (towards the port) most likely due to the introduction of the new Habrough Roundabout replacing a previous T-junction arrangement that allowed mainline traffic priority. Traffic heading inbound towards the Port was opposed by traffic heading to A1077 Ulceby Road, whereas previously Ulceby Road traffic was required to cross the A160 directly.

Journey time reliability mirrors the average journey time pattern with positive impacts in the outbound direction and slight worsening in the inbound direction.

The forecast journey times for the with-project scenario were notably quicker than observed, indicating that the traffic model was optimistic in terms of expected journey time savings. Despite this, it was clear that within the context of significant increase in demand, the project had delivered benefits and was dealing well with traffic growth in the area.

How have traffic levels changed?

The following sections examine the changes in traffic flow along the project extent and on roads in its vicinity. We have compared these with the observed national, regional, and local trends. We have also compared the observed and forecast traffic flows to understand to what extent the forecast flows were realised.

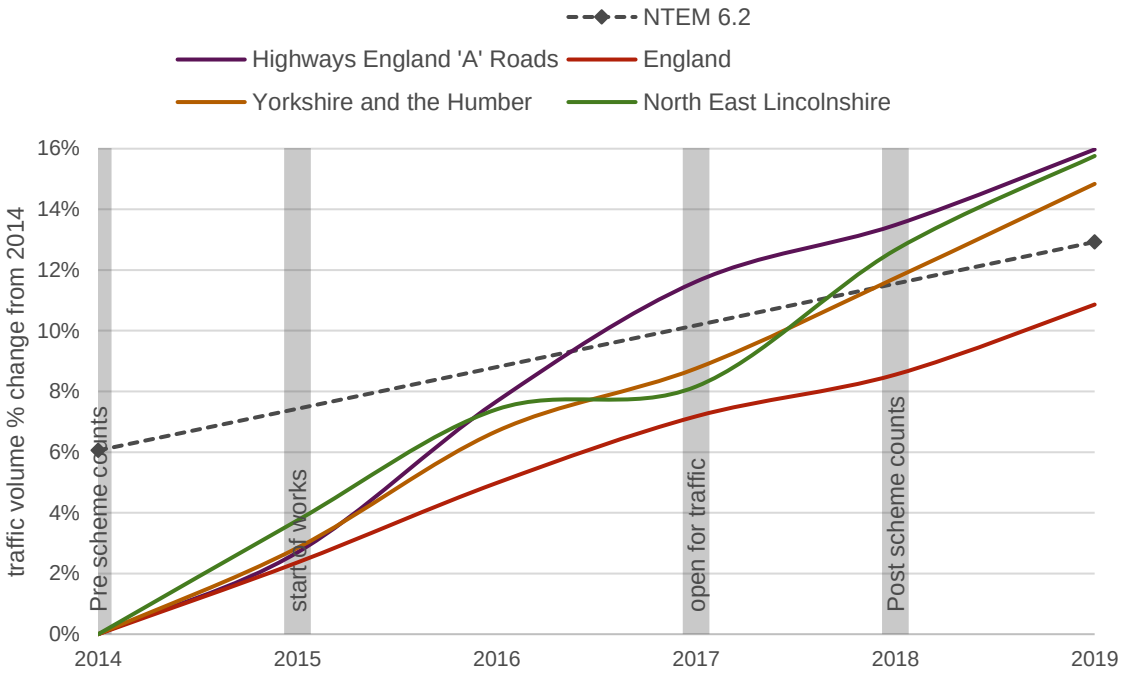
National and regional

To assess the impact of the project on traffic levels, it is useful to understand the changes within the context of national and regional traffic. Figure 2 below, shows how the traffic had grown between 2014 and 2018. We also present the percentage change in trip numbers according to the National Trip End Model (NTEM)[5] which was used in developing the forecast scenarios for the A160 Port of Immingham traffic model. The growth assumptions in NTEM were lower than the observed regional trends.

[5] NTEM – National Trip End Model, owned by the Department for Transport and used to inform the traffic modelling that supports our project appraisal. Dataset version 6.2 was used.

The traffic on the strategic A roads increased by around 14%. At the local level (Northeast Lincolnshire) traffic had increased by around 13%, while at the regional roads (Yorkshire and the Humber) traffic had increased by 12%. This growth is higher than the traffic on all road types in England which had an increase in traffic around 9%. The analysis in the following sections should be considered in this context as no adjustments have been made to take account of background traffic growth.

Figure 2 National and regional traffic trends



Source: Department for Transport road traffic statistics
https://www.gov.uk/government/statistical-data-sets/road-traffic-statistics-tra

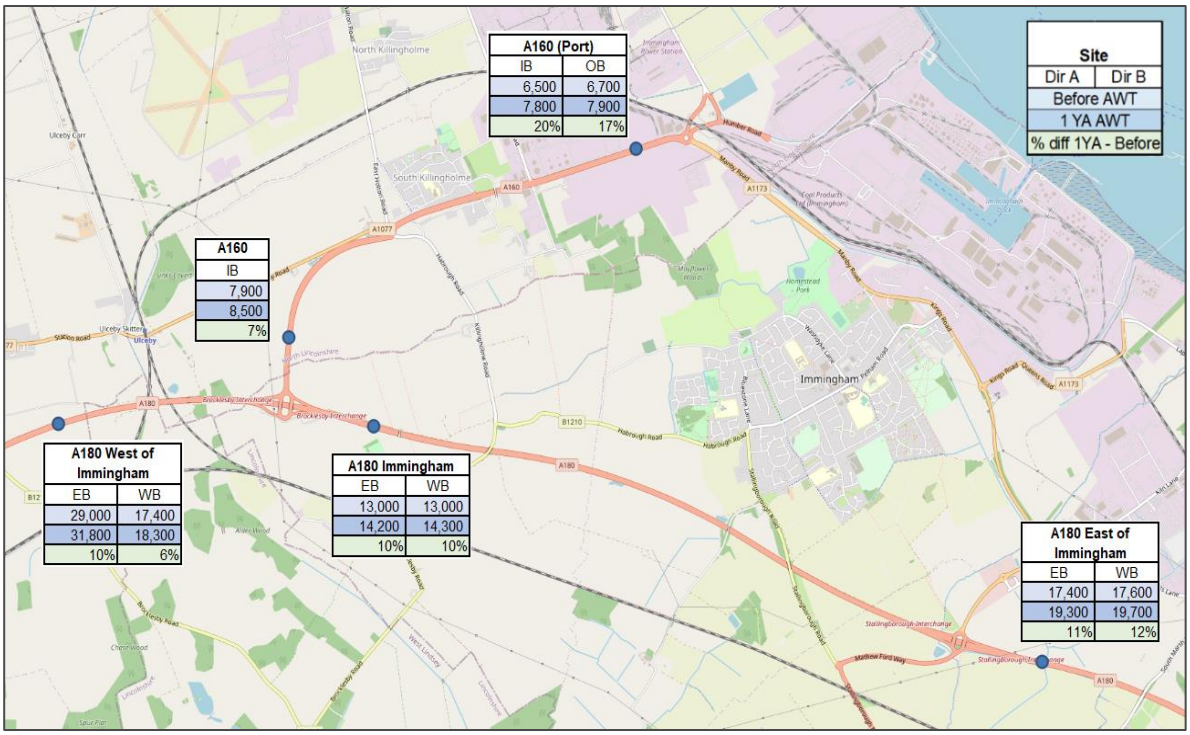
Project locality

Traffic volumes had increased in the vicinity of the project in line with or slightly above the background traffic growth levels of between 8-13% which was in line with the majority of locations, but the A160 closest to the port exceeded this.

Locations along the A180 saw around 10% growth since the project opened. Likewise, the growth along the section of the A160 between Brocklesby Interchange and Habrough was similar in magnitude having seen an increase in traffic of 7%. Growth at the A180 West of Immingham site was an outlier with only a 3% increase.

The A160 between the Habrough and Manby Roundabouts (A160 Port) showed the largest increase in traffic (between 17-20%). Between Brocklesby Interchange and Habrough Roundabout, the traffic increased by 7% (600 road users). This suggests that a substantial proportion of the 700 vehicles increase in traffic volumes at the A160 Port (inbound) traversed the entirety of the project extent. This would have aligned with the increase in port activity since 2013.

Figure 3 Comparison of before and one year after average weekly traffic



Source: WebTRIS traffic counts – September 2014 (before) and September 2018 (after), except for the A160 Port which is March 2015 and 2019. All figures are to the nearest 100.

Manby Road roundabout

To provide an insight into any changes in movements around the Manby roundabout and changes in the volumes of traffic using the junction since the project opened, we used turning count data[6] collected before and after the project improvement.

Overall, the turning counts showed a significant increase in traffic, primarily owing to the additional HGVs accessing the Port via the project. This analysis provided a strong indication that Port activity had increased, especially the number of HGVs accessing and exiting the Port. Meeting the additional demand for this activity was a key objective for the project.

A comparison between before project (November 2012) and one year after (November 2018) turning movements for the Manby Roundabout is presented in Figure 4 below with the values for HGVs following in Figure 5.

[6] The turning movements presented in this section represent 12-hour flows over the course of one weekday for the before project and for two days for the one year after. We need therefore to be mindful that using data with such a narrow timeframe could compromise the reliability of the data.

Figure 4 Comparison of 12-hour turning movements for Manby Roundabout - all vehicles

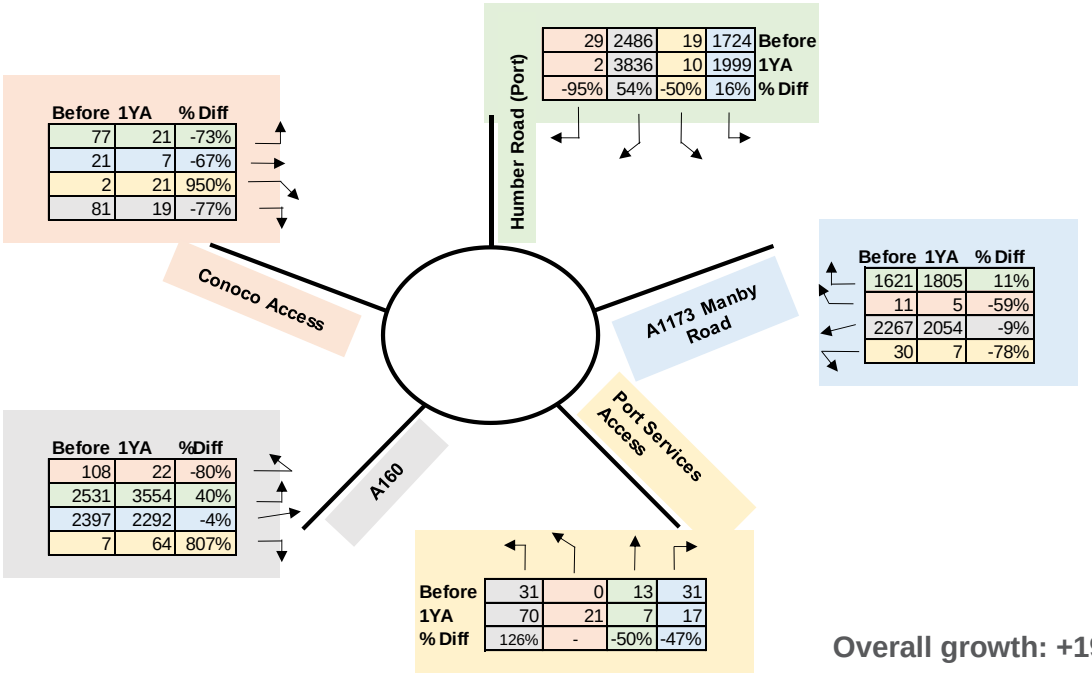
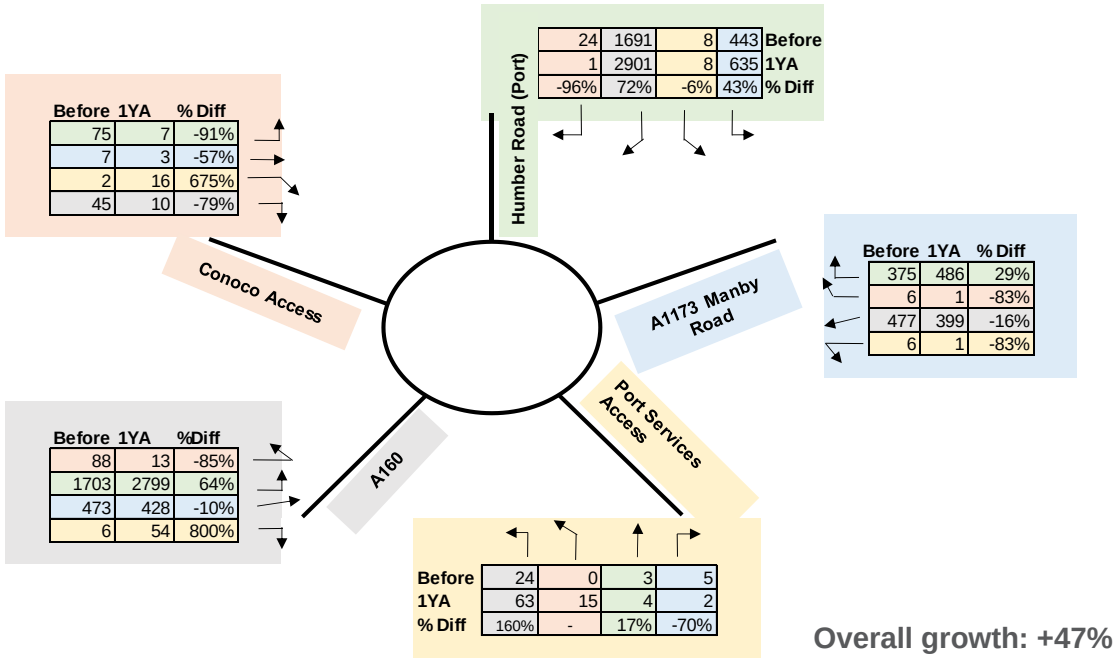


Figure 5 Comparison of 12-hour turning movements for Manby roundabout - HGVs



In interpreting the figures, it is important not to put too much emphasis on the movements that have low traffic volumes as these can easily show large percentage changes. Instead, the focus should be on what has occurred on the larger movements. Figure 4 and Figure 5 show that according to the turning count surveys:

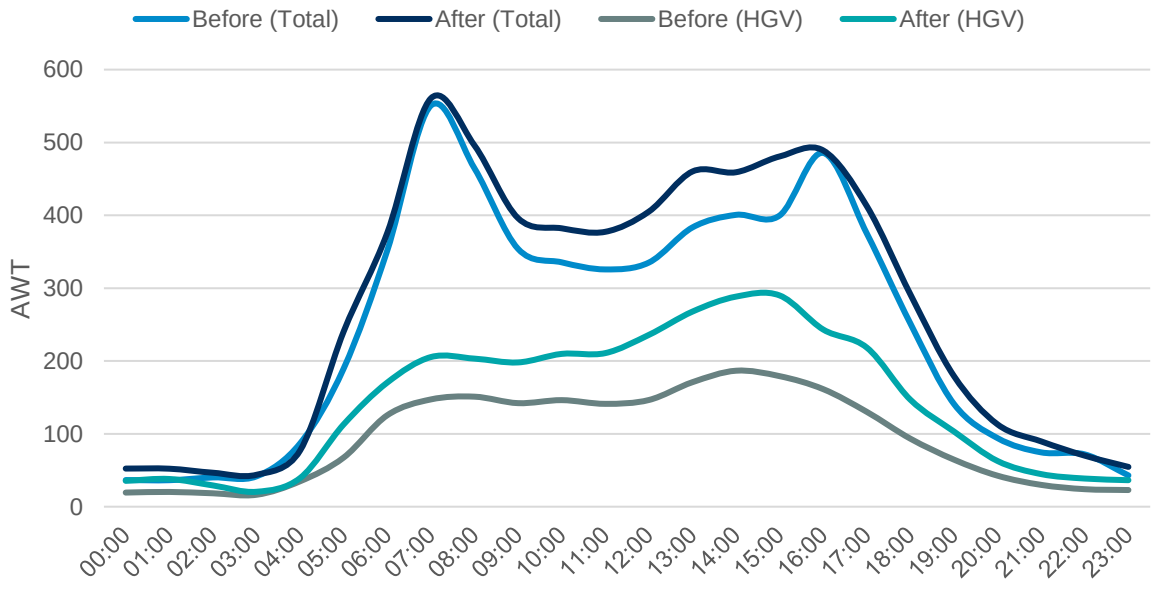
- The overall growth in traffic was 19% which was above that of the local background trend shown in Figure 2.

- The increase in the number of HGVs using the junction was far higher, at 47%.
- The major movements at the junction (both pre-project and one year after) were those relating to Port access and exit. Specifically, between the Port (Humber Road) and A160 and the A1173 Manby Road.
- The A160 to Port movement saw the largest growth with increases of 40% and 54% in the inbound and outbound directions, respectively.
- The growth in HGV volumes for this movement was higher (64% and 72%) than for the overall total indicating that this growth was primarily driven by the increase in HGV volumes.
- Despite the overall growth at the junction, traffic not linked to Port access (A160-A1173 Manby Road) had decreased by 9% since the project had opened.

How are traffic flows distributed across the day?

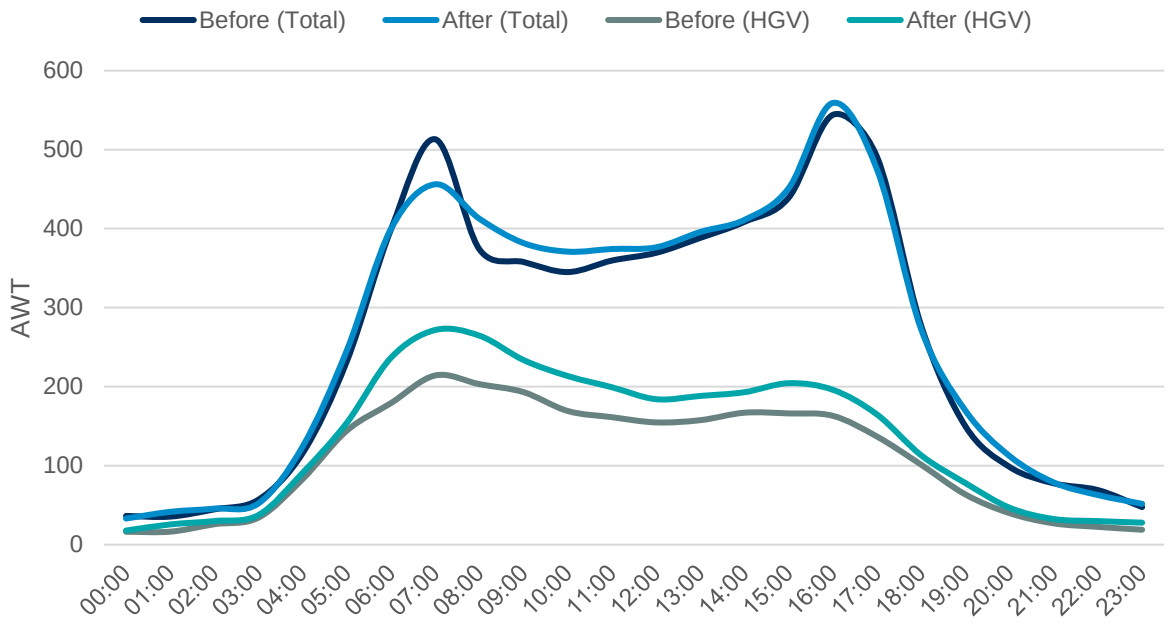
The number of HGVs accessing and exiting the Port will depend on the number of cargo ships loading and unloading on a given day. The growth in HGV traffic shown in Figure 5 will be subject to this daily variation. To confirm whether the volume of HGV traffic had significantly increased across a wider timeframe, we further analysed traffic volumes across a typical weekday to determine whether traffic growth had occurred uniformly or at certain times of day, as shown in Figure 6 and Figure 7.

Figure 6 Comparison of average weekday hourly flows before and one year after opening – A160 (Port) inbound



Source: WebTRIS sites 30361455 and 9958/1– April 2015 (before) and April 2019 (after)

Figure 7 Comparison of average weekday hourly flows before and one year after opening – A160 (Port) outbound



Source: WebTRIS sites 30361454 and 9959/1 – April 2015 (before) and April 2019 (after)

For the inbound direction, Figure 6 shows clear morning and evening peaks. Although this was true for both before and after the project's construction, the growth in traffic was distributed throughout the afternoon, not focussed on the peak hours. Growth in morning and evening peak traffic volumes is what would be expected from an increase in commuter traffic, however, as the turning count analysis showed traffic growth in this area was driven by increased Port activity. Growth in traffic volumes occurring throughout the afternoon was consistent with the additional Port activity and increased demand from HGVs.

In the outbound direction, as shown in Figure 7, the morning and evening peaks were of similar magnitude to each other. Though we saw a small decrease in the total traffic using the route in the morning peak post opening, there was an increase throughout the rest of the day. Once again, the inclusion of the HGV traffic volumes illustrates that the majority of the overall growth was down to an increase in HGV activity, with the growth distributed more uniformly throughout the day than the larger increases in the late afternoon we saw in the inbound direction.

Was traffic growth as expected?

It is important to understand how levels of traffic on the project compare to the forecasts, and whether the level of growth projected was realised.

This section compares the annual average daily traffic flows (AADT) from the Traffic Forecasting Report (TFR) with the equivalent observed data. The A160 Port of Immingham model was the basis for the forecasts. The model had a base year of 2012 and two forecast years: 2016 and 2031[7]. While the modelling covered many scenarios, only the Core Scenario results were used in this evaluation for comparison with observed flows. As the modelled opening year does not match with either the before period (2014), or the one year after period (2018), we made

[7] 2016 was identified during the appraisal process as the proposed project opening year.

estimates[8] for future years using the available data to enable us to compare between observed and forecast traffic volumes on a like-for-like basis.

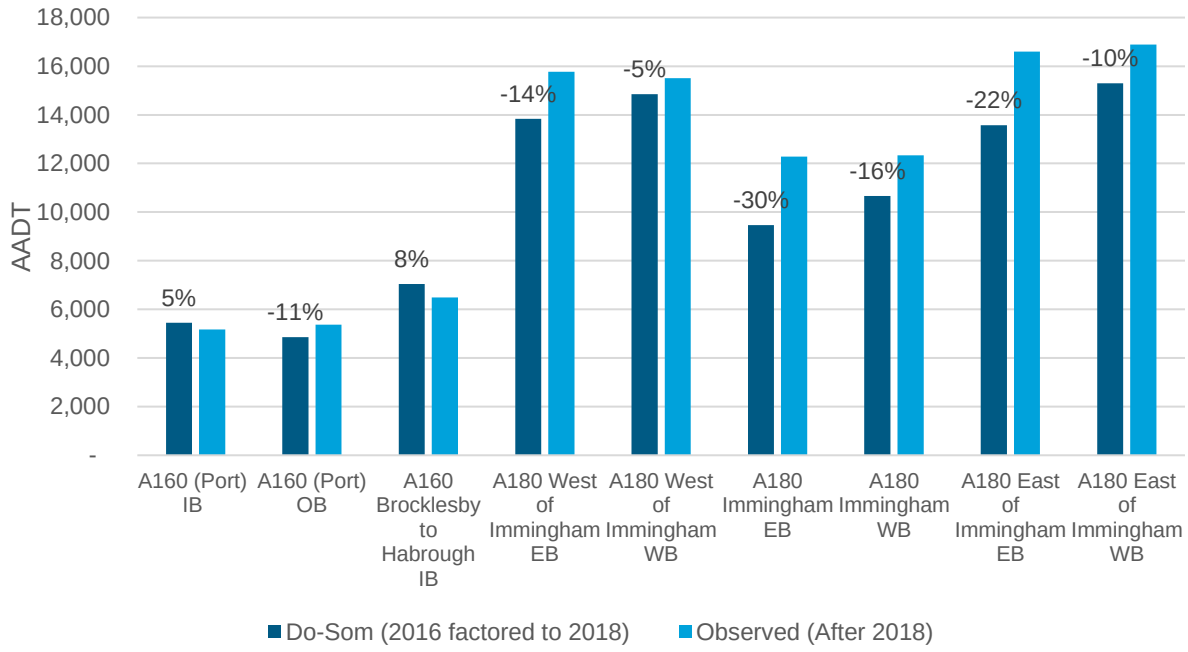
Three time periods were modelled:

- Morning peak hour (AM peak) 07:00-08:00.
- Average inter-peak (IP) hour between 10:00-16:00.
- Evening peak hour (PM peak) 16:00-17:00.

Where possible we compared model flows against observed data. We compared with the forecast of how the road network would perform if the scheme was constructed (the do-something, DS) and the forecast of how the road network would perform if the scheme was not constructed (the do-minimum, DM)

Figure 8 shows the accuracy of the flows with the project (DS) and corresponds to the sites shown in Figure 3, but uses average daily traffic (ADT) rather than average weekly traffic (AWT) to match with the model forecast data. No observed data was available for the A160 between Habrough Road Roundabout and Brocklesby Interchange in the outbound direction.

Figure 8 Do-Something Model Flows vs One Year After Observed Flows (ADT)



We found that the observed traffic volumes along the A160 link between Brocklesby and Manby Roundabout were within an acceptable range of the forecasts made to support the business case[9].

The forecasting accuracy was less accurate along the A180, where flows were higher than forecast. This is consistent with Figure 2 which showed that the underlying growth assumptions used for forecasting was exceeded by local trends. This was particularly evident on the A180 Immingham eastbound (east of the A160

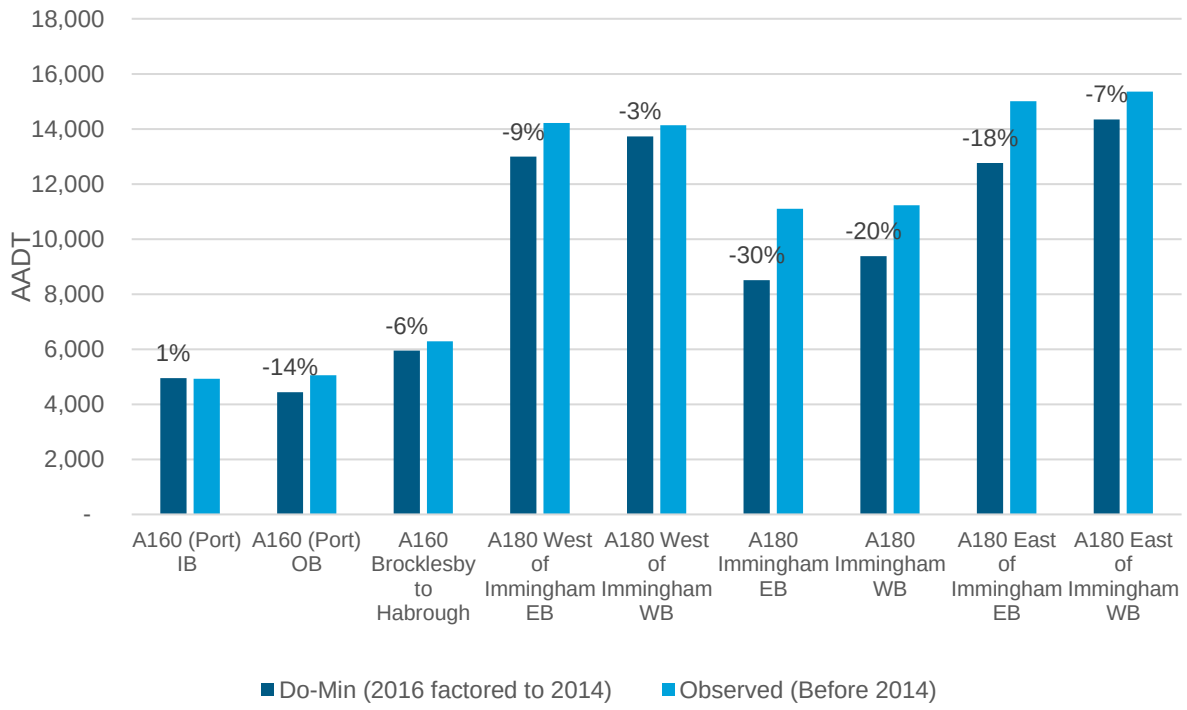
[8] Do-Something (DS) 2016 forecasts were factored to 2018 using a linear interpolation between the 2016 and 2031 forecasts. Do-Minimum (DM) 2016 forecasts were extrapolated back to 2014 based on the relationship between the 2016 and 2031 forecasts.
[9] Traffic models are typically required to be within ±15% of observed traffic volumes in their base year.

Brocklesby Interchange), where the modelled flows were 30% lower than the observed data.

The traffic volumes along the A160 itself were of primary importance and we can conclude that the modelled flows had not been significantly over or underestimated.

Figure 9 shows the accuracy of the do-minimum flows. The do-minimum (DM) is the forecast of how the road network would perform if the scheme was not constructed. It models the effects of the current road layout with any other committed projects.

Figure 9 Do-Minimum Model Flows vs. Before Project Observed Flows (AADT)



We can see from Figure 9 that the DM flows along the A160 were lower than the observed flows from before the project. However, the differences were no greater than 14% and were considered within an acceptable range for a traffic model (which typically requires the base model flows to be within ±15% of observed traffic volumes).

The difference was greater between modelled and observed flows in both directions on the A180 Immingham (situated to the east of the A160 Brocklesby Interchange) with a difference of -30% and -20% in the eastbound and westbound directions, respectively. Referring back to Figure 8 we can see that this inaccuracy in the DM modelling has impacted on the DS forecasts in this location.

Considering other sites along the A180 west of Immingham (to the west of Brocklesby Interchange) and east of Immingham (east of the A1173 junction), modelled flows were again lower than the observed flows, but were considered mostly within an acceptable range for a strategic traffic model. Again, this is consistent with the DS finding in Figure 8 and the DM modelling accuracy is likely impacting on the DS accuracy in these locations.

Relieving congestion and making journeys more reliable

We have analysed journey times and speeds as a way of identifying the impact of the project on congestion and to understand what impact the project has made to customer journeys. By exploring how much journey times varied from the average journey time we can report on how reliable a journey is. Improving journey time reliability and reducing congestion were two of the key objectives for this project.

Did the project deliver journey time savings?

We considered several routes where we expected the scheme to have impacted journey times using satnav data. The routes selected were:

- Along the project extent, between Brocklesby Interchange and the Port access at Manby Roundabout (Figure 10).
- Through Brocklesby Interchange between the A160 Habrough Roundabout and the A180 east and west of the interchange (Figure 11).
- For the potential alternative route between the A180 east of Immingham and the Port along the A1173 (Figure 11).

Figure 10 A160 Brocklesby to Manby Roundabout journey time comparison route

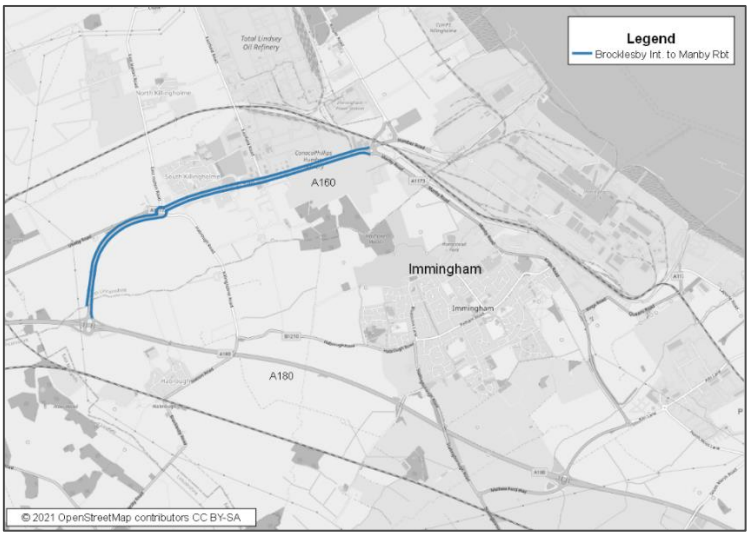
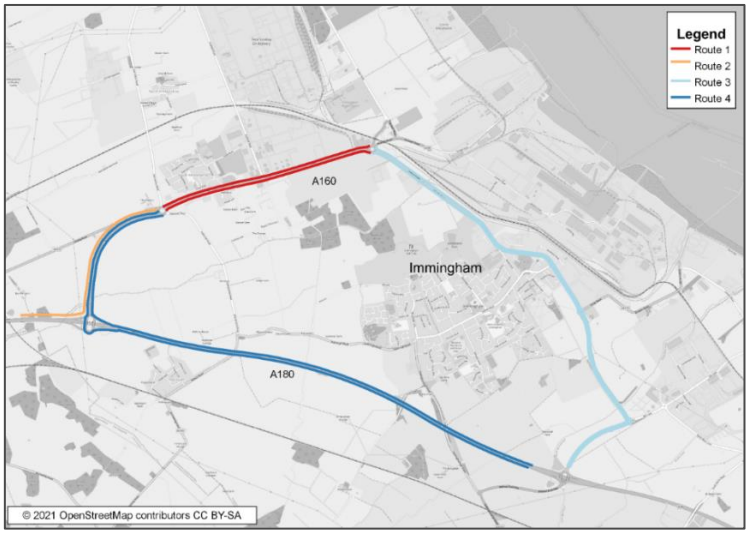


Figure 11 Additional routes



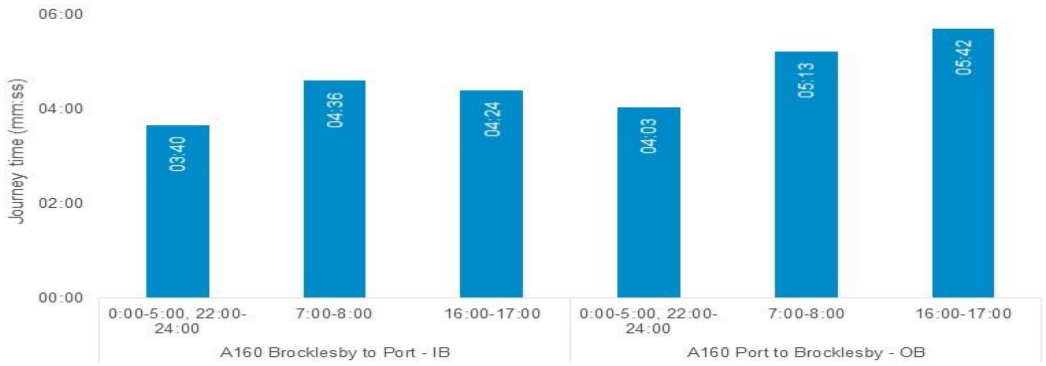
Existing congestion

The A160 route experienced some congestion prior to the project. Figure 12 compares off-peak data, during which traffic volumes were low, with morning and evening peaks. This comparison provided an indication of how congested the project route was before the project was built.

The journey times for the peak hours were slower than the off-peak journey times in both inbound and outbound direction. The percentage difference between peak journey times and the off-peak was highest during the evening peak in the outbound direction at 41%. The morning peak journey time was 29% slower. In the inbound direction the difference was lesser in magnitude with differences of 25% and 20% for the morning and evening peaks, respectively.

This indicates some evidence of delay build up during the peak hours, however, it is not abnormal for a busy section of the strategic road network. The project was not built solely to address existing congestion, but also to mitigate the impact of additional demand on the network from increased Port activity.

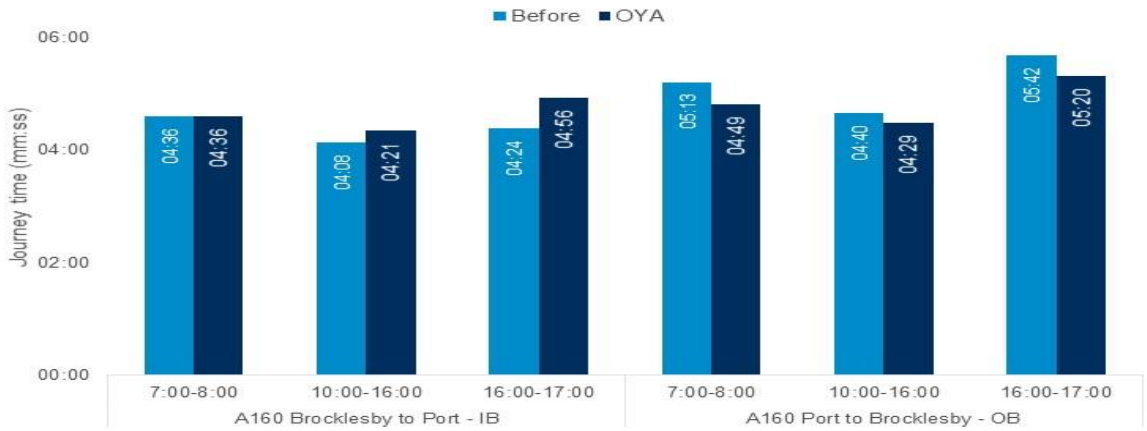
Figure 12 Peak hour comparison to free-flow (overnight) journey times (mm:ss) - pre-project



Project impacts

Focusing on the primary A160 Brocklesby to Manby route (the project sections), the journey times for the before and after period are shown in Figure 13 below.

Figure 13 A160 Brocklesby Interchange to Manby roundabout average observed journey times before and one year after project opening (mm:ss)



In the inbound direction, the journey times increased during the inter-peak and evening peak time periods. These increases were moderate in magnitude at 13 and 32 seconds, respectively. This increase is potentially explained by considering that Habrough Roundabout now had five arms and so inbound traffic on the A160 was opposed by traffic heading to the A1077 Ulceby Road.

There was no change in the journey times during the morning peak. The daily flow profile in Figure 7 showed that outbound traffic was higher than inbound (Figure 6) after the morning peak. This change in the balance of traffic over the day may help explain why there were increases in inbound journey times during the inter-peak and evening time periods but none during the morning peak.

The five-arm Habrough Roundabout arrangement replaced a pre-project junction that required road users accessing the A1077 Ulceby Road westbound, and the nearby truck stop, to cross the A160 inbound traffic directly. The new arrangement was therefore likely to be safer overall. Within the context of significantly increasing traffic volumes along the project, the slight worsening of journey times was not surprising.

The outbound direction saw decreases in average journey times across all time periods of the day. Again, these differences were moderate at 24, 11 and 22 seconds in the morning, inter-peak, and evening periods, respectively. Considering the increases in traffic volumes since the project opened, these journey time savings indicated the additional capacity created by the project was accommodating with the increased demand.

Overall, we conclude that the dualling of the section between Brocklesby and Habrough had a positive impact on vehicle speeds despite an increase in traffic volumes, particularly HGVs. Journey time analysis was also undertaken for the additional routes shown in Figure 11. Overall, the impact on journey times on these additional routes was small, with most routes seeing changes within ±15 seconds throughout all time periods.

Were journey time savings in line with forecast?

The appraisal considered journey times for three routes.

1. The A160 project extent between Brocklesby and Manby roundabout, which was our primary route for evaluation purposes.
2. The A180 between Brocklesby and the A180/A1173 junction
3. Along the A1173 between Manby roundabout and the A180/A1173 junction

It was expected that the impact on journey times for routes 2 and 3 would be minimal with only a few seconds difference with the project in place. Our analysis on these routes confirms that this forecast was accurate.

There were larger journey time savings forecast for the A160 route. To compare the impact of the project with what had been forecast we compared the before and after journey times with the do-something (DS) and do-minimum (DM) journey time forecasts. Table 2 and Table 3 below present the modelled and observed journey times for the inbound and outbound direction respectively, along with the corresponding project impact.

Table 2 A160 Brocklesby Interchange to Manby roundabout journey time savings (mm:ss) - inbound

Time period	Modelled (2016)			Observed (2014/2018)		
	DM	DS	Difference	Before	After	Difference
AM	05:44	03:30	-02:14	04:36	04:36	00:00
IP	04:10	03:30	-00:40	04:08	04:21	+00:13
PM	04:16	03:25	-00:51	04:24	04:56	+00:32

Table 3 A160 Manby roundabout to Brocklesby Interchange journey time savings (mm:ss) - outbound

Time period	Modelled (2016)			Observed (2014/2018)		
	DM	DS	Difference	Before	After	Difference
AM	04:27	03:06	-01:21	05:13	04:49	-00:24
IP	03:54	03:08	-00:46	04:40	04:29	-00:11
PM	04:49	03:07	-01:42	05:42	05:20	-00:22

In the inbound direction (Table 2), the DS journey times were around three and a half minutes in all time periods. The one year after observed journey times were slower, with the difference ranging between 66 seconds in the morning peak and a minute and a half in the evening peak. The DM (without project) journey times were more consistent with the before data. This suggests that the DS model forecasts were optimistic in terms of the achievable speeds.

Similarly, Table 3 shows that the outbound forecast journey times for the DS were faster than the observed data. The DM forecasts are accurate to within a minute, but the DS forecasts are less accurate, once again suggesting that the DS forecasting was optimistic.

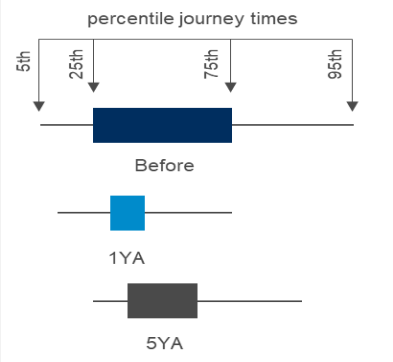
The model did anticipate that there would be benefits throughout the day in the outbound direction. However, it had also anticipated benefits inbound and that the biggest benefit would be in the morning peak inbound, and these benefits have not materialised.

Overall, we can conclude that the traffic model was optimistic in terms of achievable speeds along the A160, possibly due to strategic transport models (such as that used for the assessment of this project) not fully capturing the impact of the junction layout and the differences in speeds between different vehicle types.

Did the project make journeys more reliable?

Another important measure of the success of this project was whether it had improved journey time reliability. We calculated this using the same satnav data that was used in the average journey time analysis. We looked at the percentiles of journey times to establish whether they had become more or less reliable since before the project was implemented.

Figure 14 What does a box plot show?



The lowest point is the 5th percentile, this means 5% of journeys take less than this amount of time to complete. The highest point is the 95th percentile, this means 95% of journeys take less time than this to complete. This shows the difference between the longest and the shortest journey times observed.

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

Figure 15 and Figure 16 show the journey time reliability results for the A160 Brocklesby to Manby roundabout route in the inbound and outbound directions, respectively. The light blue box shows the spread of values for the before project period and the dark blue is for the one-year after.

Figure 15 A160 - Brocklesby Interchange to Manby Roundabout reliability- inbound

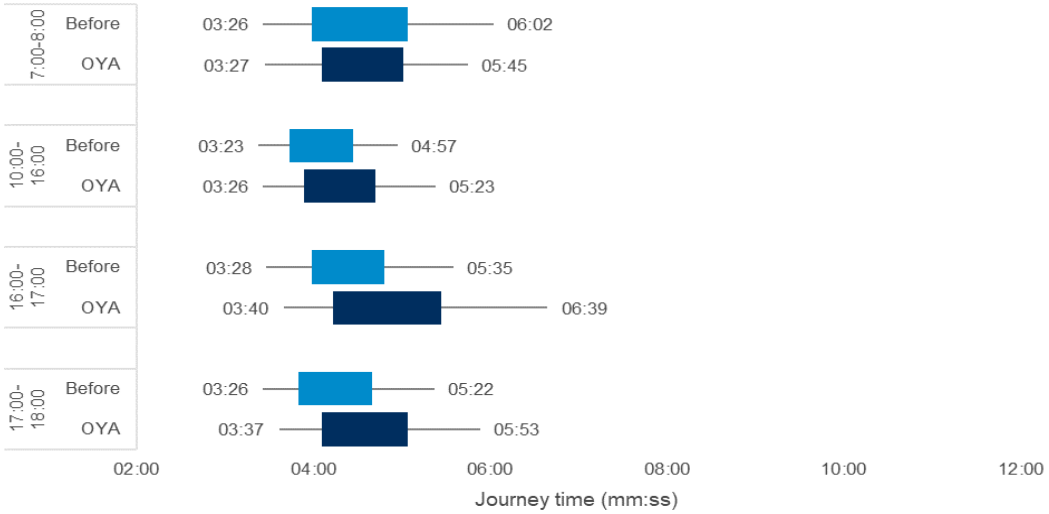
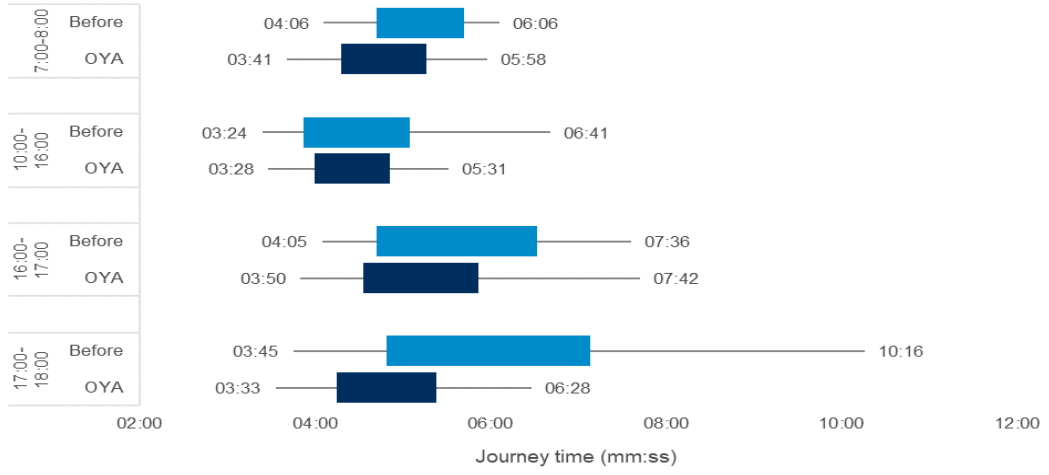


Figure 16 A160 - Manby Roundabout to Brocklesby Interchange reliability -outbound



The time periods with the worst reliability pre-project had shown improvements (outbound evening peak and the following hour). The reliability of the inbound movements had not improved, probably because it had been impacted by the new arrangement at Habrough Roundabout (whereby this traffic must give way to A160 outbound traffic travelling to A1077 Ulceby Road). The busiest time period inbound is during the morning peak and there had been some improvements in this time period.

The same pattern was seen when we calculated the Planning Time Index (PTI). This index is a reliability measure which represents how much additional time a motorist should allow to ensure they will arrive on time[10]. A decrease in the index implies an improvement in journey time reliability relative to free flow. For the purposes of calculating PTI we again focussed on the core route between Brocklesby Interchange and Manby Roundabout[11].

Table 4 shows that the inbound reliability was worse while the outbound reliability had improved. The journey time, reliability and PTI reliability findings all point to the same pattern of changes.

Table 4 – Planning Time Index

Direction	Before PTI	FYA Post Project PTI	More Reliable?
Inbound	1.42	1.48	No
Outbound	1.84	1.50	Yes

Considering the results for both the inbound and outbound directions, the overall impact on journey reliability was beneficial, with some deteriorations in reliability at certain times of the day (mostly for the inbound direction) outweighed by positive impacts (mostly for the outbound direction). Within the context of the traffic growth that had occurred we can see this as a positive. The increase in traffic volumes at one-year after was not causing any reliability issues and the project was coping well with this growth.

[10] A PTI of 2 would mean the motorist should allow double the amount of time it would take to make the journey if the road was completely clear to be 95% confident of arriving on time. It is calculated as the 95th percentile journey time divided by the free flow journey time.
[11] There were no traffic volumes that represented the whole of this route, and there was data in one direction for part of the route. As such, the PTI calculation is time weighted rather than traffic volume weighted.

5. Safety Evaluation

Summary

The safety objective for this project was to reduce collisions[12] and collision rates and improve road safety for road users and the local community. The early indications were that the safety objective was on track to be achieved. The analysis will need to be revisited in later years before we are sure that the change is significant. It will require a longer period to determine if these initial positive findings were a real trend or natural fluctuation.

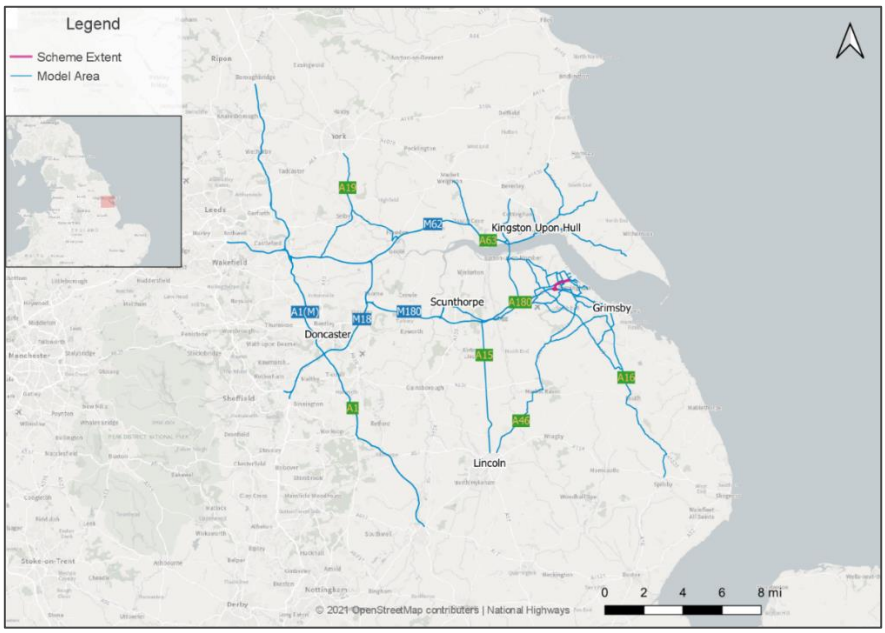
In the first year of the project being operational, there was a reduction in the rate and number of personal injury collisions compared with the annual average for the five years before the project was built. During the first 12 months of the project being open there was an average of 4 personal injury collisions compared with an average of 7 per year before the project was constructed.

Collisions were reduced at a time when congestion was being released and traffic was moving quicker in some time periods. Traffic levels are set to increase in later years, however, and so results at the follow up evaluation will be essential to check if this trend continues.

Safety study area

The safety study area is shown in Figure 17. This area was assessed in the appraisal which supported the business case for the project to check any potential wider implications for the intervention. This information was used with other predictions around the potential impact of the project such as by how much traffic may grow. We therefore replicated the appraisal study area to understand the emerging safety trends.

Figure 17 Safety study area



Source: National Highways and OpenStreetMap contributors

[12] A collision that involves at least one vehicle and results in an injury to at least one person.

What are the emerging safety trends within the first 12 months of the project?

Safety data for this evaluation was obtained from Department for Transport Road Safety Data. This records incidents on public roads that are reported to the police. This evaluation considers only collisions that resulted in personal injury.

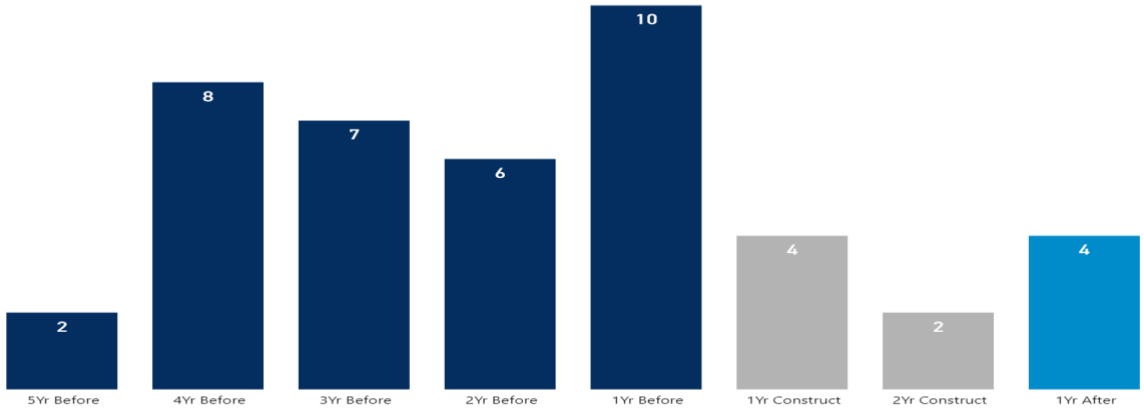
The safety analysis was undertaken to assess changes over time looking at the trends in the five years before the project was constructed to provide an annual average. We then assessed the trends from the first 12 months after the project was operational and open for road users. This provided an early indication of safety trends, but this will be monitored over a longer period before conclusions are drawn about the safety impact of the project across the following time periods:

The analysis drew on the following data collection periods:

- Pre-construction: 30 May 2010 - 29 May 2015.
- Construction: 30 May 2015 - 21 March 2017.
- Post-opening: 22 March 2017 - 21 March 2018.

The early indications were that the number of personal injury collisions for the first year of the project were lower than the period before construction began. The number of personal injury collisions had reduced from an annual average of 7 to 4 personal injury collisions along the project extent during the first 12 months of the project being open for road users (Figure 18). Safety trends can vary each year and we will monitor this trend over a longer period before drawing conclusions about the safety impact of the project.

Figure 18 Annual average number of personal injury collisions on the A160



Source: STATS19 30th May 2010 – 21st March 2018

As part of the safety evaluation, we look to assess what changes in personal injury collisions might have occurred due to factors external to the project over this period. To do this we estimate the trend in personal injury collisions which might have occurred if the project had not taken place (this is referred to as a counterfactual – see Appendix A: Safety Counterfactual Methodology). This is based on changes in regional safety trends for conventional motorways with a high volume of roads users.

In this case, it was not possible to produce a counterfactual for the project extent as to do so requires a count of at least 10 incidents per year[13].

[13] This threshold was, however, achieved in the wider area.

The results indicated that the project was on its way to achieving the objective to maintain, and where possible, improve safety standards. Another study will be conducted after the project has been open for a longer period, allowing a more representative time-period, to determine if the safety objective had been achieved.

How has traffic flow impacted collision rates?

Projects are implemented on some of England's busiest routes. It is, therefore, important to contextualise any personal injury collisions in the volume of traffic seen on this stretch. To do so a collision rate is calculated: the number of personal injury collisions (PIC) per annual hundred million vehicle miles (hmvm).

The average collision rate had decreased to 26 PIC/hmvm – this equated to travelling almost 4 million vehicle miles before an injury collision occurred. Before the project, this figure stood at 58 PIC/hmvm, equating to a decrease of 31 PIC/hmvm.

Similar to collisions, collision rates were in line with what we would have expected without the project. This was a positive initial indication; even though traffic levels had increased slightly, collisions had reduced. As these are the first year's results, however, we are not yet confident that these initial indications are enough to form a trend. An evaluation will be conducted at five years after opening to establish if early positive findings have continued.

What changes in the severity of collisions did we see?

Collisions which result in injury are recorded by severity as either fatal, severe, or slight. Police forces are transitioning to a new method in how severity of incidents is recorded. Currently Humberside Police Constabulary transitioned to Collision Reporting and Sharing (CRaSH) in 2016; collision severities are presented using unadjusted figures (more information on this can be found in Appendix B).

The evaluation found, after the project there were an average of one fewer collisions resulting in slight injuries (the annual average before the project was two, compared to one after), a reduction in collisions resulting in serious injury per year (with one before and less than one after). There have been no fatal incidents reported during the first year after the project opened or before. Figure 19 shows the severity of personal injury collisions.

Figure 19 Severity of personal injury collisions within the project extent

Source: STATS19 30th May 2010 – 21 March 2018

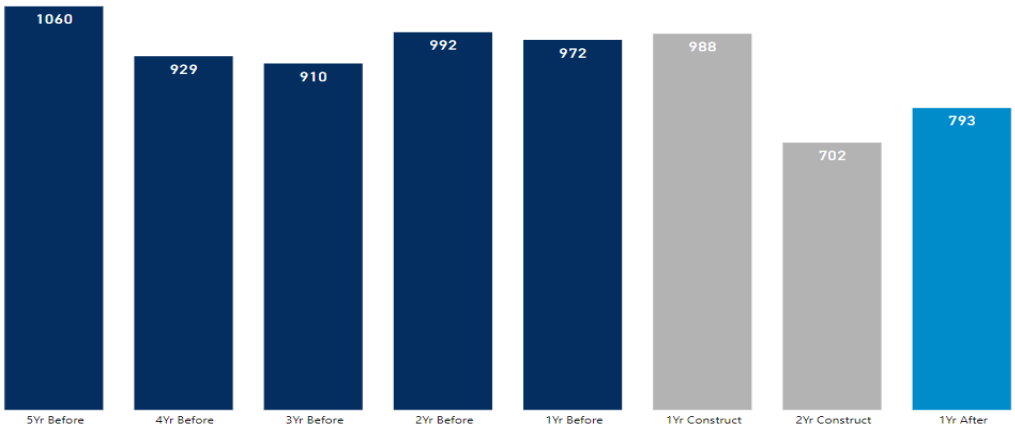
Road user safety on the wider area

What impact did the project have on safety for the wider area?

Personal injury collisions were observed for a wider impact area, which is derived from the safety appraisal for the project. The appraised wider area was split into two areas as shown in Figure 17. The local area, comprising of roads adjacent to the project extent, and a wider area to check any potential wider impacts from the intervention.

There had been a reduction in the average number of personal injury collisions per year in the wider safety area, before the project an annual average of 973 collisions were observed. After the project, this had reduced to 793, an average decrease of 180 personal injury collisions per year in the wider safety area.

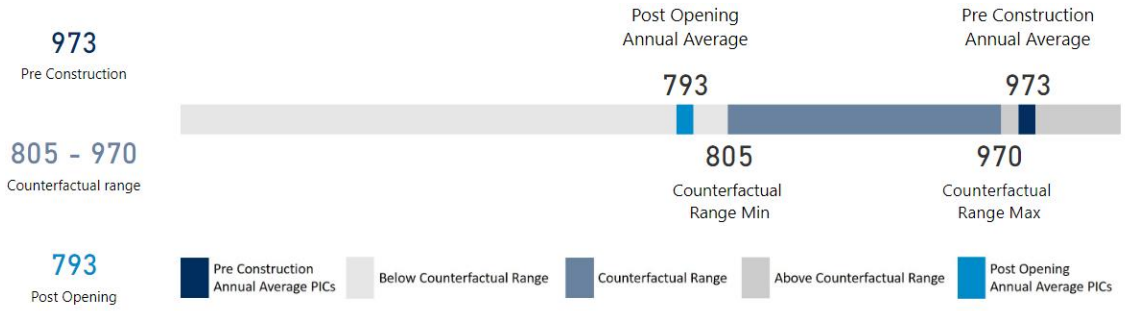
Figure 20 Annual personal injury collisions in wider area



Source: STATS19 30th May 2010 – 21st March 2018

The counterfactual analysis estimated that if the enhancements had not been made, the safety trends across the wider area would have decreased to between 805-970 personal injury collisions per year. The observed after annual average of 793 personal injury collisions falls just outside the range (Figure 21). This indicated that the project was having a positive impact on the safety of the surrounding road network as anticipated within the project's business case. However, more evidence is required before it is possible to conclude whether the anticipated safety benefits across the wider safety area are likely to be realised.

Figure 21 Observed and expected range of personal injury collisions in wider area (annual average)



Source: STATS19: 30th May 2010 – 21st March 2018

What changes in the severity of collisions did we see?

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

The evaluation found, after the project there were an average of 54 fewer collisions resulting in slight injuries (the annual average before the project was 253, compared to 199 after), a reduction in collisions resulting in serious injury per year (with 66 before and 59 after). There has also been a reduction of 53 fatal incidents, with a total of 71 before the project and 18 after. Figure 22 shows the severity of personal injury collisions.

Figure 22 Severity of personal injury collisions within the wider area

How is the project performing against its safety objectives?

The safety objective for this project was to reduce collisions and collision rates and improve road safety for road users and the local community.

In the first year of the project being operational, there was a reduction in the rate and number of personal injury collisions compared with the annual average for the five years before the project was built. During the first 12 months of the project being open there was an average of 4 personal injury collisions compared with an average of 7 per year before the project was constructed.

Collisions were reduced at a time when congestion was being released and traffic was moving quicker in some time periods. Traffic levels are set to increase in later years, however, and so results at the follow up evaluation will be essential to check if this trend continues.

The early indications were that the safety objective was on track to be achieved. The analysis will need to be revisited in later years before we are sure that the change is significant. It will require a longer period to determine if these initial positive findings were a real trend or natural fluctuation.

6. Environmental Evaluation

Summary

The evaluation of environmental impacts used information on the predicted impacts gathered from the TAG environmental appraisal and the Environmental Statement (ES) and compared them with findings obtained one year after the project opened for traffic.

Observed impacts were determined during a site visit undertaken in September 2018, supported by desktop research. The results of the evaluation are recorded against each of the TAG environmental sub-objectives and the key outcomes have been summarised below and presented in Table 6.

- The available traffic data suggested that air quality and noise impacts along the project were as expected.
- The site visit identified that the planting designed to mitigate impacts to landscape and the setting of heritage and historic resources was in poor condition. It had not established as well as was expected and so impacts were considered worse than expected. There was a risk that design year outcomes would not be met if improvements were not made. These will be reconsidered at five-years after.
- Key biodiversity mitigation had been implemented but was in poor condition and considered to be worse than expected. There was a risk that design year outcomes would not be met if improvements were not made. These will be reconsidered at five-years after when further information may be available.
- All other environmental and society impacts were broadly as expected.

Table 5 Two-way AADT flows on the A160 and A180 project extent

Site[14]	Interpolated OYA Forecast (2018) - AADT	Observed OYA (2018) - AADT	Difference between Forecast and Observed (AADT, 2018)	
			Absolute Number	Percentage
A160 Port	10,300	10,548	248	2.4%
A160 Brock to Habrough[15]	7,038	6,488	-550	-7.8%
A180 West of Immingham	28,667	31,280	2,613	9.1%
A180 Immingham	20,117	24,622	4,505	22.4%
A180 East of Immingham	28,854	33,489	4,635	16.1%

Source: Forecast traffic data interpolated from traffic forecast report and observed from one-year after counters.

[14] Sites are those listed in Figure 3
[15] Observed data was only available in one direction.

Noise

The environmental statement predicted that the widening of the A160 and amendments to the existing 'on-line' sections would lead to both beneficial and adverse impacts to nearby residential properties. This was due to changes in traffic volumes, moving traffic closer and, in some cases, further away from properties and the creation of new road links. The use of a low noise surface along sections of the project would bring benefits too. The project also considered whether noise insulation[16] would be required for nearby properties but instead identified that installing 1.8-metre-high timber noise barriers at the two locations[17] would provide the required benefits.

Overall, the assessment predicted that the impacts of the project would be beneficial.

Our evaluation considered the available documentary evidence supported by observations made during the site visit. At one-year after details of any low noise surfaces used were not available. This will be reconsidered at five-years after. During our site visit it was confirmed that the two environmental barriers had been installed as expected. Further information on the specific noise properties of the barriers would be required to quantify their benefits.

POPE methodology for evaluating local noise from traffic compares forecast traffic flows with observed post-project traffic flows. An assumption is made by POPE methodology that noise will be as expected if observed traffic flows are within 25% more or 20% less than predicted. Based on this assumption, traffic flow data in Table 5 suggested that the impact of the project on noise was 'as expected'.

Air Quality

The environmental statement highlighted that the A160 (through the project area) carried a substantial quantity of non-local traffic, particularly from the nearby docks. Local air quality was predicted to improve at receptors close to the Habrough Roundabout due to the roundabout being moved away from properties. At properties along the A160 close to the junction with Town Street, there were predicted to be increases in concentrations associated with an increase in road users using the A160, but none of the increases in pollutant concentrations were predicted to be above the threshold for perceptible change. The highest predicted concentration of nitrogen dioxide, which is the principal pollutant of concern from road traffic, was 27.5µgm^{-3} well below the air quality standard of 40 µgm^{-3}. The A160 was considered the principal route where changes in air quality were predicted to occur. No modelled impacts were reported along the A180.

Overall, the environmental statement predicted that the project would not have a significant impact on air quality.

POPE methodology for evaluating local air quality compares forecast traffic flows with observed post opening traffic flows. An assumption is made by POPE methodology that concentrations of air pollutants will be as expected if observed traffic flows are within +/- 1,000 AADT of forecast. Based on this assumption, the traffic flow data in Table 5 suggested that the concentrations of air pollutants along

[16]This would typically involve the installation of new windows.

[17] Numbers 35 to 51 School Road and Janika, off Habrough Road to the south of the A160.

the A160 section of the project are ‘as expected’ whilst the concentrations of air pollutants along the A180 section of the project are ‘higher than expected’.

The 2020 air quality annual status report published by Northeast Lincolnshire[18] reported that pollutant concentrations had been below air quality objectives at all monitoring sites since 2018. The A180, unlike the A160, does not pass through an urban area and so it was likely that pollutant concentrations near the A180 would also be below the air quality objectives. Observed traffic flows were higher than originally forecast but as discussed in section 4 the traffic forecast underestimated the actual observed background growth which may have influenced the changes we observed. Overall, even though flows along the A180 were higher than forecast there was a low risk that this would have changed the outcome of the original environmental assessment and impacts were expected to remain not significant.

Greenhouse Gases

The environmental appraisal predicted that the project would increase carbon emissions due to the changes in traffic volumes and traffic speeds that it would cause.

To evaluate the greenhouse gas emissions of the appraised project, forecast and observed traffic data is required for the appraised study area. The full extent of forecast traffic required to evaluate and quantify greenhouse gas emissions was not available for this project at one-year after. Instead, we looked at those areas where we had some data. Total flows along the A160 were lower than predicted which may have suggested that emissions were also lower along this section, however flows were higher along the A180 section. We did not have sufficient forecast data for HGVs and speeds to be able to quantify the cumulative effect of these differences and so were unable to draw any further conclusions.

Landscape

The Environmental Statement highlighted that the local landscape around the project was flat with gently rolling arable fields, belts of hedgerows and isolated woodland blocks. The flat topography and low vegetation cover allowed panoramic views and a sense of big skies. Views were also influenced by the tall chimney stacks and buildings of the industrial land use along the River Humber estuary; power lines and transportation routes such as the A180, A160 and railways. Along the project extent, the landscape between the A180 Brocklesby interchange and South Killingholme, comprised arable fields but as the A160 travelled east towards the Port of Immingham the landscape becomes industrial and dominated by an oil refinery.

The environmental statement predicted that the widening of the A160 between Brocklesby interchange and South Killingholme and new lighting would adversely affect the rural landscape. It would cause loss of vegetation and important hedgerows[19] and interrupt field patterns. To mitigate these impacts, it was expected that new planting would be provided to help integrate the project within the landscape and help screen views of moving traffic. This would replace lost

[18] https://www.nelincs.gov.uk/assets/uploads/2020/11/Air-Quality-Annual-Status-Reports-2020.pdf
[19] A hedgerow is ‘important’, and is protected, if it’s at least 30 years old and meets at least one of the criteria listed in Part II of Schedule 1 of the Hedgerows Regulations 1997.

vegetation and improve visual amenity. Overall, the impact of the project was assessed as slight adverse.

Our evaluation confirmed that as expected, the project had led to the loss of vegetation and farmland, changes to field patterns and ditches, and the introduction of additional road bridges and earthworks. Our site visit identified that although landscape mitigation planting had been implemented, it was not as well established as would be expected and several areas were incomplete or appeared unfinished. The site visit noted significant numbers of failed plants and some of the ornamental planting in poor condition. Some reseeding of grassland had been undertaken but some species-rich areas contained weeds.

In the long term, it was expected that new landscape planting would help mitigate the landscape and visual impacts of the project. However, it was considered that there was a risk that if the performance of the landscape mitigation did not improve, the longer-term visual impacts may be worse than expected and that the predicted improvement in views not realised.

Overall, due to the poor performance of the landscape mitigation at one-year after, the landscape effects of the project were worse than expected.

Figure 23 Example of poorly established ornamental planting area collecting rubbish.

Source: site visit September 2018

Figure 24 Example of unmaintained hedgerow. Cracking in the plot area could be an indication of poor ground conditions.

Source: site visit September 2018

Figure 25 View from Town Street bridge towards South Killingholme illustrating failed plants marked up for replacement, shelters not maintained upright and several not fixed in position.

Source: site visit September 2018

Townscape

The environmental statement noted that the construction of the new road bridge across the A160 in South Killingholme and associated loss of residential land would impact the local townscape character. It would lead to a loss of built form and structure within the village, and it would require the demolition of a residential property located on Town Street[20] along with the loss of part of a front garden. The loss of the property, which was reported to be unoccupied at the time, would create new views from the village towards the oil refinery. Overall, the environmental statement predicted the project would cause slight adverse effects. The environmental appraisal, which supported the investment decision but was separate to the environmental statement, assessed the impacts of the project as neutral. It considered that there would be minimal effects and that the new road bridge at South Killingholme would slightly improve connectivity in the townscape, improving the overall layout and human interaction. The appraisal did not consider the effect of the project on the sense of place or townscape character in the same way as the environmental statement and therefore came to a different conclusion.

Our evaluation, which included a site visit, considered the impact of the new bridge and demolition of the property. It was considered that at one-year after the environmental statement conclusion of slight adverse better reflected the changes to the local townscape character. The demolition had opened up views to the large-scale oil refinery and altered the character of the village at this location. At one-year the new views towards the oil refinery and new road / overbridge were visually prominent urban elements. They had adversely affected the smaller scale rural character of the village and affected the sense of enclosure around South Killingholme's historic core. This was particularly the case around the open space formed by the junction of Town Street with School Road. It was considered that these effects should have been acknowledged as part of the townscape appraisal. Therefore, at one-year after it was considered that the outcome was worse than expected by the appraisal but as expected by the environmental statement.

[20] https://goo.gl/maps/XJ5rnghCM8vSpm6b7

Figure 26 View from Town Street / School Road illustrating the new open views towards the oil refinery.

Source: site visit September 2018

Heritage of Historic Resources

The environmental assessment and appraisal considered the potential impact of the project on heritage and historic resources within the study area. It predicted that there was the potential for impacts to buried archaeology. None of the archaeology was assessed to be of high value and the environmental statement recommended that preservation by record was undertaken to mitigate the impacts. There would be no direct physical impacts on historic buildings however, indirect impacts on the setting of four historic buildings were predicted. These would be neutral or slight adverse and would be caused by the visual impact of new highway infrastructure, including overbridges, junctions, and embankments. These impacts would be mitigated by new landscape planting. The study area contained nearly 18 historic landscape character units but only five would potentially experience adverse effects. The five included the Grade I Registered Park and Garden of Brocklesby Park, but all the potential impacts were expected to reduce to neutral once landscape mitigation planting matured. Overall, it was predicted that the project would cause slight adverse effects.

Our evaluation included both a site visit and a review of the documentary evidence available at one-year after. We found that there was limited information available on the mitigation of potential archaeological impacts. Therefore, it was not possible at one-year to comment further. Impacts on archaeology will be reconsidered at five-years, by which time publication of analysis and deposition of the archive (paper records, photographs, and artefacts) should be available.

Our site visit confirmed that predicted neutral impacts on the Nook (Grade II listed) and Cross Keys pub were as expected. Views to the new bridge from the Nook were screened by other properties within the village and the context of the Cross Keys pub as a roadside inn had been maintained. However, it was likely that traffic had reduced due to the new Top Road Link. South Killingholme village and Poplar Farm, both of local historic and architectural value, were predicted to experience slight adverse impacts to their settings once landscape mitigation had established. This was due to the scale of the new Harborough roundabout and the new Town lane overbridge. However, at one-year after the new hedge planting opposite Poplar Farm and the planting on the embankments of the bridge had not established as well as was expected. Traffic, and in particular HGVs, were more prominent. Impacts to these historic buildings were considered to be worse than expected.

Our site visit confirmed that planting designed to mitigate impacts on historic landscapes had been undertaken. It included areas of woodland planting, shrubs, and intermittent trees in the vicinity of the Brocklesby Interchange to the north of Brocklesby Park. Hedgerow planting along the project was designed to tie into existing hedgerows and should help to integrate the new road into the landscape of rectilinear fields. The new planting reflected the character of the local area but at one-year it was immature and not yet sufficiently well established to reduce the prominence and visual intrusion of the project or achieve the objectives of landscape integration. This aspect will be reconsidered at five-years.

At one-year after, as the mitigation planting was poor in places, the overall effects were worse than expected.

Biodiversity

The environmental assessment identified that the project study area contained a range of ecological features including protected nature conservation sites as well as other sensitive habitats. These included wetlands, scrub, semi-improved grassland, species-poor hedgerows, watercourses, and ditches. These features also provided habitats for a range of species including voles. The assessment and appraisal predicted short term impacts on various ecologically sensitive receptors including water vole, breeding/wintering birds, badgers, and ecologically important hedgerows. It predicted that there would be no significant impacts for the two internationally important nature conservation sites.[21] The assessment concluded that with the proposed mitigation measures there would be no significant impacts and overall impacts were predicted to be neutral.

Based on the information available at one-year after including the site visit, the proposed mitigation measures had been provided[22]. At the one-year stage, the planting and seeding were not well enough established to be providing habitat connectivity, vegetation cover or to discourage barn owls from hunting within the road corridor. It was also evident that some planting and species rich grassland areas were not well established, and the translocated mature hedge along Town Street South appeared to be struggling to thrive, as were the new plants added to in-fill gaps[23]. The April 2018 Landscape and Ecology Report also supported our findings which recommended a full site inspection to determine the status of the ecological features and what remediation measures were required. The outcome of the remedial works, the on-going species monitoring, and proposed enhancement measures will be considered as part of our five-years after evaluation.

At one-year after, it was considered that the condition of planting and ecological mitigation measures was worse than expected. Key mitigation had been implemented but remedial works to address plant failures were being developed and aftercare monitoring was still on-going. Biodiversity will be reconsidered at

[21] Humber Estuary (Ramsar, Special Area of Conservation (SAC), Special Protection Area (SPA) and Site of Special Scientific interest (SSSI)) and North Killingholme Haven Pits SSSI (which is also part of the Humber Estuary Ramsar, SAC and SPA).
[22] Including replacing lost habitat; advanced water vole habitat creation area; licenced exclusion / closure of a badger sett; provision of safe wildlife crossings and fencing (although it was noted that netting had not been fixed below a farm access gate allowing the potential for badgers to access a side road carriageway); landscape planting to discourage barn owls; and pollution control measures.
[23] The hedge translocation site on the north side was not accessible on the day.

five-years when the outcome of the remediation measures will be known, and further monitoring reports should be available.

Figure 27 Section of Town Street south translocated hedge with infill section of new planting (in spiral guards) failing to thrive[24].

Source: site visit September 2018

Figure 28 Typical example of the status of species rich grassland; areas were not well established at 1 year-after

Source: site visit September 2018

Water Environment

The environmental assessment identified that the existing A160 passed several local watercourses and field drains and, surface water from the route drained into Skitter Beck and the South Killingholme Drain[25]. This then eventually discharges into the Humber Estuary. It was predicted that widening of the A160 would increase the volume and quality of surface water runoff from the road that had to be discharged. This could then have an impact on flood risk and water quality in the vicinity. To manage these potential impacts, the project's drainage design included a range of mitigation measures. These measures included sustainable drainage systems and attenuation ponds designed to slow down and regulate the

[24] Translocation of the previously well-established roadside / field boundary hedge along Town Street was required to accommodate the new junction and associated visibility splay for the new Town Street bridge.

[25] Managed by North East Lindsey Internal Drainage Board.

flow of runoff from the road prior to discharge and to help manage flood risk. These measures would also provide water treatment to improve the quality of the runoff. Overall, it was predicted that the introduction of new treatment and attenuation ponds for stretches of existing carriageway that previously had no treatment would provide slight beneficial effects.

At one-year after, our evaluation reviewed the available documentary evidence and observed those ponds and drainage features accessible from public footpaths. Based on available information and our observations, it appeared that the drainage design was implemented in line with proposals. This included drainage ditches, six new attenuation ponds along with the expected pollution control measures. We noted that there was variable establishment of grassland including species-rich around ponds and within drainage ditches with some natural regeneration of marginal plants. Ponds were open water although some algal bloom was noted at Pond 4 near the Truck Stop. Water in the ditch culverted below the South Killingholme road bridge was blanketed by algal bloom and the hard engineered solution,[26] to prevent scour in times of high rainfall / flood, was visually prominent. We reviewed the project's March 2018 Landscape Monitoring Report which included a section on attenuation ponds inspection and maintenance. This identified that most of the ponds, inlets and outlets were free of debris and had low silt levels. However, the report also noted that there was excessive siltation, litter and weed growth in the ditches at the surface water culvert under the A160 near the Truck Stop which needed to be cleared.

It was considered that at one-year after, the effects of the project on the water environment were likely to be as expected. We will review performance of the drainage system and on-going maintenance at five-years to confirm that the design year outcomes are still likely to be met.

Physical Activity and Severance

The environmental appraisal predicted that severance along the A160 would be slightly reduced. This was because a new Toucan[27] crossing would be provided at Top Road east of the new Habrough roundabout and a new crossing point provided on the south side of the Eastfield Road junction. Improvements to the footway along Ulceby Road would also be provided. However, due to the low numbers using the footpaths, the overall assessment was neutral.

For physical activity, the appraisal predicted that improved facilities for walkers and cyclists might encourage more physical activity and concluded that the overall effects of the project would be Slight Beneficial.

No new non-motorised user surveys were undertaken specifically for our evaluation and no pre or post construction user or vulnerable user surveys / audits were undertaken to enable comparison. As expected, improved facilities were provided for pedestrians, cyclists, and horse riders. This included increased footway widths, dropped kerbs and improvements to cycling provision locally. The new toucan crossing was provided and the over bridge at Town Street, which has high level parapets to enable safe use by equestrians, provided a further safer crossing point across the A160. Steps were also incorporated into the embankment slopes of the new bridge to provide a shorter alternative for pedestrians than

[26] Concrete side slopes of the drainage ditch either side of the culvert headwall.
[27] A type of pedestrian crossing point that also allows bicycles to cross.

walking the entire length of the bridge. Low level pillar lighting had also been provided.

During the site visit pedestrians, dog walkers and cyclists were seen using the footpaths / cycle ways and Town Street bridge. Although no quantification was possible, the evidence suggested that the impacts of the project on severance and physical activity were likely to be as expected.

Journey Quality

The environmental appraisal considered the impact of the project on journey quality by assessing impacts to traveller care (facilities and information), traveller views, and traveller stress (frustration, fear of potential accidents, and route uncertainty). The appraisal predicted that the project would provide large beneficial impacts for road users. This was because driver stress would be reduced by the improvements to the new road layout, road widening and better segregation of pedestrians and cyclists from other road users. No significant effects were expected for traveller care or traveller views.

Our evaluation confirmed that there had not been any significant change to traveller care. Whilst some views west of South Killingholme had been changed at one-year after as expected, impacts were likely to be minimal by the design year provided mitigation planting establishes effectively. Driver stress was likely to have reduced because journey times had improved, and the widening was likely to make the route more resilient to the impact of collisions. Improvements to facilities for cyclists and pedestrians should also have reduced frustration for all road users.

Based on the information available, it was concluded that the effects of the project on journey quality were likely to be as expected.

Overview

The results of the evaluation at one-year after are summarised against each of the Transport Appraisal Guidance (TAG)[28] environmental sub-objectives and presented in Table 6.

Table 6 Environmental Impacts

Sub-objective	Appraisal summary table score	One-year evaluation	Summary
Noise	Without project: People annoyed 168. With project: People annoyed 154. Net change in population annoyed: 14	As expected at one-year after.	Comparison of forecast and observe traffic flows confirmed that the impact of the project on the noise environment was as expected.

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

Sub-objective	Appraisal summary table score	One-year evaluation	Summary
Air Quality	Local air quality score: PM_{10} :-11, NO_2:-95 Overall improvement	Overall, not significant as expected	The impact of the project on local air quality was as expected for the A160 and worse than expected for the A180.
Greenhouse Gases	Increase in CO_2 from increased traffic	Unable to evaluate	The evaluation could not provide an outcome at one-year after due to lack of data.
Landscape	Slight adverse	Worse than expected	Impacts were broadly as expected but landscape mitigation was not as well established as would be expected. There was potential that the landscape mitigation measures would not achieve their objectives by the design year.
Townscape	Neutral	Worse than expected	The new road bridge had caused the loss of built form and structure within the village. This was acknowledged correctly by the environmental assessment but should have been acknowledged by the appraisal too.
Heritage of Historic Resource	Overall: Slight Adverse	Worse than expected	Impacts to the settings of historic buildings and landscapes worse than expected due to the poor performance of mitigation planting.
Biodiversity	Neutral	Worse than expected	Key mitigation measures implemented but poor establishment of hedges and grasslands risked design year outcomes not being met.
Water Environment	Slight beneficial	Likely to be as expected	Attenuation and treatment ponds were included and appeared to be functioning as expected.
Severance	Neutral	As expected	New safer crossing points were provided to mitigate severance impacts.
Physical Activity	Slight beneficial	As expected	Improved facilities including safer crossing points were provided. This should encourage more physical activity.
Journey Quality	Large beneficial	As expected	Impacts to traveller views should be minimal by design year provided landscape mitigation establishes. Improvements to the road standard and layout likely to have reduced driver stress.

7. Value for money

When a project is appraised, an economic assessment is used to determine the project's value for money. The assessment is based on an estimation of costs and benefits from various sources, including Transport Economic Efficient (TEE) benefits (savings related to travel times, vehicle operating costs and user charges), accident costs (savings related to numbers and severity level of accidents) and costs to users due to delays during construction and future maintenance periods.

This is out of scope for the one-year after evaluation, but an attempt to reforecast at five-years after will be made.

Appendix A

A.1 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 a 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.

Appendix B

B.1 Incident reporting mechanisms

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

Police forces using the new systems, called injury-based severity reporting systems, (also known as CRaSH and COPA) report more seriously injured casualties than those which 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.

Appendix C

Unadjusted collision severity

The project extent is covered Humberside police constabulary. Humberside police constabulary transferred from Stats19 to CRaSH in 2016.

Table 7 shows the unadjusted collision severities on the project extent:

Table 7 Unadjusted collisions by severity for project extent

Observation Year	Fatal	Serious	Slight
5Yr Before		1	2
4 Yr Before		4	9
3 Yr Before		1	11
2 Yr Before		3	11
1 Yr Before		5	9
Construct Yr1			4
Construct Yr2			2
1Yr After		1	4

Source: STATS19: 30th May 2010 – 21 March 2018.

The wider safety area of the A160 Immingham project is covered Humberside, Lincolnshire, Nottinghamshire, North Yorkshire, West Yorkshire, and South Yorkshire police constabulary. Humberside and South Yorkshire police constabulary transferred from Stats19 to CRaSH in 2016. Nottinghamshire and West Yorkshire transferred from Stats19 to CraSH in 2021. Lincolnshire and North Yorkshire have not transferred.

Table 8 shows the unadjusted collision severities on the wider safety area:

Table 8 Unadjusted collisions by severity for wider area

Observation Year	Fatal	Serious	Slight
5Yr Before	22	182	1524
4 Yr Before	17	139	1278
3 Yr Before	23	175	1249
2 Yr Before	7	175	1393
1 Yr Before	15	138	1366
Construct Yr1	10	142	1457
Construct Yr2	12	130	973
1Yr After	19	195	992

Source: STATS19: 30th May 2010 – 21 March 2018.

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