Post Opening Project Evaluation

M62 J25-30 Smart Motorway - One Year After

April 2016

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Executive summary

Scheme description

M62 J25-30 Smart Motorway is a Highways England scheme to improve 15 miles (24.5km) of the motorway south of Bradford and Leeds by providing additional capacity. This has been provided as follows:

- Dynamic Hard Shoulder Running on J26 – 27 – 28 both directions and J29 – 30 eastbound
- Controlled All Lane Running on J25 – 26 both directions and J29 – 30 westbound
- Controlled motorway on J28 – 29 both directions

The scheme was fully opened to traffic in October 2013.

Objectives

Objective (stated in Client Scheme Requirements)	Objective Achieved?
To provide additional motorway capacity, making best use of existing infrastructure where possible	✓
To reduce the number and severity of accidents per vehicle-kilometre	✓ too soon to assess severity
To minimise the detrimental effects on traffic on the surrounding road network where possible	✓
To improve journey time reliability, as measured by the average delay experienced in the worst 10% of journeys	✓
To improve journey times	Improved during peak period but not in inter-peak
To offset the detrimental environmental effects of the scheme through mitigation measures where technically and economically feasible	✓
To improve the quality of information provided to drivers about the state of traffic flow in the motorway	✓

Key findings

- Traffic flows have increased although not to the levels expected, which is most likely due to the economic downturn. Consequently, congestion levels are lower than expected, meaning that the use of the Variable Mandatory Speed Limit (a Smart Motorway feature) has led to reduced average speeds and a slight worsening of journey times in some time periods.
- In the opening year, as predicted, journey times have improved during the peak periods, but worsened outside of the peak periods.
- Reliability as measured by how widely journey times vary, has improved in the most congested weekday periods.
- Safety has improved significantly on the M62 with the collision rate shown to have fallen by over one-third, and this is better than expected.
- Forecasts expected a negligible improvement in journey times in the opening year. Larger journey time benefits were expected in later years with traffic growth leading to increased congestion. This trend of benefits increasing from negligible benefit in the opening year to a significant benefits by 2031 means that at this stage it is too soon to confidently evaluate the long term economic benefits.

Summary of Scheme Impacts

Traffic

Flows

- M62 J26-27, the busiest section of the motorway within the scheme has seen weekday traffic flows increase from 146,000 to 155,000 vehicles per day.
- Traffic growth on the M62 and adjacent motorways is in line with the rate forecast, although overall numbers are lower due to there being lower than expected traffic levels before the start of works in 2011 which coincided with the economic situation at that time.
- Major roadworks on the adjacent M1 may have led to some rerouting affecting the traffic flows on the M62 west of the M1.
- As a result of lower than forecast traffic flows on the scheme section, congestion is less than expected.

Operation of Smart Motorway

- Dynamic Hard Shoulder Running (DHSR) is in operation (speed limits reduced, hard shoulder open) on J26-27 and J27-28 during the majority of the weekday peak periods and up to 23% of the inter-peak.
- Where congestion was evident before scheme opening, the DHSR has had a positive impact on journey times, however at times of low congestion, e.g. in the inter-peak period, the DHSR has had a negative impact on average journey times due to traffic being limited to a maximum speed of 60mph, sometimes unnecessarily.
- Lane occupancy data shows that in the peak periods in the two sections with DHSR, J26-27 shows that the hard shoulder has a similar level of vehicle use as the other 3 lanes, whereas the section J27-28 has a very low level of use of the hard shoulder by traffic when open. This applies to both carriageways. The low level of hard shoulder usage on J27-28 is linked with issues at J27.

Journey Times

- Significant journey time savings are observed in the AM and PM peak periods.
- The greatest savings are seen for the westbound traffic in the PM peak where there are savings of between 40 seconds and over 3 minutes on each of the sections from J29 to J26. Eastbound journey times show the highest savings in the AM peak.
- Inter-peak and off-peak periods show increased journey times which can be explained by the traffic growth and the setting of the speed limit to 60mph or slower for some of the time in the inter-peak. Although there has been some traffic growth in these time periods, the hard shoulder is infrequently open.
- The traffic flow is now smoother in the peak periods on the busiest sections as demonstrated by the fact that traffic in all lanes travels at similar speeds.

Journey Times Forecasting

- AM and PM peak periods were forecast to have journey time savings overall and on most individual sections of the M62, the AM forecasts were fairly accurate whereas the PM less so.
- Inter-peak journey times were predicted to increase slightly in the opening year and the observed data shows that this has occurred as expected.
- The forecast was that, over all time periods there would be only a small net benefit in the opening year, but that by 2031 with the scheme, savings would be experienced throughout the day. However, small benefits in observed time savings are seen in the first year, which is better than expected.
- The forecast of benefits increasing from virtually zero in the opening year to a significant benefits within 10 years means that at this stage it is too soon to confidently evaluate the long term economic benefits based on only one year's data.

Reliability

- Journey times over the full length of the scheme on weekdays in all time periods and both directions have shown a reduction in the variation of times which indicates an improvement in journey time reliability.
- Peak periods on weekdays show substantial reductions in the extreme slowest journey times.
- Reliability for the worst 10% of journeys in the AM and PM peak periods has improved in both directions.

Safety

- Analysis of data for collisions which resulted in injury before and after the scheme was built has shown that the annual average number of collisions on the M62 between J25-30 has decreased by 34% (22.8 collisions per year) post opening. This change is statistically significant, and although only based on one year of post opening data, suggests that the scheme has had a direct impact on safety post opening.
- Since scheme opening, there has been a marginal increase in severity of collisions, although this is generally due to a large decrease in the number of slight collisions, rather than an increase in fatal and serious collisions.
- Collision rates taking into account changes in traffic along the M62, have also decreased (by 36%), suggesting that even with the increase in traffic, safety has improved. This change is statistically significant, and although only based on one year of post opening data, suggests that the scheme has had a direct impact on safety post opening.

Environment

- Localised noise increases were expected around J28, with or without the scheme, although observed traffic flows are lower than predicted for the year 2015 so the noise increase may be lower than expected.
- The M62 highway corridor is known to be of low value habitat. Biodiversity impacts are being mitigated through mixed planting which at this stage has yet to establish fully.
- Overall the impact on landscape is as expected, although it is noted that the erection of visual fencing near to some residential areas is a positive addition.
- Greenhouse gas emissions have increased by 4% in the opening year with the scheme but this is only half the forecast increase. In the longer term, it is still expected that the impact of the scheme will be a net reduction in carbon emissions.
- Overall, the impact on landscape is as expected, although the erection of fencing near to some residential properties is a positive addition to visual screening for local properties.

Accessibility & Integration

- There has been no change to severance impact of the motorway for pedestrians and other non-motorised users, and the scheme is aligned with relevant local, regional and national policies.

Summary of Scheme Economic Performance

All monetary values in £million 2002 market prices, discounted		Forecast	Outturn re-forecast
Present Value Benefits	Journey Times	£729.9m	n/a
	Vehicle Operating Costs (VOC)	£-29.3m	£-24.1m
	Construction & maintenance delay	£-44.0m *	
	Safety	£33.8m	£59.3m
	Indirect Tax	£19.7m	£16.2m
	Other (noise, carbon)	£18.9m *	
	Total PVB	£729.1m	n/a
Present Value Costs including operating costs (PVC)		£147.7m	£122.4m
Benefit Cost Ratio (BCR)		4.9	n/a

* Assumed to be as forecast

- An outturn BCR has not been calculated due to the difficulty in evaluating the journey time benefits at the OYA stage.
- Benefits from journey time savings were forecast to be large and provide the majority of the monetised benefits. It has not been possible to re-forecast the long term benefits based on the opening year results because the forecasts quoted low benefits in the first year but rising significantly in later years, hence at this stage it is too early to be confident about this trend. However, it is encouraging that actual journey time benefits in this first year are greater than those forecast.

- The monetary benefits of the savings in the number of injury collisions is evaluated as £59m over 60 years, nearly double that forecast despite excluding the impact of background reduction in collisions over this period from the benefits.
- The investment cost of building the scheme was £95.9m, 17% lower than forecast in 2011.
- Long term costs for Highways England of operating the smart motorway are assumed to be as forecast at £39m and are included in the overall costs.
- The original assessment forecast incident reliability benefits of £180m, but this figure was not included in the overall forecast benefits or BCR. A reforecast incident reliability benefit of £181.2m has been calculated. If journey time reliability is included in the BCR the outturn BCR would be 1.7 (excluding any potential journey time benefits), meaning the scheme would be considered medium value for money.

1. Introduction

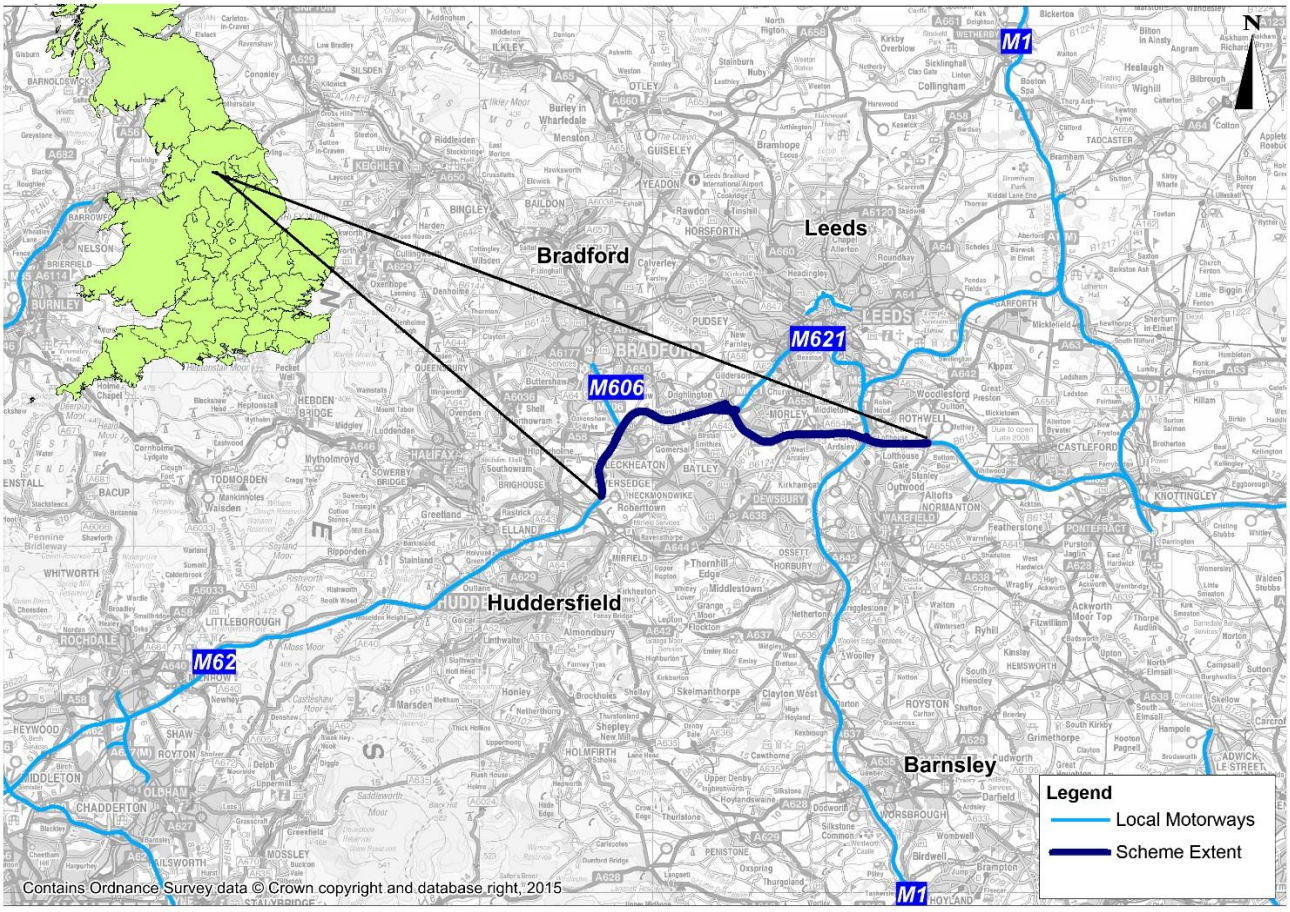
1.1. This report presents a One Year After (OYA) opening evaluation of the M62 J25-30 managed motorway scheme which was fully open and operational by 3rd October 2013. This evaluation has been prepared as part of the Highways England (formerly known as the Highways Agency) Post Opening Project Evaluation (POPE) programme. The purpose of this report is to present the initial impacts of the scheme.

Scheme Context

Location

1.2. The M62 J25-30 scheme is part of a strategic route providing the Trans Pennine east-west route across the north of England, connecting Merseyside, Lancashire and Manchester to Yorkshire and the Humber. It also provides a more local role, connecting the conurbations of Bradford and Leeds.

Figure 1-1 Location



1.3. This section of the M62 carries as many as 160,000 vehicles on a peak day, with an average of 140,000 vehicles carried per day (vpd). As a result, drivers using this section of the M62 experienced congestion and long delays, particularly during peak periods prior to this scheme. These problems were seen most week days, and as a result impacted journey time reliability (source *Client Scheme Requirements* (CSR) 2009).

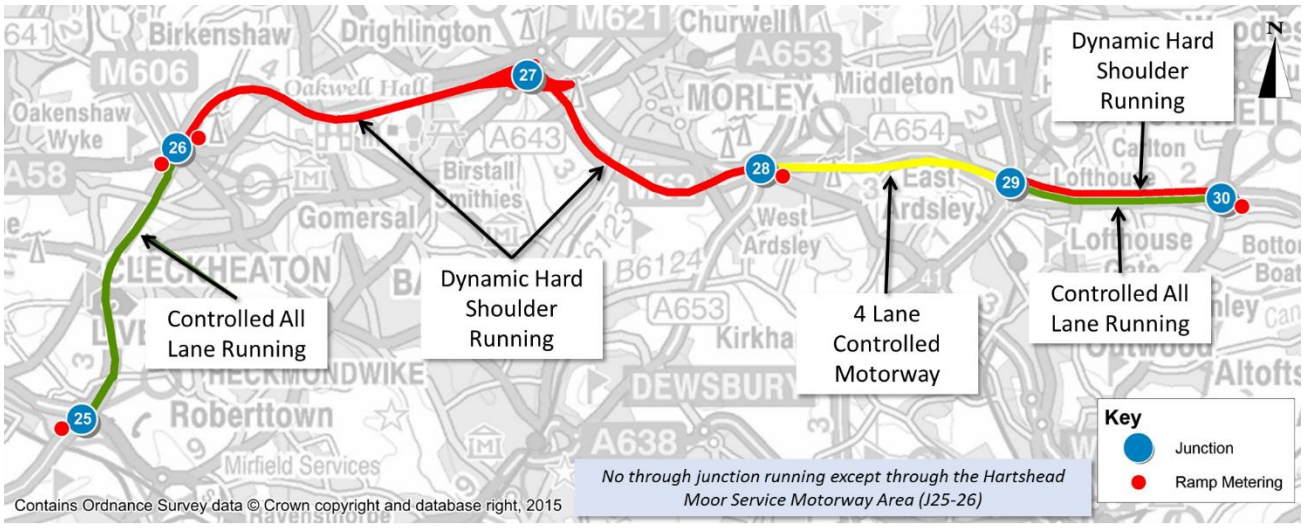
1.4. In particular, the CSR notes that congestion between J26 and J27 was a particular issue in both directions, due to the incorporation of motorway to motorway links (with the M606 to Bradford and M621 to Leeds).

1.5. High numbers of heavy goods vehicles (HGVs) use this section of the M62 which, combined with gradients of up to 3%, resulted in slow moving vehicles along the route.

Scheme Description

1.6. The M62 J25-30 scheme provided additional capacity through introducing controlled motorway elements including, the use of dynamic hard shoulder running (DHSR), permanent hard shoulder running and ramp metering. The upgrading of 15.3 miles (24.5km) of motorway to provide up to 4 lanes in each direction required a number of different features, the detail is shown in Figure 1-2 and summarised in the following text.

Figure 1-2 Scheme layout



Controlled All Lane Running (CALR)

1.7. All-Lane Running Smart motorways use the hard shoulder permanently as a running lane for traffic. Lane one (formerly used solely as the hard shoulder) is only closed to traffic via overhead and verge mounted signs, in the event of an incident. On these sections broken white lines between all lanes indicates that each lane has the same status.

1.8. Overhead gantry signs display the mandatory speed limit which varies depending on the traffic conditions. Signs can also be used to close lanes should that be required. If an incident occurs in lane one (formerly the hard shoulder) a red X symbol is displayed on the overhead gantry to let motorists know the lane has been closed to traffic. CCTV is used extensively to monitor traffic for any incidents. There are emergency refuge areas (ERAs) at the side of the carriageway for motorists to use should they not be able to reach a location of safety in the event of a breakdown.

Dynamic Hard Shoulder Running (DHSR)

1.9. Dynamic Hard Shoulder Running sections involve opening the hard shoulder as a running lane to traffic at busy periods to ease congestion. On these stretches a solid white line differentiates the hard shoulder from the normal carriageway as on a standard motorway section. Overhead gantries indicate whether or not the hard shoulder is open to traffic through the use of signing. Gantries also display the mandatory speed limit which varies according to the traffic conditions.

1.10. If an incident occurs whilst DHSR is in operation, the hard shoulder may revert back to a non-running lane, and a red X symbol would be displayed to let drivers know the lane has been closed to traffic. CCTV is used extensively to monitor traffic for any incidents. ERAs are also available should the hard shoulder remain open for any stranded vehicles.

Controlled Motorways (CM)

1.11. Controlled motorways have three or more lanes (in this scheme each direction has four lanes) with variable speed limits indicated through the use of overhead gantry signing. The hard shoulder is not used as a running lane, and is only used in a genuine emergency.

Ramp Metering

1.12. A ramp meter (in the form of a traffic light) regulates the flow of traffic entering onto the motorway according to current traffic conditions.

Scheme Objectives

1.13. The objectives of the scheme, as set out in the *Client Scheme Requirements* (September 2009) were:

- To provide additional motorway capacity, making best use of existing infrastructure where possible
- To reduce the number and severity of accidents per vehicle-kilometre.
- To minimise the detrimental effects on traffic on the surrounding road network where possible.
- To improve journey time reliability, as measured by the average delay experienced in the worst 10% of journeys.
- To improve journey times.
- To offset the detrimental environmental effects of the scheme through mitigation measures where technically and economically feasible.
- To improve the quality of information provided to drivers about the state of traffic flow on the motorway.

History

1.14. A brief history of the key events in the development of the scheme is provided below:

Date	J25-30 Event	Other events
Spring 2000		South West Yorkshire Multimodal Model (SWYMMS) study recommends a widening scheme between M62 J25-J28
July 2008	Scheme extended to cover J25-30, considered both widening and hard shoulder running options.	
January 2009	Scheme included in the Roads Programme – Motorways and Trunk Roads Announcement	
June-October 2009		Fiscal Stimulus drainage and concrete barrier works J29-30 (50mph and narrow lanes)
September 2009-July 2010		Fiscal Stimulus concrete barrier works J25-28 (50mph and narrow lanes)
2011	Public Consultation	
November 2011	Start of construction	
Spring/Summer 2013	Phased opening of hard shoulder running	
3rd October 2013	Official scheme opening.	

Overview of POPE

1.15. Highways England are responsible for improving the strategic highway network (motorways and trunk roads) through the Major Schemes programme. At each key decision stage through the planning process, schemes are subject to a rigorous appraisal process to provide a justification for the project's continued development.

1.16. When submitting a proposal for a major transport scheme, the Department for Transport (DfT) specifies that an Appraisal Summary Table (AST) is produced which records the degree to which

the five Government objectives for Transport (Environment, Safety, Economy, Accessibility and Integration) have been achieved[1]. The contents of the AST allow judgements to be made about the overall value for money of the scheme. The AST for this scheme is presented in Appendix A of this report.

1.17. POPE studies are carried out for all Major Schemes to evaluate the strengths and weaknesses in the techniques used for appraising schemes. This is so that improvements can be made in the future. For POPE, this is achieved by comparing information collected before and after the opening of the scheme, against predictions made during the planning process. The outturn impacts of a scheme are summarised in an Evaluation Summary Table (EST) which summarises the extent to which the objectives of a scheme have been achieved. The EST for this scheme can be found in Appendix A of this report.

Contents of this Report

1.18. Following this introduction, the report is divided into eight further chapters as follows:

- Chapter 2 – Traffic Impact Evaluation;
- Chapter 3 – Safety Evaluation;
- Chapter 4 – Economic Evaluation;
- Chapter 5 – Environmental Evaluation;
- Chapter 6 – Accessibility and Integration Evaluation;
- Chapter 7 – Conclusions;
- Appendix A – Appraisal Summary Table (AST) and Evaluation Summary Table (EST);
- Appendix B – Environment;
- Appendix C – Tables and Figures in this Report; and
- Appendix D – Glossary

[1] These were the objectives for transport at the time of the scheme appraisal.

2. Traffic Analysis

Introduction

2.1. In order to evaluate the traffic flow, journey time and reliability impacts of the scheme, the following section reports on :

- Data Collection;
- Background Traffic Changes;
- A summary of the traffic modelling approach and forecast assumptions;
- Traffic Volume Changes;
  - Motorway Traffic; and
  - Local Traffic.
- Journey time changes on the M62
- Comparisons between forecast and observed traffic impacts
  - Forecast vs. observed traffic volumes; and
  - Forecast vs. observed journey times;
- Reliability impacts.

Sources

Data collection

2.2. The analysis of Traffic in this section of the report is based on data collected from the following sources

Operation of the Smart motorway

- Highways England's HALOGEN data. This is a record of the signs displayed on the overhead gantries for the smart motorway. The data can be used to determine when, and for how long, the hard shoulder was open for traffic and the different speed limits in place as part of the variable speed limit (queue protection) used in Smart Motorways.

Traffic volumes and classifications

- Highways England's TRADS database for motorway locations;
- DfT data on national and regional traffic levels.
- Count data collected by Leeds City Council on its roads;
- Temporary ATC counts commissioned for the purpose of this study to supplement the above;

Traffic speeds and journey times

- Highways England's MIDAS[2] data
- Journey time data was obtained from sat-nav[3] data from vehicles using the M62 along the full length of the scheme before start of construction and in March 2015.

2.3. Documents which have been sourced for the background to the traffic modelling and forecast traffic impacts are:

- M62 J25 – J30 Managed Motorways Forecasting Report (Sept 2010)
- Addendum to M62 Managed Motorway Forecasting Report (Sept 2010)
- SWYMBUS SATURN Assignment Model Local Model Validation Report (Dec 2009)

[2] Motorway Incident Detection and Automatic Signalling (MIDAS) monitors traffic flow and speed from sensors in the road, usually every 500 metres. These are installed to provide real-time data to support both the automatic and manual operation of the smart motorway system.
[3] Drivers who use satellite navigation devices have the option to voluntarily allow anonymous data about their journeys to be collected and used to provide a range of services, including the analysis of historic journey times along specific routes.

Scheme modelling

2.4. The scheme was one of a number arising from the South and West Yorkshire Motorway Best Use Study (SWYMBUS) which had developed a large SATURN model of the whole area including the South and West Yorkshire motorways. Model runs included various future year development aspirations as provided by relevant local authorities.

2.5. The Local Model Validation Report (LMVR) outlined that full variable demand modelling (VDM) approach was used in developing the future year matrices in the highway model of this scheme.

2.6. Traffic Forecasting Report (TFR) model had three forecast years, 2016, 2023 and 2031. Following the issue of the initial TFR, the DfT issued new traffic growth forecasts which were lower than used in the TFR.[4]

2.7. Given the status of the appraisal of this scheme, it was felt that testing should be undertaken to determine the impact of the new forecasts on the scheme appraisal.

2.8. The Addendum Forecasting Report (AFR) presented the methodology and results of work to update the Traffic Forecasts for the Managed Motorway Dynamic Hard Shoulder running scheme using new TEMPRO 6.1 forecasts, to provide a sensitivity test for the operational and economic assessments. Updates were also made to the detail of proposed developments included in the model.

2.9. Although the original TFR included low, central and high forecasts, the central case traffic forecasts were the only ones to be updated using the new development database and NTEM Version 6.1.The central case presents the “Core Scenario”.

2.10. NTEM Version 6.1 demand levels were on average 14% lower in 2016 than the Version 5.4 forecasts but the later years had demand levels closer to the older forecasts, showing that future development was still forecast but expected to be delayed compared with the previous forecasts.

Background Changes National, Regional Traffic Trends

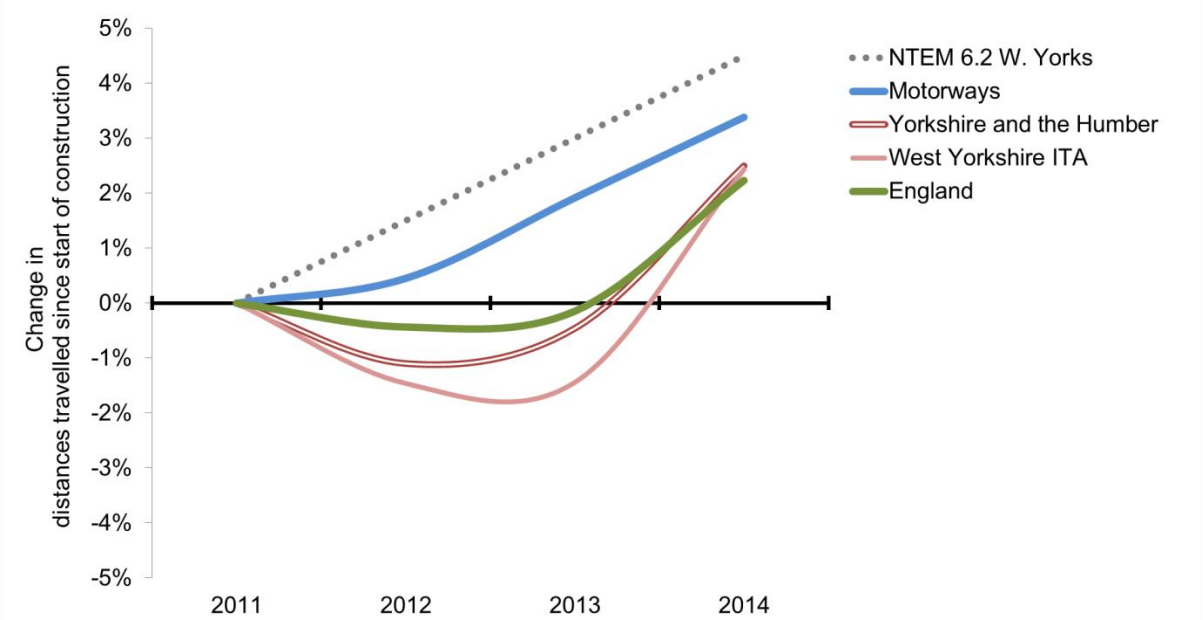
2.11. Historically in POPE scheme evaluations, the ‘before’ counts have been factored to take account of background traffic growth so that they are directly comparable with the ‘after’ counts. This usually involves the use of National Road Traffic Forecasts (NRTF), with local adjustments made using National Transport Model (NTEM) Local Growth Factors.

2.12. However, in light of the recent economic climate, which has seen widespread reductions in motor vehicle travel in the UK as a whole since 2008, it is no longer deemed appropriate to use this method of factoring ‘before’ counts to reflect background changes in traffic. Rather, recent POPE studies have taken a more considered approach in order to assess changes in the vicinity of the scheme, within the context of national, regional and locally observed background changes in traffic.

2.13. The best measure of the wider trends in overall traffic levels both regionally and nationally is shown in DfT annual statistics for total distance travelled (million vehicle kilometres). Figure 2-1 shows the changes by year in the period from 2011 (at start of construction) and 2014 (the latest available) for the region in which it lies, and motorways managed by Highways England, and for England as a whole.

[4] The National Trip End Model (NTEM) forecasts and the TEMPro (Trip End Model Presentation Program) software are used for transport planning purposes. The forecasts include: population, employment, households by car ownership, trip ends, and simple traffic growth factors, all based on data from the National Transport Model (NTM).

Figure 2-1 National and Regional Trends



2.14. The key points regarding the wider trends in recent years are:

- NTEM 6.2 forecast for West Yorkshire was greater than has been observed in recent years, and this is due to traffic trends during 2011/12 which are associated with the economic downturn.
- Motorways nationally have shown growth of traffic greater than overall traffic levels nationally and in the region.
- Regional traffic growth is in line with national growth for all road types.

2.15. The observed traffic flows presented in the traffic analysis in this chapter are as recorded have not been adjusted for the background trend of net growth between 2011 and 2014.

Traffic Volumes before and after

2.16. Weekdays traffic flows have been analysed for the M62 through the scheme and for the surrounding motorways and 'A' roads. The results are presented in Figure 2-2 and Figure 2-3.

2.17. The key points shown for the traffic flows on the M62 are:

- Post opening, the weekday flows are between 0% and 7% higher compared with that observed before construction (2011) which is in line with the background level of traffic growth.
- J26 – 27 remains the busiest section of the M62 in this region, with a two-way AWT of nearly 155,000 vehicles per day (vpd).
- J26 – 27 has also seen the greatest level of traffic growth which is consistent with trip suppression occurring here before now being released by the provision of additional roadspace by the scheme.

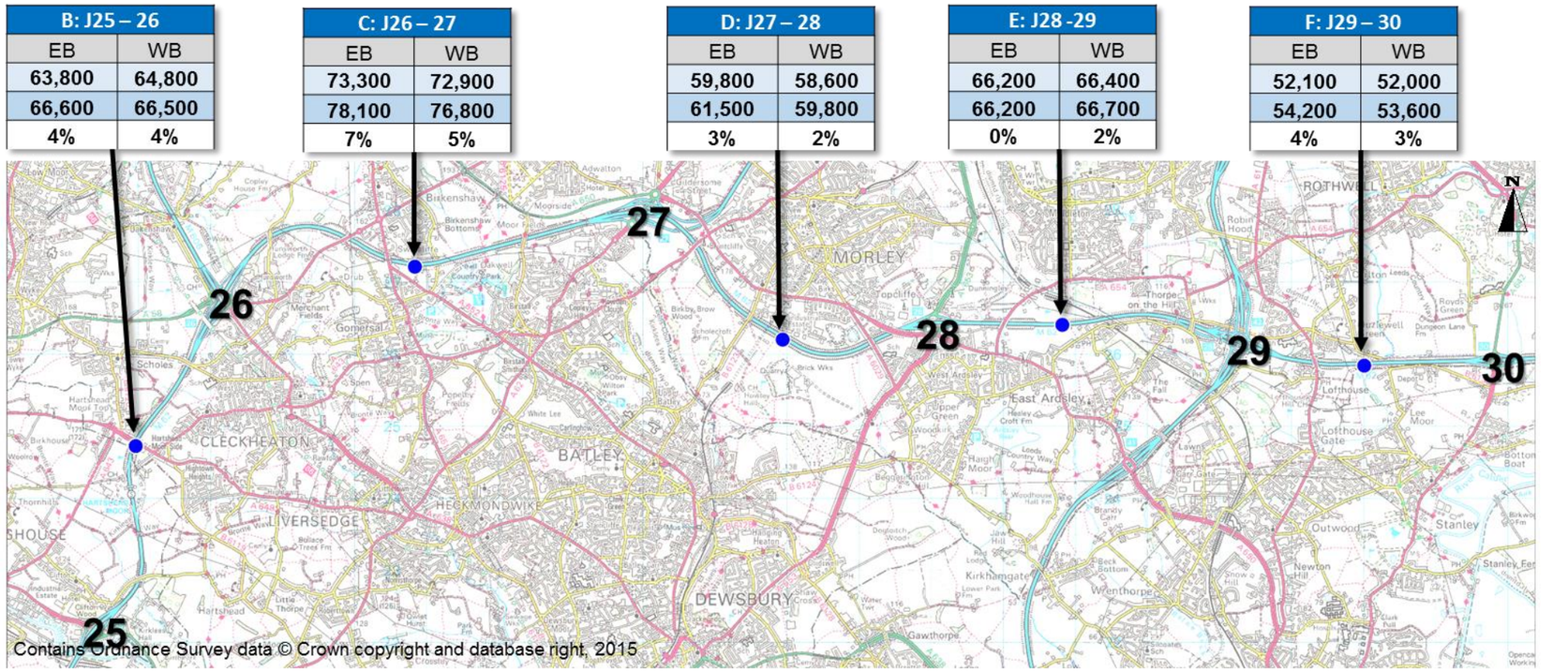
2.18. West of the M1 on J28 – 29 , there has been much lower traffic growth which is probably due to the impact of major roadworks on the M1 leading to some choice of alternative routes.

2.19. The key points shown for the traffic flows on the adjacent other motorways and 'A' roads are:

- Post opening, the weekday flows on the non-motorway roads show an average increase of 1% which is negligibly small and in line with the regional trend shown in Figure 2-1 but between the individual roads there are considerable variations of increases and decreases.
- The two urban motorways M606 and M621 which link the M62 to the city centres of Bradford and Leeds both show increased traffic

- At J26, there has been an increase in traffic from the M606 which has a freeflow link to the M62 west whilst the other four adjoining roads show falls in traffic volume.
- The greatest changes in traffic flows have occurred around J27, where the non-M62 roads show a weekday increase of over 13,000 vpd mainly on the M621.
- At J25, flows on the adjoining A644 east and west of the junction have increased by nearly 1,000 vpd which may indicate additional traffic accessing the M62 here.
- The sections of the M1 north and south of the M62 J29 show no change and a reduction respectively which is contrary to the general traffic growth trend on motorways shown in Figure 2-1 and hence can be presumed as directly linked to the current roadworks on the M1. The reduction on the M1 south of the M62 may also be due to some very wide area rerouting of strategic traffic to use the M62 west of the M1 due to the M1 roadworks.

Figure 2-2 M62 Before and After Average Weekday Traffic Flows (AWT)

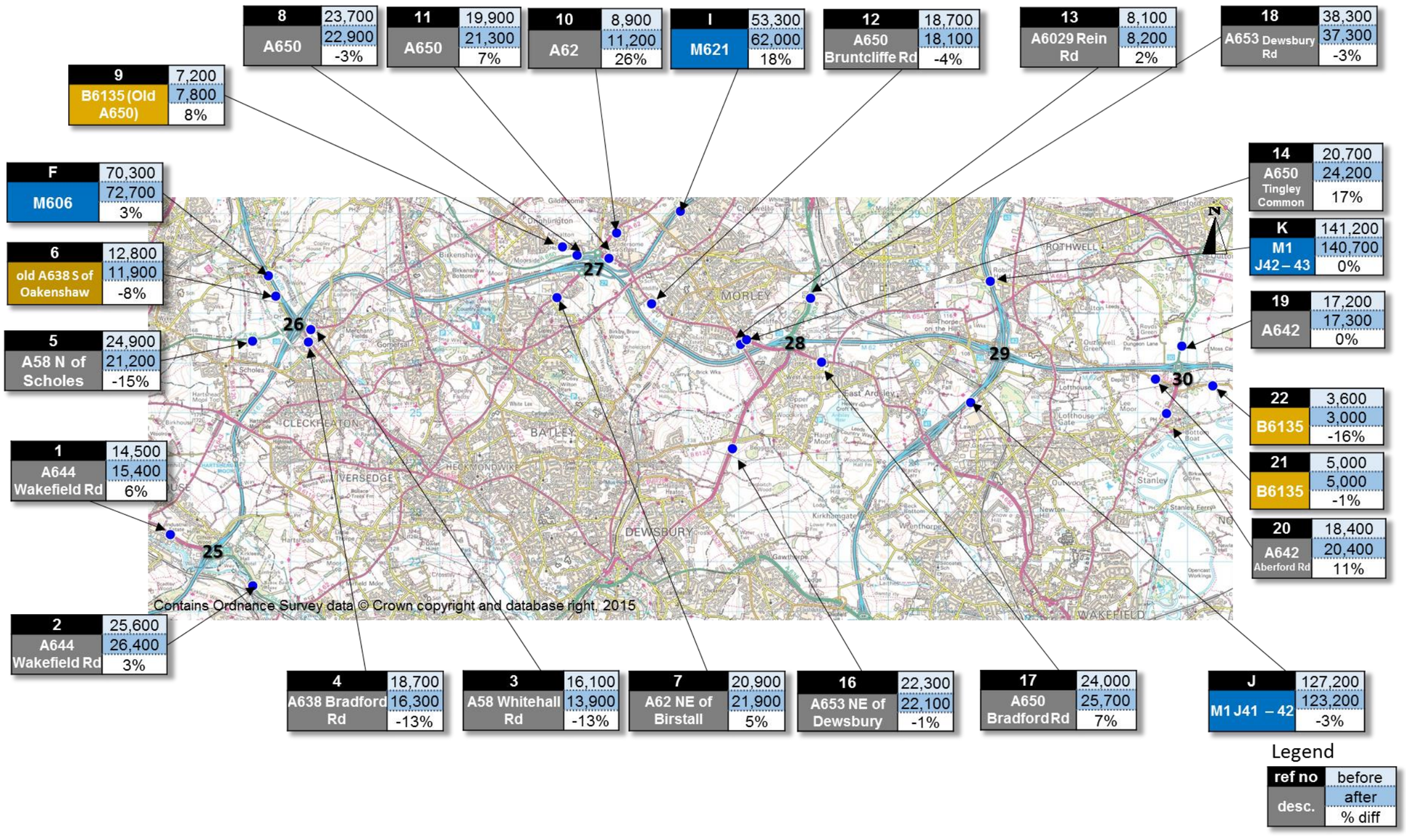


Legend

Ref no : M62 section	
EB	WB
AWT March 2011	AWT March 2011
AWT March 2015	AWT March 2015
difference %	difference %

30 M62 jct no.

Figure 2-3 Traffic flows on other motorways and 'A' roads



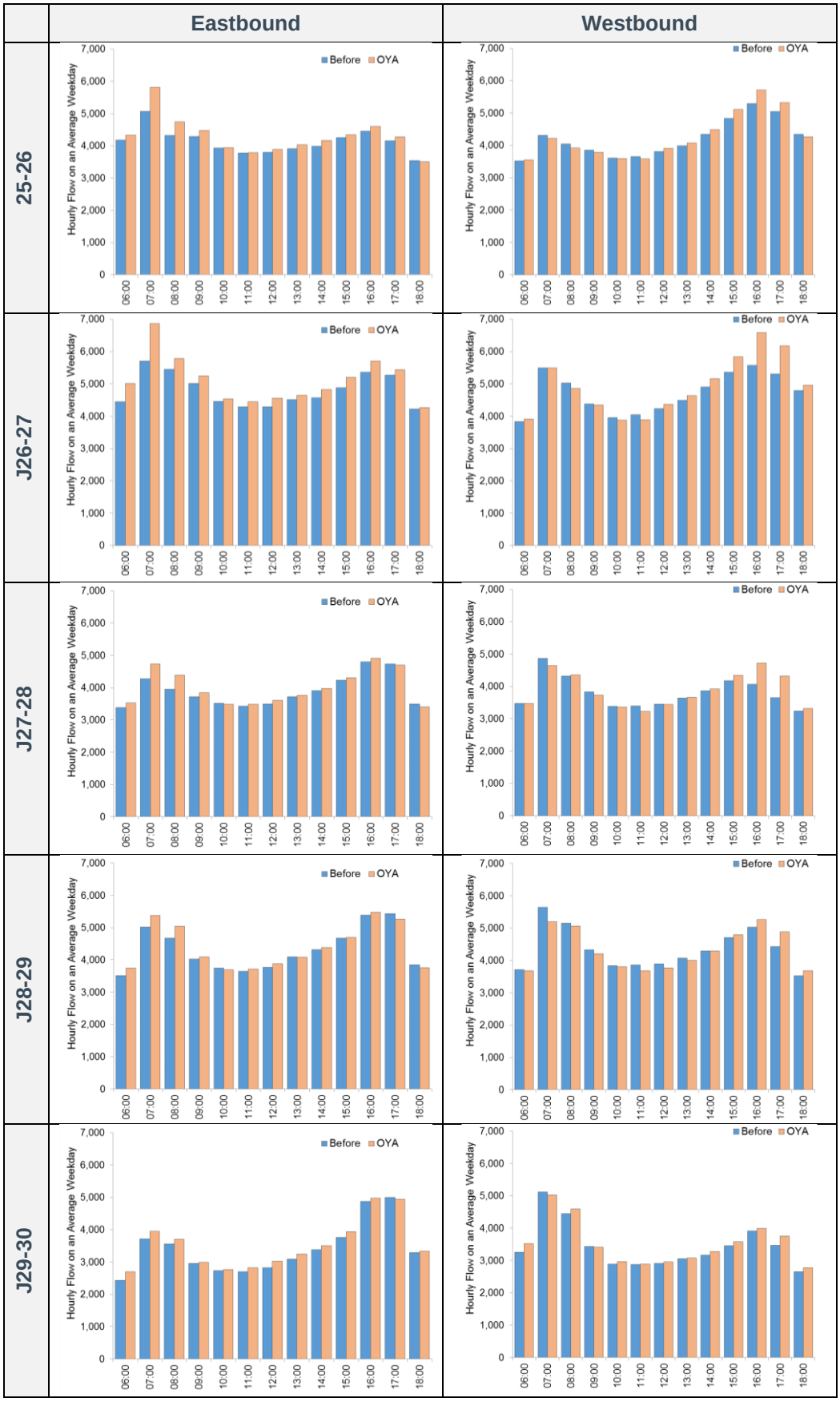
Traffic Volumes by Hour

2.20. The scheme provided additional capacity to the M62, and it was noted earlier that there is only a low amount of additional traffic following the opening of this scheme in line with the background trend, so we now look at how the traffic flows have changed by time of day. Figure 2-4 shows the hourly traffic volumes on the sections within the scheme on weekdays.

2.21. The key points shown by the hourly traffic flow graphs are:

- Traffic flow growth which has occurred after opening of this scheme on the busiest sections (J25-26 and J26-27) has been focused on the peak flow periods namely in the AM peak eastbound and PM peak westbound.
- The changes in the flow profile across the day suggest that in the before period, there was trip suppression in the peak periods hence there was peak spreading occurring and now the improvement made by this scheme has now enabled this traffic to use this route in the peak hours.

Figure 2-4 Hourly traffic flows (weekdays)



HGV traffic

2.22. Table 2-1 shows the proportions of traffic which are categorised as Heavy Goods Vehicles (HGV).

2.23. Note that here the definition is slightly different depending on the source of the count data. Motorway data based on permanent count sites, shows proportion of vehicles over 6.6m in length, while data for other roads here is based on temporary counters which show vehicle classes 5 to 12 i.e. truck or buses with 3 or more axles.

Table 2-1 HGVs as proportion of all weekday traffic

Map ref	Location	Before	OYA	Net difference
A	M62 J24-25	18.4	18.2	-0.2
B	M62 J25-26	17.6	20.5	2.9
C	M62 J26-27	14.8	20.3	5.5
D	M62 J27-28	21.9	22.0	0.1
E	M62 J28-29	19.3	22.2	2.9
F	M62 J29-30	19.0	21.0	2.0
G	M62 J30-31	21.4	22.1	0.7
H	M606 South of Euroway Trading Est	10.6	11.2	0.5
I	M621 M62 J27 to M621 (WB prox'd)	7.0	8.5	1.5
J	M1 J41-42 (north of M62)	11.4	11.3	-0.1
K	M1 J42-43 (south of M62)	11.3	11.4	0.1
1	A644 Wakefield Road West of Mirfield	5.9	5.2	-0.7
2	A644 Wakefield Road East of Brighouse	6.0	4.2	-1.8
7	A62 North East of Birstall	5.0	4.3	-0.7
13	A6029 Rein Road	0.8	0.5	-0.3
14	A650 Tingley Common	4.0	2.7	-1.2
17	A650 Bradford Road	2.1	1.8	-0.3
21	B6135 Castle Gate	3.7	2.5	-1.3
22	B6135 Newmarket Lane	3.4	0.8	-2.6

2.24. The key points regarding the HGV proportions are:

- Post opening, the proportion of HGVs has increased on the M62 throughout the scheme. As total traffic flows have increased on this section (as shown in Figure 2-2), this shows that growth in HGV numbers has been greater than for light vehicles.
- The urban motorway spurs into Bradford (M606) and Leeds (M621) city centres also show increased HGV traffic above the general traffic increase.
- The six ‘A’ roads and two ‘B’ roads where before and after HGV data was available, all show falls in the proportion of HGV traffic.

Traffic Volumes forecasting accuracy

2.25. Justification of the scheme was based on detailed forecasting of the traffic impacts. We will now compare the observed traffic impacts with those forecast. As noted earlier (page 13), the final traffic flow forecasts were modelled for the central growth option only using TEMPRO and NTEM 6.1 and for the three forecast years, 2016, 2023 and 2031.

2.26. As the modelled opening year was 2016 for the Do Minimum and Do Something scenarios, for comparisons with observed traffic data from before start of construction in 2011 and one year after opening in 2015, we have created proxy forecasts for 2015 Do Something to compare against post opening data, and proxy 2011 Do Minimum data to compare against observed pre-

scheme data. The adjustment was made using factors from TEMPRO 6.2 for West Yorkshire area.

2.27. Table 2-2 shows the accuracy of the modelling before and after construction for the sections of the M62 within the scheme and nearby sections of motorway. Forecasts were made for a more extensive length of the M1, down as far south as the M18 (M1 J32) but these have not been examined here as there is currently extensive roadworks for the M1 smart motorway schemes.

Table 2-2 Forecast and Observed Traffic flows (AADT) on M62

	Location	Dir	Without scheme 2011			With Scheme 2015			Increase with scheme*	
			Forecast[5]	Observed	% diff	Forecast[6]	Observed	% diff	F'cast	Obsv'd
A	M62 J24-25	EB	55,300	50,300	-9%	56,600	52,500	-7%	2%	4%
		WB	58,400	52,000	-11%	60,600	53,400	-12%	4%	3%
B	M62 J25-26	EB	63,100	58,500	-7%	66,100	61,500	-7%	5%	5%
		WB	65,600	59,200	-10%	69,300	61,400	-11%	6%	4%
C	M62 J26-27	EB	76,200	67,100	-12%	79,800	70,700	-11%	5%	5%
		WB	74,600	66,700	-11%	80,800	71,800	-11%	8%	8%
D	M62 J27-28	EB	61,500	54,800	-11%	62,500	56,700	-9%	2%	3%
		WB	58,700	54,000	-8%	58,900	55,400	-6%	0%	3%
E	M62 J28-29	EB	73,200	60,300	-18%	73,400	62,100	-15%	0%	3%
		WB	72,000	60,800	-16%	72,000	61,000	-15%	0%	0%
F	M62 J29-30	EB	57,800	46,700	-19%	58,600	48,400	-17%	1%	4%
		WB	54,500	46,800	-14%	54,700	48,900	-11%	0%	4%
G	M62 J30-31	EB	56,700	30,200	-47%	58,000	32,300	-44%	2%	7%
		WB	54,000	33,600	-38%	55,100	34,400	-38%	2%	2%

* Difference between 2011 DM and 2015 DS including net impact of scheme and wider trend

2.28. The key points regarding the accuracy of the forecasts for the scheme and adjacent M62 sections are:

- Post opening traffic flows are lower than expected by between 6% and 17% within the scheme length, averaging 11% lower. Other motorway sections show similar trends.
- Flows before the start of construction are very similarly around an average of 12% lower than forecast.
- Although the Do Minimum and Something scenario traffic flows were inaccurate, they were to a similar level meaning that the proportionate change between 2011 and 2015 with the scheme has been largely as expected.

2.29. Table 2-3 similarly shows the accuracy of the modelling on the adjacent motorways and 'A' roads.

[5] Forecast DM flows 2016 adjusted down to 2011 using TEMPRO 6.2 factors for West Yorkshire.
[6] Forecast DS flows 2016 adjusted down to 2015 using TEMPRO 6.2 factors for West Yorkshire.

Table 2-3 Traffic flow (AADT) Forecast and observed – other motorways and 'A' roads

	Location	Dir	Without scheme 2011			With Scheme 2015			Increase with scheme*	
			Forecast	Observed	% diff	Forecast	Observed	% diff	F'cast	Obsv'd
1	A644 Wakefield Rd N of J25	NB	9,500	6,000	-37%	10,100	6,000	-41%	6%	1%
		SB	9,000	7,400	-18%	9,800	8,200	-16%	8%	10%
2	A644 Wakefield Rd S of J25	NB	13,300	11,800	-12%	13,900	11,800	-15%	4%	0%
		SB	12,200	12,100	-1%	12,700	12,800	1%	4%	6%
3	A58 Whitehall Rd E of J26	EB	8,900	7,100	-20%	9,000	6,300	-30%	1%	-12%
		WB	9,500	7,100	-25%	8,900	6,600	-26%	-6%	-8%
4	A638 Bradford Rd S of J26	NB	8,500	8,900	5%	8,700	7,900	-10%	3%	-12%
		SB	8,300	8,400	0%	8,600	7,400	-14%	3%	-11%
5	A58 Whitehall Rd W of J26	EB	9,700	10,300	6%	10,000	9,900	-1%	3%	-4%
		WB	8,400	12,400	48%	9,100	9,900	8%	9%	-20%
H	M606 between J1 and M62 J26	NB	33,500	30,800	-8%	35,100	31,800	-9%	5%	3%
		SB	34,000	32,900	-3%	35,100	34,600	-1%	3%	5%
8	A650 NW of J27	EB	5,800	10,400	79%	5,800	10,200	75%	0%	-2%
		WB	2,700	10,600	300%	2,400	10,600	342%	-10%	0%
I	M621 between J1 and M62 J27	EB	29,100	23,600	-19%	30,700	27,700	-10%	6%	17%
		WB	27,800	24,800	-11%	32,100	28,600	-11%	15%	16%
16	A653 Dewsbury Road S of J28	NB	9,700	10,200	5%	10,100	10,100	0%	4%	-1%
		SB	11,200	10,200	-9%	11,300	9,800	-14%	2%	-4%
17	A650 Bradford Rd SE of J28	EB	8,100	11,400	40%	8,800	11,100	26%	8%	-2%
		WB	6,100	11,200	85%	6,800	12,800	88%	12%	14%
18	A653 Dewsbury Road N of J28	NB	8,200	18,700	128%	8,100	17,500	117%	-1%	-6%
		SB	12,200	17,300	41%	11,200	16,800	51%	-9%	-3%
J	M1 J41-42 S of M62 J29	NB	68,600	57,600	-16%	70,600	55,900	-21%	3%	-3%
		SB	71,800	57,700	-20%	73,400	57,300	-22%	2%	-1%
K	M1 J42-43 N of M62 J29	NB	73,400	63,200	-14%	75,300	63,700	-15%	3%	1%
		SB	78,700	64,100	-19%	80,700	64,900	-20%	2%	1%
19	A642 Wakefield Rd N of J30	NB	10,800	8,300	-24%	11,200	8,000	-29%	4%	-3%
		SB	9,900	7,500	-24%	10,100	7,800	-23%	2%	3%
20	A642 Aberford Rd S of J30	NB	12,500	8,600	-31%	12,800	9,300	-28%	3%	8%
		SB	12,100	8,400	-30%	12,700	9,100	-28%	4%	8%

2.30. The key points regarding the accuracy of the forecasts for the scheme on the nearby 'A' roads are:

- Post opening traffic flows are mostly lower than expected, as noted for the flows on the M62 in Table 2-2, and likewise a similar pattern is seen for the Do Minimum accuracy level.
- The very large differences between the forecast and observed data (site 8 A650 N-W of J27, appears to reflect an error in the model; possibly data for the old A650 now bypassed may have been used).
- Approaching the J26, the A58 and A638 (sites 4 and 5) differ from the wider trend by showing more than expected traffic without the scheme, but with the scheme

traffic levels fell rather than increased as expected. This difference indicates that some traffic rerouted away from accessing the motorway from the A roads at J26 and this was not expected.

- Flows on the M1 north and south of the M62 J29 are much lower than forecast which can be attributed to the ongoing roadworks for the M1 smart motorway on this section in 2014/15, whereas the model was based on the M1 scheme already completed.

Journey Time Analysis

2.31. This section considers the impact on journey times following the scheme's implementation. Pre-scheme journey times along the M62 route are compared with post-opening journey times for both directions as recorded by sat-nav devices in vehicles using the route. For consistency all the data was taken from March 2011 and March 2015, as for the M62 traffic flow data in Figure 2-2 above.

2.32. The journey time analysis is split into three components:

- Analysis of pre and post-scheme journey time differences along the scheme.
- A comparison of forecast and outturn journey times along the scheme.
- A comparison of journey time reliability pre-scheme and post-opening.

Observed Journey Times before and after – based on Sat-Nav data

2.33. This section examines the journey times on the M62 before the scheme's construction and one years after as recorded by sat-nav devices of vehicles travelling though the route. For consistency all the data was taken from March 2011 and March 2015, as for the M62 traffic flow data in Figure 2-2 above.

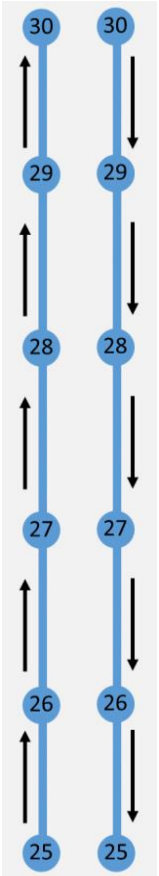
2.34. The time periods examined are align with the modelled journey times in the Traffic Forecasting report (TFR) and the addendum (AFR), with additional analysis of weekend traffic, and are as follows:

- Weekday AM peak (07:00 – 10:00)
- Weekday Interpeak (10:00 – 16:00)
- Weekday PM peak (16:00 – 19:00)
- Weekday Off-peak (00:00 – 07:00, 19:00 – 24:00)
- Saturday peak (10:00 – 18:00)
- Sunday peak (10:00 – 18:00)
- Saturday and Sunday off-peak (0:00 – 10:00, 18:00 – 24:00)

2.35. Table 2-4 and Table 2-5 show the mean of the times observed between the junctions in each direction through the scheme and for the total through journey, for all these time periods. It should be noted that the net journey times here include both improvements and worsening; negative values are a saving.

2.36. Note that the journey times here are measured between the mid-points of the junctions on the mainline carriageway.

Table 2-4 M62 Weekday Journey times (mm:ss)

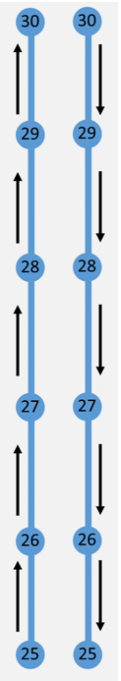
	Eastbound				Sections between junctions	Westbound			
J29-30	**Before**	**OYA**	**Diff (secs)**			**J30-29**	**Before**	**OYA**	**Diff (secs)**	
AM	02:06	02:13	7	6%		AM	02:47	03:21	34	20%
IP	02:06	02:13	7	6%		IP	02:12	02:20	8	6%
PM	02:07	02:18	11	9%		PM	02:14	02:22	8	6%
Off-peak	02:03	02:13	10	8%		Off-peak	02:16	02:20	4	3%
J28-29						**J29-28**				
AM	02:33	02:39	6	4%		AM	02:51	02:42	-9	-5%
IP	02:30	02:35	5	3%		IP	02:30	02:40	10	7%
PM	02:30	02:43	13	9%		PM	03:44	03:04	-40	-18%
Off-peak	02:26	02:33	7	5%		Off-peak	02:40	02:36	-4	-3%
J27-28						**J28-27**				
AM	02:58	03:13	15	8%		AM	03:49	03:20	-29	-13%
IP	02:54	03:08	14	8%		IP	03:03	03:16	13	7%
PM	02:54	03:22	28	16%		PM	07:06	03:48	-198	-46%
Off-peak	02:52	03:00	8	5%		Off-peak	02:57	03:04	7	4%
J26-27						**J27-26**				
AM	06:25	06:00	-25	-6%		AM	05:01	04:40	-21	-7%
IP	03:57	04:15	18	8%		IP	03:56	04:06	10	4%
PM	05:12	04:27	-45	-14%		PM	07:01	05:50	-71	-17%
Off-peak	03:50	04:05	15	7%		Off-peak	03:44	03:57	13	6%
J25-26						**J26-25**				
AM	06:55	05:46	-69	-17%		AM	03:04	03:09	5	3%
IP	03:09	03:22	13	7%		IP	03:06	03:14	8	4%
PM	03:31	03:24	-7	-3%		PM	03:16	03:25	9	5%
Off-peak	03:07	03:15	8	4%		Off-peak	03:03	03:10	7	4%
Full length of Scheme						**Full length of Scheme**				
AM	20:57	19:51	-66	-5%		AM	17:32	17:12	-20	-2%
IP	14:36	15:33	57	7%		IP	14:47	15:36	49	6%
PM	16:14	16:14	0			PM	23:21	18:29	-292	-21%
Off-peak	14:18	15:06	48	6%		Off-peak	14:40	15:07	27	3%

2.37. The key points regarding changes to weekday journey times are:

- Most of the differences to the journey times are relatively small, but over the full length of the scheme these can total changes in over a minute.
- Eastbound journey times shows over a minute's time saving in the AM peak and this is due to savings from J25 to J26 and J26 to J27, travelling towards Bradford and Leeds.
- Westbound journey times shows the highest level of saving and these occur in the PM peak; J28-27 shows a saving of over 3 minutes and journey along the whole route are down by nearly 5 minutes in the PM peak.
- Journeys toward J30 may have been affected by the works for the adjacent Pinchpoint scheme on J30-3, extending the variable message signs to that section the M62.
- The inter-peak and off-peak periods show increased journey times which will be discussed later in this chapter.

Table 2-5 M62 Weekend Journey times (mm:ss)

	Eastbound					Westbound				
J29-30	**Before**	**OYA**	**diff**			**J30-29**	**Before**	**OYA**	**diff**	
Saturday peak	01:57	02:04	7	6%		Saturday peak	02:03	02:09	6	5%
Sunday peak	01:56	02:04	8	7%		Sunday peak	02:01	02:09	8	7%
Weekend off-peak	01:57	02:07	10	9%		Weekend off-peak	02:04	02:12	8	6%
J28-29						**J29-28**				
Saturday peak	02:19	02:25	6	4%		Saturday peak	02:20	02:28	8	6%
Sunday peak	02:18	02:25	7	5%		Sunday peak	02:20	02:29	9	6%
Weekend off-peak	02:19	02:25	6	4%		Weekend off-peak	02:21	02:29	8	6%
J27-28						**J28-27**				
Saturday peak	02:45	02:52	7	4%		Saturday peak	02:46	02:54	8	5%
Sunday peak	02:42	02:55	13	8%		Sunday peak	02:45	02:55	10	6%
Weekend off-peak	02:44	02:54	10	6%		Weekend off-peak	02:46	02:55	9	5%
J26-27						**J27-26**				
Saturday peak	03:36	04:07	31	14%		Saturday peak	03:31	03:46	15	7%
Sunday peak	03:33	03:55	22	10%		Sunday peak	03:31	03:47	16	8%
Weekend off-peak	03:35	03:48	13	6%		Weekend off-peak	03:30	03:46	16	8%
J25-26						**J26-25**				
Saturday peak	02:54	03:11	17	10%		Saturday peak	02:54	03:00	6	5%
Sunday peak	02:53	03:01	8	5%		Sunday peak	02:53	03:00	7	6%
Weekend off-peak	02:55	03:01	6	3%		Weekend off-peak	02:54	03:02	8	6%
Full length of Scheme										
Saturday peak	13:31	14:39	68	8%		Saturday peak	13:34	14:17	43	5%
Sunday peak	13:22	14:20	58	7%		Sunday peak	13:30	14:20	50	6%
Weekend off-peak	13:30	14:15	45	6%		Weekend off-peak	13:35	14:24	49	6%

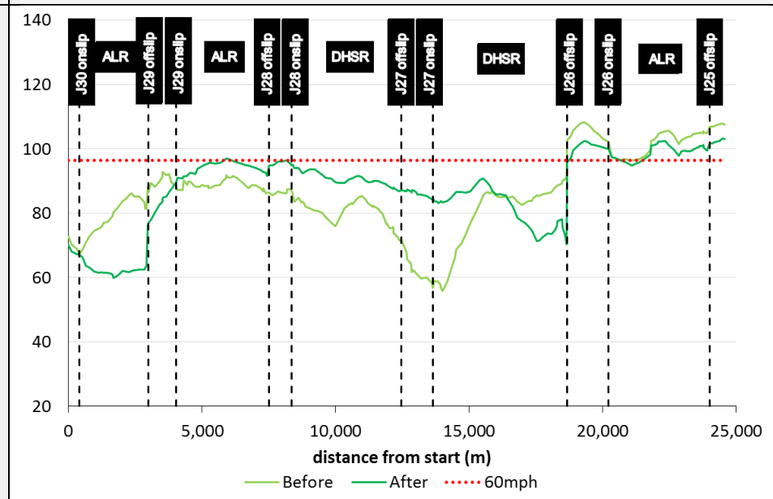
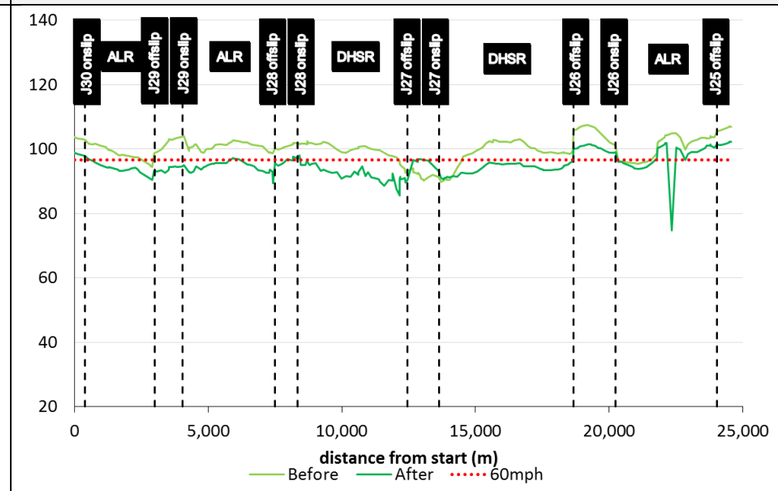
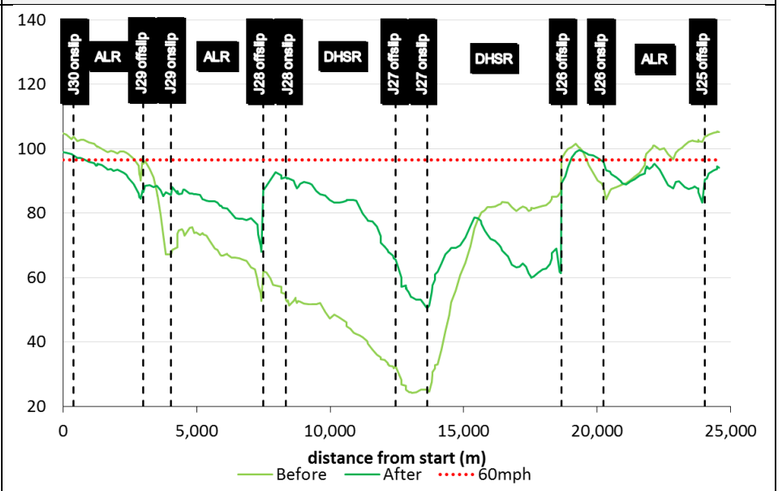
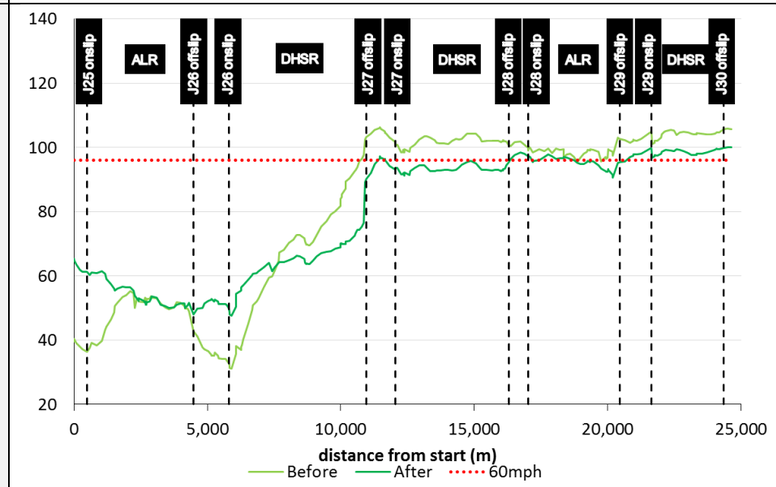
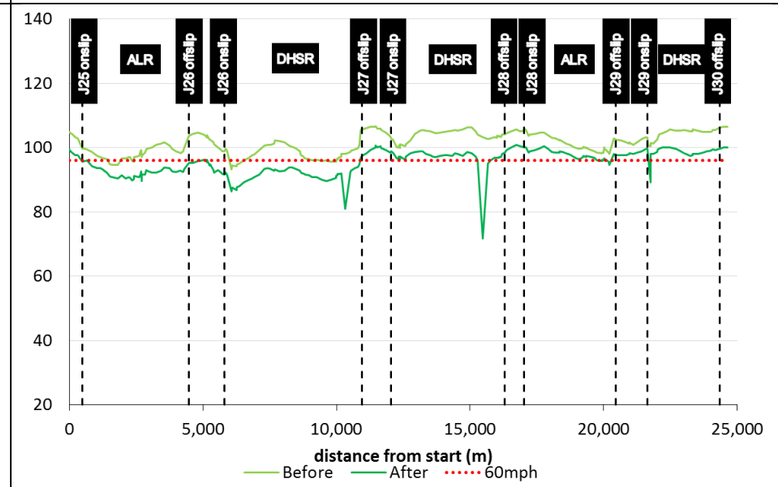
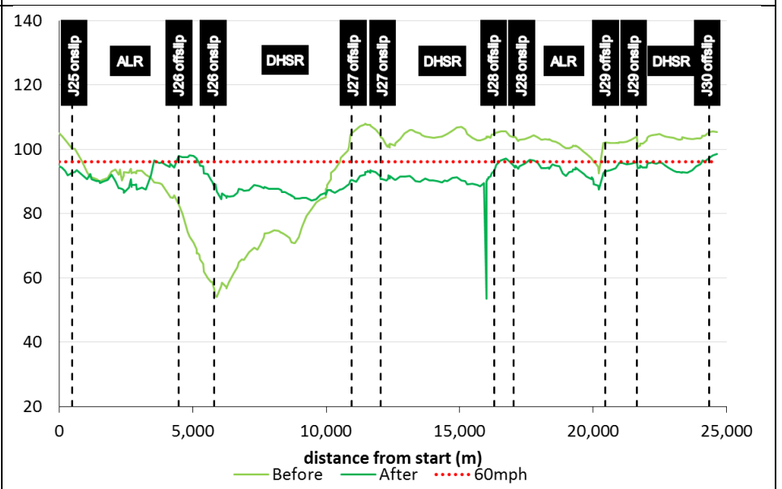


2.38. This shows that weekends experienced increased journey times. This is similar to the impacts observed in Table 2-4 for the weekday off-peak periods,

Journey speeds through the scheme

2.39. Following the above analysis of the changes to overall journey times along the length of the scheme, we now examine how average speeds have varied along the carriageway.

Figure 2-5 M62 J25-30 Average speeds along the scheme by direction and weekday time period

	AM peak	Interpeak	PM peak
Westbound speed (kph)			
Eastbound speed (kph)			
Key points	• Big improvements in speeds at the times and locations which previously experienced the slowest speeds (hence congestion) : - Westbound J27; and - Eastbound J26. • Slight decreases in speeds at locations where they were fairly free-flowing before the scheme was built.	• The less busy inter-peak periods show a slight reduction in average speeds. This can be attributed to the operation of the smart motorway applying a variable speed limit which makes traffic speeds more uniform by reducing stop and go traffic, but should also be considered to be linked to the increase in traffic flows (as shown in Figure 2-2).	• As for the AM peak, there are large improvements in speeds at the times and locations which previously experienced the slowest speeds (hence congestion) : - westbound J29-26, especially J28-27; and - eastbound J26 • Also as in the AM peak, there are slight decreases in speeds at locations where they were fairly free-flowing before the scheme was put in place.

Journey Time forecasting accuracy

2.40. The Addendum to the Traffic Forecasting Report (AFR) included detailed forecasts of the journey times between the individual motorway junctions through the scheme sections and the wider motorway network. These covered the peak periods by hour and the full intermediate interpeak period. No forecast were given for the weekends or the weekday off-peak from the end of the PM peak to the following AM peak. Here we present a simplified version of the forecast journey time impacts for the sections of the M62 within the scheme compared against the observed impacts.

2.41. The AFR presented forecasts for journey times in the DM and DS scenarios based on the central growth and NTEM 6.1 and the revised guidance on the appraisal of managed motorway schemes (2009). This used 60mph dynamic hard shoulder running managed motorways speed/flow curves for the DS. These forecasts in this version of the forecast were based on lower traffic flows compared with the earlier TFR which meant there was less delay in the DM scenario and hence less scope for journey time improvements in the DS scenario. It was noted that, as in the original forecasts, increasing delay in the DM scenario would mean much greater benefits for the design year of 2031 with savings of between 2 and 6 minutes.

2.42. Forecast journey times were published by hour for the three hours within each of the AM and PM weekday peaks and for the weekday inter-peak period. For comparisons with observed data where the peak periods are based on the full three hour periods, forecasts were agglomerated, and weighted by flows.

2.43. The observed savings by time period, based on the changes between 2011 and 2015 as reported above in Table 2-4 and Table 2-5 are compared against the forecast net change between the DM and DS scenarios for 2016 in Table 2-6, Table 2-7 and Table 2-8. It should be noted that the net journey times here include both improvements and worsening; negative values are a saving.

Table 2-6 Forecasting Accuracy of AM peak Journey Time savings

Section		Forecast		Observed	
		Net impact (seconds)	%	Net impact (seconds)	%
J25 – 26	EB	-59	-21%	-69	-17%
	WB	3	1%	6	3%
J26 – 27	EB	-37	-11%	-25	-6%
	WB	-62	-18%	-21	-7%
J27 – 28	EB	15	8%	15	9%
	WB	-13	-6%	-28	-12%
J28 – 29	EB	24	15%	6	4%
	WB	21	12%	-9	-5%
J29 – 30	EB	12	9%	7	6%
	WB	-1	0%	35	21%
Full scheme length	EB	-45	-4%	-66	-5%
	WB	-52	-5%	-18	-2%

2.44. The key points regarding AM journey time forecasts shown here are:

- The AM peak was predicted to experience overall journey time savings, with the greatest benefits expected on J26 – 27 and J25 – 26 eastbound.
- Observed data shows the net impact on journey times has been roughly similar to forecast on most of the sections.
- Overall, the journey time through the whole scheme eastbound was 21 seconds better than expected but westbound was 35 seconds worse.

Table 2-7 Forecasting Accuracy of Inter-peak Journey Time savings

Section		Forecast		Observed	
		Net impact (seconds)	%	Net impact (seconds)	%
J25 – 26	EB	17	9%	12	7%
	WB	10	5%	8	4%
J26 – 27	EB	2	1%	18	8%
	WB	-15	-5%	10	4%
J27 – 28	EB	23	13%	14	8%
	WB	17	9%	13	7%
J28 – 29	EB	23	15%	6	4%
	WB	23	15%	10	7%
J29 – 30	EB	14	11%	7	6%
	WB	14	11%	7	6%
Full scheme length	EB	79	9%	57	7%
	WB	49	5%	48	5%

2.45. The key points regarding inter-peak journey time forecasts shown here are:

- The inter-peak period was predicted to experience mainly increases in journey times. This would be due to the expected operation of the DHS of the smart motorway to have the hard shoulder open to traffic at certain times during the less busy period.
- Observed journey times during this period showed the small increases as expected.

Table 2-8 Forecasting Accuracy of PM peak Journey Time savings

Section		Forecast		Observed	
		Net impact (seconds)	%	Net impact (seconds)	%
J25 – 26	EB	-8	-3%	-7	-3%
	WB	-24	-10%	9	5%
J26 – 27	EB	-15	-5%	-45	-14%
	WB	-61	-17%	-71	-17%
J27 – 28	EB	-23	-9%	28	16%
	WB	-12	-6%	-198	-46%
J28 – 29	EB	22	12%	12	8%
	WB	21	14%	-41	-18%
J29 – 30	EB	-5	-4%	11	9%
	WB	12	9%	8	6%
Full scheme length	EB	-28	-3%	0	0%
	WB	-64	-6%	-292	-21%

2.46. The key points regarding PM journey time forecasts shown here are:

- The PM period was predicted to experience savings in journey times on the majority of sections with a net saving overall in each direction.
- Observed journeys showed much better savings than expected for the westbound section J28 – 26 which experiences the main tidal flow in the PM period, giving a greater than expected overall saving of 21% when only 6% was forecast.
- Eastbound traffic did not experience all the expected savings, especially on J27 – 28, giving and overall impact of no change where a 3% fall was forecast.

Observed Journey Times before and after – Midas data

2.47. In addition to the traffic flow and journey time analysis presented in this chapter, additional analysis has been completed using MIDAS data focusing on the AM peak in the eastbound direction and the PM peak in the westbound direction. Unlike the sat-nav data, MIDAS data includes a breakdown by lane.

2.48. The graphs presented in the remainder of this section show the lane-by-lane traffic flows and speeds on an average March 2015 weekday. This is the same month that has been used for post-opening analysis throughout this chapter. In each figure, the different coloured lines represent the different lanes as shown in the key. The distance on the x-axis is the distance in metres from within J26 in the eastbound direction and within J28 in the westbound direction. All analysis has been completed on the mainline MIDAS sites at 37 locations on each carriageway.

2.49. It should be noted that the sections of motorway in this scheme vary in the number of lanes and operation of the motorway. For simplicity of presentation of the lane data for the full length on the scheme the common lane numbering used here is based on the following:

- Lane 4 is the outside lane which runs continuous from J25-20 and J30-25;
- Lane 3 is left of lane 4 and is also continuous;
- Lane 2 is left of lane 3 and runs through J26,J27,J28 but does not run through J29; and
- Lane 1 is the inside lane for ALR sections (which have 4 lanes) and the hard shoulder in the DHS sections. It does not run through any junction.

2.50. Data for the slip roads are not included here, which means that Lane 1 flow data has large gaps at the junctions.

Figure 2-6 MIDAS data: Speeds and Flows by Lane on DHSR sections - AM peak Eastbound

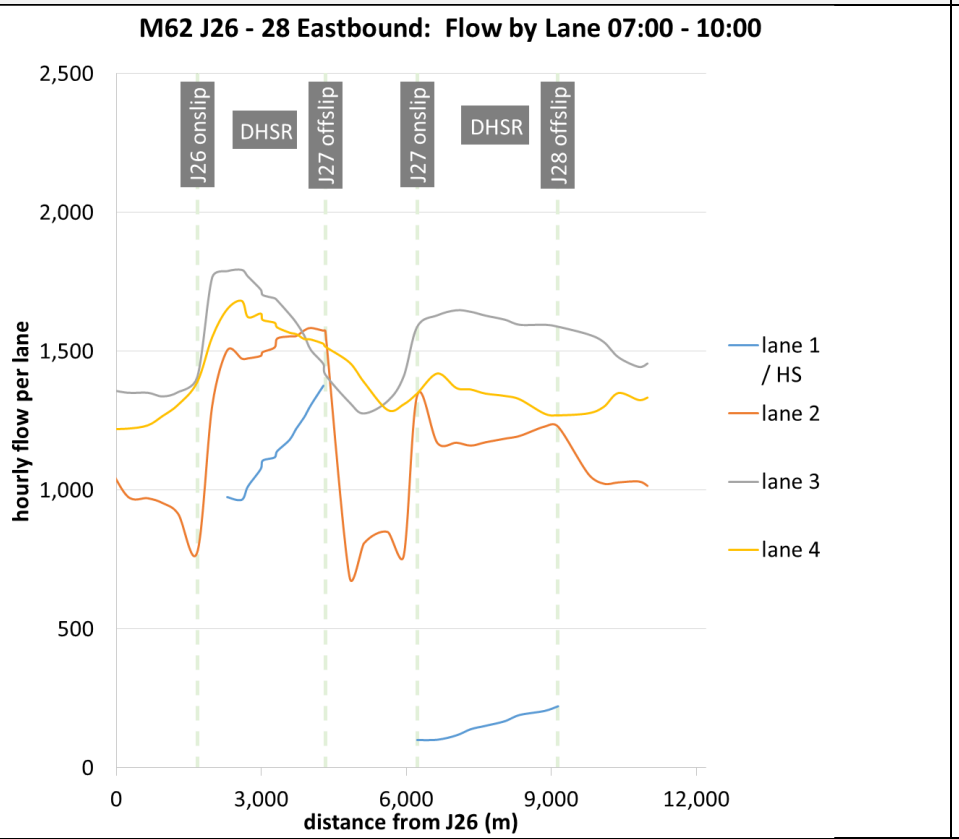
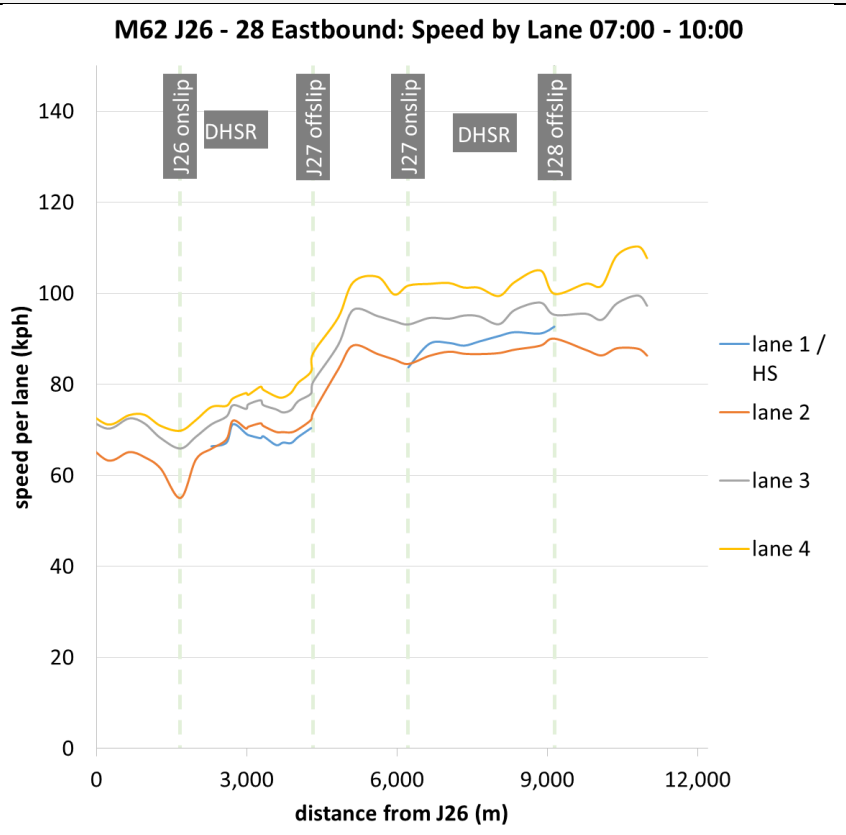
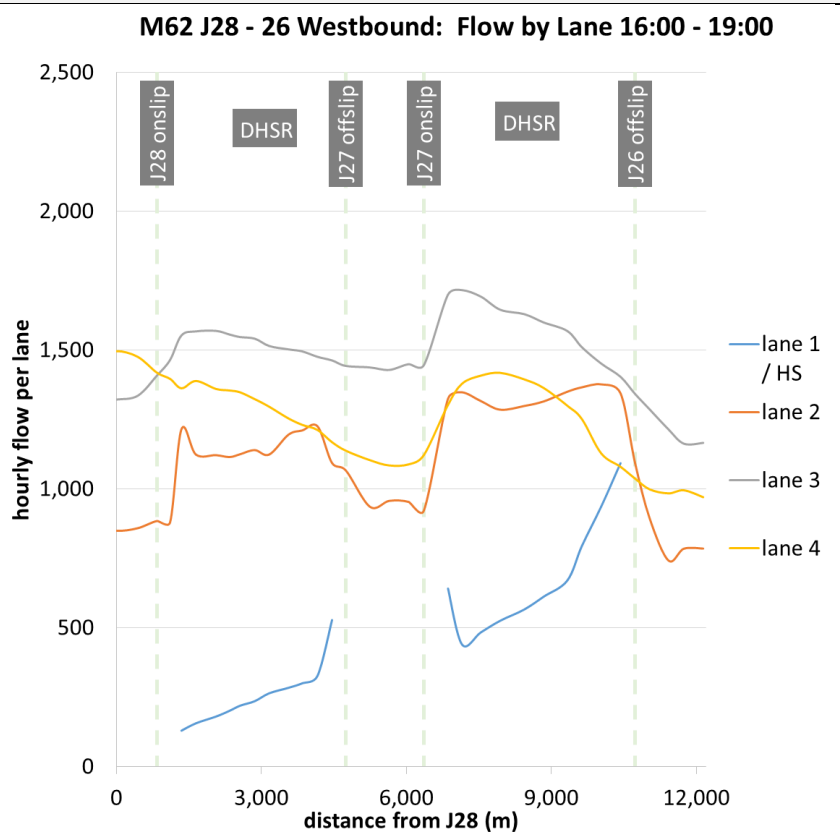
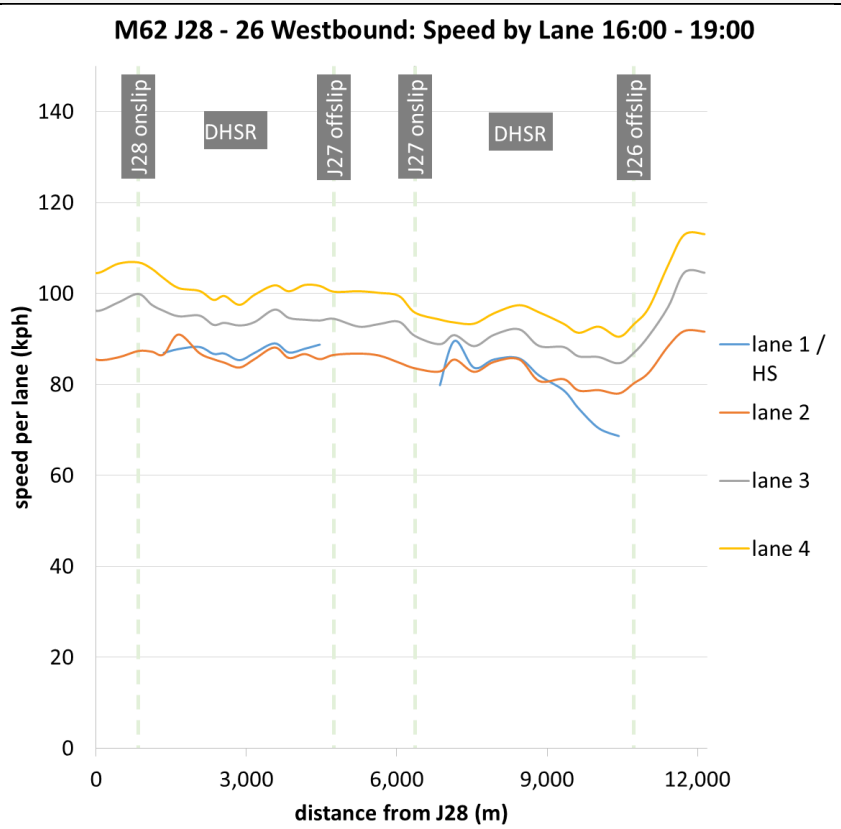
	Flows by Lane	Speeds by Lane
AM peak		
Comment	• Between J26 and 27, the level of traffic flow using the DHS (lane 1) increases westwards along the scheme from two-thirds of the other three lanes to reach similar level of use at the start of the slip road. • The DHS from J27-28 has a very low level of usage. This is despite it being open for traffic during this time period (as shown later in Figure 2-9). This finding has been checked against flow data for the slip road, confirming that at the end of the slip road almost all vehicles have moved to lanes 2, 3 and 4 leaving few using lane 1.	• Along this section of the scheme, traffic speeds are generally below 96 kph (60mph), this is a result of the DHS being open for a relatively high proportion of the time, and the associated setting of the speed limit to 60mph or below. • Speeds are very similar across all four lanes at all points through this section of the motorway, making lane change easier. • Increased use of the hard shoulder at this location would presumably have a beneficial impact on speeds.

Figure 2-7 MIDAS data: Speeds and Flows by Lane on DHSR sections - PM peak Westbound

	Flows by Lane	Speeds by Lane
PM peak		
Comment	• Between J28 and 27, the DHS (lane 1) also shows a low level of use although greater than observed in the opposite carriageway AM peak as shown in Figure 2-6.	• As seen in the eastbound AM peak, speeds are very similar across all four lanes at all points through this section of the motorway. • Despite the low traffic flows using the DHS, speeds are similar to those observed in the other lanes.

2.51. Above are the movements with the greatest demand. A further investigation has been made of the MIDAS data for the speeds by lane in the off-peak period. The detailed results are not presented here, but the analysis shows that under free-flow conditions, there is a clear differentiation between average speeds by lane along this part of the M62: lane 1 (or the hard shoulder when open) is the slowest, lane 2 is faster, and as would be expected lane 3 and 4 the fastest.

Operation of Smart Motorways

2.52. We now present a summary of how the smart motorway is operating based on data as recorded in HALOGEN data (Highways England's Agency LOGging ENvironment)

HALOGEN Operation Data Analysis

2.53. Analysis of this data has been undertaken for March 2015, to be consistent with the flow and speed data above. Note that this is a record of the smart motorway settings as installed by this scheme, and therefore there is no equivalent pre-scheme data shown here. Analysis of HALOGEN data has been used for the following purposes:

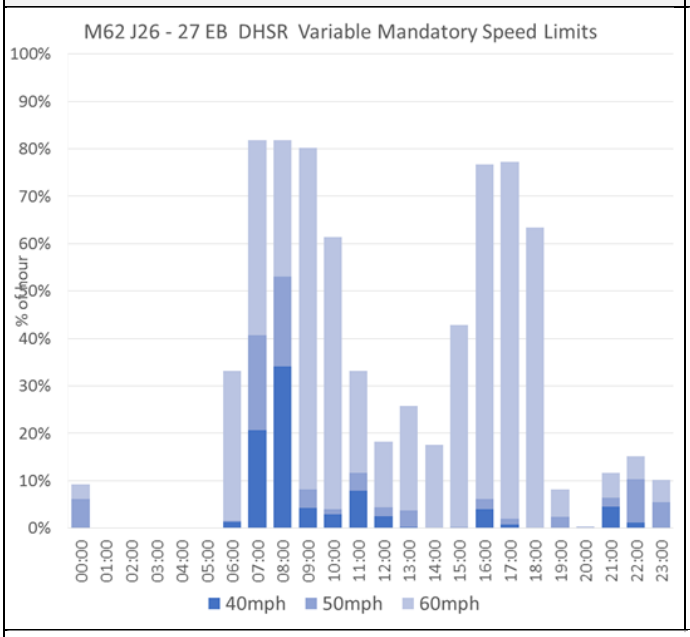
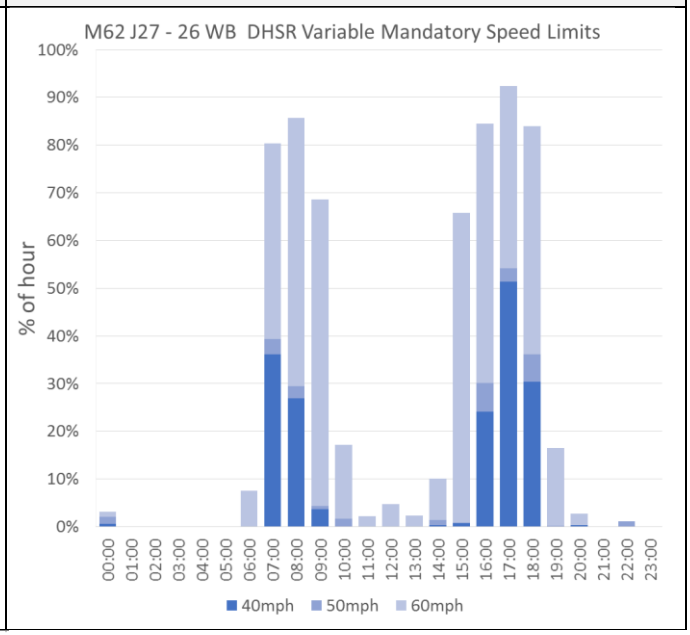
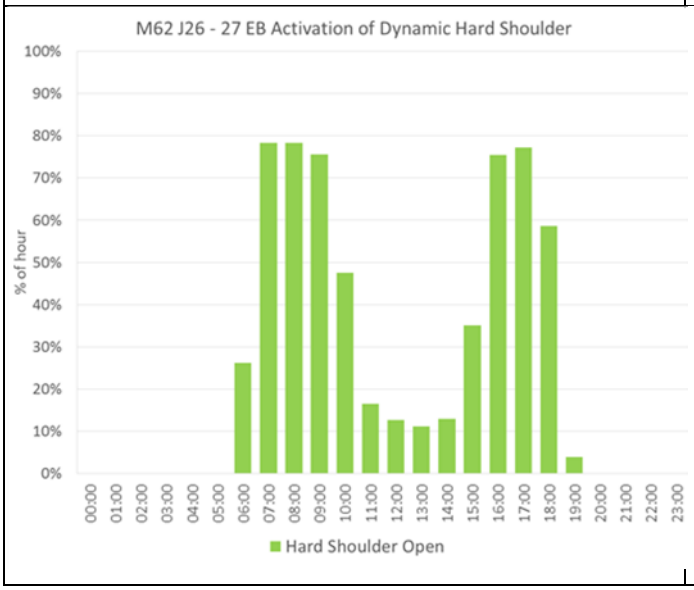
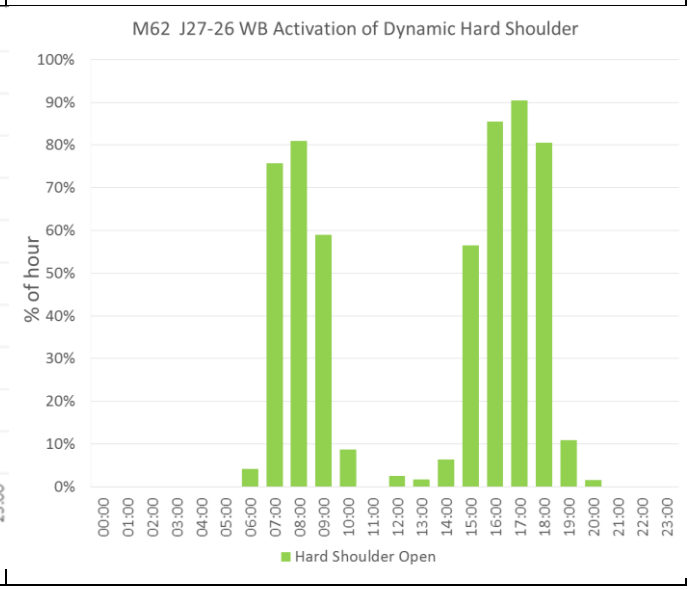
- To determine how much, on average, the hard shoulder was open for traffic during the different peak periods.
- To determine how much, on average, different speed limits were in place during the peak periods.

2.54. The time periods used in this analysis are 07:00-10:00, 10:00-16:00 and 16:00-19:00 for the AM, inter-peak and PM peaks respectively.

2.55. HALOGEN data has been analysed for each section and direction of the scheme. HALOGEN data points have been taken roughly in the centre of each junction to junction section. The speed limits set by the variable mandatory speed limits (VMSL) can vary along a section of carriageway, so the speed limit analysis is relevant to the location chosen. The timing if the opening of the DHS however, applies to the full length of each section.

2.56. Firstly, for the section of the M62 with the highest flows and hence congestion problems (J26-27) we present the detail of the operation of the smart motorway by hour, both the setting of VMSL and opening of the hard shoulder. Figure 2-8 shows the average proportions of each weekday hour that VMSL were set and the proportion of the hour that the dynamic hard shoulder (DHS) was open to traffic in March 2015. Note that, if the DHS is open, then the VMSL will be always be active, whilst the converse does not have to be the case; the speed limit can be set to 60mph or lower without the DHS being open. This difference is for operational reasons: VMSL can be set automatically in response to detected traffic conditions whilst the opening of the DHS requires manual intervention by operators.

Figure 2-8 M62 J26-27 Speed Limit settings and Hard Shoulder Opening by hour

Eastbound	Westbound
	
	

2.57. Figure 2-8 shows for the section with the highest traffic flows:

- Both carriageways have the DHS open for around 70-80% for 3 hours in the peak periods.
- The eastbound carriageway seem higher usage of the HS; it is frequently open during the shoulder to the peak periods (from 6:00 and after 18:00) and some of the interpeak period while westbound is rarely open outside the peak periods.
- 60mph is the most common speed limit setting, even in most of the peak periods. The only exceptions are the 8:00-9:00 peak eastbound and the reverse tidal flow in the 17:00-18:00 peak westbound.
- Setting of speed limits at night in the off-peak period are mainly due to roadworks, e.g. for scheduled overnight maintenance.
- Although not illustrated here, 20mph and 30mph limit settings are rarely used, hence not part of the normal congestion handling operation of the SM.

2.58. Activation of the speed limit settings for all sections of the smart motorway and the opening of the DHS where applicable are shown in Figure 2-9.

Figure 2-9 Activation of Smart Motorway in AM peak (% of time period)

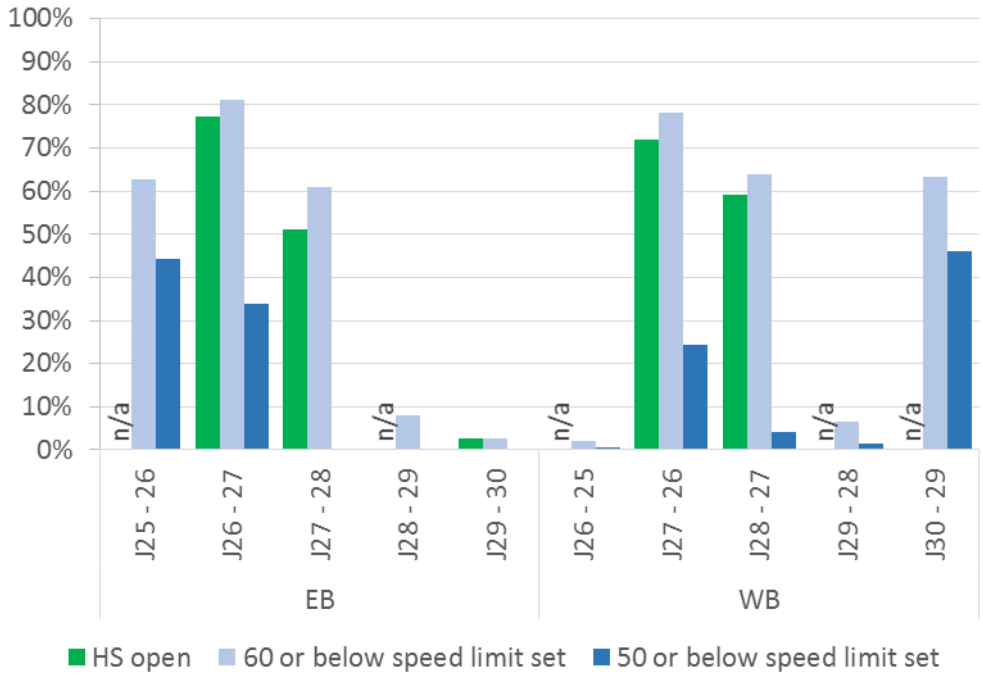
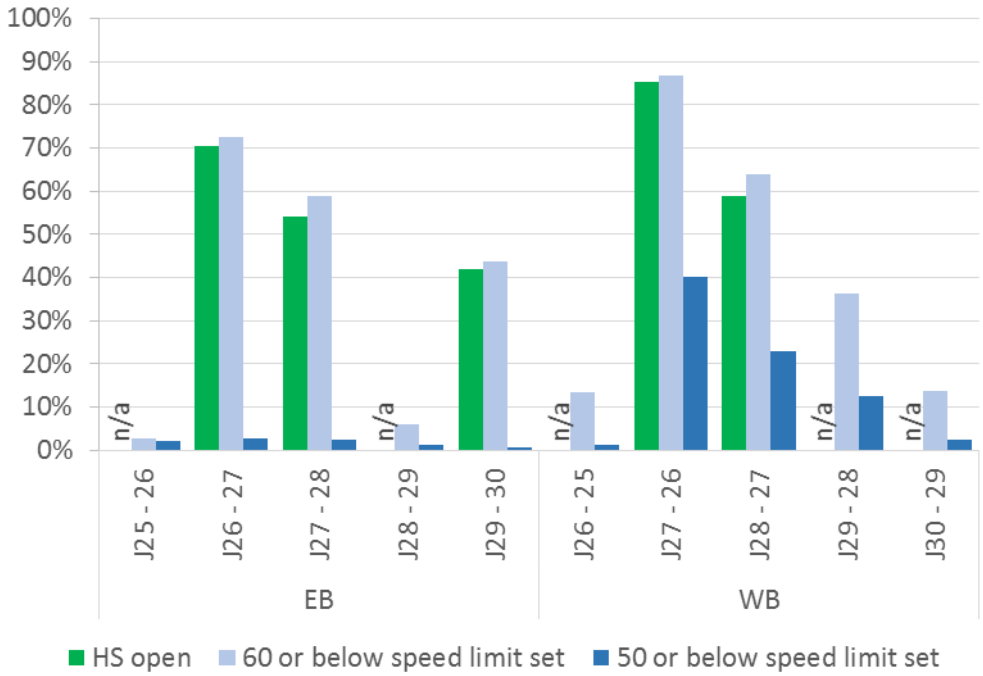


Figure 2-10 Activation of Smart Motorway in PM peak (% of time period)



2.59. The key points on the activation of the Smart Motorway features in the peak periods are:

- In the AM peak, there is normally a setting of the speed limit (60mph or lower) on the eastbound carriageway from J25-28 and westbound from J28-26. Also at this time, the DHSR part of this section (J26-28) has the DHS frequently open to traffic.
- Sections J26-27-28 in both directions show the highest level of activation of the SM. This part has the highest daily traffic flows and the activation of the smart motorway is response to congestion for commuter traffic towards Leeds and Bradford city centres. It is worth noting that that the activation of the SM on these sections in the AM peak has improved journey times on these sections, as shown earlier in Table 2-4, except for the section J27-28 EB.

- The PM peak sees the reverse of the tidal flow, with the most frequent activation for westbound traffic from J27-26 away from Leeds city centre. As with the AM peak the sections with the high levels of SM activation are also shown to have time savings in Table 2-4, except J27-28 EB.
- On the section J29-30 which lies east of the M1, there are high levels of SM activation toward the M1 in the AM peak and away in the PM peak.

2.60. Greater detail of the proportion of the time periods in which the SM is activated is given in Table 2-9 below.

2.61. The key points regarding the data on the activation of all the sections of the scheme by time periods throughout the day are:

- Activation of the SM in the inter-peak period is a rare occurrence (i.e. not caused by regular traffic patterns), except for J26-27 where 60mph or lower limit is set 33% of the time period on the eastbound carriageway and 17% of the time on the westbound carriageway.
- Inter-peak period activation of the SM on J26-27 may reflect its use immediately following the AM peak period due to continuing congestion or the SM being left on by the operators, or preceding the start peak period due to early congestion or in anticipation of the start of congestion.
- In the off-peak period, the DHSR is rarely in operation nor the speed limit set.

Table 2-9 Activation of Smart Motorway features by time period

Proportion of time period when Hard Shoulder (HS) is open or speed limits are set by Smart Motorway		AM			Inter-peak			PM			Off-peak		
		HS open	60 or below speed limit set	50 or below speed limit set	HS open	60 or below speed limit set	50 or below speed limit set	HS open	60 or below speed limit set	50 or below speed limit set	HS open	60 or below speed limit set	50 or below speed limit set
EB	J25 - 26		63%	44%		5%	2%		3%	2%		3%	2%
	J26 - 27	77%	81%	34%	23%	33%	4%	70%	72%	3%	3%	7%	3%
	J27 - 28	51%	61%	0%	2%	4%	1%	54%	59%	3%	0%	1%	0%
	J28 - 29		8%	0%		1%	0%		6%	1%		0%	0%
	J29 - 30	3%	3%	0%	0%	1%	0%	42%	44%	1%	0%	8%	5%
WB	J26 - 25		2%	1%		1%	1%		13%	1%		6%	3%
	J27 - 26	72%	78%	24%	13%	17%	1%	85%	87%	40%	1%	3%	0%
	J28 - 27	59%	64%	4%	3%	6%	3%	59%	64%	23%	0%	1%	1%
	J29 - 28		6%	1%		3%	2%		36%	13%		1%	0%
	J30 - 29		63%	46%		5%	1%		14%	2%		1%	0%

Reliability

2.62. Reliability sub-objective of this scheme was appraised using the HSR INCA (Incident Cost Benefit Appraisal) which forecast a benefit over 60 years of £183.4m (2002 prices). Of this 90% was due to variability benefits and the remaining 10% from delay benefits.

2.63. It is not possible to evaluate reliability using data on observed incidents before and after the scheme was built because the nature of the smart motorway means that recording of incidents has much improved. Clearly a basic assessment of the data would show more incidents being recorded through the smart motorway technology that recorded by more manual means earlier.

2.64. The alternative approach to the evaluation of reliability impact is to study the impact that the scheme has had on the variability of journey times.

2.65. Variability is the extent to which journey times vary from the expected average journey time on a particular day of the week at the time of day in question. The distribution of journey times is considered to be a good indication of how much journey times vary. The monetisation of reliability is considered further in the Economy chapter of this report.

2.66. The satellite navigation data was used to determine the average journey time along the route also provides the distribution of journey times by percentile ranges. Figure 2-11 and Figure 2-12 present the variability in journey times for the different peak periods. The analysis presented is for the route as a whole. The nature of traffic flows and congestion issues vary by peak and direction depending on the section of the scheme so, in turn, the variability is greater for individual sections of the scheme.

Figure 2-11 M62 J25-30 Journey Time Variability – Eastbound

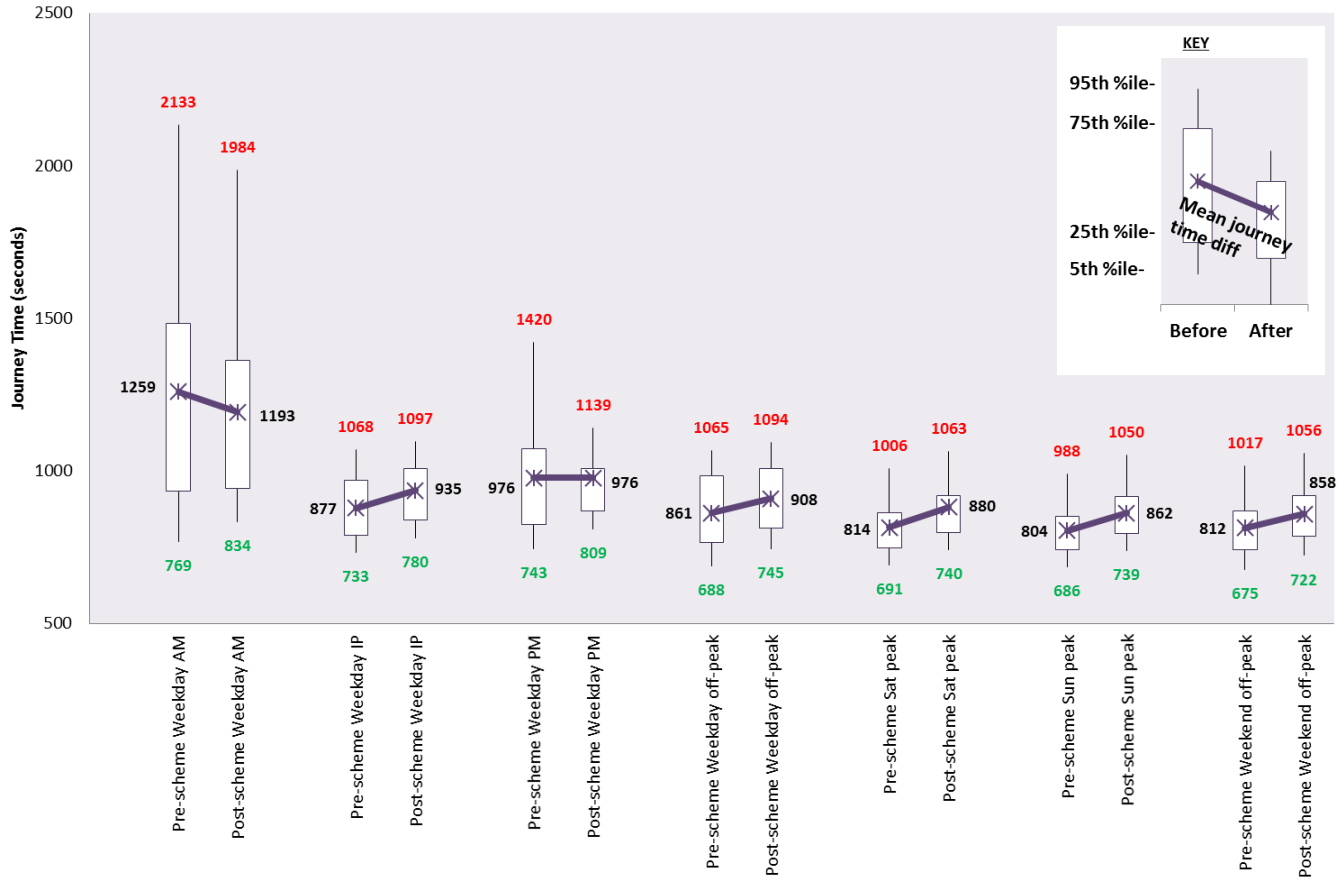
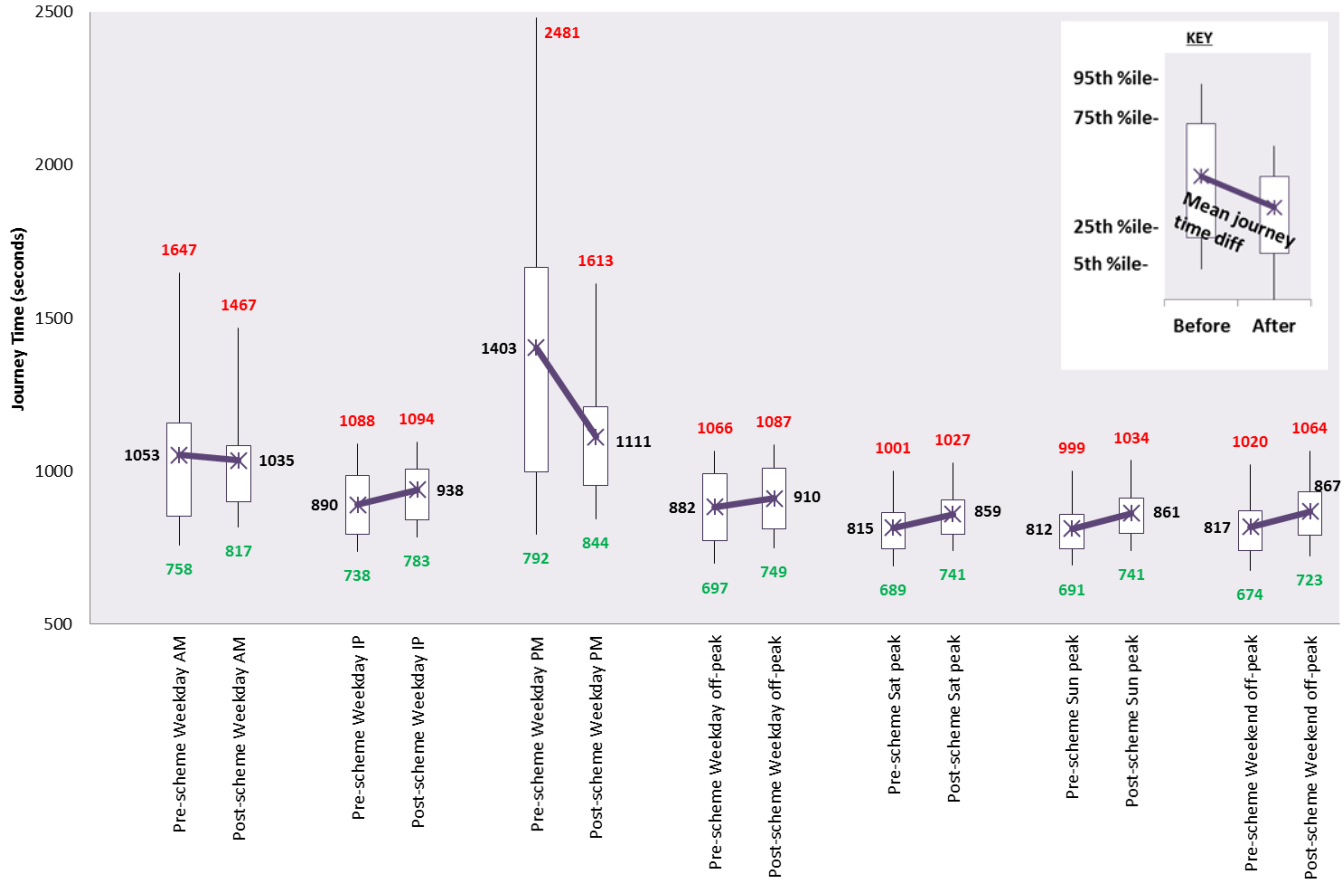


Figure 2-12 M62 J25-30 Journey Time Variability – Westbound



2.67. Figure 2-11 and Figure 2-12 show the following key points regarding reliability changes:

- AM peak eastbound and PM peak westbound show large reductions in mean journey times and improvements in reliability.
- The inter-quartile range has reduced on weekdays in all time periods and both directions indicating an improvement to reliability for journeys during these periods. The highest inter-quartile ranges by direction in the pre-scheme journeys were the in the AM peak eastbound and PM peak westbound and both of these showed large falls, post-opening.
- Likewise, the range between the slowest and fastest 5% of journeys has fallen, especially during the weekday peak periods.
- Peak periods on weekdays show substantial reductions in the slowest extreme journey times.
- Weekend journey times show negligible change in variability.

Reliability as measured by change to Worst 10% of journeys

2.68. The scheme's stated objective for reliability was objectives was

To improve journey time reliability, as measured by the average delay experienced in the worst 10% of journeys

2.69. To evaluate the impact against this objective using the available sat-nav data we have examined the data for the recorded journey times for during the most congested periods i.e. the peak periods, before and after. The delay for the worse 10% of journeys has been measured as the difference between the mean journey time and the 90th percentile journey time for each of the before and after periods. These are for the full length of the route and are shown in Figure 2-13 and Table 2-10.

Figure 2-13 Changes to delay for worst 10% of journeys in peak periods

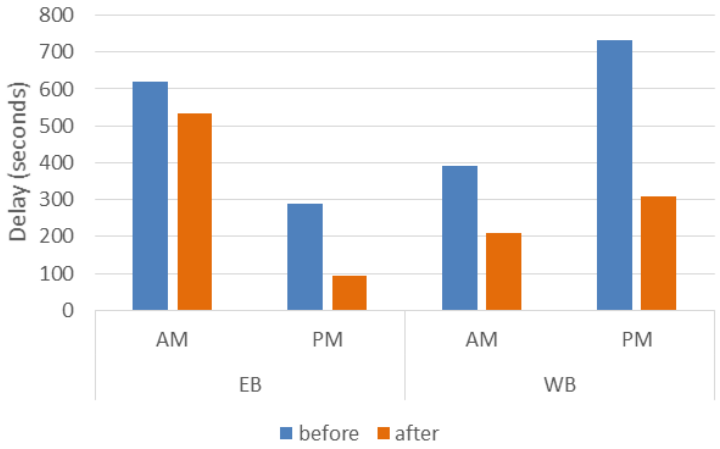


Table 2-10 Delay saving for Worst 10% of journey times in Peak Periods

Direction	Peak period	Saving of Delay between mean and 90th percentile journey time (mm:ss)	Saving %
EB	AM	01:25	14%
	PM	03:16	68%
WB	AM	02:59	46%
	PM	07:20	58%

2.70. The key points regarding the impact on delay for worst 10% are:

- Delays are reduced for the worst 10% of journeys in both of the peak periods in both directions;
- The greatest net improvement is over 7 minutes observed in the PM peak westbound, which is also where the greatest improvement in the average journey was observed as noted in Table 2-4;
- The peak period journeys which are not the main tidal flow (EB in the AM and WB in the PM) show clear improvements in as measured by reliability for the slowest 10 of journeys despite there being little change to the average journeys as noted in Table 2-4 . This shows that the smart motorway is benefiting traffic in these periods more than is indicated by the average saving.
- The objective to improve reliability for the worst 10% of journeys is shown to have been achieved at OYA,

Traffic Impacts - Key points

Traffic Flow impacts

- Traffic flows on the M62 have increased by up to 7% on weekdays and this is higher than traffic growth in the region and for motorways in general during the same period, however most sections are in line with background growth.
- Similar growth has been seen on the adjacent M606 and M621 which are effect motorway spurs linking the M62 to the city centres on Bradford and Leeds.
- J26 – 27 remains the busiest section of the M62 in this region, with a two-way AWT of nearly 155,000 vehicles per day and showed the highest rate of traffic growth.
- Major roadworks on the adjacent M1 has kept traffic growth down on the M1 adjacent sections of the M62 and may have led to some rerouting affecting the M62 west of the M1.
- There has been a reduction in peak spreading on the busiest sections for the eastbound AM and westbound PM traffic.
- HGV traffic on the M62 and the urban motorways has increased at a greater rate than overall traffic whilst HGV levels on the other nearby roads have fallen.

Traffic Flow Forecasting

- Do Minimum traffic forecasts are higher than the observed flows before the scheme was built in 2011.
- Post opening traffic flows on the M62 in 2015 are lower than the central growth forecasts, by an average of 11%.
- The proportion of the traffic flow increase is as expected through the scheme in line with local growth rates (NTEM/TEMPRO). The highest rate of increase was 8% on J26-27 westbound.

Journey Times

- Significant journey time savings are observed in the AM and PM peak periods.
- The greatest savings are seen in the westbound traffic in the PM peak where there are savings of between 40 seconds and over 3 minutes on each of the sections from J29 to J26.
- Eastbound journey times showed the highest savings in the AM peak and westbound in the PM peak.
- Inter-peak and off-peak periods show increased journey times which can be explained by the fact that the flows have increased even during these periods whilst the hard shoulder is less likely to be open to traffic during these times hence there is no additional capacity.
- MIDAS data of speeds by lane shows that on the busiest section in the peak periods, traffic in all lanes travels at similar speeds.

Operation of Smart Motorway

- DHSR is in operation on J26-27 and J27-28 during the majority of the weekday peak periods and up to 23% of the inter-peak.
- Lane occupancy data from MIDAS shows that in the peak periods in the two sections with DHSR, J26-27 shows that the DHS has a similar level of occupancy as the other 3 lanes, while the section J27-28 has a very low level of use by traffic. This applies to both carriageways.

Journey Time Forecasting

- AM and PM peak periods were forecast to have journey time savings overall and on most individual sections of the M62, the AM forecasts were fairly accurate whereas the observed PM journey times showed no saving eastbound but much higher than expected saving westbound.
- Inter-peak journey times were predicted to increase slightly in the opening year and the observed data shows that this has occurred as expected.
- Journey time forecasting showing that in the opening year for weekdays, there was a small net disbenefit, but that by 2031 with the scheme, savings would be experienced throughout the day. However, observed time savings in this first year, whilst small, are better than expected. This trend of benefits increasing from virtually zero in the opening year to a significant benefits within 10 years means that at this stage it is too soon to confidently evaluate the long term economic benefits based on only one year's data.

Reliability

- Journey times over the full length of the scheme on weekdays in all time periods and both directions have shown a reduction in the variation of times which indicates an improvement to reliability for journeys during these time periods.
- Peak periods on weekdays show substantial reductions in the extreme slowest journey times.
- Reliability for the worst 10% of journeys in the AM and PM peak periods has improved in both directions.

3. Safety

Introduction

3.1. This section of the report considers the impact of the scheme in terms of the level of success in addressing the objective of reducing collisions.

3.2. The Client Scheme Requirements (CSR) document notes that in particular, '*the sections of the M62 between J25-26 eastbound and 26-27 in both directions have been identified as having a high number of accidents of which a high proportion are shunt type accidents potentially attributable to congestion'*.

3.3. In order to assess the impact of the scheme on collisions, personal injury collisions (PICs) occurring in the pre-construction period, and the available post opening period have been analysed. Evaluation of the schemes impact on personal security has been undertaken through the use of observations made during a site visit.

Sources

3.4. The sources used in this section are:

- AST
- EAR
- Recorded Collision data
- Interim Review of Safety Objectives

Forecast

3.5. The 2010 AST notes that the scheme would result in 'an accident reduction of 15%'. The Economic Assessment Report (EAR, 2011) states that the *'Economic Assessment of MM-DHS Guidance Note suggests appraisers to assume that MM-DHS will lead to a 15% reduction in personal injury accidents*.'

3.6. This section of the study concerns collision numbers; the economic impact of the change in collisions is evaluated later in the Economy section of this report.

3.7. The forecast was applicable to the length of road directly affected by the scheme, in this case, the M62 between J25 and J30. In order to ensure like for like comparison between the predicted and observed collision changes, the overall geographical area of analysis used for this study is the same area, including the slip roads at each of the junctions. Observed data has included the mainline between J25-30 and the on/off slips at each of the intermediary junctions. The circulatory carriageway of each of the junctions has not been included.

Observed

3.8. Collisions by their nature include a random element and are somewhat unpredictable events. Therefore to ensure that the scheme is the main change in the immediate area, and therefore the observed changes are likely to be linked to the scheme, the following approach has been taken.

3.9. Collision data has been obtained from Leeds Metropolitan Borough Council (LMBC) for the scheme area (mainline M62 between J25-30, including slip roads, but not the circulatory carriageway of each junction) covering the following time periods:

- Pre Scheme – June 2004 to May 2009
- Construction – October 2011 to September 2013
- Post Construction – October 2013 to September 2014

3.10. As detailed in the introduction, concrete central reserve barrier works undertaken between June 2009 and mid 2010 means that this period has been excluded from our evaluation, and a full five consecutive year period has been taken as representative of the pre scheme situation.

3.11. The collision data is based on the records of Personal Injury Collisions (PICs) that are recorded in the STATS19 database as collected by Police when attending collisions. Collisions that do not result in injury are not included in this dataset, and are therefore not included in this evaluation.

3.12. Collision analysis is normally undertaken with three full years' of data, so the emerging trends identified in a one year POPE, should be treated with some caution.

3.13. It should also be noted that at this stage the collision data may not yet have been validated by the DfT. The requirement for up-to-date and site specific information necessitated the use of unvalidated data sourced from the local authority. Thus the data is judged to be sufficiently robust for use in this study but it may be subject to change. It is not anticipated that this would be significant in terms of the analysis of collision numbers presented in this report.

3.14. A summary of the findings from the *M62 J25-30 Smart Motorway: Meeting the Safety Objectives (Interim Review)* report is also presented here.

Collision Numbers

3.15. This section analyses the observed changes in PICs following the implementation of the scheme. This section includes an investigation into the changes in the number of collisions and associated casualties as well as whether there has been any change in the relative severity of recorded collisions.

Background Collision Reduction

3.16. It is widely recognised that, over a decade, there has been a year on year reduction in the number of personal injury collisions on the roads, even against a trend of increasing traffic volumes over much of that period. The reasons for the reduction are considered to be wide ranging and include improved safety measures in vehicles and reduced numbers of younger drivers. This background trend needs to be considered when looking at he changes in collision numbers in the scheme area in the before and after periods. If the scheme had not been built, collision numbers in the area are still likely to have been influenced by wider trends and reduced.

3.17. When the number of collisions in the area in the years before and after the scheme was built are compared, and the net change associated to be primarily due to the scheme, the background reduction needs to be taken into account. The best way to do this is to assume that, if the scheme had not been built, the number of collisions on the roads in the study area here would have dropped at the same rate as they did nationally during the same time period[7]. This gives what is known as a counterfactual 'without scheme' scenario on a like for like basis with the observed post opening data which is the 'with scheme' scenario.

3.18. The difference between the numbers of collisions in these two scenarios can then be attributed to the scheme rather than the wider national trends. This result will inform the calculation of monetised safety benefits achieved by the scheme as discussed in the economy chapter of this report.

Evaluation of Collision Numbers and Severity in the Scheme Key Links

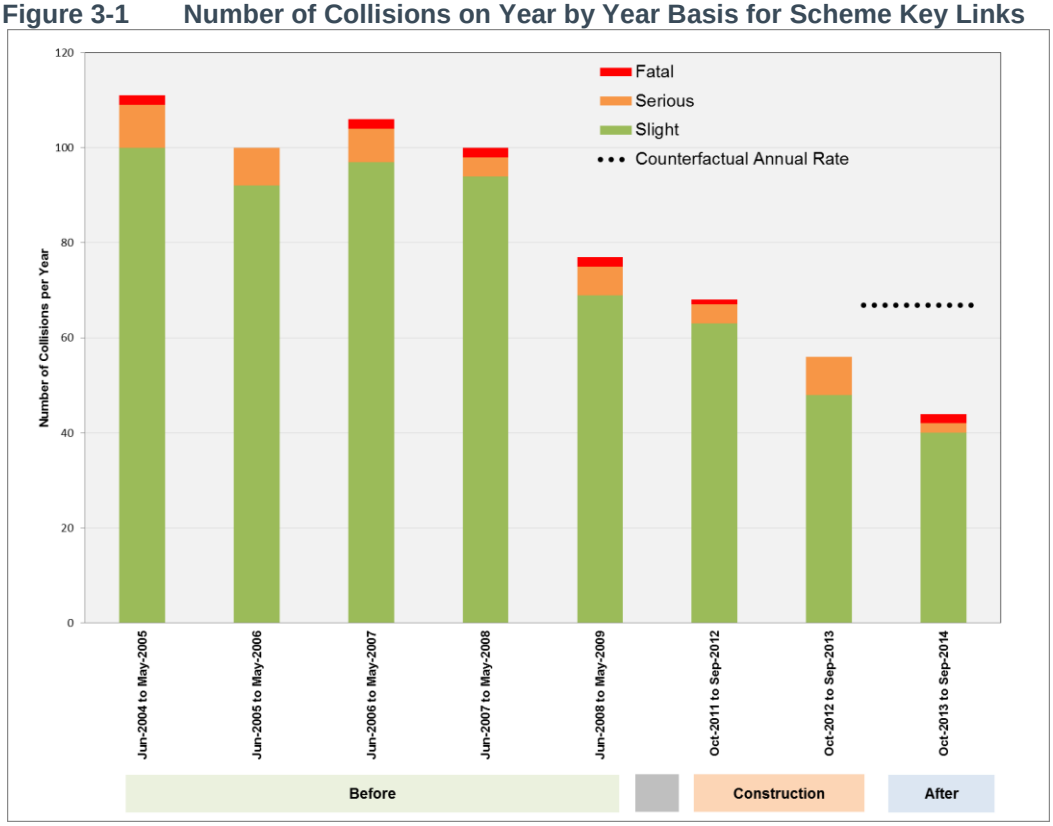
3.19. An evaluation of the before and after collision numbers by year for the scheme area is shown in
3.20. Table 3–**1** and Figure 3-1. The severity of a collision is defined by the most serious injury incurred.

Table 3–1 Number of Collisions by Severity in the Scheme Key Links

Period	Time Period		Collision Severity			Total	Annual Average
	From	To	Fatal	Serious	Slight		
Pre Scheme	Jun 2004	May 2005	2	9	100	111	98.8
	Jun 2005	May 2006	0	8	92	100	
	Jun 2006	May 2007	2	7	97	106	
	Jun 2007	May 2008	2	4	94	100	
	Jun 2008	May 2009	2	6	69	77	
Without Scheme Counterfactual (adjusted for background reduction)							**66.9**
Construction	Oct 2011	Sept 2012	4	4	63	68	62.1
	Oct 2012	Sept 2013	0	8	48	56	
Post Opening	Oct 2013	Sept 2014	2	2	40	44	**44.1**

[7] National trend data sourced from DfT table RAS10002

Figure 3-1 Number of Collisions on Year by Year Basis for Scheme Key Links



3.21. From

3.22. Table 3–**1** and Figure 3-1 it can be seen that:

- The average number of collisions recorded post opening was 44.1 per year, which is a 55% decrease when compared to the before period in which an average of 98.8 collisions were recorded per year.
- The 'without scheme' counterfactual collision rate (accounting for the background reduction in collisions over time) is calculated as 66.9 collisions per year. Compared to the post opening period collision rate this represents an annual collision saving of 22.8 collisions a year (34%), suggesting that the scheme has had a clear beneficial effect on the frequency of collisions along the M62 key links between J25-30. This change is considered to be statistically significant, and likely to be directly attributable to the scheme.
- The scheme has had little discernible impact on fatal collisions and the annual average number of serious collisions has reduced by 71% post opening.

3.23. Statistical significance testing found the reduction in the number of collisions to be significant in that it was unlikely to have occurred without the scheme[8].

Evaluation of Collision Severity Index

3.24. The collision severity index is the ratio of the number of collisions classed as serious or fatal compared to the total number of collisions. A summary of the before and after opening collision severity indices by year for the M62 scheme section is shown in **Table 3–2.**

[8] The statistical significance test known as a chi-square test used for the study area. This test uses the without scheme counterfactual and post opening collision numbers to establish whether changes are significant and attributable to the scheme or are likely to have occurred by chance. The results found that the reduction in collisions is statistically significant at the 95% confidence level, hence it is unlikely to be have occurred without the opening of the scheme.

Table 3–2 Collision Severity Index

Period	Average Collision Severity Index on key links
Pre Scheme	8.5%
Construction period	10.5%
Post Opening	9.1%

3.25. This shows that there has been a small increase in collision severity post opening. The decrease in total collisions along the scheme is not matched here with the reduction in severity. This is due to the fall in the number of slight collisions being at a greater rate than the fall in the total number of fatal and serious collisions.

Safety Impact by time period

3.26. As the smart motorway is only active for part of the day, the numbers of collisions by time period has also been examined. This analysis showed that no period showed an increase in collisions. Further analysis of time related trends should be considered when more data is available in the FYA study.

Road Safety Audit (RSA) Stage 4a

3.27. The Road Safety Audit Stage 4a (12 months) of this scheme was published in May 2015. A review of the report notes the following items of interest from the review of safety data available:

- The annual total number of collisions have reduced by more than 50%, although the severity has increased.
- Three collisions close to J25 included aquaplaning in the collision descriptions.
- The majority of the collisions were typical of those that occur on the motorway, lane changing and shunts in heavy traffic or congestion, and loss of control.
- Two collisions included detail to indicate that elements of the managed motorway could have contributed to the collisions. The one involved a broken down vehicle in Lane 1, within a section of CALR, being struck by another vehicle. In the other, a driver claimed to be distracted by the changing speed limits.

3.28. In addition, the RSA notes an area of potential confusion on the M62 eastbound exit slip at J30. The RSA reports that West Yorkshire Police had raised concerns that '*traffic is misusing the hard shoulder on the exit slip which has led to number near misses with Police and other vehicles parked on the hard shoulder. They suspect that this behaviour is due to signs within the link letting motorists to use the dynamic hard shoulder, but there are no signs informing motorist not to use the hard shoulder on the slip road.*' The RSA goes on to note that there have been no recorded injury collisions at this locations, nor any evidence of damage only collisions. As there was no evidence to confirm, the RSA does not recommend remedial action.

3.29. In terms of issues at particular locations, the RSA notes the following:

- J26 westbound diverge – congestion extending back onto the mainline during the PM peak. This resulted in 'swooping' from lane 2 into lane 1, increasing the risk of nose-to-tail collisions in lane 1 and 2 due to sudden breaking. The RSA recommended that the capacity of the slip road be increased. It notes that despite some signal phasing changes, the problem remains, and a circulatory carriageway widening pinch point scheme is due to be implemented here, outside of the M62 scheme.
- J25 westbound diverge – congestion extending back onto the mainline during the PM Peak. This resulted in '*swooping' from lane 2 into lane 1, increasing the risk of nose-to-tail collisions in lane 1 and 2 due to sudden breaking*. The RSA recommended that the capacity of the slip road be increased, possibly through the provision of traffic signals. The RSA notes that the Area 12 MAC are investigating the feasibility of increasing the capacity through the junction.

3.30. Overall, the RSA concludes that there is ongoing monitoring of the information on the overhead gantries, to ensure that appropriate messages are provided, particularly advance warning of standing traffic and closed lanes. It notes that the national 'Red X' campaign should help ensure drivers do not abuse mandatory closures.

3.31. It is understood from the Highways England Project Manager (post publication of RSA) that further investigations at J25 identified the root cause of congestion at the junction was a local road junction 1.5 miles to the east of the junction. Therefore capacity improvements at J25 are not currently considered necessary as would not alleviate the problem.

Summary of findings of Report: Meeting the Safety Objectives (Interim Review)

3.32. This report (April 2015) was produced to provide Highways England with an early indication of the scheme's performance. As such, it reports on a relatively small timeframe, and it should also be noted that at this stage the collision data may not yet have been validated by the DfT. The requirement for up to date and site specific information necessitated the use of unvalidated data sourced from the local authority. Thus the data is judged to be sufficiently robust for use in this study but it may be subject to change. It is not anticipated that this would be significant in terms of the analysis of collision numbers presented in this report.

3.33. This interim review reports similar findings to this POPE report in terms of a large decrease in the number of collisions across the scheme, but a small increase in KSI. The report notes that this is due to the number of slight collisions decreasing by more than 50%, but serious and fatal collisions have not reduced to the same level.

3.34. The report breaks up the scheme by mainline and slip roads, and notes the following:

- J25-26 EB – 63% reduction in collisions, but an increase in KSI from 4.7% to 28.6%.
- J25-26 WB – 10.5% reduction in collisions, and an increase in KSI from 16.7% to 25%. The report notes that the two serious collisions on this section post opening were likely as a result of driver impairment through alcohol.
- J29-30 EB – 34.8% reduction in collisions, and an increase in KSI from 8.3% to 14.3%.
- J25 WB off slip – an increase in collisions with 3 collisions seen in the 1st year, although this is an increase from 0. No clear issue was noted, and the limited timeframe for information means '*that this slip road should continue to be monitored in future safety reviews'*.
- J26 WB on slip – an increase in collisions equating to 1 slight pre scheme, and 3 slight, 1 serious post scheme. These were generally noted as loss of control collisions (unrelated to SM), and are to '*be reassessed in the next interim assessment when further data is available'*.
- J29 EB off slip – 79% reduction collisions and an increase in FWI from 0% to 100%. The report notes that the fatal collision was part of a police pursuit, and considered unrelated to the scheme.

3.35. In conclusion, the report notes that the SM operation is unlikely to have contributed to any of the sections where a decrease in performance is recorded, although J26-27 EB, J25 WB off slip and J25 WB on slip are considered worthy of further monitoring.

Fatalities & Weighted Injuries

3.36. The collision rate discussed previously does not take into account the severity of collisions. To analyse this the Fatalities and Weighted Injuries metric (FWI) which is a combined measure of casualties based on the numbers of fatal, serious and slight casualties is also presented here. The FWI for the three years before start of construction and the available after period are shown in Table 3–3. To take into account the increased traffic on the M62 and for comparison with other schemes, we also present the FWI rate per billion vehicle kilometres (bvkm) and billion vehicle miles (bvm). It should be noted that these figures do not include any adjustment for changes in the background reduction in casualties as presented in the counterfactual scenario collision data above.

Table 3–3 FWI on the M62 J25-30 Key Links

Period	Three years before	One year After
FWI /PIC	0.054	0.070
Average FWI / year	5.08	3.10
FWI / bvkm (billion vehicle km)	4.98	2.92
FWI / bvm (billion vehicle miles)	8.02	4.70

3.37. Table 3–3 shows that as measured by the FWI/PIC metric, the seriousness of collisions has increased post opening, however, as discussed above, this is due to the drop in the number of collisions being steeper for slight collisions, resulting in the proportion of slight accidents reducing.

3.38. The average FWI per year and the ratio of the FWI per bvkm is substantially reduced post opening.

Forecast vs. Outturn Collision Rates

3.39. The number of collisions along a length of road used together with the AADT for the same section can be used to calculate a collision rate, known as PIC/mvkm. This allows comparisons to be made which take into account traffic growth.

3.40. The CSR states that the safety related objective of the scheme was '*To reduce the number and severity of accidents per vehicle-kilometre'*.

3.41. In this section, combined observed collision rates during the pre and post scheme periods for the key links improved by the scheme (motorway between J25-30) are compared with the forecast of a 15 % reduction over the same area.

3.42. The EAR notes that '*the valuation of accident cost savings for the implementation of MM-DHS on the M62 has been calculated to a forecast year of 2072, where the scheme produces 1,308 fewer accidents, the majority of these are slight, however there are also reductions in the number of serious and fatal accidents over the 60 year period'.* The EAR does not include any assessment as to what the saving was forecast to be for the opening year.

3.43. Table 3–4 shows the collision rate calculated for the M62 J25-30 forecast vs observed pre- and post-opening.

Table 3–4 Forecast vs. Observed Collision Rates (PIC/mvkm) for M62 J25-30 Scheme

	Forecast (2016 Opening Year)	Observed
Before Opening Observed PIC/mvkm	-	0.095
Without scheme PIC/mvkm (Counterfactual for same period as After opening data)[9]		0.063
After Opening Observed PIC/mvkm		0.041
Net change PIC/mvkm		-0.023
Percentage Saving	**15%**	**36%**

3.44. Table 3–4 shows that the observed reduction in collision rate across the scheme key links is larger than expected, with a saving of 0.023 PIC/mvkm (36%) compared to a forecast of 15%

[9] Counterfactual without scheme is the observed rate in the before period multiplied by the national reduction in collisions rate per mvkm during the comparable period, for the middle year of the data collection periods, in this case 2006 for before the period and 2012 for the after period.

saving. Hence it can be considered that the scheme has successfully reduced the rate of collisions for the key links affected by the scheme at the OYA stage.

3.45. This reduction in the collision rate is statistically significant[10].

Security

3.46. The aim of this sub-objective is to consider both the changes in security and the likely number of users affected by the changes. For highway schemes, security includes the perception of risk from damage to or theft from vehicles, personal injury or theft of property from individuals or from vehicles. Security issues may arise from the following:

- On the road itself (e.g. being attacked whilst broken down).
- In service areas/car parks/lay-bys (e.g. vehicle damage while parked at a service station, attached whilst walking to a parked car).
- At junctions (e.g. smash and grab incidents while queuing at traffic lights.
- The primary indicators for roads include surveillance, landscaping, lighting and visibility, emergency call facilities and pedestrian and cycling facilities.

Forecast

3.47. The scheme appraisal stated that a 'Slight Beneficial' impact was expected for Security. The AST noted that 'CCTV surveillance will be improved allowing earlier detection and monitoring of users. The use of Emergency Refuge Areas will provide a secure environment for users'.

Evaluation

3.48. Additional street lighting was limited to between J29-30 and at the ERAs, as there was already existing lighting in place along much of the route.

3.49. This evaluation supports the AST assessment as the facilities were introduced as proposed as can be seen in the photograph below, showing the emergency refuge areas and CCTV. The comments in the RSA 4a report regarding possible Red X misuse have not been quantified, and may not be due to driver confusion. Overall the impact of the scheme is considered to be slight beneficial, as expected.

Figure 3-2 Emergency Refuge Area on eastbound carriageway between J25-26

[10] At a 95% confidence level, as previous statistical test.

Safety Impacts - Key points

Collisions

- Analysis of observed collision data for the scheme key links which were directly affected by the scheme shows a large decrease (when compared to the counterfactual) of 22.8 (34%) collisions one year after opening, indicating that the scheme has had a beneficial an impact on safety.
- Collision savings are particularly noted in the AM and inter-periods.
- These reductions are statistically significant, therefore it is considered that the scheme has had a direct impact on safety improvement post opening.
- When traffic flow changes are taken into account, the collision rate for the scheme key links has decreased by 36% even taking into account the background trend in collision reduction on motorways. This savings is also statistically significant.
- Collision severity has increased marginally over the scheme, although this is generally due to a large decrease in the number of slight collisions, rather than an increase in fatal and serious collisions.

Forecast vs. Outturn Collision Rate Savings

- The scheme was forecast to have a saving of 15% in the collision rate for the M62 between J25-30. When background decline in collisions over time is taken into account, an observed 36% decrease is seen, suggesting that the scheme has improved safety at the OYA stage.

Security

- Emergency refuge areas have been implemented as planned, therefore the overall impacts is scored as slight beneficial.

4. Economy

Introduction

4.1. This section presents an evaluation of how the scheme is performing against the DfT's economy objective, which is defined in WebTAG as:

To support sustainable economic activity and achieve good value for money

4.2. The sub-objectives for economy are as follows:

- To achieve good value for money in relation to impacts on public accounts;
- Improve transport economic efficiency for business users and transport providers;
- Improve transport economic efficiency for consumer users;
- Improve reliability; and
- Provide beneficial wider economic impacts.

4.3. When a scheme is appraised, an economic assessment is used to determine the scheme's value for money. This assessment is based on an estimation of costs and benefits from different sources:

- Transport Economic Efficiency (TEE) benefits (savings related to travel times, vehicle operating costs and user charges);
- Collision costs (savings related to numbers and severity level of collisions); and
- Costs to users due to delays during construction and future maintenance periods.

4.4. This section provides a comparison between the outturn costs and benefits and the forecast economic impact, as well as evaluating reliability and the scheme's wider economic impacts.

Sources

4.5. The economic forecasts presented in this section are based upon:

- Figures presented in M62 J25 to J30 Managed Motorway Economic Assessment Report (EAR) dated 28 April 2011;
- Forecast costs of the scheme from the same EAR;
- AST; and
- TUBA and INCA model runs.

4.6. The outturn results are sourced from:

- Outturn costs from the Regional Finance Manager in March 2015; and
- Benefits based on the observed findings of the impacts on the traffic and collisions as detailed in the preceding traffic and safety sections of this report monetised to create re-forecasts of the long term impacts.

4.7. The reports provide forecasts of the benefits for a 60 year appraisal period. All costs presented in the EAR and this chapter are in 2002 prices discounted to 2002 unless otherwise stated.

Present Value Benefits

4.8. The appraisal of this scheme considered the economic benefits of this scheme expressed in terms of present value (present value benefits - PVB) for the aspects set out in Table 4–1. This table also sets out the approach taken in this post opening evaluation to the re-forecasting based on the observed data at this stage, and those which have not been evaluated and have been assumed as forecast. A green tick indicates that the element of benefits is considered as part of this evaluation. A red cross indicates that the forecast impact from the appraisal will be used in place of a full evaluation at this stage.

4.9. Only forecasts based on central growth estimates were presented in the EAR.

Table 4–1 Economic Benefits of Scheme (2002 prices)

Benefits in £m 2002 market prices, discounted	Forecast (EAR)	Evaluate ?	Evaluation Approach
Journey Time	729.9	✓	Outturn journey time impacts in opening year can be calculated from observed data and forecasts.
Vehicle Operating Costs (VOC)	-29.3	✓	Ratio between EAR forecast and POPE re-forecast changes in indirect tax as measured by fuel consumption applied to the monetary forecast VOC in order to calculate a proxy outturn re-forecast value of VOC.
Journey time and VOC impacts during construction & future maintenance	-44.0	✗	Not known and this stage and not within the remit of POPE to evaluate, so assumed to be as forecast.
Safety	33.8	✓	Based on reduction in collision numbers.
Carbon Benefits	15.8	✗	Assume as forecast as opening year is not good indicator of long term trend and only small proportion of the overall scheme impacts
Noise Benefits	3.3	✗	Small proportion of the overall scheme impacts. Assumed as forecast.
Total PVB	709.3		
Indirect tax impact as a benefit	19.7	✓	Calculate outturn change in fuel consumption and use ratio against forecast change to re-forecast 60 year benefit
Total including Indirect Tax Revenue	729.1		

TUBA modelling of Journey Time, VOC and Indirect Tax Benefits

4.10. In line with the Department for Transport's (DfT) guidance at the time of appraisal, this scheme's journey time, VOC and Indirect Tax benefits were forecast using the TUBA 1.7b (Transport Users Benefit Analysis) program in conjunction with the MM-DHS assessment spreadsheet.

4.11. Unlike the standard approach, where all time periods are considered, the economic impact of the smart motorway scheme was assessed using an average period based only on the proportions of the year when DHS would be in operation. A number of assumptions were made and are summarised here as follows:

- DHS operating at 60mph;
- DHS is equivalent to 4 lanes of traffic , with the same capacity as a D4M; and
- Scheme has no impact on traffic unless DHS is operating.

4.12. The breakdown the forecast benefits by year from the TUBA model is shown in Figure 4-1.

Figure 4-1 Forecast benefits profile over 60 years

4.13. The key point illustrated in this chart is that in the opening year, journey time benefits were much lower than subsequent years, making up on 0.3% of the total 60 year benefit. This is important from the perspective of evaluating the long term benefits based on the opening observations as discussed in the sub-section below.

Evaluation of Journey Time Benefits

4.14. The POPE methodology for evaluating the economic value of benefits arising from journey time benefits is based upon comparing the observed vehicle hour savings in the opening year against a forecast of the savings. It is then assumed that the ratio between these at OYA is indicative of the long term trend, hence the 60 year outturn monetised benefits can be derived from the forecast 60 year benefits.

4.15. Detailed forecasts for journey times and traffic flows were available for weekday AM, IP and PM peak hours on the M62 between J25-30 in both directions. In order to establish the proportion of vehicle hours saved compared to that forecast, it was necessary to calculate the observed vehicle hours saved per annum based on the before and OYA journey times and traffic flows as presented earlier in this report. This was done using a 'saving per vehicle' approach for existing traffic.

4.16. Calculating the vehicle hour benefits attributable to the scheme is not a simple calculation. A number of logical assumptions were therefore required and these are summarised below:

- The traffic already using the routes included in the assessment (in the before period) receives the full journey time benefit observed at this one year after stage;
- Any additional traffic receives half of the journey time benefits. This concept is known as the 'rule-of-a-half' and is the standard approach for dealing with extra traffic; and
- Weekend and off-peak periods are omitted as no forecasts were provided for these time periods.

4.17. The opening year savings by time period based on the forecast and observed speed and flows available are shown in Table 4–2.

Table 4–2 Vehicle hour savings in opening year

Period	Forecast (2016)	Observed (2015)
AM weekdays	127,000	106,400
IP weekdays	-229,300	-172,600
PM weekdays	89,700	237,900
Total	-12,700	171,700

4.18. This assessment of vehicle hours saving (using information available for a direct comparison) shows that the forecast was for a small net disbenefit in the opening year for weekdays due to the reduction in speeds in the inter-peak period outweighing the improvements in the AM and PM peak periods. As shown previously, the TUBA forecast breakdown of the benefits by year (as illustrated in Figure 4-1) showed that only 0.3% of the 60 year benefit of £729.9m was expected in the opening year. The difference between the vehicle hours calculation and the TUBA forecast is likely to be due to TUBA taking into account more time periods (for which detailed forecasts were not available for inclusion within the direct comparison vehicle hour calculation).

4.19. For this OYA evaluation of journey time benefits we have calculated a re-forecast using the observed vehicle hour saving from Table 4–2 capitalised over 60 years using the capitalisation factor derived from the PAR 6.2 guidance document[11] based on NTEM09 growth forecasts which is compatible with the NTEM 5.4 traffic growth used in the EAR. This calculation of the benefits is shown in Table 4–3.

Table 4–3 Summary of forecast Journey time benefits

	Calculation
OYA observed vehicle hours saved on M62 J25-30 12 hours on weekdays	171,700
Value Of Time per hour for opening year, at 2002 market prices	£12.71
Annual Time Saving at 2002 prices	£2.182m
60-Year Capitalisation Factor (NRTF Traffic Growth)	50.511
Discount factor	0.662
60-Year Time Saving discounted to 2002 in market prices	£73.0m

4.20. As the PAR approach to capitalising opening year benefits to 60 years does not follow the rate of worsening of speeds on the M62 in the inter-peak period without the scheme in place (Do Minimum scenario), this evaluation of benefits gives an unrealistically conservative assessment of the long term trend.

4.21. Given the high level of benefits predicted to be occurring by 2031 and the low benefits predicted for the first year after opening, it is considered that it is too early at the 'one year after' stage to conclude whether the scheme will achieve the predicted level of journey time benefits

Vehicle Operating Costs (VOC)

4.22. Vehicle Operating Costs are the net change the costs paid by road users as a results of a scheme. For this scheme, they were appraised with TUBA as part of the TEE benefits.

4.23. For most highway schemes including this one, the VOC and indirect tax impacts are both very closely linked to changes in fuel consumption (e.g. changes in speeds) which has similar magnitude of impacts, but from opposite sides of the benefits balance. That is, if there is a decrease in fuel consumption, VOC will decrease due to users paying less for fuel (i.e. a benefit to road users) but as indirect tax will be collected by the Treasury this is considered to be a negative benefit to public accounts according to current guidance. For this evaluation, the ratio

[11] Project Appraisal Report (PAR) is Highways England's standard approach to appraisal typically used for smaller schemes based on webTAG guidance on economic assessment. It provides a basis for POPE evaluations where is not appropriate to re-run full models.

used for the re-forecast indirect tax impact calculation (as shown in Table 4–9) has been applied to the calculation of the monetary value for VOC.

4.24. The forecast and the outturn vehicle operating costs comparison is shown in Table 4–4.

Table 4–4 Predicted vs. Outturn VOC Benefits (£m)

Costs in £m 2002 market prices, discounted	Forecast	Outturn
Vehicle Operating Costs (VOC)	-29.3	-24.1

4.25. As for indirect tax impact, the VOC impact has been evaluated to be slightly less negative than expected. This is due to lower than expected traffic levels, resulting in a lower increase in fuel consumption on this route than was forecast.

Monetised Safety Benefits

4.26. As set out in the EAR, the original forecasting of safety benefit was carried out for a wide area and based on:

- COBA guidance on accident rates by link type; and
- For the DHS links, a saving of 15% in the accident rate was assumed based on the Economic Assessment of MM-DHS guidance Note, as there was already MIDAS in place on this part of the M62.

4.27. The EAR stated that over 60 years, the forecast collision saving was 1,308 injury collisions of all severities and the economic value was £33.8million.

4.28. No COBA model was obtained for this study. The POPE methodology for evaluating safety benefit is based on the difference between the forecast and observed number of collisions, the PAR method for monetising injury collisions, and the forecast 60 year monetary savings. As there was no forecast opening year saving, a proxy was calculated using the 1,308 value for 60 years and the PAR6.2 capitalisation factor to give an opening year forecast of 15.7. How these combine to produce a re-forecast outturn monetary benefit is set out in Table 4–5.

Table 4–5 Predicted and Outturn Collision Saving and Monetary Benefit (£million 60 years)

Benefits in £m 2002 prices, discounted	Forecast Modelled area		Outturn (M62 only)	
60 year collision saving	(a)	1,308		
Opening year collision saving	(b)	15.7	(c)	22.7
Difference from forecast			(d) =(c) - (b)	7.0
Value of a motorway collision in 2014			(e)	£101,533
60 year benefits of difference in opening year collisions, capitalised and discounted to 2002 prices			(f)=(d) x (e) x factors	£25.5m
60 year monetary (present value benefits)	(g)	£33.8m	(f) + (g)	**£59.3m**

4.29. This evaluation of the monetary benefits of the collision savings reported in section 3 of this report are £59.3m, 75% higher than expected.

Carbon Benefits

4.30. The scheme was forecast to result in a net reduction in carbon emissions over 60 years, and this was monetised as a £15.8m Net Present Value (NPV). Paragraph 5.41 (page 67) in the environmental section of this report discussed the carbon assessment. The value of the forecast carbon impact was monetised using the WEBTAG global emissions worksheet.

4.31. The outturn evaluation of the carbon impact has been to assume as forecast. The opening year assessment of carbon show less than expected disbenefit in the opening year on the M62, but as most of the future years were expected to have positive benefits on carbon it is clear that the

opening year is not good indicator of long term trend for re-evaluation purposes. Hence for economic purposes, we assume a £15.8m benefit as forecast.

Noise Benefits

4.32. The forecast of the monetised impact of the scheme on the noise was £3m over 60 years. This was based on lower noise surfacing on the M62, and changes in the speed profiles which would lead to noise increases or decreases depending on the location.

4.33. Assessment of the outturn noise impact in the opening year (page 63) shows that it is in line with expectation. As the value of the benefit it is only a small proportion of the overall benefits, the outturn assessment is to simply assume the outturn benefit to be as forecast.

Journey Time Reliability

4.34. The scheme appraisal estimated the reliability benefits for the scheme. The monetised reliability benefit was not included in the overall monetised benefits in the EAR. The reliability sub-objective includes the impact of the scheme on incidents and day-to-day journey time variability.

4.35. Benefits of delays and travel time variability costs relating to incidents were examined using INCA. The appraisal used INCA (INcident Cost Benefit Assessment) version 4.1 for estimating the benefits of reduced delay and travel time variability (TTV) caused by unforeseen incidents that reduce capacity, such as collisions, breakdowns, debris on the carriageway and major disruptions such as fire, load shedding or spillage. The combined impact on variability and delay are known as reliability. The forecast INCA benefit was not however included in the overall benefits for the purpose of calculating the BCR. This is in line with the webTAG guidance which states that the monetised reliability benefits should not be included in the overall Analysis of Monetised Costs and Benefits (AMCB).

4.36. INCA modelling was based on four modelled years (2013, 2016, 2023 and 2031) from which the INCA software forecasts the 60 year benefits. Table 4–6 shows the forecasts as stated in the EAR and from a rerun of the INCA model obtained for this study. Additionally the INCA model was rerun using post opening observed traffic flows for the M62 in the opening year to give a re-forecast.

Table 4–6 INCA reliability benefits forecast (£million 60 years)

Benefits in £m 2002 prices, discounted	Forecast (EAR)	Re-run forecast using original INCA model	Re-forecast using INCA model with observed data for 2013, and as forecast for 2016 onwards
Travel Time variability benefit	164.5	162.2	162.5
Delay Benefit	18.9	18.7	18.8
Total	**183.4**	**180.9**	**181.2**

4.37. The re-forecast reliability impact is very slightly higher and this is due to the observed traffic flows being lower than forecast which gives slightly higher benefits for day-to-day variability and from the impacts of collisions. As most the years in the re-forecast are still based on the original model from 2016 onwards there is little overall difference, so there is still considerable uncertainty in terms of whether the scheme is likely to achieve the forecast monetary benefit for reliability.

4.38. It is further noted that the INCA assessment is based on the observed data on incidents on the motorway. Although this data does exist for the M62 before and after the scheme was built, the data cannot be compared on a like-for-like basis as once a smart motorway is fully operational, the additional technology means that far more incidents are automatically being detected and hence recorded, than was the case with manual recording before.

4.39. Therefore, no outturn value of the reliability benefits of this scheme is reported by POPE in the overall summing up and benefit cost ratio for this scheme.

Summary of Present Value Benefits

4.40. Table 4–7 summarises the benefits forecast and evaluated as described above. The total PVB showed here is later used in the assessment of the benefits cost ratio in Table 4-11.

Table 4–7 Present Value Benefits (PVB) summary (£million 60 years)

Benefits in £m 2002 prices, discounted	Forecast (EAR)	Outturn Re-forecast of benefits Based on observed impacts
Journey Time	729.9	n/a
Vehicle Operating Costs (VOC)	-29.3	-24.1
Construction & future maintenance	-44.0	
Safety	33.8	59.3
Carbon Benefits	15.8	15.8
Noise Benefits	3.3	3.3
Total PVB	709.3	n/a
Indirect Tax impact treated as a benefit	19.7	16.2
Total PVB including indirect Tax impact	729.1	n/a

4.41. As journey time savings were forecast to comprise the majority of the benefits of the scheme and as noted earlier, that the likely profile of such benefits over time means that the opening year provides poor evidence on which to predict the long term success. Therefore, no overall outturn PVB has been presented here.

Scheme costs

4.42. Costs of the scheme are also considered for the full appraisal period of 60 years such that they can be compared with the benefits over the same period. Investment costs are considered in terms of a common price base of 2002 for comparison with forecast. For comparison with the benefits, overall costs are expressed in terms of present value, termed Present Value Cost (PVC).

Present Value Costs (PVC)

4.43. Cost benefit analysis of a major scheme requires all the costs to be considered for the whole of the appraisal period and they need to be expressed on a like-for-like basis with the benefits. This basis is termed Present Value. Present Value is the value today of an amount of money in the future. In cost-benefit analysis, values in differing years are converted to a standard base year by the process of discounting giving a present value.

4.44. Following current Treasury Green Book guidance, calculation of the present value entails the conversion to market prices, then discounting by year. This using a rate of 3.5% for the first 30 years and 3% thereafter. Note that the base year used here is 2002, not 2010 as in current guidance.

4.45. Appraisal of this scheme included the following types of cost:

- Investment costs : before and during construction;
- Operational costs of the smart motorway during the 60 years after opening; and
- Impact on Indirect Tax revenues: during the 60 years after opening.

Investment Cost

4.46. The investment cost is the cost to Highways England of the following:

- costs of construction;
- land and property costs;
- preparation and supervision costs; and

- Allowance for risk and optimism bias.

4.47. There have been a number of different forecast costs for this scheme. For the purpose of this evaluation we have used the costs presented in the EAR which included revised costs from April 2011. [12]

4.48. For the purpose of this evaluation, we have determined the forecast scheme cost based on data presented in the Stage VfM Assessment of M62 J25-30 (Amended 10 June 2011) which was an update on the figures presented in the EAR. This gave a Final Target Cost of £150.1m.

4.49. For comparison with the outturn costs on an equivalent basis, the investment part of the PVC was calculated assuming the same spread by year as in the EAR, and discounting removed, giving 2002 prices, as presented in **Table 4–8**. This has been confirmed by Highways England's MP Portfolio Office.

4.50. The outturn investment costs as of March 2015 for building this scheme have been obtained from the Regional Finance Manager at Highways England covering the period 2010 – 2015. For the purpose of comparison between forecast and actual, and with other major schemes, prices have been converted to 2002 prices. This figure can then be compared with the forecast cost on a comparable basis. These figures are shown below in Table 4–8.

Table 4–8 Investment Cost of Scheme (2002 prices)

Forecast	Outturn	Difference
£116.2m	£95.9m	-17%

4.51. This shows that the outturn cost was 17% lower than forecast. It is understood that this saving was achieved through value engineering.

Indirect Tax

4.52. Indirect tax revenue impact in the context of scheme appraisal means the changes to the revenue raised by central Government. For highways schemes this primarily means the revenue from fuel duty for all users and, for consumers, from VAT which will change if the scheme impacts the amount of fuel used by road users. Fuel usage changes are from the following :

- Changes in speeds which mean that vehicle are travelling at a greater or worse fuel efficiency;
- Changes to the amount of traffic; and
- Change to the journey lengths.

4.53. In the case of this scheme, it is the changes in speeds and flows which are key. To evaluate the outturn impact, the net change in fuel consumed in the opening year was calculated using observed data and similarly a forecast fuel calculation was made using forecast data. The ratio between the two was then used to re-forecast the 60 year outturn impact, as shown in Table 4–9.

Table 4–9 Indirect Tax Impact of scheme as a cost (£m 60 years, 2002 prices and values)

Costs in £m 2002 market prices, discounted	Forecast	Outturn
Indirect taxation impact on costs	-19.7	-16.2

4.54. This shows that the scheme was forecast to result in a net increase in tax revenue for the Treasury.

4.55. When this impact is considered within the costs, this has the impact of reducing the cost. The OYA outturn evaluation shows that the indirect tax impact is less than expected due to lower than expected traffic levels and lower net increase in fuel consumption. Although the net tax impact is lower than expected, when considered as part of the wider costs to the Treasury, the scheme cost would still be reduced by the tax impact over the 60 year appraisal period.

[12] A later stage 5 cost was presented in the Stage VfM Assessment of M62 J25-30 (Amended 10 June 2011), but that has not been used here as there is insufficient detail of the basis of the costs and benefits to compare with the outturn.

Operational Costs

4.56. Operational costs of the scheme cover expenditures relating to:

- Day-to-day running and operation of the smart motorway; and
- Capital costs of renewal. This was the costs over 60 years of the maintenance of both the technology and the road surfacing. Note that this is distinct from Vehicle Operating Cost (VOC) which is the impact on the costs to road users, and is considered as part of the benefits assessment above.

4.57. No reassessment of the operating costs has been made as at this stage; the assumptions made in the appraisal are still considered to hold true.

Summary of Present Value Cost (PVC)

4.58. Table 4-10 shows the total of the present value costs, both with, and without the indirect tax element.

Table 4-10 Present Value Costs Summary (£m)

Costs in £m 2002 prices, discounted	Forecast	Outturn
Investment cost	108.3	82.9
Operating costs	39.5	
Indirect Tax impact as cost	-19.7	-16.6
Total PVC (as appraised including indirect tax impact)	128.0	106.1
Total PVC according to recent guidance	147.7	122.4

4.59. With these costs expressed in Present Value on the same basis as the benefits, we can now assess the benefit cost ratio.

Benefit Cost Ratio

4.60. The benefit-cost ratio (BCR) is an indicator used in the cost-benefit analysis of a road scheme that attempts to summarize the overall value for money of a project or proposal. The BCR is the ratio of the benefits of a project or proposal, expressed in monetary terms, relative to its costs, also expressed in monetary terms. All benefits and costs are expressed in present values as detailed in the above sub-sections.

4.61. The treatment of the indirect tax impact in the scheme economic appraisal has changed in recent years from being part of the cost (to the Treasury), to part of the benefits, leaving the cost to be expressed as only for the wider transport budget. In this scheme's appraisal, the indirect tax impact was calculated by TUBA and EAR presented the impact the impact on the BCR both using the new approach but also noting former approach (labelled NATA).

4.62. Table 4-11 shows the calculation of the BCR using the costs and benefits presented earlier in Table 4–7 and Table 4-10.

Table 4-11 Benefit Cost Ratio (all monetary value in 2002 prices £m, discounted)

	Costs in £m 2002 prices, discounted	Forecast	Outturn
Indirect tax in costs	Present Value Benefits (PVB)	£709.3m	n/a
	Present Value Costs (PVC)	£128.0m	£102.6m
	Benefit Cost Ratio (BCR)	5.5	n/a
Indirect tax in benefits	PVB	£729.1m	n/a
	PVC	£147.7m	£122.4m
	BCR	4.9	n/a

4.63. The key points regarding the BCR are:

- At OYA, it is considered too early to accurately determine the level of monetary benefits of this scheme hence a BCR has not been calculated.
- Journey time benefits were forecast to provide the large majority of the benefits of the scheme but with only one year of outturn results, the monetary benefits cannot be re-forecast confidently in a POPE assessment, given that the scheme was forecast to have low initial benefits based on the peak periods, rising to benefits through the daytime by 2031 onwards.
- Treatment of the indirect tax impact as either part of the costs or benefits has only a small impact on the benefits cost ratio.

4.64. Reliability benefits (as shown in Table 4–6) are not included in this BCR assessment, in line with the original appraisal. If they are included then the forecast BCR rises to 6.2. For the outturn, if we take the rerun reliability benefit (Table 4-6) and on the grounds that journey time reliability has been observed to improve, then the outturn BCR is 1.7. Note, this outturn BCR does not include any benefits for journey time savings as noted in Table 4-3 due to the uncertainty around the 60 year benefits.

4.65. It should be noted that the BCR ignores non-monetised impacts. In the former NATA assessment and its replacement, the Transport Business Case, the impacts on wider objectives must be considered but are not monetised.

4.66. The VfM assessment for this scheme noted that key non-monetised benefit would be to air quality where there was expected to be an overall improvement around the M62 corridor, while the key non-monetised disbenefit would be for landscape. Landscape impacts were forecast to be a slight adverse due to a slight increase in visual clutter from added gantries.

4.67. The evaluation of the environmental, accessibility and integration objectives is covered in the following sections.

Wider Economic Benefits

4.68. The M62 Junctions 25-30 Managed Motorway Scheme Preferred Option Appraisal Summary Table and Worksheets report (2010) states that during appraisal, an initial scoping EIR (Economic Impact Report, 2008) was produced which identified small travel time savings expected to be made. However, as the scheme was unlikely to have a significant impact on employment, the assessment of the Wider Economic Impacts was deemed unnecessary and as a consequence the overall impact was considered to be neutral.

4.69. The evaluation of this scheme has shown there to have been time savings. No assessment of any identifiable impact on employment has been made but the forecast impact of ‘neutral’ is deemed as the outturn assessment on Wider Economic Benefits.

Economic Impacts - Key points

Benefits

- Benefits from journey time savings were forecast to be large and provide the majority of the monetised benefits. It has not been possible to re-forecast the long term benefits based on the opening year results because the forecast expected low benefits in the first year rising to benefits through the day by 2031 and at this stage it is too early to be confident about the trend.
- The monetary benefits of the savings in the number of injury collisions is evaluated as £59 million over 60 years, nearly double that forecast despite excluding the impact of background reduction in collisions over this period from the benefits.
- Disbenefits from the delay during construction period and maintenance of the technology in future years are £44m and are an important reason why the total benefits are low.
- Other monetised benefits are roughly as expected.
- Reliability benefits from the reduction in incidents related delay and improved travel time variability were significant in the appraisal. Based on the information currently available to POPE journey time variability has improved, and therefore the benefits are likely to have been realised.

Costs

- The investment cost of building the scheme was £95.9m, 17% lower than forecast in 2011.
- Long term costs of operating the smart motorway are assumed to be as forecast at £39m.

BCR

- An outturn BCR has not been calculated due to the difficulty in evaluating the journey time benefits at the OYA stage.
- If monetised reliability benefits were achieved in line with the rerun figures, and were included in this assessment, the outturn BCR is 1.7, meaning the scheme would be value for money.

5. Environment

Introduction

5.1. This section documents the evaluation of the impacts of the scheme on the environmental sub objectives.

5.2. The Environment Assessment Report (EnAR) noted that the objective for the scheme was to relieve congestion and improve journey time reliability by implementing a Managed Motorway solution (now referred to as Smart Motorways) which will include the use of hard shoulder running within the existing Highways Operational Area.

Data Collection

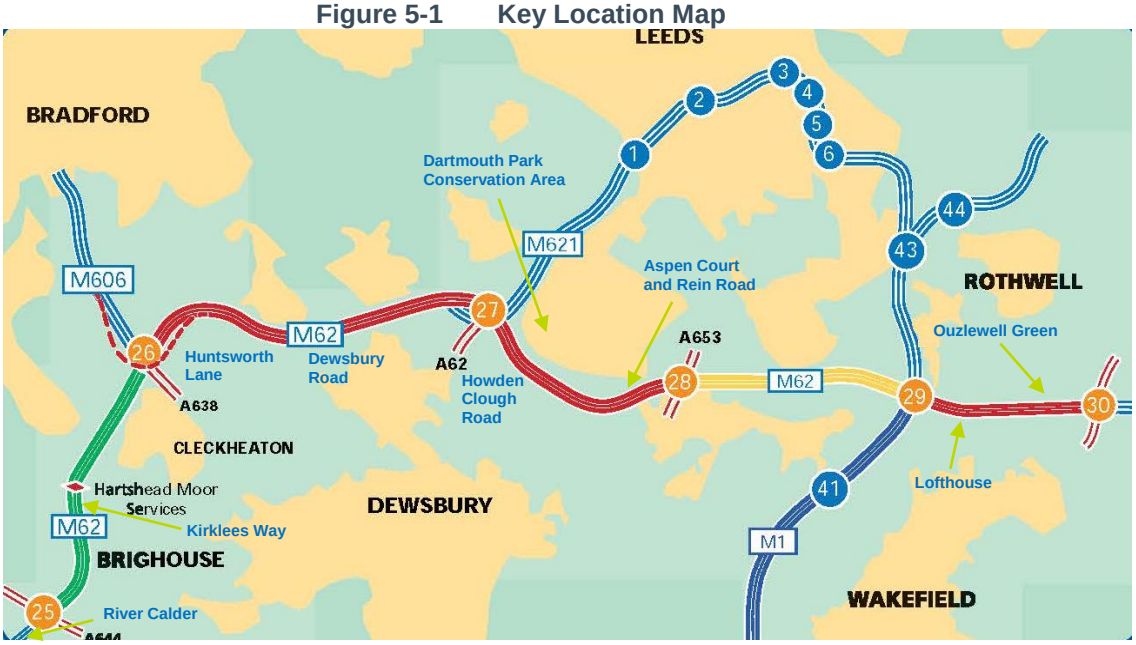
5.3. The following documents have been used in the environmental evaluation part of this study:

- Appraisal Summary Table (AST), January 2010;
- Environmental Appraisal Report (EnAR) Volumes 1 and 2, November 2009
- As Built drawings (Landscape) (Pavements, Kerbs, Footways and Paved Areas) (Drainage), 2013;
- Health and Safety File Volume 7 Environment;
- NMU Context Reports for Junctions 25 – 28 and Junctions 27 – 28, October 2006; and
- Handover Environmental Management Plan (HEMP), July 2013.

Site Inspections

5.4. A site visit was undertaken in May 2015. Photographs included within this chapter were taken during this visit. Photomontages were not available in the EnAR. Key locations referred to in this report are shown in Figure 5-1 below.

Figure 5-1 Key Location Map



Consultations

5.5. Table 5-1 lists the organisations contacted regarding their views on the impacts they perceive the road scheme has had on the environment, and whether they feel that the mitigation measures implemented have been effective.

Table 5-1 Summary of Environmental Consultation Responses

Organisation	Field of Interest	Comments
Environment Agency	Water	Response received and included in the Water Quality and Drainage section below.
Natural England	Biodiversity / Landscape	Natural England did not have any detailed comments to make, but are not aware of any significant impacts that the scheme has had on landscape, protected species or other ecological interest, or public rights of way.
Historic England	Heritage	No responses received as of August 2015.
Calderdale Council	General	No responses received as of August 2015.
Kirklees Council	General	No responses received as of August 2015.
Bradford Council	General	Not able to make any comments.
Leeds City Council	General	Comment made regarding PRoW. Contained within the relevant section. Unable to make comment in respect of Nature Conservation. Some Air Quality monitoring data supplied.
Drighlington Parish Council	General	No responses received as of August 2015.
Gildersome Parish Council	General	Responses received, comments included in relevant sub topics in Chapter 5.
Morley Town Council	General	No responses received as of August 2015.
Wakefield Council	General	No responses received as of August 2015.

Animal Mortality

5.6. The Managing Agent Contractor (MAC) has been consulted with regard to animal mortality figures. Both pre and post scheme data was provided by the MAC in June 2015. Consideration of the information is given in the Biodiversity Section.

Traffic Forecasts and Evaluation

5.7. Three of the environmental sub-objectives (noise, local air quality and greenhouse gases) are directly related to traffic flows. No new environmental surveys are undertaken for POPE and an assumption is made that if the observed level of traffic is in line with forecasts, then it is likely that local noise and air quality are as expected.

5.8. The traffic forecast comparisons in Table 5-2 are extracted from the predictions for the original scheme as presented in the Environment Assessment Report (2009) and thus differ from those of the later Traffic Forecasting Report presented in Section 2 of this report.

5.9. It was expected that traffic flows would increase on this part of the M62 compared with the 2005 baseline. Some sections have seen increases, but all sections had lower traffic one year after opening than had been predicted. As noted in section 2 of this report, the wider background trends in traffic flows are the key reason for the discrepancy in the forecast accuracy.

5.10. Based solely on a comparison of traffic figures available, traffic flows are lower than predicted throughout the entire scheme between 6 and 17%. The largest differences have been observed on the links between J29 and 30 (EB), -17%, and between J28 – 29 (EB and WB), - 15%.

5.11. The proportion of HGVs is generally higher than predicted, but this is only by 3% at most. However, HGV numbers are generally lower than predicted, in all junction link locations with the exception of J26 – 27 westbound and J25 – 26 eastbound.

Table 5-2 Two-Way Forecast 2013 adjusted AADT vs. Observed 2015 OYA AADT

Route (Junction Link)	Obs'd Baseline (AADT) 2005[13]	Traffic Flows			HGV	
		Forecast DS (AADT)	Obs'd 2015 DS (AADT)	Difference Forecast DS v Obs'd	Forecast	Observed
J25 - 26 EB	59,300	66,100	61,500	- 7%	10,600(16%)	11,000 (18%)
J25 - 26 WB	61,900	69,300	61,400	- 11%	11,100 (16%)	10,400 (17%)
J26 - 27 EB	72,800	79,800	70,700	- 11%	13,600 (17%)	11,300 (16%)
J26 - 27 WB	71,200	80,800	71,800	- 11%	12,900 (16%)	13,600 (19%)
J27 - 28 EB	54,900	62,500	56,700	- 9%	11,300 (18%)	10,800 (19%)
J27 - 28 WB	53,800	58,900	55,400	- 6%	10,600 (18%)	10,500 (19%)
J28 - 29 EB	64,600	73,400	62,100	- 15%	13,200 (18%)	11,800 (19%)
J28 - 29 WB	63,900	72,000	61,000	- 15%	13,700 (19%)	11,600 (19%)
J29 - 30 EB	51,500	58,600	48,400	- 17%	11,100 (19%)	9,200 (19%)
J29 - 30 WB	48,400	54,700	48,900	- 11%	9,800 (18%)	8,300 (17%)

Noise

Forecast

AST

5.12. The AST stated that with the scheme, the traffic speed profiles would be smoother on both carriageways (i.e. higher speeds at congested sections and slightly lower speeds at free-flowing sections). Combined with the effects of lower noise surfacing, change in speed profiles would lead to noise increases or decreases depending on the location.

5.13. The significant improvement in the future year would be due to the application of lower noise surfaces as part of routine maintenance works. The noise reductions would typically be spread across the entire scheme. By 2028 the noise increases would be concentrated around J28 due to the combined effects of changes to speed on both carriageways. There would be 511 residential properties exposed to noise levels of 68 dB LA_{eq}18hr or greater in the design year (2028) with the scheme.

Environment Assessment Report

5.14. The EnAR identified that the scheme would provide additional capacity on the M62, allowing traffic flows to increase.

5.15. Changes in noise were expected to be due to combined effects of traffic growth and traffic redistribution. Impacts would typically be due to speed changes, with speeds generally being smoother and traffic being more free-flowing.

5.16. By the future assessment year (2028) it was expected that there would be an overall improvement in the noise environment, but this was attributed to the application of lower noise surfaces that would occur without the scheme.

5.17. At the scheme's opening year it was assessed that both noise increases and decreases would occur. Increases were expected to the east of J26 and decreases would occur between J27-28. It was assessed that changes to the noise environment would be associated with the increased flows. However the noise impacts would typically be due to speed changes, speed profiles would be smoother resulting in more free flowing traffic and noise reductions.

[13] Taken from Environment Assessment Report 2009 Chapter 12.

5.18. In the longer term noise increases were expected with or without the scheme in a small number of locations by 2028, these were concentrated around J28.

5.19. The airborne vibration levels and the night-time noise levels would typically be expected to be reduced, in line with the calculated day-time noise levels.

5.20. Although not considered as Noise mitigation measures, the application of lower noise surfaces, expected to be carried out as part of routine maintenance works, would benefit a significant number of dwellings throughout the entire length of the scheme. No Scheme specific mitigation was proposed.

Consultation

5.21. The consultation response from Gildersome Parish Council, stated that it considers that there have been no changes in noise levels as a result of the scheme. However it is not aware of any monitoring data that would back this up.

Evaluation

5.22. POPE Environment methodology for assessment allows for variation in traffic flows of 25% more or 20% less, % HGV is different by at least 20%, and average speed differences of +/- 10kph, when compared with what was originally forecast in a particular year, which would allow for the assumption that the local noise impact is likely to be either ‘worse than’ or ‘better than’ expected. Average speed data was not reviewed as part of this OYA study.

5.23. Although not considered as Noise mitigation measures, the application of lower noise surfaces was expected to be carried out as part of routine maintenance works. As Built Drawings (Series 700) October 2013, show that in locations where resurfacing was required as part of the scheme, a combination of surfacing types was used referred to as RS1, RS2 and HF1. No confirmation on the noise reduction value of the surfacing has been available to POPE at this stage. To be re-considered as part of FYA study.

5.24. No information has made been made available to POPE that would suggest that mitigation for the noise environment was required.

5.25. At the scheme’s opening year it was assessed that both noise increases and decreases would occur. Increases were expected to the east of J26 and decreases would occur between J27-28. Traffic flows between J26 and 27 (east of J26) are observed at 11% lower than forecasted on both the eastbound and westbound carriageways. Whilst these flows are lower than forecast they are not by greater than 20%. Also HGV% observed figures are 9% (J27 -28 eastbound) and 6% (J27 -28 westbound) less than forecast at OYA. In line with POPE methodology, these observed figures would indicate that the impacts at these locations (increase in noise) are ‘as expected’, an increase in noise.

5.26. Observed traffic flows are lower than predicted throughout all the junction links they are within -20% of the forecast and based on data included in Table 5-3 above, noise is therefore considered to be ‘as expected’. As part of the FYA study, available traffic data should be reviewed to see if this remains the case.

Table 5-3 Summary of Noise Evaluation

Origin of Assessment	Summary of Predicted Effects	Assessment
AST	Change in population annoyed (year 15) = -107. PVB (Residential) =People annoyed by noise in scheme corridor in 2031: 2890 without scheme, 2784 with scheme. Total population considered ~20,000. Change in population annoyed (year 15) = -107 PVB (Residential) = £3.34m	-
EST	Observed flows are lower than predicted for the year 2015. At none of the junction links are they more than 20% less than forecast. Also along none of the links are observed HGV % greater or less than a difference of 10%. Therefore the impacts are considered to be 'as expected', (some increases and some decreases in noise) at OYA. No confirmation of the noise reduction value of surfacing provided. This should be confirmed at FYA.	Likely to be as expected (subject to confirmation of noise reduction value of road surfacing)

Local Air Quality

Forecast

AST

5.27. The AST stated that the scheme would result in a reduction in pollutant concentrations around the M62 mainline and a small increase in concentrations in the wider area, but the scheme would result in an overall improvement in air quality. Two air quality management areas (AQMA)[14] along the M62 mainline would show an improvement. One other AQMA (Wakefield M1 AQMA) was present in the wider area, but would not experience a change in concentrations.

Environment Assessment Report

5.28. The EnAR stated that the overall effect of the scheme would be an improvement in local air quality. The overall impact of introducing the Hard Shoulder Running was predicted to be beneficial, with an overall reduction in the number of properties with concentrations above the EU Limit Value15. No exceedances of the criteria for particulate matter (PM_{10}) were predicted with or without the scheme.

5.29. For nitrogen dioxide (NO_2), the introduction of the scheme was expected to almost halve the number of exceedances expected in comparison to the scenario with no changes being made to the highway by 2013 (anticipated scheme opening year). The seventeen locations within the mainline corridor expected to exceed in 2013 were located as follows:

- to the west of J26, in Kirklees;
- between J27-28, in Leeds; and
- between J28-29 in Leeds.

5.30. The above locations were also all expected to experience exceedances without the scheme. Concentrations of NO_2 were expected to be lower with the scheme.

5.31. It was identified that three AQMAs could be affected by the scheme, two of which are located partially within the scheme corridor and one located within the wider affected road network. It was expected that there would be no exceedances in the AQMAs with or without the scheme.

5.32. No mitigation was proposed as part of the scheme.

[14] Wakefield M62 AQMA & Wakefield City AQMA, located to the south of the M62, starting between J29-30.
[15] EU Limit values are legally binding EU parameters that must not be exceeded. Limit values are set for individual pollutants and are made up of a concentration value, an averaging time over which it is to be measured, the number of exceedances allowed per year.

Consultation

5.33. Some monitoring data has been provided by Leeds City Council. The consultation response from Gildersome Parish Council, indicates that it considers that there have been no changes in local air quality as a result of the scheme. However it is not aware of any monitoring data that would back this up.

Evaluation

5.34. For Local Air Quality, if observed after opening traffic flows identified vary by more than +/- 10% AADT or by 200 HGV AADT it can be assumed that local air quality could be 'better than' or 'worse than' expected.

5.35. Based on the traffic data included in Table 5-2 above observed flows are lower than predicted for year 2015.

5.36. At all road links the flows are lower than predicted therefore estimated concentrations with the scheme are likely to be lower than expected.

5.37. Generally observed HGV% are in line with the forecasts. However, observed HGV numbers generally indicate that the numbers using the motorway are lower than expected at OYA in all but two of the road links (J25 – 26 eastbound and J26 – 27 westbound). As the difference between forecast and observed HGV numbers is greater than 200 at the road links, this indicates that there is potential for estimated pollutant concentrations to be lower than expected.

5.38. Air quality monitoring data was provided by Leeds City Council, for locations between J28 – 30, for years up to and including 2014, where available. Monitoring was carried out at the Lofthouse area between J29 and J30 up to 2012 only but was ceased as concentrations in this area were below the annual mean criterion of 40 µg/m^3. Data at the two monitoring sites in the East Ardsley area between J28 and J29 showed small differences in concentrations between 2013 and 2014 (+1 µg/m^3 at D31 and -2 µg/m^3 at D144). A request for subsequent data should form part of the FYA study. Data from Wakefield Council's Air Quality Progress Report shows that at one location (diffusion tube site 106, located near to Junction 30), concentrations in 2012 and 2013 were lower than 2011. No data was available for 2014.

5.39. Local monitoring data should also be considered in the FYA report if made available to POPE.

Table 5-4 Summary of Air Quality Evaluation

Origin of Assessment	Summary of Predicted Effects	Assessment
AST	Nitrogen dioxide: 3010 properties with improvement, 2440 with deterioration, 4211 with no change. PM_{10}: 2168 properties with improvement, 659 with deterioration, 6834 with no change	Not available
EST	Observed flows lower than predicted for year 2015. At 7 of the junction links the observed numbers are more than 1000 AADT lower than forecast, therefore there is the potential for localised impacts to be 'better than expected'. At two junction links HGV numbers are more than +200 greater than forecast and therefore impacts could be 'worse than expected'.	Pollutant concentrations likely to be lower than expected as a result of the observed traffic flows being lower than forecast at OYA.

Greenhouse Gases

5.40. For transport, Carbon Dioxide (CO_2) is considered the most important greenhouse gas therefore it has been used as the key indicator for the purposes of assessing the impacts of a road scheme on climate change. Changes in CO_2 levels are considered in terms of equivalent tonnes of Carbon released as a result of the scheme under evaluation.

Forecast

5.41. The AST and its associated worksheets stated that the scheme was forecast to increase carbon emissions in the opening year of 2013. However from 2018 onwards carbon emissions would be lower with the scheme (Do Something) than the Do Minimum scenario, hence over 60 years there would be a net benefit which was also monetised, as noted earlier in the economy section of this report.

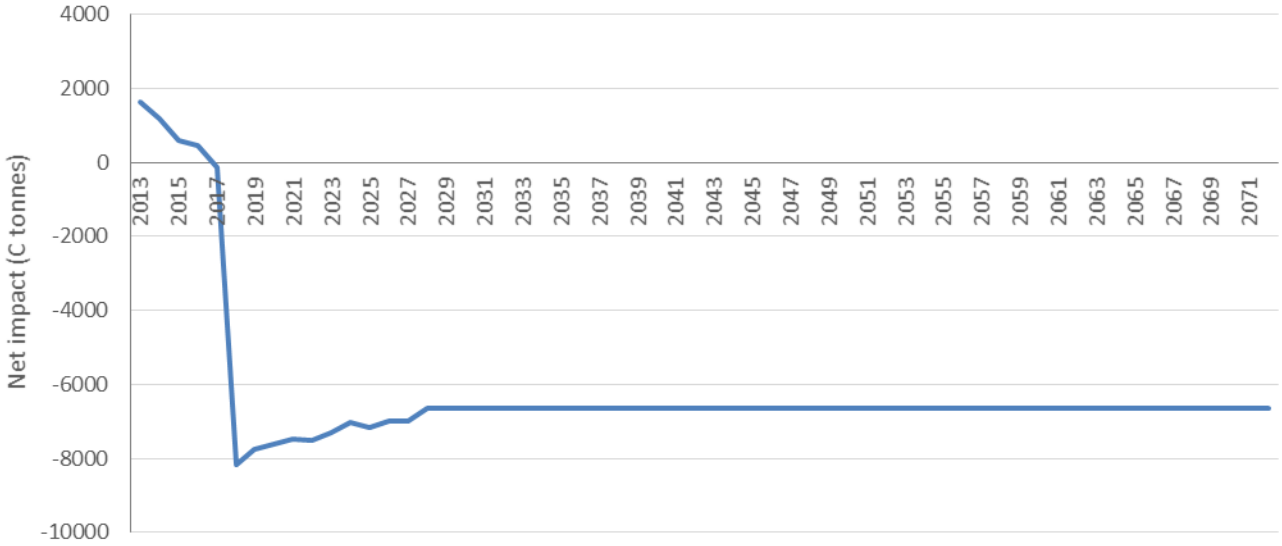
5.42. Assessment was undertaken using the DMRB screening tool 1.03c on a link by link basis and Traffic growth rates were calculated from 2013, 2018 and 2032 traffic data. The scope of the links included was not detailed but the magnitude of the emissions shows that it was a large network of which the M62 is only a small part.

5.43. Table 5-5 and Figure 5-6 summarise the forecast carbon impact in the opening year and how the subsequent years net annual impact is profiled.

Table 5-5 Greenhouse gases Forecast impact (tonnes carbon)

	Opening year (2013)	60 years
Do Minimum	3,803,362	232.75 million
Do Something	3,804,994	232.38 million
Net impact	+1,633 (+0.04%)	-370,096 (-0.16%)

Figure 5-2 Forecast Carbon emission impact over 60 years



Evaluation

5.44. The evaluation of the impact of the scheme on carbon emissions has been based on the traffic changes on the M62 within the scheme only. As this cannot be directly compared with the forecast for the wide area as shown in Table 5-5, an alternative forecast has been calculated for the same links using the traffic forecasts from the TFR.

5.45. Emissions have been calculated for 2014 with and without the scheme using the DMRB air quality regional assessment spreadsheet and the results are shown in Table 5-6. HDV proportions are all based on the observed data for OYA as there is no data on the forecast level and it is reasonable to assume that there is no change in the proportion as a result of the scheme.

Table 5-6 Forecast and Outturn opening year carbon impact (tonnes carbon)

	Forecast	Outturn
Do Minimum/ Without scheme	108,219	104,006

Do Something / with scheme	117,781	108,592
Net impact	9,562 (+9%)	4,586 (+4%)

5.46. This evaluation shows that the impact based on the M62 only was expected to be a 9% increase in the first year but the outturn assessment based on the changes on the same links is a much lower 4%. The increase is due to both increased traffic and increased average daily speeds. There has been less increase in traffic than predicted hence a lower rate of carbon increase.

Landscape and Townscape

Forecast

AST

5.47. The AST stated that the scheme proposals would be set within the context of an existing corridor and would not result in significant adverse effects in landscape terms. Where possible visual impact had been reduced by siting gantries in cuttings. Substantial vegetation loss would be required in some locations for slopes near the ERAs16 and for the provision of sightlines and monitoring. Trees to the top of slopes were considered to be of low value, but assisted in integrating the road into the landscape, and were considered to be of moderate significance for screening. Mitigation proposals including replacement and new planting would reduce visual impacts. The impact overall was assessed as Slight Adverse.

5.48. The AST confirmed that the proposals would not have a direct impact on townscape due to the motorway being dominant already and the use made of existing cuttings (58% of route length).

Environment Assessment Report

5.49. The EnAR identified that whilst the scheme runs through Green Belt, it is not located within a landscape 'sensitive area' as designated in the National Parks and Access to the Countryside Act 1949 and therefore was considered to be of low landscape value.

5.50. It was reported that the scheme design took advantage of the existing landform of the motorway corridor, of which 58% of the scheme's route length is in cutting. Siting gantries within cuttings was proposed where operationally achievable. Impacts on the landscape were expected to be minimal, with the greatest impact occurring on the pattern of landscape. It was assessed that the expected loss of mature trees for the construction of ERAs would have short term insignificant impact on landscape pattern. With the inclusion of replacement planting as part of the scheme this was expected to reduce to a negligible impact at year 15 (2028).

5.51. Visual impacts associated with the scheme were connected with the removal of existing highway planting and / or the introduction of gantries (approximately 8 metres in height) and other scheme operational infrastructure such as ERAs (which would be lit) and CCTV columns.

5.52. It was anticipated that scheme elements, mainly Span Gantries (SG), would be visible from numerous visual receptor locations. However, it was considered that at the majority of these location they would be partial views, or viewed from an oblique angle. The assessment outcomes were based on the winter scenario, for which little or limited screening would be provided by the intervening vegetation, including that already present within the highway corridor. In this scenario the greatest impacts on static receptors was expected to be moderate adverse. A reduction in these impacts was anticipated during the summer months, when screening provided by vegetation would increase. Mitigation in the form of new planting areas, replacement planting and retention of planting to the upper / lower limits of the slopes was proposed.

5.53. Major adverse winter scenario impacts were anticipated at over bridge locations along the scheme due to the introduction of several gantries being visible from these locations.

5.54. The EnAR noted that whilst most of the existing Scheme route was lit, the stretch between J29 and J30 was not, however. Carriageway lighting was not to be introduced as part of the scheme between J29 and J30, but permanent lighting would be included at the ERAs, for safety reasons, and intermittent lighting would be introduced when the gantries were operational. As part of the

[16] Emergency Refuge Areas

scheme design low level lighting was included at these ERA locations to minimise any associated impacts. Particular mention was made of ERA WB13, at this location it was expected that the removal of vegetation for the construction of the ERA would increase visibility of the motorway and lighting from visual receptors located to the south of the motorway (settlement of Lofthouse).

5.55. Additional lighting proposed at the ERA locations along the remainder of the route (already lit stretches) were not considered to give rise to significant effects as the gantries and ERA lighting would be smaller in height than the existing motorway lighting columns.

Consultation

5.56. Natural England does not have any detailed comments to make, but is not aware of any significant impacts that the scheme has had on landscape.

5.57. The consultation response from Gildersome Parish Council, indicates that in regards to Public Rights of Way and views to and from within the highway corridor that the impacts of the scheme are as expected. With regards to impacts on the local landscape character, character of the motorway and impacts landscape features (woodlands and hedgerows), to be better than expected. They consider that the retention of existing highway planting and the planting included as part of the scheme would be effective in reducing visual impacts.

Evaluation

5.58. During the POPE OYA study it has been identified that, six of the gantries proposed in the EnAR were not constructed (SG2; SG5; SG7; SG17; SG26 and SG29). These were removed from the scheme as part of the Value Engineering process. Furthermore it is understood that some span gantries (those which span both east and westbound carriageways) have been reduced to gantries that cantilever over one carriageway only. These changes are discussed, where relevant, below.

5.59. It was established post EnAR that the Japanese knotweed identified during the EnAR surveys would be dealt with through on-site disposal. A location to the south of J27 is identified on the As Built drawings.

5.60. It is understood from the HEMP July 2013 that surplus material from the site has been placed, in an area already used for this purpose, near J27. This area has been regraded using the site won material and reseeded. A specialist firm were employed to eradicate areas of Japanese Knotweed present on the site. It placed some of this material in a lined pit in this area. The Environment Agency was contacted in this regard in December 2011. It was confirmed during the POPE site visit that this area has been seeded and is establishing. It is also considered that visual impacts associated with this material disposal area are limited. As shown in Figure 5-3 below, intervening vegetation and changes in landform provide low level screening of this location from the surrounding area.

Figure 5-3 Limited view from Howden Clough Road, looking westwards towards the Japanese knotweed burial area, located at J27.

5.61. From observations made during the POPE site visit, the scheme planting has been undertaken in accordance with that proposed. Establishment is in line with what would be expected at this time, however in some locations the presence of weed growth was greater than would be expected, illustrated in Figure 5-4 below. A Handover Environmental Management Plan (HEMP) was produced in July 2013, which clearly states the maintenance requirements and responsibilities for the aftercare period. The HEMP includes a three year period for planted areas and a one year period for grassed areas, both commenced in December 2013, after which, the responsibility lies with the MAC, therefore the responsibility for the grassed areas now lies with the MAC. It was evident that grass cutting activities have historically been taking place and grass cutting activities were witnessed during the POPE site visit.

5.62. In addition to the HEMP, a Landscaping Maintenance Memorandum of Understanding[17] was agreed in October 2013 between the scheme contractor and the MAC. The purpose of this document was to define and clarify the obligations of various parties after the completion of works. Tasks agreed include the replacement of failed plants, general upkeep of planting plots, grass cutting to sight lines to signs and visibility splays to ERAs and slip roads. The success of this document as a tool to clarify maintenance responsibilities could be considered for its use in future projects.

5.63. Adherence to the above handover documents should ensure successful establishment of the scheme planting. This should be confirmed as part of the FYA study. In order to confirm the successful establishment of landscape elements such as species rich grasslands and hedgerow, access within the Highway boundary should be considered as part of the FYA study.

Figure 5-4 Mitigation planting location showing presence and early establishment but with high levels of weed growth indicating a potential lack of maintenance.

5.64. The retention of planting to the upper / lower limits of embankments / slopes appears to have been achieved throughout the scheme and the vegetated character of the highway corridor has in general been successfully retained as illustrated, at a location on the eastbound verge, near to Hartshead Moor service station in Figure 5-5 below. POPE concludes that the impacts in connection with the removal of vegetation on landscape character are ‘as expected’.

[17] Forms Appendix J of Volume 7 of the Health and Safety File

Figure 5-5 Illustration of the successful retention of established vegetation to the upper limits of slopes

5.65. No photomontages were produced for the EnAR but a visual schedule was produced (included in EnAR Volume as Appendix R). This included a description of the expected changes to views and the likely significance of the impact. During the OYA site visit the expected impacts on static visual receptors was considered and several EnAR viewpoint locations were visited and the observations are recorded in Table 5-7 below. These were viewed in late spring, when screening potential was good. Screening during winter is expected to be less, as the majority of the existing Highway planting is of deciduous species. The EnAR when the assessment was undertaken during the winter months, when screening was minimal.

Table 5-7 Impacts at representative viewpoints based on EnAR Visual Schedule

Viewpoint	Nature of Impact	**EnAR** Assessment	OYA Evaluation
P8 : Kirklees Way and P11: A649 Overbridge	Four gantries visible and HSR in operation.	Major Adverse	As expected.
54: 234 – 248 Huntsworth Lane	Vegetation removal on the lower slopes of the embankment to establish a visibility splay within the highway corridor. Minor increase in visibility of the motorway during winter from residential properties on Huntsworth Lane.	Minor Adverse	As expected, or better than expected. Removal of vegetation for the creation of a visibility splay within the highway corridor appears minimal and no adverse effects on the integrity of the retained mature highway planting appears at OYA. Mitigation planting present as expected. The success of its establishment will need confirming as part of the FYA report.
65: Residential Properties on Dewsbury Road	Vegetation removal for the construction of ERA westbound 5, increasing the visibility of the existing highway corridor and Scheme gantry SG16.	Moderate adverse	Better than expected. Gantry SG16 and ERA WB5 were not built as part of the scheme.
91: Residential Properties 45 – 70 Howden Clough Road	Vegetation removal adjacent to the westbound carriageway to create a visibility splay expected to increase visibility of highway corridor and proposed gantry SG22	Moderate adverse	Better than expected. The design for SG22 was reduced from a gantry that spanned the entire carriageway to one that was cantilevered on the eastbound carriageway only.
104: Residential properties at Aspen Court	Partial visibility of gantries SG30 and SG31 in foreground.	Moderate adverse	Better than expected. The design for SG30 was reduced from a gantry that spanned the entire carriageway to one that was cantilevered on the westbound carriageway only. Moving it away from the properties at Aspen Court. Also an additional visual screen fencing is in place, which was not considered as part of EnAR.
P57: A6029 / Rein Road Overbridge	Direct visibility of four gantries	Major adverse	Better than expected. Due to only three gantries being built (SG29 not built)
152: Ouzlewell Green	Vegetation removal on the eastbound side of the highway corridor predicted in connection with the construction of gantry and ERA.	Moderate adverse	As expected. Scheme implemented as expected.

Viewpoint	Nature of Impact	**EnAR** Assessment	OYA Evaluation
154 : Lofthouse	Vegetation removal for the construction of ERA westbound 13 and gantry may increase motorway and scheme element visibility. Partial views only. Vegetation to top of embankment suggested as mitigation	Minor adverse	Better than expected. Gantry visibility limited as expected. Planting to the upper limits of the embankment retained.

5.66. It is understood that in the period between the EnAR and construction, concerns regarding a reduction in visual amenity were raised by local residents in the Aspen Court area. In response to these concerns a visual barrier (4m fence) at Aspen Court has been included as part of the scheme. As shown in Figure 5-6 and Figure 5-7 below (photographs taken during the POPE visit in 2015), the fencing provides full visual screening of the scheme and motorway. A moderate adverse impact was expected in the EnAR and POPE concludes that the visual impact for the receptors at Aspen Court is 'better than expected' for these visual receptors. It should be noted that the only purpose of this fence is to provide visual screening.

Figure 5-6 Visual Screen Fence as viewed from Aspen Court

Figure 5-7 Visual Screen Fence as viewed from Rein Road (A6029)

5.67. One of the issues raised within the EnAR was the introduction of permanent lighting between the unlit J29 - 30. It was anticipated that illumination of the gantries would be visible during the hours of darkness throughout the winter months and this was considered as part of the impact identification. It was assessed that changes in light level would not be perceived in the context of the existing lit highway corridor.

5.68. It was predicted that any light spill between these Junctions would generally be minimal and not greatly perceived. No night time visits have been undertaken to confirm this at OYA.

5.69. Two ERAs WB13 and EB12 were expected to have minor adverse impacts associated with light spillage on receptors 155, 157 and 158 respectively.

5.70. For ERA WB13, POPE considers that extent of vegetation retention on the embankment and the intervening vegetation will both provide greater screening of the lighting than was expected in the EnAR and therefore the impacts are potentially ‘better than expected’.

5.71. Impacts associated with ERA EB12 are considered to be ‘as expected’, as the extent of intervening vegetation provides a lesser degree of screening.

Table 5-8 Summary of Landscape and Visual Evaluation

Origin of Assessment	Summary of Predicted Effects	Assessment
AST	Scheme proposals would be set within the context of an existing corridor and would not result in significant adverse effects in landscape terms. Where possible visual impact had been reduced by siting gantries in cuttings. Substantial vegetation loss would be required in some locations for slopes near the ERAs and for the provision of sightlines and monitoring. Trees to the top of slopes were considered to be of low value, but assisted in integrating the road into the landscape, and of moderate significance for screening. Mitigation proposals including replacement and new planting would reduce visual impacts.	Slight Adverse
EST	Overall impacts on the highway landscape and visual receptors are considered to be as expected. With the situation likely to 'better than expected' in some locations. The number of span gantries throughout the scheme has reduced, the retention of existing highway planting on the slopes / embankments has been maximised and the integrity of the existing highway planting is considered to be good. The erection of visual fencing adjacent to Aspen Court has been a positive addition, reducing visibility of the scheme elements and existing motorway from these residential locations. Consideration could be given to undertaking both winter and summer POPE site visits part of the FYA study to help identify successful establishment.	As expected at OYA.

Table 5-9 Summary of Townscape Evaluation

Origin of Assessment	Summary of Predicted Effects	Assessment
AST	No direct impact on townscape due to the motorway being dominant already and the use made of existing cuttings (58% of route length).	Neutral
EST	Scheme was constructed within the existing highway boundary, with over half of it located within cutting as expected. No direct impact on townscape.	As expected

Biodiversity

Forecast

AST

5.72. The AST stated that there would be potential loss of some highway verge of negligible ecological value. The magnitude of impacts and the resulting assessment scores were considered to be neutral for local nature reserves; non statutory sites of nature conservation importance; woodlands and ponds. Species surveys recorded no signs of protected species within the site limits. With mitigation measures in place, impact to local hydrology or water quality within statutory and non-statutory sites of nature conservation was considered to be neutral.

Environment Assessment Report

5.73. The EnAR stated that the potential impacts to the habitats immediately adjacent to the sites limits would be limited. The habitats within the highway boundary were considered to not be of particular high value.

5.74. With the inclusion of appropriate standard construction mitigation methods and practices it was assessed that the scheme would cause no change to the statutory and non-statutory sites. Those identified as being at potential risk where Oakwell Park Local Nature Reserve (LNR), Clifton Interchange Site of Ecological / Geological Importance (SEGI), Dolphin Beck Marsh Local Nature Area (LNA) and Bushey Cliffe Wood LNA.

5.75. Signs of badgers were identified within the vicinity of the scheme and the EnAR stated that there was potential for disturbance to this species during construction. It was considered that a Natural England licence would likely be required for works in these areas.

5.76. No protected species were found during the EnAR surveys undertaken for reptiles, water vole, otter, white clawed crayfish, bats and great crested newts (GCN). After the surveying period in 2009, an additional pond, was identified that required a GCN survey prior to the commencement of the scheme. It was also stated that Bat surveys were required at three bridge structure, where access was restricted during the EnAR surveying period.

5.77. It was concluded in the EnAR that, with the inclusion of standard mitigation measures during construction, there would be no change to the identified habitats and legally protected species. It was considered that the replacement of grass verge and boundary hedgerows with species rich mixes, would result in a slight beneficial impact on habitats.

Consultation

5.78. Natural England does not have any detailed comments to make, but is not aware of any significant impacts that the scheme has had on biodiversity.

5.79. The consultation response from Gildersome Parish Council, indicates that impacts on habitats and identified LNR are as expected.

Evaluation

5.80. The loss of low value habitat is limited to within the highway corridor as expected and has furthermore been mitigated through planting as expected. Species rich mixes of grassland and hedgerows have been included in the planting scheme as expected.

5.81. POPE has not been made aware of any adverse impacts on statutory and non-statutory designated sites or protected species.

5.82. It was confirmed to POPE that the appropriate surveys were undertaken at the additional pond location, located near to the A469 over bridge on the eastbound carriageway of the motorway, between J25 - 26. A Habitat Suitable Index (HSI) survey was carried out in March 2010, in which the pond was assessed as providing average suitability for use by GCN. Further Presence and Absence surveys were carried out between 29th March and 5th May 2010. No GCN were recorded but it was considered that the pond was likely to support low populations of smooth

newts. It was concluded that the scheme was likely to have no impacts on GCN and no significant impacts on other amphibians.

5.83. The bat surveys at the three bridge locations were subsequently deemed unnecessary due to the distance of the locations from major construction activities.

5.84. It has been confirmed by Highways England's client representative that no badger setts were impacted by the scheme and therefore there was no Natural England licence requirements.

5.85. From the information made available it is considered that the effects of the scheme on Biodiversity are as expected at OYA.

Animal Mortality Figures

5.86. The Managing Agent Contractor (MAC) has been consulted with regard to animal mortality due to motorway traffic between J24 and Junction 30 and have provided the records shown in Table 5-10 below. The figures provided are based on MAC records for which specific locations could not easily be deciphered by POPE.

5.87. The figures show that there has been a significant decrease in the animal mortality numbers on the network. The figures also show that of all 8 incidents that have occurred in the post opening 20 month period, 3 mortalities have been of deer. Whilst the data provided indicates that there has been a reduction in the levels of animal mortality on the motorway, POPE considers that these changes cannot be attributed to the scheme as no mitigation measures were included to reduce the likelihood of animals making their way onto the carriageway.

Table 5-10 Animal Mortality Figures provided by the Managing Agent Contractor (June 2015)

Number of Incidents by Species	Cat	Deer	Dog	Fox	Badger	Unidentified	Total
Pre Scheme Oct 2010 – Oct 2011	4	3	4	9	1	0	23
Post Scheme Oct 2013 – June 2015	1	3	0	2	0	1	8

Table 5-11 Summary of Biodiversity Effects

Origin of Assessment	Summary of Effects on Biodiversity	Assessment
AST	There would be potential loss of some highway verge of negligible ecological value. The magnitude of impacts and the resulting assessment scores were considered to be neutral for local nature reserves; non statutory sites of nature conservation importance; woodlands and ponds. Species surveys recorded no signs of protected species within the site limits. With mitigation measures in place, impact to local hydrology or water quality within statutory and non-statutory sites of nature conservation was considered to be neutral.	Neutral
EST	The loss of low value habitat within the highway corridor is limited as expected and has been mitigated through mixed species planting as expected. Further study at FYA is required to confirm the establishment of these species rich grassland areas. Impacts on protected species are considered to be as expected. No GCN were identified in the additional pond and it was confirmed that surveys for bats and Natural England licences for works near to badger setts was not required.	As expected

Cultural Heritage and Archaeology

Forecast

AST

5.88. The AST stated that ground-disturbing works were proposed within the highway boundary and it was considered that previous highway construction works would have removed or severely degraded any buried archaeological remains that could have survived. As a result it was considered unlikely that there would be any remaining adverse effects on buried archaeological remains. Four Grade II listed buildings were recorded within 500m of the proposed gantry locations. The proposed groundworks, elevations and associated planting would be restricted to within the highway boundary and would not materially change the settings of these listed buildings. The impact overall was assessed as Neutral.

Environment Assessment Report

5.89. No adverse effects on the buried archaeological or cultural heritage resource was identified in the EnAR. The EnAR stated that due to the nature of the proposed scheme, i.e., no new land-take in previously undisturbed land, has allowed for issues relating to know or potential buried archaeological remains to be scoped out.

5.90. A total of 25 listed buildings were identified within a 500m from motorway centreline study area. Also identified within the study area was one Conservation Area, Dartmouth Park in Morley. No other designated cultural heritage assets were identified.

5.91. Four Grade II listed buildings were identified as being within close proximity (500m) to proposed gantries and therefore had the potential to be affected by the scheme. These buildings were identified as the following:

- 145 – 147 Wakefield Road, Morley, a pair of mid to late 18th century cottage, gantry SG21;
- Thompson Farm House, Lofthouse, a former 17th century farmhouse, now converted to three dwellings, gantry SG35;
- Barn located 30m north of Royds Hall, 17th century, gantry SG39; and
- Royds Hall, a former 18th century farmhouse now converted to a dwelling, gantry SG39.

5.92. However, it was concluded that as the proposed groundworks, elevations and associated planting would be restricted to land within the highways boundary they would not materially change the settings of these listed buildings.

5.93. No mitigation was proposed for the cultural heritage resource.

Consultation

5.94. Historic England was consulted but no response was received at the issuing of this report.

5.95. Gildersome Parish Council is not aware of any unforeseen impacts on historic resources.

Evaluation

5.96. In the EnAR, four Grade II listed properties were identified as being located within 500m of proposed gantries. All these buildings are located within 500m of a gantry as expected and no information has been made available to POPE that indicates that the construction of the scheme has led to any unforeseen impacts of these cultural heritage assets.

5.97. The above four locations were visited as part of the POPE site visit and it was confirmed that no land take outside the Highway corridor was required in any of the locations and existing vegetation was retained to provide screening, as illustrated in Figure 5-8 below, taken from the settlement of Lofthouse.

Figure 5-8 Intervening Highway and Open space planting providing screening of the motorway from the settlement of Lofthouse and Thompson House Farm

5.98. No impacts were expected on Dartmouth Park Conservation Area (Bruntcliffe, Morley), located off Bruntcliffe Road, near to J27. From the POPE site visit it is considered that this is the case.

5.99. The Client's representative has confirmed that there were no archaeological finds during the construction of the scheme.

5.100. POPE considers that the impacts on the cultural heritage resource has been neutral 'as expected'.

Table 5-12 Summary of Cultural Heritage Evaluation

Origin of Assessment	Summary of Predicted Effects	Assessment
AST	Ground-disturbing works were proposed within the highway boundary and it was considered that previous highway construction works would have removed or severely degraded any buried archaeological remains that could have survived. As a result it was considered unlikely that there would be any remaining adverse effects on buried archaeological remains. Four Grade II listed buildings were recorded within 500m of the proposed gantry locations. The proposed groundworks, elevations and associated planting would be restricted to within the highway boundary and would not materially change the settings of these listed buildings.	Neutral
EST	The Four Grade II listed properties are located within 500m of a gantry as expected. From POPE site visits it appears as those no adverse impacts on the setting of these listed buildings has occurred.	As expected

Water Quality and Drainage

Forecast

AST

5.101. The AST stated that the M62 had an impact on the water environment of the watercourses it discharges to and crosses due to possible dilution for routine run-off and an increased risk of accidental spillages. These impacts were dependent on traffic flows. The overall impact was assessed as Neutral.

Environment Assessment Report

5.102. A total of 15 watercourses were identified within the study area, all except the River Calder (near J25), were considered relatively minor watercourses. 14 of the watercourse failed the standard considered acceptable under routine discharge of pollutants and serious accidental spillage with and without the scheme.

5.103. No Sites of Special Scientific Interest (SSSIs) or Special Areas of Conservation (SACs) were identified within the EnAR study area.

5.104. No new culverts or bridges or extensions to such structures, or new attenuation devices were expected as part of the scheme. Any changes to water flow rates were expected to be dealt with through the existing flow systems.

5.105. The EnAR considered the expected changes to traffic flows, and in particular the percentage makeup of HGVs in these flows, as these are most likely to cause serious spillage.

5.106. The EnAR stated that whilst an expected increase in AADTs would occur with the scheme by the design year (2031) a decrease in accident risk was anticipated due to an improved safety record.

5.107. Based on the risk calculations used in the EnAR, the effects of the scheme were not expected to cause the level of pollution risk to exceed that considered acceptable for either routine discharge or serious accidental spillage and therefore no actions for mitigating pollution risk was recommended as part of the scheme.

Consultation

5.108. The Environment Agency has identified ‘diffuse urban runoff, including motorway drainage to be a contributing factor in the failure to meet good ecological status/potential in some of the watercourses in this area’. Indicating that the watercourse quality is still poor.

5.109. ‘Due to the use of existing drainage systems for this scheme, little long term change was anticipated and indeed we are not aware of any significant change to the quality of receiving waters resulting from this scheme.’

Evaluation

5.110. POPE has not been made aware of any significant changes to the drainage system of the motorway as part of the scheme. As expected, no mitigation has been included.

5.111. POPE has been provided with a Health and Safety File, which includes documentation of the management of environmental procedures, such as Environmental Procedure (EP) notes for preventing water pollution; oil storage and refuelling; reporting environmental incidents and site waste management plans. POPE has not been provided within any information indicating whether any pollution incidents occurred during the construction phase. This should be re-considered as part of the FYA study.

5.112. In the HEMP July 2013, drainage is described as presenting no additional environmental implications on the current drainage system as part of the scheme. Analysis of Change Following Value Engineering Report, November 2010. Identified that it was expected that the existing drainage system would be retained where possible with the addition of Accidental spillage pollution control measures provided at ERA locations. A review of drainage as built drawings (dated December 2013), show pollution control chambers being present at ERA locations.

5.113. The EnAR stated that whilst an expected increase in AADT would occur with the scheme by the design year (2031) a decrease in accident risk was anticipated due to an improved safety record.

Table 5-13 Summary of Water Quality and Drainage evaluation

Origin of Assessment	Summary of Predicted Effects	Assessment
AST	The M62 had an impact on the water environment of the watercourses it discharges to and crosses due to possible dilution for routine run-off and an increased risk of accidental spillages. These impacts were dependent on traffic flows. Changes in traffic flows due to the scheme changed the magnitude of the impact: a small negative impact of the scheme had been noted for 3 of the watercourses affected. This impact was minor and the significance was therefore noted to be negligible. The rest of the watercourses were subject to impacts of negligible or minor positive magnitude with the result that these impacts were insignificant.	Neutral
EST	The Environment Agency is not aware of any significant change to the quality of receiving waters resulting from this scheme, the quality of the receiving remains poor. No information has been has been made available to POPE regarding the occurrence of pollution incidents during construction. This should be re-considered as part of the FYA study.	As expected

Physical Fitness

Forecast

AST

5.114. The AST stated that no Public Rights of Way (PRoW) or motorway crossing points would need to be diverted or stopped-up beyond that necessary during the construction period. The impact overall was assessed as Neutral.

Environment Assessment Report

5.115. This topic was considered within the EnAR under the Effects on all Travellers. The EnAR stated that as the scheme was to be constructed within highway operational land and would require no demolition of structures. All Public Rights of Way and crossing points were assessed along the length of Scheme and it was assessed that no permanent impacts would occur on pedestrians, cyclists or equestrians. Journey lengths would not be affected, journey amenity would not be affected and people would not be deterred from making the journeys.

5.116. The EnAR did state that further work may be required going forward to investigate whether the higher flow rates of traffic may increase the risk of exposure, for those crossing the crossing points at interchanges, to live traffic.

Consultation

5.117. A response from Leeds City Council confirmed that ‘there was no direct impact on public rights of way within their boundaries. However, they are unable to comment as to whether any indirect impacts have occurred due to noise or visual distractions.’ The latter two points from this consultation response are considered in the Noise and Landscape sub-objectives of this section were appropriate.

5.118. Gildersome Parish Council is not aware of any unforeseen impacts on local access, including footpaths, cycleways and bridleways.

Evaluation

5.119. Based on site visits, consultation comment and as built information there has been no direct changes to the PRoW network as part of the scheme. It is also stated in the HEMP July 2013 that no Public Rights of Way were affected by the scheme.

5.120. The NMU (Non-Motorised User) Context Reports Junctions 25 – 27 and 27 – 28, dated October 2006, stated that 'accident data for the M62 motorway between J25 – 28, including roundabouts and slip roads indicated that, between the years 2000 and 2004 inclusive there was a total of 441 accidents, one of which involved an NMU at an NMU crossing point. No trends relating to NMU crossing points and accidents were identified.'

5.121. POPE requires copies of the subsequent NMU Audits, once available, to report on whether any trends have occurred following the opening of the scheme.

5.122. At this stage POPE considers the effects on Physical Fitness to be as expected.

Table 5-14 Summary of Physical Fitness evaluation

Origin of Assessment	Summary of Predicted Effects	Assessment
AST	The 2010 AST stated that no Public Rights of Way or motorway crossing points would need to be diverted or stopped-up beyond that necessary during the construction period.	Neutral
EST	As expected, there has been no direct changes to the PRoW network as a result of the scheme. NMU Audit reporting should be reviewed, once available, as part of the FYA study to understand if any impacts have occurred in respect of non-motorised users at junction crossing points or any impacts not expected within the pre-scheme context and assessment reporting.	As expected, to be re-considered at FYA

Journey Ambience

Forecast

AST

5.123. The AST stated that the managed motorway proposals would improve traveller information, and that although narrower lanes might increase fear of accidents this should be mitigated by the controlled environment. Driver frustration was expected to remain high due to the number of vehicles wanting to use the motorway along this stretch remaining high (high demand). The impact overall was assessed as Neutral.

AST Worksheets

5.124. The supporting AST worksheets produced in 2010, stated that for the majority of factors (traveller care, travellers' views, and driver stress), the situation would remain neutral with the scheme in place, with the exception of traveller information (an aspect of traveller care), where it was assessed that it would be better with the scheme, as illustrated in an extract from the AST worksheet in Table 5-15 below.

Table 5-15 Summary of Forecast Vehicle Travellers (AST worksheet 2010)

Factor	Sub-factor	Better	Neutral	Worse
Traveller Care	Cleanliness		✓	
	Facilities		✓	
	Information	✓		
	Environment		✓	
Travellers' Views	-		✓	
Traveller Stress	Frustration		✓	
	Fear of potential accidents		✓	
	Route uncertainty		✓	
Overall Score			✓	

Environment Assessment Report

5.125. Only aspects concerning traveller views and driver stress were considered in the EnAR, therefore information for traveller care has been taken from the AST worksheets only.

Traveller Care – Assessment of Effects

5.126. No consideration of Traveller Care was included in the EnAR.

Traveller Views – Assessment of Effects

5.127. The EnAR noted that the main views for the motorist were either contained within the corridor due to significant lengths of the motorway being in cutting or were to the far hills or adjacent farmland / settlements, according to the elevation of the motorway and that although the proposed Scheme would not affect the existing long distance views the provision of the gantries etc. would affect the views along the motorway corridor.

Driver Stress – Assessment of Effects

5.128. Driver stress was considered to be 'high' on all sections of the existing motorway between J25-30, and particularly between J25-27 which at the time of the baseline surveys, were subject to the highest levels of congestion and lowest vehicle speeds.

5.129. The implementation of the scheme was expected to slightly reduce levels of driver stress, but they were expected to remain high between J25-27 and J28-30. The increased capacity between J27-28 was expected to lower driver stress to moderate along this stretch.

Consultation

5.130. No comments have been received to date with regards to journey ambience.

Evaluation

Traveller Care

5.131. Overall it was assessed that the traveller care would be neutral, with a betterment expected in the sub-category of Information. The scheme has improved traveller care (information) through the provision of additional signage and driver information in the form of gantries and variable message signage as expected. A typical example is shown in Figure 5-9 below, which shows four lanes of the motorway being used by drivers in response to the instructions given on the gantries.

Figure 5-9 Traffic responding to the Gantry signage, using the hard shoulder on the M62 between J27 and 26.

5.132. For all other aspect of this category the OYA evaluation is neutral, as expected because for all sub-categories, excluding 'Information' there have been no new facilities introduced as part of the scheme.

Traveller Views

5.133. Longer distance views have remained opened as expected, as illustrated in Figure 5-10 below. The presence of additional highway furniture has cluttered views and in some locations has temporarily foreshortened views in some locations along the highway corridor but from the site visit, POPE considers these to be a minimal changes to views that are barely perceived by the traveller.

Figure 5-10 Longer distance views beyond the Highway Corridor

Driver Stress

5.134. Whilst traffic was expected to increase along the scheme's length it was expected that traffic flows would become smoother and congestion would reduce. However, for most of the route it was expected that Driver Stress would remain high. The increased capacity and lower levels of congestion anticipated between J27-28 was expected to lower driver stress to moderate along this Junction link. Traffic flows have increased as expected but are slightly lower that predicted at OYA.

5.135. Overall it is considered that Driver Stress is likely to be 'as expected' at OYA.

Table 5-16 Summary of Journey Ambience Evaluation

Factor	Sub-factor	AST score	OYA evaluation
Traveller Care	Cleanliness	Neutral	As expected
	Facilities	Neutral	As expected
	Information	Better	As expected
	Environment	Neutral	As expected
Travellers' Views	-	Neutral	As expected
Traveller Stress	Frustration	Neutral	As expected
	Fear of potential accidents	Neutral	As expected
	Route uncertainty	Neutral	As expected
Overall Score		Neutral	As expected

Key Points

Noise

Improvements in the overall noise environment, including to airborne vibration and night-time levels of noise were expected with or without the scheme. Localised noise increases were expected around J28, with or without the scheme. Observed flows are lower than predicted for the year 2015. At none of the junction links are they more than 20% less than forecast. Also along none of the links are observed HGV % greater or less than a difference of 10%. Therefore on this basis the impacts are considered to be 'as expected', (some increases and some decreases in noise) at OYA. No confirmation of the noise reduction value of surfacing provided. This should be confirmed at FYA.

Local Air Quality

Observed flows lower than predicted for year 2015. At 7 of the junction links, the observed numbers are more than 10% lower than forecast, therefore there is the potential for localised impacts to be 'better than expected'. At two junction links HGV numbers are more than +200 greater than forecast and therefore impacts could be 'worse than expected'. Study of observed traffic flows at FYA should be undertaken and a 'Simple' assessment considered at relevant locations.

Greenhouse Gases

Carbon emissions on the M62 through the scheme increased by 4,600 tonnes in the opening year which at a 4% rise was only half the forecast increase.

Landscape and Townscape

Overall impacts on the highway landscape and visual receptors are considered to be as expected. With the situation likely to 'better than expected' in some locations. The number of span gantries throughout the scheme has reduced, the retention of existing highway planting on the slopes / embankments has been maximised and the integrity of the existing highway planting is considered to be good. The erection of visual fencing adjacent to Aspen Court has been a positive addition, reducing visibility of the scheme elements and existing motorway from these residential locations.

Biodiversity

The loss of low value habitat within the highway corridor is limited as expected and has been mitigated through mixed species planting as expected. Further study at FYA is required to confirm the establishment of these species rich grassland areas. Impacts on protected species are considered to be as expected. No GCN were identified in the additional pond (surveyed post EnAR) and it was confirmed that surveys for bats and Natural England licences for works near to badger setts was not required.

Cultural Heritage

The Four Grade II listed properties are located within 500m of a gantry as expected. From POPE site visits it appears as those no adverse impacts on the setting of these listed buildings has occurred.

Water

The Environment Agency is not aware of any significant change to the quality of receiving waters resulting from this scheme, the quality of the receiving remains poor. No information has been has been made available to POPE regarding the occurrence of pollution incidents during construction. This should be re-considered as part of the FYA study.

Physical Fitness

As expected, there has been no direct changes to the PRoW network as a result of the scheme. NMU Audit reporting should be reviewed at the FYA stage when available to see if any impacts have occurred in respect of non-motorised users at junction crossing points or any impacts not expected within the pre-scheme context and assessment reporting.

Journey Ambience

Overall it is considered that Driver Stress is likely to be 'as expected' at OYA, with all sub-factors remaining neutral and traveller care: information improving.

6. Accessibility and Integration

6.1. This chapter evaluates the impact of the scheme on the accessibility and integration objectives; comparing qualitative forecast assessments from the scheme AST with post-opening findings and analysis of objectives.

Accessibility

6.2. The accessibility objective is concerned with how the scheme has affected the ability of people in different locations to reach different types of facility, using any mode of transport. The accessibility objective consists of three sub-objectives. These are:

- Option Values;
- Access to the Transport System; and
- Severance.

Option Values

Forecast

6.3. Option Values, as defined in webTAG related to the availability of different transport modes within the study area, even if they are not used. For example, a car user may value a bus service along their route even if they never use it, because they have the option of another mode if their car becomes unavailable.

6.4. The AST for this scheme notes that there would be '*No services added or withdrawn as part of scheme'.* As such the AST forecast a score of Neutral for this objective.

Evaluation

6.5. This scheme has had limited impact on public transport services, as expected. Local bus services do not use the motorway. Consultation with National Express noted that this scheme had not resulted in any changes to their long distance services between Liverpool/Manchester and Leeds/Bradford.

6.6. As no services have been added or withdrawn as a result of this scheme, the overall assessment of this scheme on Option Values is Neutral, as expected.

Access to the Transport System

6.7. This sub-objective assesses access to the transport system based on two key variables; availability of a vehicle for private use, and the proximity to a public transport service.

Forecast

6.8. For this objective the AST forecast impact states 'No direct effect from the scheme'. The worksheets stated that the scheme does not include freight or passenger interchanges therefore this sub-objective is not applicable. The overall score is therefore considered to be neutral.

6.9. Given the anticipated impact, the AST forecast a score of Neutral for this sub objective.

Evaluation

6.10. Coach services using this section of the M62 will have experienced increased journey time reliability and reduced journey times in most peak times. However, as no physical changes were made to improve access to the transport system, the AST score of Neutral is upheld.

Severance

6.11. The severance sub-objective is concerned with non-motorised modes, especially pedestrians. Transport links can have a detrimental social impact on communities, leading to severance.

Forecast

6.12. The AST forecast that 'No Public Rights of Way or motorway crossing points will need to be diverted or stopped-up, therefore no effect on pedestrian or cyclist routes'. Given the anticipated impact, the AST forecast a score of Neutral for this sub-objective.

6.13. In addition, the AST worksheets stated the scheme would not result in any additional severance and included no improvement measures to reduce severance.

Evaluation

6.14. The outturn evaluation is consistent with the AST forecast of 'neutral'. There has been no change in routes to community facilities and with the exception of changes to traffic flows on local roads, there has been no impact on movements and activities within communities.

Integration

6.15. The integration objective consists of two main elements:

- Interchange with other transport modes: how the scheme assists different modes of transport in working together and the ease of people moving between them to choose sustainable transport choices
- Land use Policy and Other Government Policies: How the scheme integrates with local land use and wider government policies.

Transport Interchange

6.16. The transport interchange objective relates to the extent to which the scheme contributes towards the Government objective of improving transport interchange for passengers and freight.

Forecast

6.17. The scheme AST states that '*Not applicable as no transport interchanges between different modes forms part of this scheme'*. Given the anticipated impact of the scheme, the AST forecast a score of Neutral for this objective.

Evaluation

6.18. No freight interchanges were included within the scope of the scheme. It is understood that National Express now use the service area as a layover, although it has been confirmed by National Express that this not linked to changes in reliability brought about by the scheme.

6.19. It is therefore concluded that as no interchanges were affected as part of the scheme, a post opening evaluation assessment score of Neutral, as expected is appropriate.

Land use

6.20. The scheme was forecast to comply with elements of local, regional and national policy namely those which specifically support the upgrading of the Strategic Road Network whilst conflicting with a number of environmental and sustainability policies at all three policy spheres to a certain degree, although it is recognised in national, regional and local policy that road development of a national or regional level would be accepted as a justifiable "special circumstance" as described in PPG2. It is noted that the scheme required no land take.

6.21. The scheme runs through the administrative area covered by Calderdale Council, Kirklees Council and Leeds City Council. The improvements also run directly to the north of the administrative area of Wakefield Council between J29-30. The forecast land use impacts and the observed impacts at OYA are summarised in Table 6.1.

Table 6.1 Scheme Alignment with relevant National Regional and Local Policy identified in appraisal

Policy scope	Policy Document	Relevant Policy Objective/Reference	Relevant Scheme Impacts	Alignment
Local	West Yorkshire Local Transport Plan 2	Policy C4 of the West Yorkshire Local Transport Plan 2 aims to tackle congestion through improving the highway network, and policy T1(ii) by providing investment to implement road safety and management and maintenance of the highway.	Reduction in peak period congestion on motorway and improvement to safety	yes
	UDPs of Calderdale Council, Kirklees Council and Leeds City Council Wakefield Metropolitan District Council. Development Policies DPD	Policies GT3, EP1, EP12 and EP20 of the Calderdale UDP, T1 and T2 (Kirklees UDP), and T18 and N38(a) (Leeds UDP) around congestion and safety improvements. Policy D24 of the Wakefield Development Policies DPD considers flood risk management.	Ditto No impact on flood risk	Yes No change
		Policies NE1, NE15, GNE2, NE22, and EP5 of Calderdale UDP provide for protection of a range of environmental resources. Policies BE2, EP4 and EP6 of the Kirklees UDP. Strategic Principles 1 and 2 and policies N1 and N32 of the Leeds UDP protect the countryside and greenspace from inappropriate development and allocate them as important land uses.	Works all within highway land	yes
Regional	Regional Spatial Strategy for Yorkshire and Humberside	With regards to transport networks, policy T1 of the RSS/Regional Transport Strategy protects the function of the Strategic Road Network to provide efficient and convenient long distance travel, through the appropriate location of development and as such, supported scheme. Transport and Investment priority A10, which seeks the improvement of journey time, capacity and quality between Leeds and Manchester through improvements to the management and capacity of the M62.	Scheme benefits long-distance travel through improved journey times and reliability on the motorway. However it is noted that junction capacity may have limiting impacts on access between the motorway and the local road network in the future.	yes

		Policy ENV1 seeks to ensure flood risk is managed in new development. Policy ENV3 considers the region's water quality Policy ENV6 seeks to protect and enhance the regions trees and woodland, and supports planting in urban areas and on land by motorways.	No impact on water quality Mitigation planting of hedgerows and wildflower areas on highway land	No change Yes
National	PPG 13 (Planning Policy Guidance)	Objectives of PPG13 include an aim of reducing congestion and improving accessibility. Other objectives such as promoting more sustainable transport choices and reducing the reliance on private road transport are also part of PPG13.	Improvements to reliability on motorway No impact for sustainable transport options	Yes No change

6.22. In summary, the scheme has been evaluated at OYA to be aligned with relevant local, regional or national policies, or have no impact.

7. Conclusions

7.1. To conclude this report, this section summarises how the scheme is meeting its specified objectives.

Scheme Specific Objectives

7.2. Table 7.1 presents an evaluation of the scheme's objectives using the evidence presented in this study.

Table 7.1 Summary of Achievement of Scheme Objectives

Objective	Has the objective been achieved?	
To provide additional motorway capacity, making best use of existing infrastructure where possible.	Scheme constructed within existing corridor. Use of HS provides extra capacity although not always used as well as predicted.	✓
To reduce the number and severity of accidents per vehicle-kilometre.	Both numbers of collisions and the rate per vehicle-kilometre have fallen. Too soon to determine impact on severity.	✓ too soon to assess severity
To minimise the detrimental effects on traffic on the surrounding road network where possible.	Traffic on nearby local road network is in line with forecasts.	✓
To improve journey time reliability, as measured by the average delay experienced in the worst 10% of journeys.	Delays are reduced for the worst 10% of journeys in both of the peak periods in both directions.	✓
To improve journey times.	Reduced times observed during peak periods, by up to 5 minutes in the WB peak but worsened outside of peaks, as expected.	Improved during peak period but not in inter-peak
To offset the detrimental environmental effects of the scheme through mitigation measures where technically and economically feasible.	Mitigation planting on slopes completed.	✓
To improve the quality of information provided to drivers about the state of traffic flow in the motorway.	Gantries provided by the scheme have improved driver information.	✓

Appendices

Appendix A. Appraisal Summary Table (AST) and Evaluation Summary Table (EST)

Table A.1 Appraisal Summary Table (AST), March 2010

Extract from Doc. No. 5082905/32793 Revision 4		M62 Junction 25-30 Managed Motorway Scheme Environmental Assessment, Preferred Option		
OBJECTIVE	**SUB-OBJECTIVE**	**QUALITATIVE IMPACTS**	**QUANTITATIVE MEASURE**	**ASSESSMENT**
ENVIRONMENT	**Noise**	With the scheme, the traffic speed profiles would be smoother on both carriageways (i.e. higher speeds at congested sections and slightly lower speeds at free-flowing sections). Combined with the effects of lower noise surfacing, change in speed profiles would lead to noise increases or decreases depending on the location. The significant improvement in the future year would be due to the application of lower noise surfaces as part of routine maintenance works. The noise reductions would typically be spread across the entire scheme. The noise increases would be concentrated around Junction 28 due to the combined effects of changes to speed on both carriageways. There would be 511 residential properties exposed to noise levels of 68 dB $L_{Aeq18hr}$ or greater in the design year with the scheme.	People annoyed by noise in scheme corridor in 2031: 2890 without scheme, 2784 with scheme. Total population considered ~20,000.	Change in population annoyed (year 15) = -107 PVB (Residential) = £3.34m
	Local Air Quality	Reduction in concentrations around M62 mainline and small increase in concentrations in the wider area, but results in an overall improvement. Two AQMAs (Wakefield M62 AQMA & Wakefield City AQMA) along the M62 mainline both have an improvement. One other AQMA (Wakefield M1 AQMA) in the wider area, but no change in concentrations. Reduction in concentrations with the Scheme at locations exceeding without scheme. Trigger statements for NO2 not met (no increase in annual mean NO2 concentrations >2 >g/m3 where concentrations are above the NO2 annual mean air quality criteria of 40 >g/m3). Trigger statement for PM10 met, with an increase in annual mean PM10 concentrations >1 >g/m3 at 3 properties adjacent to the M606 (however these locations do not exceed the annual mean).	Nitrogen dioxide: 3010 properties with improvement, 2440 with deterioration, 4211 with no change. PM10: 2168 properties with improvement, 659 with deterioration, 6834 with no change	Nitrogen dioxide: - 1155 PM10: -119
	Greenhouse Gases	The overall effect of introducing DHS will lead to a reduction in green house gas emissions. Vehicle km would increase by 2.2million vehicle km over the sixty year appraisal period. However, the total carbon dioxide emissions with the scheme would be 370,000 tonnes lower	Change in emissions Opening Year +1,633 tonnes. 60 year appraisal period:-370,096 tonnes.	NPV of +£15.6m
	Landscape	The proposals would be set within the context of the existing corridor and will not result in a significant adverse effects in landscape terms. Where possible visual impact has been reduced by siting gantries in cuttings. Substantial vegetation loss will be required in some locations for the regarding of slopes near the ERAs and for the provision of sightlines and monitoring. Trees to the top of slopes are of low value, but assist in integration the road into the landscape, and of moderate significance for screening. Mitigation proposals including replacement and new planting will reduce visual impacts.	-	Slight Adverse
	Townscape	Proposals will have no direct impact on townscape due to motorway being dominant already and use made of existing cuttings (58% of route length.	-	Neutral
	Heritage of Historic Resources	Ground-disturbing works are proposed within the highway boundary and it is considered that previous highway construction works would have removed or severely degraded any buried archaeological remains that could have survived. As a result it is considered unlikely that there would be any remaining adverse effects on buried archaeological remains. Four Grade II listed buildings were recorded within 500m of the proposed gantry locations. The proposed groundworks, elevations and associated planting would be restricted to within the highway boundary and would not materially change the settings of these listed buildings.	-	Neutral
	Biodiversity	There will be potential loss of some highway verge of negligible ecological value. The magnitude of impacts and the resulting assessment scores are considered to be neutral for local nature reserves; non statutory sites of nature conservation importance; woodlands and ponds. Species surveys recorded no signs of protected species within the site limits. With mitigation measures in place, impact to local hydrology or water quality within statutory and non-statutory sites of nature conservation is considered to be neutral. With mitigation measures it is considered that the potential overall impact to be neutral.	-	Neutral
	Water Environment	The M62 has an impact on the water environment of the watercourses it discharges to and crosses due to possible dilution for routine run-off and an increased risk of accidental spillages. These impacts are dependent on traffic flows. Changes in traffic flows due to the Scheme change the magnitude of the impact: a small negative impact of the Scheme has been noted for 3 of the watercourses affected. This impact is minor and the significance is therefore negligible. The rest of the watercourses are subject to impacts of negligible or minor positive magnitude with the result that these impacts are insignificant	-	Neutral
	Physical Fitness	No Public Rights of Way or motorway crossing points will need to be diverted or stopped-up beyond that necessary during the construction period.	-	Neutral
	Journey Ambience	Managed motorway proposals will improve traveller information, however narrower lanes may increase fear of accidents however this should be mitigated by the controlled environment. Driver frustration still remains high due to high demand. The overall impact on journey ambience is neutral.	-	Neutral
SAFETY	**Accidents**	An accident reduction of 15% was applied compared with the 'Do-Minimum' model.	-	PVB: £33.811m
	Security	CCTV surveillance will be improved allowing earlier detection and monitoring of users. The use of Emergency Refuge Areas will provide a secure environment for users.	-	Slightly Beneficial
ECONOMY	**Public Accounts**	investment cost of scheme: £148,349,000 (P50 Discounted Cost), Indirect Tax Revenue:-£29,902,000	-	PVC £118.447m
	Business Users & Providers	Travel Time benefits:£438,303,000 Vehicle operating costs:-£3,890,000 and Construction and Maintenance Disbenefits: -£22,903,000	-	Net Business Benefits: £411.510m
	Consumer Users	Travel Time benefits:£279,140,000 Vehicle operating costs: -£43,887,000 and Construction and Maintenance Disbenefits: -£30,433,000	-	Net Consumer Benefits: £204.820m
	Reliability	Total Travel \Time Variability Benefit: £164,451,454 and Total Delay Benefit £18,919,606.	-	£183.371m
	Wider Economic Impacts	Current assessment identified small travel time savings, but as the scheme is unlikely to have significant impact on employment the wider economic effects of the scheme has not been assessed at this stage.	-	Neutral
ACCESSIBILITY	**Option values**	No services added or withdrawn as part of scheme	-	Neutral
	Severance	No Public Rights of Way or motorway crossing points will need to be diverted or stopped-up, therefore no affect on pedestrian or cyclist routes.	-	Neutral
	Access to the Transport System	No direct effect from the scheme	-	Neutral
INTEGRATION	**Transport Interchange**	Not applicable as no transport interchanges between different modes forms part of this scheme.	-	Neutral
	Land-Use Policy	Scheme complies with elements of local, regional and national policy particularly justifiable under 'special circumstances'. No land acquisition required (except by agreement), therefore no change	-	Beneficial
	Other Government Policies	Roughly equal number of polices are either helped or hindered by the proposals. The impact is therefore neutral.	-	Neutral

Table A.2 Evaluation Summary Table (EST)

M62 J25-30 Managed Motorway		QUALITATIVE IMPACTS	QUANTITATIVE ASSESSMENT	ASSESSMENT
OBJECTIVE	**SUB-OBJECTIVE**			
ENVIRONMENT	**Noise**	Observed flows are lower than predicted for the year 2015. At none of the junction links are they more than 20% less than forecast. Also along none of the links are observed HGV % greater or less than a difference of 10%. Therefore the impacts are considered to be 'as expected', (some increases and some decreases in noise) at OYA.		Likely to be as expected
	Local Air Quality	Observed flows lower than predicted for year 2015. At 7 of the junction links the observed numbers are more than 1000 AADT lower than forecast, therefore there is the potential for localised impacts to be 'better than expected'. At two junction links HGV numbers are more than +200 greater than forecast and therefore impacts could be 'worse than expected'.		Pollutant concentrations likely to be lower than expected as a result of the observed traffic flows being lower than forecast at OYA
	Greenhouse gases	Carbon emissions on the M62 through the scheme increased by 4,600 tonnes in the opening year which at a 4% rise was only half the forecast increase.	4,600 tonnes in the opening year (+4%)	Better than expected
	Landscape	Overall impacts on the highway landscape and visual receptors are considered to be as expected. With the situation likely to 'better than expected' in some locations. The number of span gantries throughout the scheme has reduced, the retention of existing highway planting on the slopes / embankments has been maximised and the integrity of the existing highway planting is considered to be good. The erection of visual fencing adjacent to Aspen Court has been a positive addition, reducing visibility of the scheme elements and existing motorway from these residential locations.		As expected
	Townscape	Scheme was constructed within the existing highway boundary, with over half of it located within cutting as expected. No direct impact on townscape.		Neutral As expected
	Cultural Heritage	Scheme was constructed within the existing highway boundary, with over half of it located within cutting as expected. No direct impact on townscape.		Neutral As expected
	Biodiversity	The loss of low value habitat within the highway corridor is limited as expected and has been mitigated through mixed species planting as expected. Further study at FYA is required to confirm the establishment of these species rich grassland areas. Impacts on protected species are considered to be as expected. No GCN were identified in the additional pond and it was confirmed that surveys for bats and Natural England licences for works near to badger setts was not required.		Neutral As expected
	Water Environment	No evidence of any change in water quality of motorway drainage runoff		Neutral As expected
	Physical Fitness	No direct change to PRoW network		Neutral As expected
	Journey Ambience	Improvement to signage from new gantries and benefit for driver stress from improved journey time reliability		Neutral As expected
SAFETY	**Accidents**	Reduction in accident rate of 36% (after backgrounded reduction considered)	22.8 saving in opening year	£58.6m
	Security	Emergency Refuge Areas have been installed with CCTV, providing greater information and surveillance.		Slight Beneficial As Expected
ECONOMY	**Public Accounts**	Cost to public accounts lower than forecast, including indirect tax as reduction in cost.		PVC £102.6m
	Transport, economic efficiency: business users and transport providers	Forecast of small net saving in vehicle hours in the opening year due to some disbenefit in the inter-peak , changing to large benefits throughout the day in future years means that it is too soon to evaluate the long term benefit.	Not monetised at OYA	-
	Transport, economic efficiency: Consumers	As for business TEE	Not monetised at OYA	-
	Reliability	Variability of journey times has reduced in the peak periods, although this has not been monetised.	Not monetised	Beneficial
	Wider Economic Impacts			
ACCESSIBILITY	**Option Values**	No Impact on option values.		Neutral As Expected
	Severance	There has been no change in routes to community facilities.		Neutral As Expected
	Access to the Transport System	No direct change in public transport provision as a result of the scheme.		Neutral As Expected
INTEGRATION	**Transport Interchange**	Not applicable as the scheme does not include any transport interchange facilities.		Neutral As Expected
	Land Use Policy	The scheme is within the highway boundary.		Neutral
	Other Government Policies	The scheme is within the highway boundary. The scheme either aligns, or has had no impact on applicable policies.		Neutral As expected

Appendix B. Environment

B.1. Sources

Table B.1 Standard list of information required to evaluate the environmental sub-objective.

Requested Information	Response
Environmental Statement	n/a (HSR Scheme, within highway boundary)
Environmental Assessment Report	EnAR Vol 1 and 2 Nov 2009
AST	AST Option 1 2010 provided
Any amendments/ updates/addendums etc. to the EnAR or any further studies or reports relevant to environmental issues. Have there been any significant changes to the scheme since the EnAR.	PMI Assessment 1 May 2012 provided PMI Assessment 2 Aug 2012 provided PMI Assessment 3 Nov 2012 provided PMI Assessment 4 Feb 2013 provided PMI Assessment 5 July 2013 provided PMI Assessment 6 Sep 2013 provided M62 J25-30 Managed Motorway Scheme: Analysis following VE. Nov 2010 provided. M62 J25-30 Managed Motorway Scheme GCN Survey. May 2010 provided.
'As Built' drawings for landscape, ecological mitigation measures, drainage, fencing, earthworks etc. Preferably electronically or on CD.	Landscape, Drainage, Pavements, Kerbs, Footways and Paved Areas As Builts. Aug 2013 provided
Copies of the Landscape/Ecology Management Plan or Handover Environmental Management Plans	HEMP July 2013 provided
Contact names for consultation	Not received. Sourced by POPE.
Archaeology - were there any finds etc. Have any Archaeological reports been written either popular or academic and if so are these available?	No archaeological finds, so no documents produced.
Have any properties been eligible for noise insulation?	No properties were eligible for noise insulation.
Has any post opening survey or monitoring been carried out e.g. for ecology/biodiversity or water quality and if so would copies of the reports be available?	No information available at time of OYA. Inspections due at the end of maintenance period.
Animal Mortality Data	Information provided by MAC.
Any publicity material	M62 Managed Motorway Exhibition May 2010 provided M62 White Chapel Bridge Aug 2010 provided M62 Managed Motorway Apr 2011 provided Managed Motorway PFV May 2010 provided
Pre scheme Non Motorised User (NMU) Audit or Vulnerable User Survey	NMU Context Report Oct 2006 provided.
Copy of NMU post opening survey	Not received
Employers Requirements Works Information - Environment sections	Works information, including Series 3000 specification 2011 provided.
Health and Safety File – Environment sections	H&S File Env Vol 7 provided
Construction Environment Management Plan (CEMP)	Project Management Plan including Environmental Procedures Nov 2011 provided
Landscape and Ecology Aftercare Plan (LEAP) and / or Landscape Management Plan (LMP)	Landscaping Memorandum of Understanding Aug 2013 provided.
Handover Environmental Management Plan	HEMP July 2013 provided

(HEMP)	
Has the scheme received any environmental awards	No

B.2. Photographic Record of Scheme

Figure B.1 EnAR Photoview P19 South – before

Figure B.2 EnAR Photoview P19 South – OYA

Figure B.3 EnAR Photoview P19 North - before

Figure B.4 EnAR Photoview P19 South - OYA

Figure B.5 EnAR Photoview P28 North - before

Figure B.6 EnAR Photoview P28 North - OYA

Figure B.7 EnAR Photoview P57 North (and 104 Aspen Court) - before

Figure B.8 EnAR Photoview P57 North (and Aspen Court) - OYA

Figure B.9 EnAR Photoview P78 North - before

Figure B.10 EnAR Photoview P78 North - OYA

Appendix C. Tables and Figures in this Report

Tables

Figures

Appendix D. Glossary

AADT	Average of 24 hour flows, seven days a week, for all days within the year.
ALR	All Lane Running is the type of smart motorway in which all lanes are open to traffic at all times. There is no lane which dynamically varies as a hard shoulder or normal lane.
AQMA	Air Quality Management Area
AST	Appraisal Summary Table This records the impacts of the scheme according to the Government's five key objects for transport, as defined in DfT guidance contained on its Transport Analysis Guidance web pages, WebTAG
BCR	**Benefit Cost Ratio** This is the ratio of benefits to costs when both are expressed in terms of present value i.e. PVB divided by PVC
DHS, DHSR	**Dynamic Hard Shoulder** is the inside line on a smart motorway when can operate in one of two modes: • As the default, as a normal motorway hardshoulder i.e. only for emergency use; and • Under operator control, open to all traffic. Dynamic Hard Shoulder Running is the system in a smart motorway which includes DHS.
Discount Rate	The percentage rate applied to cash flows to enable comparisons to be made between payments made at different times. The rate quantifies the extent to which a sum of money is worth more to the Government today than the same amount in a year's time.
Discounting	Discounting is a technique used to compare costs and benefits that occur in different time periods and is the process of adjusting future cash flows to their present values to reflect the time value of money, e.g. £1 worth of benefits now is worth more than £1 in the future. A standard base year needs to be used which is 2002 for the appraisal used in this report.
Do Minimum	In scheme modelling, this is the scenario which comprises only the existing road network and other committed schemes.
Do Something	In scheme modelling, this is the scenario detailing the planned scheme plus improvement schemes that have already been committed
EAR	Economic Assessment Report
EnAR	Environment Assessment Report
EIR	Economic Impact Report
ERA	Emergency Refuge Area
EST	Evaluation Summary Table In POPE studies, this is a summary of the evaluations of the TAG objectives using a similar format to the forecasts in the AST.
FWI	Fatalities & Weighted Injuries
FWI/bvkm	This figure is a combined measure of casualties based on the numbers of fatal, serious and slight casualties. It is weighted by severity of injuries, with fatalities having the

FWI/mvm	highest weighting.
FYA	Five Years After
GCN	Great Created Newt
Halogen Data	Halogen Data is the record of the overhead gantry settings and message screens forming part of a smart motorway scheme over time.
HEMP	Handover Environmental Management Plan
HSI	Habitat Suitable Index
INCA	**Incident Cost Benefit Assessment** can be used to estimate the benefits of reduce delay and travel time variability caused by unforeseen incidents that reduce capacity such as breakdowns, accidents and debris on the carriageway and major disruptions such as spillages.
KSI	Killed or Seriously Injured
LNA	Local Nature Area
MAC	Managing Agent Contractor
MIDAS Data	MIDAS data is held by Highways England which contains lane by lane traffic flows and speeds
MM-DHS	See DHS
NMU	Non-motorised User
OYA	One Year After
PIC	Personal Injury Collision Data on these is obtained from records of road collisions collected from by police officers attending accidents.
PIC/mvkm	Ratio of PIC to the level of travel measured in million vehicle kilometres (mvkm)
Present Value	Present Value is the value today of an amount of money in the future. In cost-benefit analysis, values in differing years are converted to a standard base year by the process of discounting giving a present value.
PVB	Present Value Benefits Value of a stream of Benefits accruing over the appraisal period of a scheme expressed in the value of a Present Value
PVC	Present Value Cost
RSA	Road Safety Audit
Smart Motorway	Referred to previously as “managed motorways”: a motorway which uses technology to vary speed limits in response to driving conditions. These smart motorways make the hard shoulder available to traffic. This could be permanently or at particularly busy times of the day.
SEGI	Site of Ecological / Geological Importance
SG	Span Gantry

VMSL	Variable Mandatory Speed Limit
WEBTAG	Department for Transport's website for guidance on the conduct of transport studies at http://www.webtag.org.uk/