# Smart Motorway
# All Lane Running

## M25 J5-7 Monitoring Third Year Report

Highways England

**8 February 2018**

# Notice

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This document has 30 pages including the cover.

## Document history

| **Job number: 5150343** | | | **Document ref: 5150343/06/04** | | | |
|---|---|---|---|---|---|---|
| Revision | Purpose description | Originated | Checked | Reviewed | Authorised | Date |
| Rev 1.0 | Draft Issue to client | Joe Castle | Andrew Truscott | Jill Hayden | Jill Hayden | 06/12/2017 |
| Rev 2.0 | Final Issue | Joe Castle | Andrew Truscott | Jill Hayden | Joe Castle | 08/02/2018 |
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## Background

Smart motorways increase capacity to reduce congestion and improve journey time reliability while maintaining safety, by making the hard shoulder available as a traffic lane and by using variable speed limits to smooth traffic flow, supporting economic growth.

**Expanding evidence base to provide confirmation of performance**

The Smart Motorway All Lane Running (SMALR) scheme, M25 J5 to J7, converted J5 to J6 to ALR, widening it to 4 lanes. J6 to J7 was upgraded to SM but this section still has a hard shoulder and remains 4 lanes. The scheme has previously been monitored and evaluated for Yr1 and Yr2 After periods. This report details the performance after 3 years of operation and confirms that All Lane Running is performing as expected. This report completes the evaluation of the scheme in this format and further monitoring and evaluation will continue as part of Highways England's business as usual monitoring and evaluation processes, including Road Safety Audits and Post Opening Evaluation Reports.

Atkins was therefore commissioned to perform a wide-ranging, comprehensive evaluation of the third year of operation in order to:

- review the safety performance during the initial period of operation;
- continue to monitor and understand the change in risk to road users and to road workers;
- quantify and provide evidence of the benefits of the concept; and
- provide evidence to help improve the concept of operation and the design requirements.

This report presents the results following a third year of after evaluation from May 2016 to April 2017.

## Overview of Year 3 results

**The scheme has exceeded its safety objective**

| M25 J5-J7 | | |
|---|---|---|
| **Safety** | The scheme has exceeded its safety objective of maintaining safety by significantly improving it. |  |

On the J5 to J6 ALR section, the collision rate has significantly improved and the results are similar for the entire scheme, J5 to J7. The scheme has exceeded its safety objective.

## Safety

**There have been improvements in the collision rate and FWI rate.**

Against the background of higher flows, the scheme has exceeded its safety objective[1]:

- no increase in number or rate of fatal and weighted injury (FWI) casualties;
- no evidence that any population has been adversely affected.

The collision rate has improved as a result of the scheme. The FWI rate has also improved, while severity index and KSI rate have both increased, but these changes are not directly attributable to the scheme. In addition, severity index and KSI may have been impacted by the Police CRASH collision recording system.

**Red X compliance is 94%**

Compliance with Red X signals was observed on average to be 94% of the total flow on the carriageway during the lane closure. This is consistent with findings in both Y1 and Yr2 after periods.

[1] Defined as required by Smart Motorways Interim Advice Note 161, http://www.standardsforhighways.co.uk/ha/standards/ians/pdfs/IAN161_15.pdf

# 1. Introduction

## 1.1. Scope of project and purpose of this report

Having completed the monitoring and evaluation of the second year of operation, Highways England commissioned this project to monitor and evaluate the impact following a third year's operation of the first SMALR scheme, the M25 Junction 5 to Junction 7. The evidence base is being continually expanded, providing ongoing confidence in the ALR concept. It is crucial that the performance of the scheme is accurately assessed for a third year of operation in order to:

- review the safety performance during the initial period of operation;
- continue to monitor and understand the change in risk to road users and to road workers;
- quantify and provide evidence of the benefits of the concept; and
- provide evidence to help improve the concept of operation and the design requirements.

With a third year of data available it is possible to conclude whether the collision rate metric has changed with a level of statistical significance that demonstrates it is the result of SMALR. If the change is not statistically significant it can be concluded that the SMALR objective of maintaining a high level of safety has been achieved.

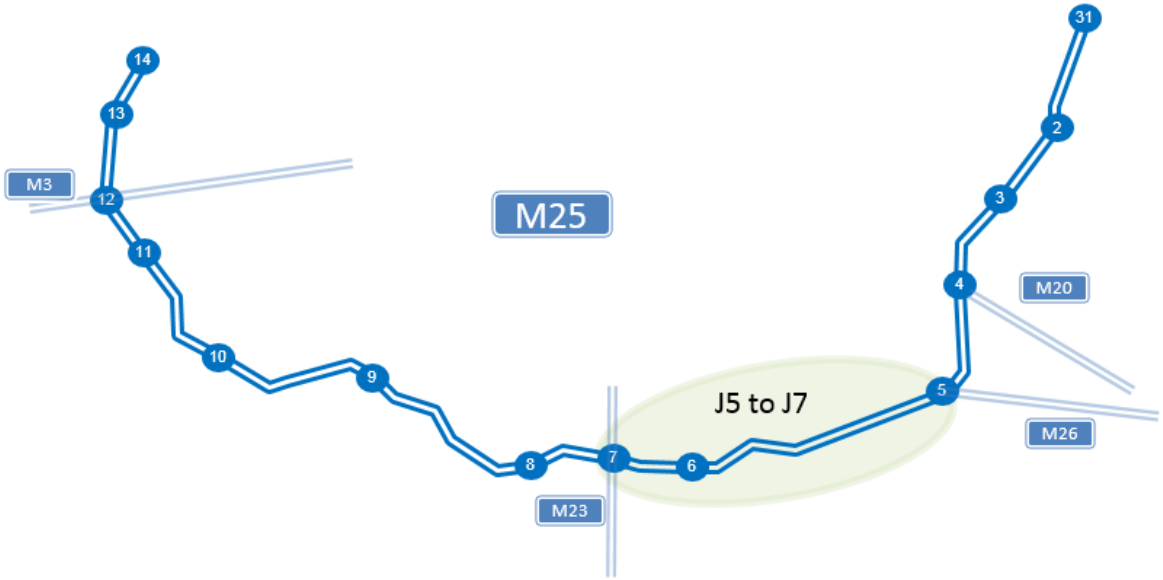
As part of the previous SMALR Monitoring project, an evaluation methodology was designed. There is still a need to increase the evidence base for safety for a third year; however the changes in flows and journey times are now well understood so have not been included for the third year evaluation of this scheme. The analysis for the Before period, Yr1, Yr2 and Yr3 After follows the evaluation methodology to ensure that all results are comparable.

## 1.2. Background of the scheme

### 1.2.1. Location

M25 J5 to J7 is part of the key strategic orbital route around London which forms the hub of the English motorway network and also serves as a commuter route for local traffic. It lies in the counties of Surrey and Kent and is located in the southern segment of the M25. It starts at J5 which is the intersection with the M26, A21 and A25 and finishes at J7; the intersection with the M23.

**Figure 1-1 Geographical location of the M25 J5 to J7 SMALR scheme**



Although constructed as one Smart Motorway scheme, only J5 to J6 is all lane running, while the much shorter J6 to J7 is four lanes plus hard shoulder on the link and three lanes plus hard shoulder through the junctions.

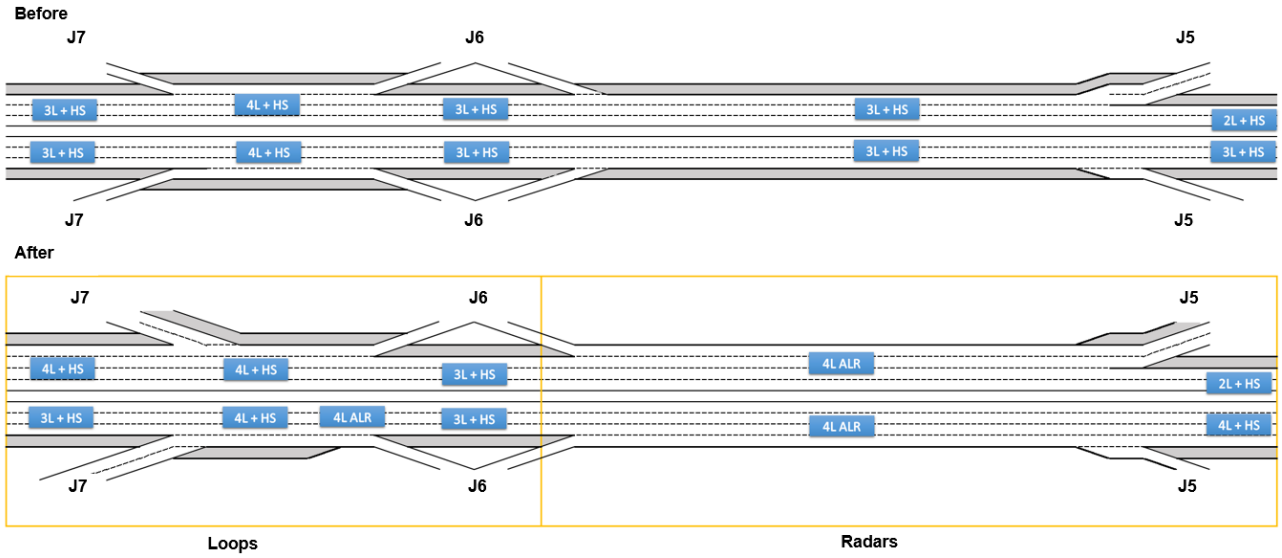
The majority of the M25 is Smart Motorway with hard shoulders which, together with the SMALR scheme, form an overall long term strategy to manage the existing motorway network more effectively.

### 1.2.2. The SMALR scheme

SMALR is a controlled four lane carriageway with no hard shoulder. This is supported by technology in the form of Motorway Incident Detection and Automatic Signalling (MIDAS) traffic detection and traffic control. The signs and signals can be controlled by operators and by automatic algorithms for Congestion Management (CM) and Queue Protection (QP). Emergency Areas (EAs) are available for emergencies.

The M25 J5 to J7 SMALR is a mixture of 4 lane ALR and 4 lanes plus hard shoulder, see Figure 1-2. It has been changed from the previous layout which was a mixture of 4 lanes plus hard shoulder and 3 lanes plus hard shoulder. As part of the upgrade to Smart Motorway, radar detectors were installed at 500m intervals from J5 to J6. Loop detectors were retained from J6 to J7.

**Figure 1-2 M25 J5 to J7 layout schematic**




## 1.3. Evaluation timescales

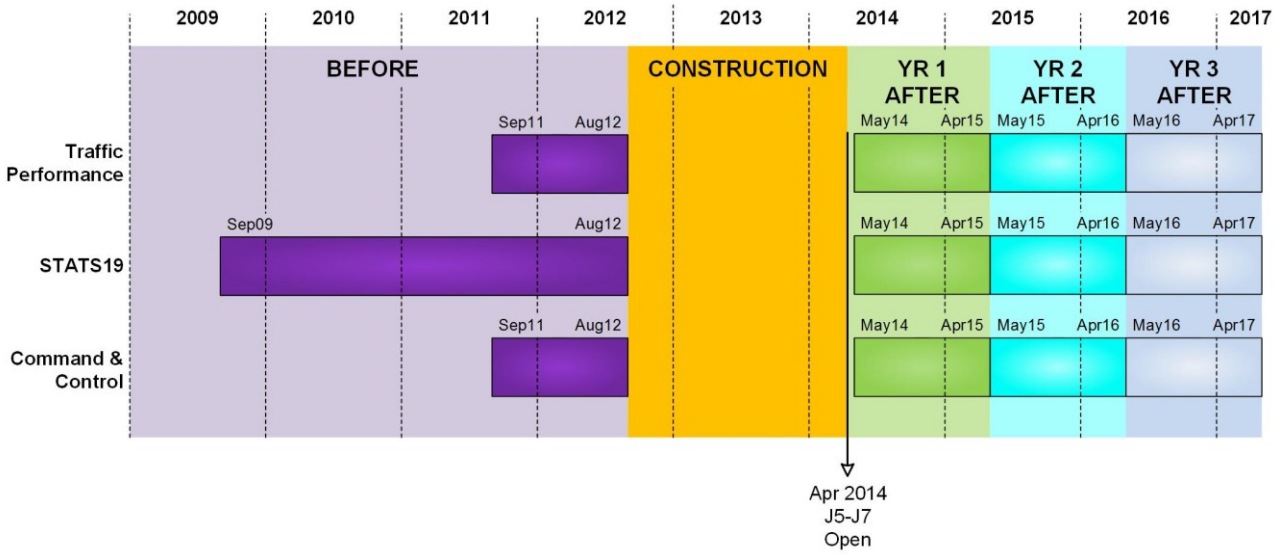
This report presents the results of evaluation and monitoring following three years' operation of the scheme from May 2014 to April 2017. For clarity and efficiency, the evaluation periods will be referred to as follows throughout this report:

- Before - Baseline;
- Yr1 After - First year after opening;
- Yr2 After - Second year after opening;
- Yr3 After - Third year after opening; and
- After - Entire after period.

The evaluation makes comparisons between the Before and After periods, while operational monitoring has taken place for Red X compliance analysis during the After periods only.

Figure 1-3 shows the evaluation periods used for the Before and After periods.

**Figure 1-3 Data collection & evaluation periods**




## 1.4. Expected effects of SMALR

The SMALR concept involves increasing the number of running lanes from three to four by re-allocating the space previously used by the hard shoulder. In addition, other infrastructure is provided to deliver a controlled environment to manage the risks associated with converting the hard shoulder to a traffic lane.

The effect of an increase in capacity is that periods of congestion are expected to be less frequent, shorter and less intense leading to reductions in journey time and better journey time reliability. The road effectively becomes more resilient to regular and incident related congestion.

In addition, safety benefits could be realised because traffic speeds become more consistent and the speed differential between lanes reduces. The number of non-emergency hard shoulder stops, which are inherently risky, is also reduced.

These effects can be seen by looking at traffic performance on a daily basis. The following subsections show speeds by lane, flows by lane, speed distribution and speed flow curves for typical days in the Before and Yr3 After periods. The plots show a snapshot of just one location and one day, to demonstrate the impacts after three years of operation.

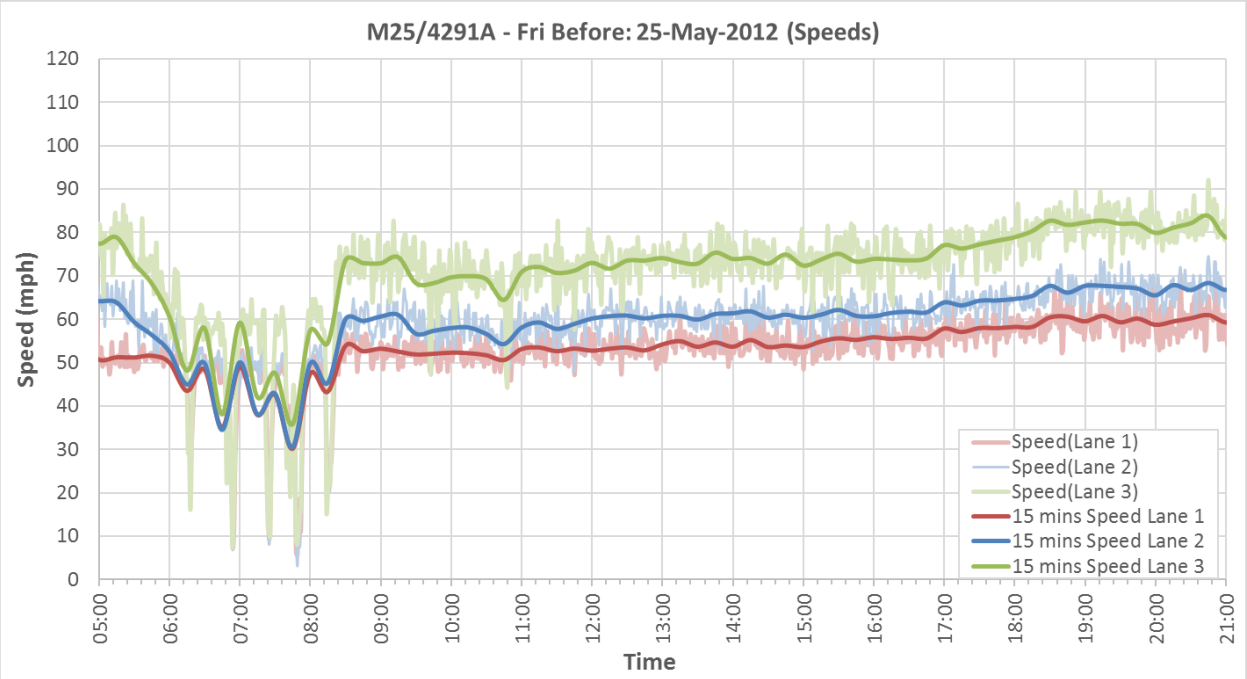
### 1.4.1. Speed by lane

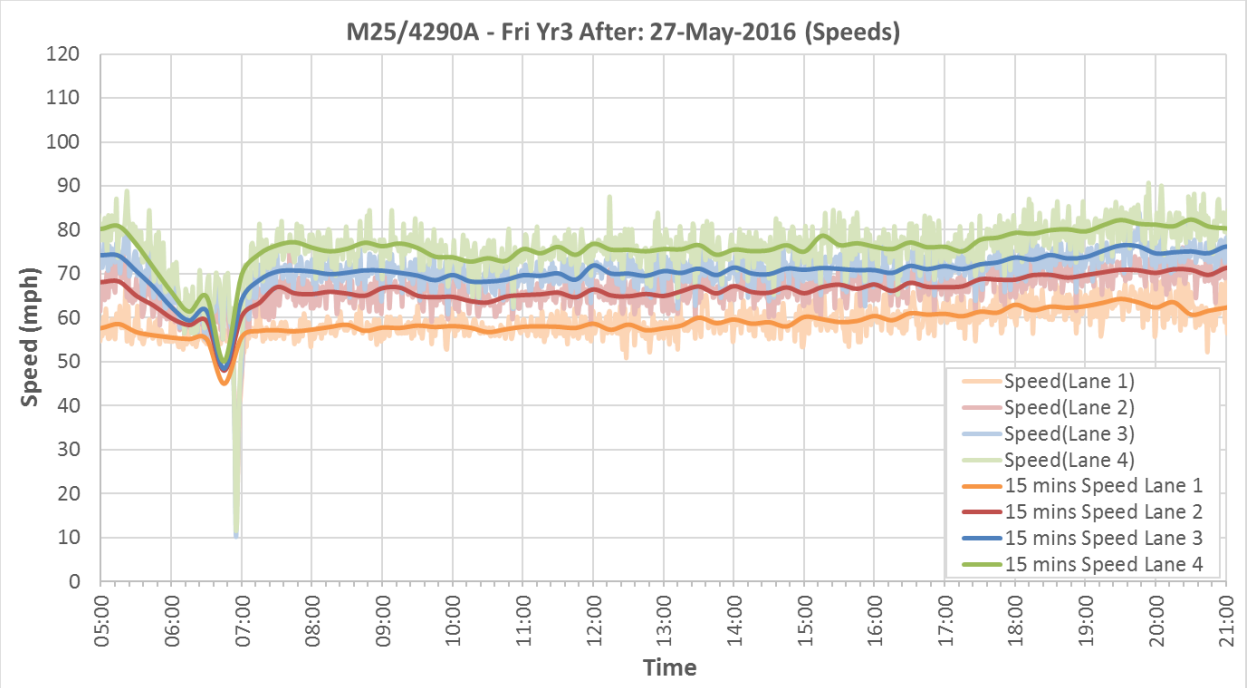
Figure 1-4 shows a snapshot of data from Before and Yr3 After collected during the evaluation process. The 15-minute average speed for each lane is also plotted on the same chart to emphasise the trend.

The congestion benefits seen in Yr1 and Yr2 are being slightly eroded. The scheme now suffers slight congestion during the AM peak in Yr3 After but still significantly less than in the Before period. In both cases, the congestion starts from about 06:00 onwards before recovering to free flow speeds. However, in Yr3 After the speeds do not fall as low or for as long as in the Before.

There has been a notable reduction in speed differential between lanes. Before the scheme there was a speed differential of about 10mph between lanes while in the Yr3 the speed differential is about 6-7mph.

**Figure 1-4 Speed by lane Before and Yr3 After**



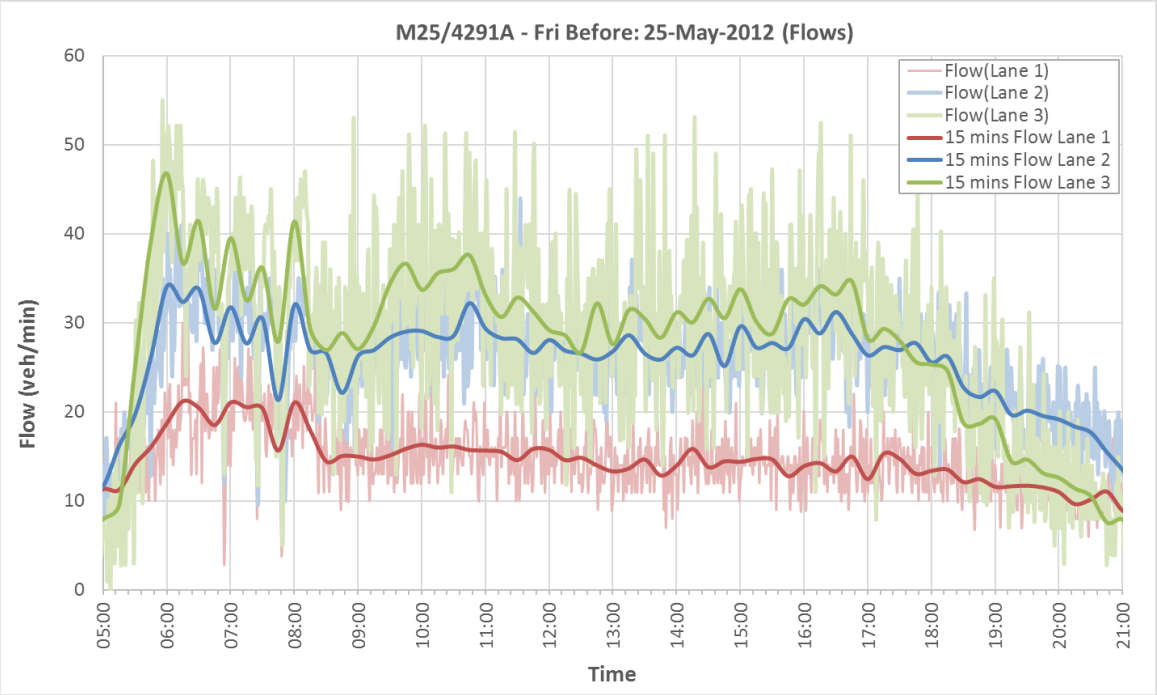



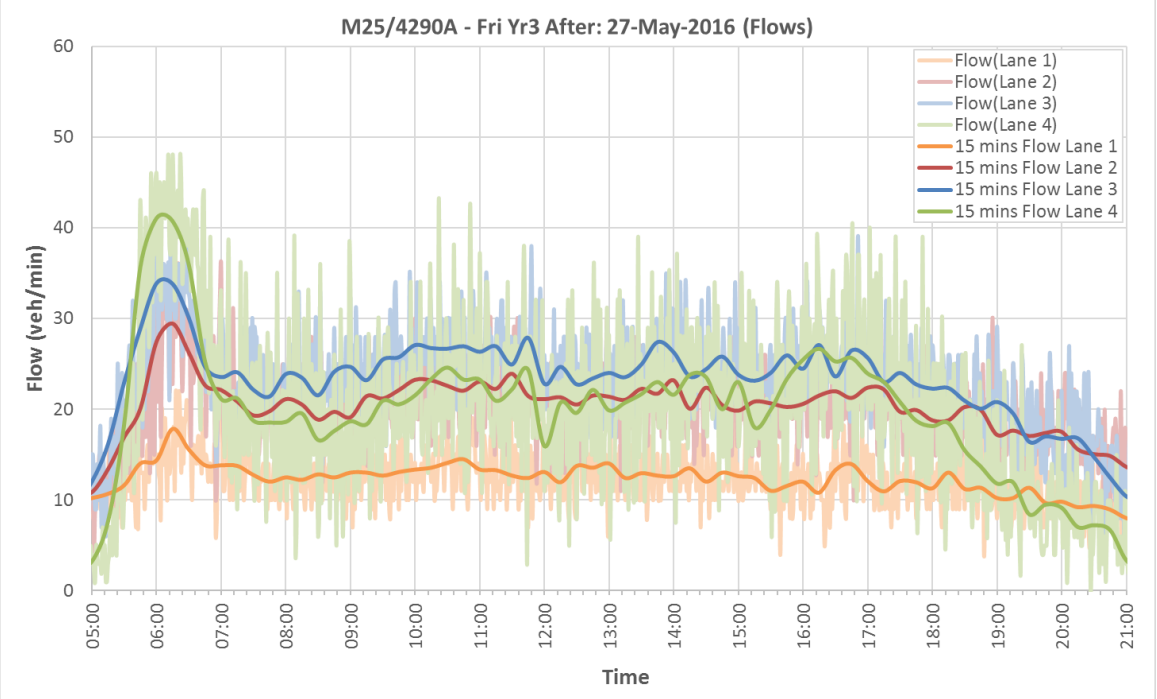

## 1.4.2. Flow by lane

Figure 1-5 shows the flow by lane for Before and Yr3 After periods. In both periods, lane 1 flows are much lower than the other lanes; this could be because there is a lane drop arrangement which can make lane 1 less likely to be used.

In the Before period, the motorway experiences high volumes of traffic throughout the day, with 15min peaks of 100vpm across the carriageway. Traffic flow in the offside lane (lane 3) is consistently higher than other lanes through the peaks and during the interpeak, suggesting the road was nearing capacity. In Yr3 After, traffic volume is higher with AM 15-minutely flows exceeding 120vpm across the carriageway. Despite some slowing in the AM peak, the motorway is not at capacity for most of the day demonstrated by offside lane flows being lower than other lanes.

**Figure 1-5 Flow by lane Before and Yr3 After**

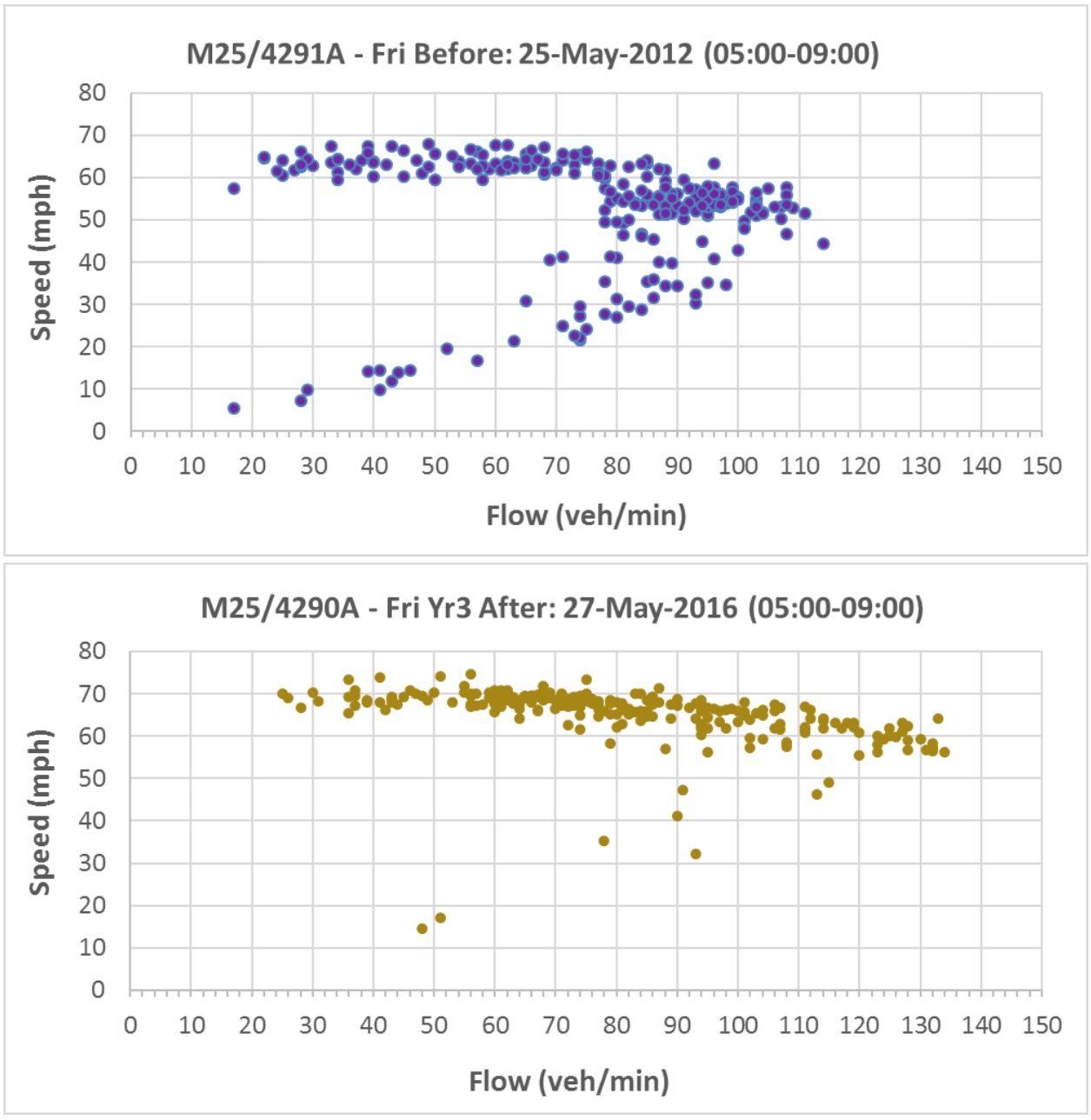


### 1.4.3. Speed flow curves

The weighted speed across the whole carriageway was plotted against the total flow to give the resulting speed-flow curves in Figure 1-6.

**Figure 1-6 Speed flow curves Before and Yr3 After**




Speed-flow curves in Figure 1-6 show that before the scheme flow peaked at 114vpm, compared to 134vpm in Yr3 After.

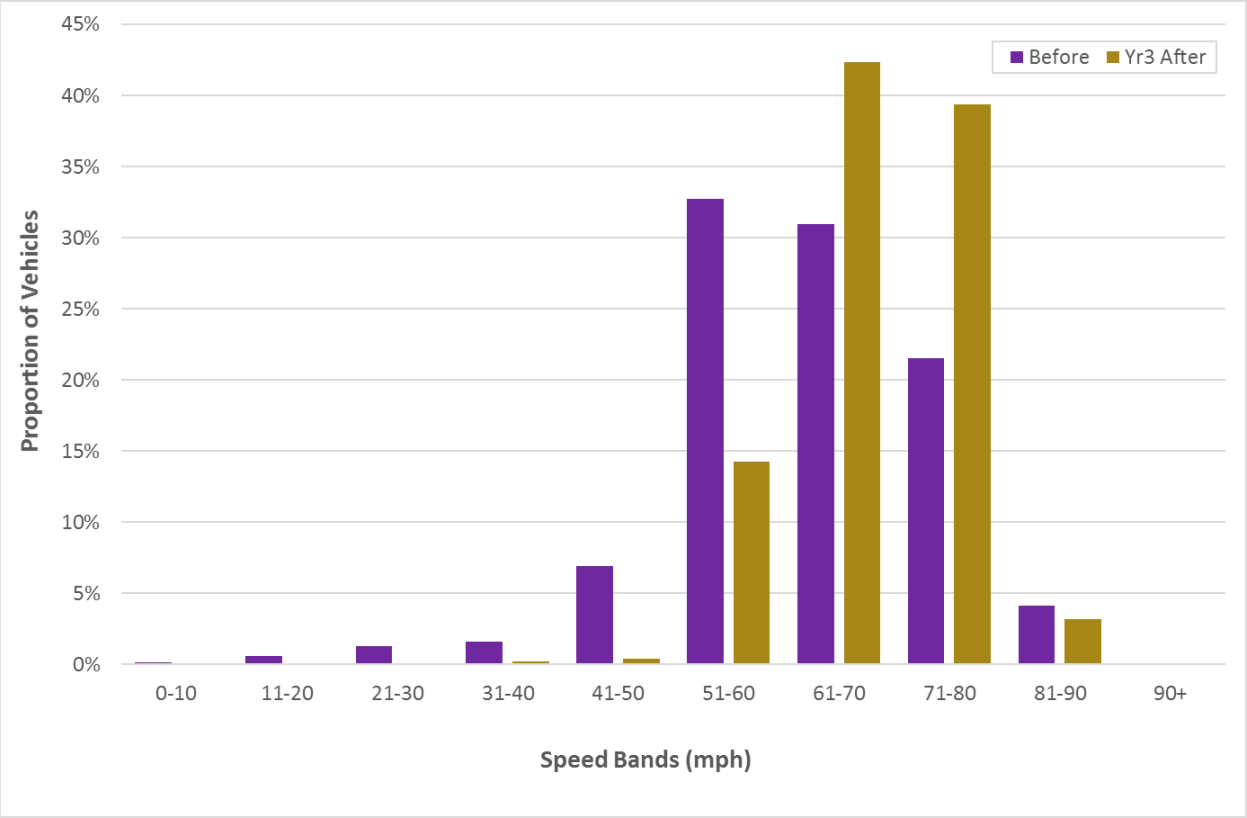
The congestion in Yr3 After is still demonstrably less than Before, but there is a small amount when in Yr2 After there was none.

### 1.4.4. Speed distribution

Figure 1-7 shows the approximate proportions[2] of vehicles travelling at speeds in different 10mph 'bands', over a 24 hour period in the Before and Yr3 After. The key points of interest are:

- Yr3 After period continues the same trend as Yr2 After, with a reduction of vehicles travelling at low speeds and an increase in vehicles travelling at free flow speeds.
- The proportion of vehicles exceeding the national restriction in the 71-80 mph has increased by nearly 50% and there is a 20% reduction in the proportion of vehicles traveling at excessive speeds in 81-90mph band.

**Figure 1-7 Speed distribution Before and Yr3 After**




[2] TCD data has been used providing the average speed minutely per lane.

# 2. Safety

## 2.1. Introduction

This section compares the Before and After safety performance of the M25 J5-7 SMALR scheme. Detailed results for J5 to J6, the ALR part of the scheme, are presented the main report. Headline findings for the whole scheme, J5 to J7, which are broadly similar, are presented in Appendix A.1.

The results from the STATS19 data have been used to identify the number and rate of personal injury collisions. For this analysis three years of data have been used for the After period which is generally accepted to be the minimum sample size due to motorways being the safest roads with relatively few collisions occurring compared to the total vehicle mileage travelled. In this case, the results were statistically significant even after two years due to the size of the change between the three years in the Before period and the two years after. They are still significant after three years.

STATS19 collates all injury collision data in a consistent manner each year and is a generally reliable source for numbers of injury collisions. Damage-only collisions are not recorded in STATS19 so it is not a record of all collisions. Recording collision details relies on police input at the collision scene, therefore there is some scope for inconsistencies when the information is recorded.

### 2.1.1. Changes in STATS19 reporting of collisions

The recent release of 2016 STATS19 data by DfT[3] has highlighted that there has been a national trend of increasing Killed and Seriously Injured (KSI) incidents across all the roads in England, including the strategic road network, which is counter to the historic trend of increasing safety. This increase affects 3 lane motorways with continuous hard shoulders as well as smart motorways, including all lane running.

A contributing factor for this increase is the change in the way incidents are automatically classified using the CRASH database. CRASH has been implemented during the After period of our evaluation. Since this change, it has become noticeable that there are subtle differences in the way the data is recorded that have made comparisons between the two datasets more challenging. Previously Police forces would have determined if somebody's injuries were slight / serious / fatal. The exact injury is now recorded by Police but categorised by the CRASH system. This has resulted in reported increases in the severity of collisions, known as 'the CRASH effect'. The DfT have identified is potentially reporting the number of serious injuries 10 to 15% higher than forces where the CRASH system is not used.

The CRASH effect, the increase in the proportion of non-fatal casualties recorded as serious, occurs due to the CRASH system deciding severity based on injury instead of the Officer in Charge (OIC) deciding severity. There are rules within the system that auto-fill some of the data, such as severity, based on other inputs. The recorded severity appears to have worsened in some cases as a result. This means the two data sets cannot be compared like-for-like, so severity results in this chapter should be treated with caution.

## 2.2. Number and rate of collisions

Table 2-1 shows the number of collisions during the Before and After periods, the rate of collisions and the percentage change. Overall the results show a 29% reduction in the collision rate. To fully understand the results, we also need to take into account the background trend in collisions described in Section 2.2.1.

The two fatal collisions in the Before period included a vehicle losing control before leaving the carriageway and a vehicle colliding with an overbridge. Both were single vehicle collisions. There were a total of 13 serious collisions in the Before period.

[3] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/648081/rrcgb2016-01.pdf

**Table 2-1 Number of collisions by severity and collision rates**

| Period | | Fatal | Serious | *Fatal & Serious* | Slight | Total |
|---|---|---|---|---|---|---|
| Before | Year 1 | 2 | 7 | 9 | 57 | 66 |
| | Year 2 | 0 | 4 | 4 | 54 | 58 |
| | Year 3 | 0 | 2 | 2 | 45 | 47 |
| | Total | 2 | 13 | 15 | 156 | 171 |
| | Collision rate (collisions per hmvm) (13.0 hmvm) | 0.154 | 0.999 | 1.153 | 11.993 | 13.146 |
| | Collision rate (collisions per mvkm) (2,093 mvkm) | 0.001 | 0.006 | 0.007 | 0.075 | 0.082 |
| After | Year 1 | 0 | 9 | 9 | 39 | 48 |
| | Year 2 | 0 | 4 | 4 | 39 | 43 |
| | Year 3 | 0 | 6 | 6 | 37 | 43 |
| | Total | 0 | 19 | 19 | 115 | 134 |
| | Collision rate (collisions per hmvm) (14.4 hmvm) | 0.000 | 1.323 | 1.323 | 8.006 | 9.329 |
| | Collision rate (collisions per mvkm) (2,312 mvkm) | 0.000 | 0.008 | 0.008 | 0.050 | 0.058 |

There have been no fatalities in the After period, however there have been a total of 19 serious collisions. These are described as follows:

- Eight collisions involving motorcycles: (from 11 collisions of all severities involving motorcycles)
  - Two due to loss of control for unknown reasons;
  - One due to a probable medical episode where the rider has slowed down and was hit by the following rider;
  - One due to a tyre blow out;
  - One where a motorcycle filtering through lanes in stationary traffic lost control as a result of a driver opening a vehicle door;
  - One due to a motorbike filtering through slow moving traffic colliding with a vehicle changing lane abruptly;
  - One due to either a motorbike filtering through traffic or a vehicle abruptly changing lanes. The cause of this collision is unclear as there are different accounts given at the scene and recorded in the STATS19 entry; and
  - One due to the motorcycle hitting the rear of a vehicle and falling;
- Three collisions associated with lane changing and/or failing to look;
- One single vehicle collision involving a vehicle losing control on a bend and colliding with the central barrier;
- Two single vehicle collisions due to a vehicle aquaplaning and losing control;
- One collision as a result of a vehicle hitting debris (tyre) in the road;
- Two nose to tail collisions:
  - One where a vehicle braked sharply for an unknown reason causing a nose to tail collision involving a total of three vehicles, the vehicle at the front and back left the scene; and
  - One nose to tail collision in a 40mph temporary speed limit involving four vehicles. (It is not stated whether the temporary 40mph speed limit was due to roadworks or queue protection);
- One collision where a vehicle swerved to avoid an animal in the carriageway, striking the crash barrier. A second vehicle collided with a section of crash barrier that had become detached and was in the carriageway; and
- One other single vehicle collision where the driver fell asleep at the wheel and left the carriageway to the nearside.

The above collisions could have happened on any section of motorway and cannot be attributed to ALR.

The contributory factors by severity for the collisions are shown in Appendix A.2.

### 2.2.1. Background trend in collisions

There is a trend over time leading to a reduction in the number of personal injury collisions against a trend of increasing traffic volumes. The reasons for the reduction are wide ranging and include improved safety

measures in vehicles and on the road. This trend needs to be accounted for when comparing the Before and After periods.

The best way to take into account the national trend 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. This provides what is known as a counterfactual 'without scheme' scenario and can be compared on a like-for-like basis with the observed After data which is the 'with scheme' scenario[4]. The difference between the numbers of collisions in these two scenarios can then be attributed to the scheme rather than the wider national trends.

Table 2-2 shows that there has been a reduction in the collision rate of 20% over and above the background reduction in collisions (compared to the 29% absolute reduction in Table 2-1).

**Table 2-2 Number of collisions and collision rates taking into account national trends**

| Period | Annual average number of collisions | Collision rate (collisions per hmvm) | Collision rate (collisions per mvkm) |
|---|---|---|---|
| Before | 57.00 | 13.15 | 0.082 |
| Counterfactual Before | 54.37 | 11.66 | 0.072 |
| After | 44.67 | 9.33 | 0.058 |

### 2.2.2. Statistical significance

A Chi squared test compared the number of Before and After collisions and Annual Average Daily Traffic flows (AADTs) against expected values if there was no change. The test result indicates that the reduction in the collision rate is statistically significant at the 95% level: We can be 95% confident that the change in collision rate is not a result of chance alone and therefore the scheme has had a direct impact on collision rates.

## 2.3. Severity and severity index

The severity index is calculated based on fatal and serious collisions as a proportion of all collisions. The results in Table 2-3 indicate an increase in the severity index; this is due partly to the relative reduction in slight collisions and partly to the relative increase in fatal and serious collisions. This should be taken in the context that the increases in KSI collision and casualty rates are not attributable to the scheme. In addition, severity index and KSI may have been impacted by the Police CRASH collision recording system which the DfT have identified is potentially reporting the number of serious injuries 10 to 15% higher than forces where the CRASH system is not used.

**Table 2-3 Collisions by severity and severity index**

| Period | Number of collisions by severity | | | | Severity Index |
|---|---|---|---|---|---|
| | Fatal | Serious | Slight | Total | |
| Before (36 months data) | 2 | 13 | 156 | 171 | 0.09 |
| After (36 months data) | 0 | 19 | 115 | 134 | 0.14 |

## 2.4. Casualties, FWI and KSI rate

Fatal and weighted injury (FWI)[5] is calculated based on the numbers of fatal, serious and slight casualties as weighted proportions, to adjust for the severity. The FWI rate allows a comparison between road sections with different flows and lengths.

[4] The counterfactual factor is calculated using the national collision data for motorway class roads After period (2015) and for the middle year in the Before period (2011). The calculated factor between these years is 0.95 for the number of collisions and 0.89 for the collision rate.
[5] FWI is defined as: (number of fatalities) + 0.1 x (number of serious casualties) + 0.01 x (number of slight casualties).

Table 2-4 shows that both the number and rate of FWIs in the After period is no more than in the Before period; this means that the scheme has met the FWI aspects of its safety objective[6].

**Table 2-4 Number of casualties and FWI rate**

| Period | Severity | | | Total | FWI | FWI rate per hmvm | FWI rate per bvkm |
|---|---|---|---|---|---|---|---|
| | Fatal | Serious | Slight | | | | |
| Before (36 months data) (13.0 hmvm, 2.09 bvkm) | 2 | 14 | 279 | 295 | 6.19 | 0.48 | 2.96 |
| After (36 months data) (14.4 hmvm, 2.31 bvkm) | 0 | 21 | 185 | 206 | 3.95 | 0.27 | 1.71 |

The results in Table 2-5 indicate an increase in the Killed and Seriously Injured (KSI) casualty rate; this is due to the proportionally larger number of serious casualties recorded is not directly attributable to the scheme. In addition, severity index and KSI may have been impacted by the Police CRASH collision recording system which the DfT have identified is potentially reporting the number of serious injuries 10 to 15% higher than forces where the CRASH system is not used.

**Table 2-5 Total KSI and KSI rate**

| Period | Total KSI casualties | KSI rate per hmvm | KSI rate per bvkm |
|---|---|---|---|
| Before (36 months data) (13.0 hmvm, 2.09 bvkm) | 16 | 1.23 | 7.64 |
| After (36 months data) (14.4 hmvm, 2.31 bvkm) | 21 | 1.46 | 9.08 |

## 2.5. User groups

The number of casualties from different user groups are shown in Appendix A.3. The results show the majority of the injuries are associated with car occupants, both Before and After. The sample sizes of casualties are too small to draw any conclusions about the changes between periods for specific user groups. Based on the data in the analysis, no user group has been adversely affected by the scheme, which meets this aspect of the safety objective.

## 2.6. Red X (lane closed) analysis

An analysis of Red X compliance was undertaken using HALOGEN data for sign and signal settings and MIDAS TCD files for minutely flows per lane. The two data sets were combined to identify lane closures and flows along the lane during the restriction. An example of a Red X event is presented in Figure 2-1.

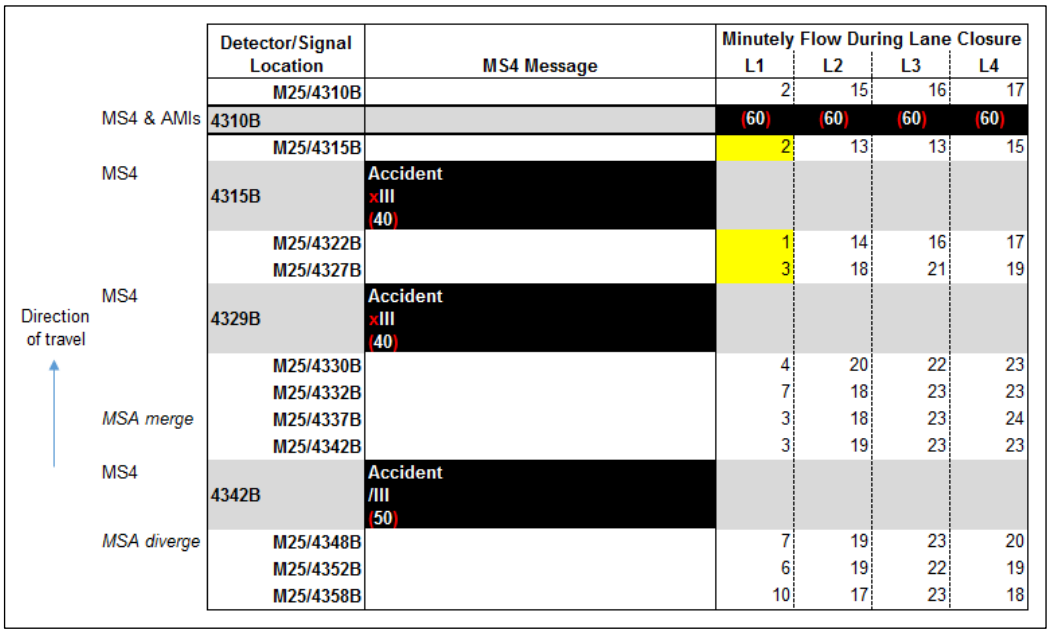
A total of 122 lane closures have been assessed in the Yr3 After period and the results are summarised in Appendix A.4. The per-lane minutely flow is provided to give an indication of how busy the motorway was; a flow of 30 vehicles per minute per lane is a high flow (one vehicle every 2 seconds).

Non-compliance in this sample ranges from 0 to 14 vehicles per minute, 0% to 20% of total flow; across all Red X events analysed the minutely average flow of non-compliance vehicles was 3 per minute. Compliance with Red X as a percentage of total flow was 94%, which is the same in the Yr2 After period and similar to the 93% in the Yr1 After period.

The percentage of non-compliance was compared to the incident duration and traffic flow; no correlation was found with either. This suggests that the subset of drivers who choose not to comply with Red Xs do so regardless of how busy the motorway is or how long the incident duration is.

[6] As required by Smart Motorways Interim Advice Note 161, http://www.standardsforhighways.co.uk/ha/standards/ians/pdfs/IAN161_15.pdf

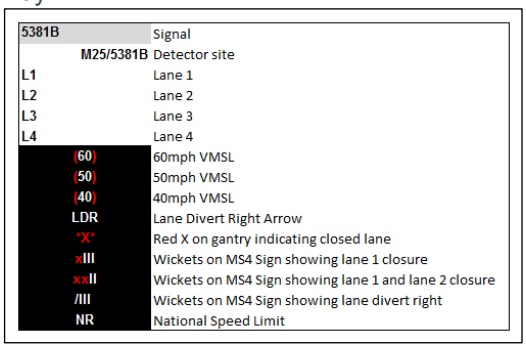
**Figure 2-1 Example lane closure event**



| | Detector/Signal Location | MS4 Message | Minutely Flow During Lane Closure L1 | L2 | L3 | L4 |
|---|---|---|---|---|---|---|
| | M25/4310B | | 2 | 15 | 16 | 17 |
| MS4 & AMIs | 4310B | | (60) | (60) | (60) | (60) |
| | M25/4315B | | 2 | 13 | 13 | 15 |
| MS4 | 4315B | Accident xIII (40) | | | | |
| | M25/4322B | | 1 | 14 | 16 | 17 |
| | M25/4327B | | 3 | 18 | 21 | 19 |
| MS4 | 4329B | Accident xIII (40) | | | | |
| | M25/4330B | | 4 | 20 | 22 | 23 |
| | M25/4332B | | 7 | 18 | 23 | 23 |
| *MSA merge* | M25/4337B | | 3 | 18 | 23 | 24 |
| | M25/4342B | | 3 | 19 | 23 | 23 |
| MS4 | 4342B | Accident /III (50) | | | | |
| *MSA diverge* | M25/4348B | | 7 | 19 | 23 | 20 |
| | M25/4352B | | 6 | 19 | 22 | 19 |
| | M25/4358B | | 10 | 17 | 23 | 18 |

Direction of travel

Key:



| | |
|---|---|
| 5381B | Signal |
| M25/5381B | Detector site |
| L1 | Lane 1 |
| L2 | Lane 2 |
| L3 | Lane 3 |
| L4 | Lane 4 |
| (60) | 60mph VMSL |
| (50) | 50mph VMSL |
| (40) | 40mph VMSL |
| LDR | Lane Divert Right Arrow |
| *X* | Red X on gantry indicating closed lane |
| xIII | Wickets on MS4 Sign showing lane 1 closure |
| xxII | Wickets on MS4 Sign showing lane 1 and lane 2 closure |
| /III | Wickets on MS4 Sign showing lane divert right |
| NR | National Speed Limit |

## 2.7. Summary

Against the background of higher flows, the scheme has exceeded its safety objective[7]:

- no increase in number or rate of fatal and weighted injury (FWI) casualties;
- no evidence that any population has been adversely affected.

The collision rate has improved as a result of the scheme. The FWI rate has also improved, while severity index and KSI rate have both increased, but these changes are not directly attributable to the scheme. In addition, severity index and KSI may have been impacted by the Police CRASH collision recording system.

Compliance with Red X signals was observed on average to be 94% of the total flow on the carriageway during the lane closure. This is consistent with findings in both Y1 and Yr2 after periods.

[7] Defined as required by Smart Motorways Interim Advice Note 161, http://www.standardsforhighways.co.uk/ha/standards/ians/pdfs/IAN161_15.pdf

# 3. Conclusions

Against the background of higher flows, the scheme has exceeded its safety objective[8]:

- no increase in number or rate of fatal and weighted injury (FWI) casualties;
- no evidence that any population has been adversely affected.

The collision rate has improved as a result of the scheme. The FWI rate has also improved, while severity index and KSI rate have both increased, but these changes are not directly attributable to the scheme. In addition, severity index and KSI may have been impacted by the Police CRASH collision recording system.

Compliance with Red X signals was observed on average to be 94% of the total flow on the carriageway during the lane closure. This is consistent with findings in both Y1 and Yr2 after periods.

[8] Defined as required by Smart Motorways Interim Advice Note 161, http://www.standardsforhighways.co.uk/ha/standards/ians/pdfs/IAN161_15.pdf

# Appendices

# Appendix A. Additional information

## A.1. Number and rate of collisions (J5 to J7)

The table below shows the number of collisions in the Before and After periods, the rate of collisions and the percentage change for the whole scheme, J5 to J7.

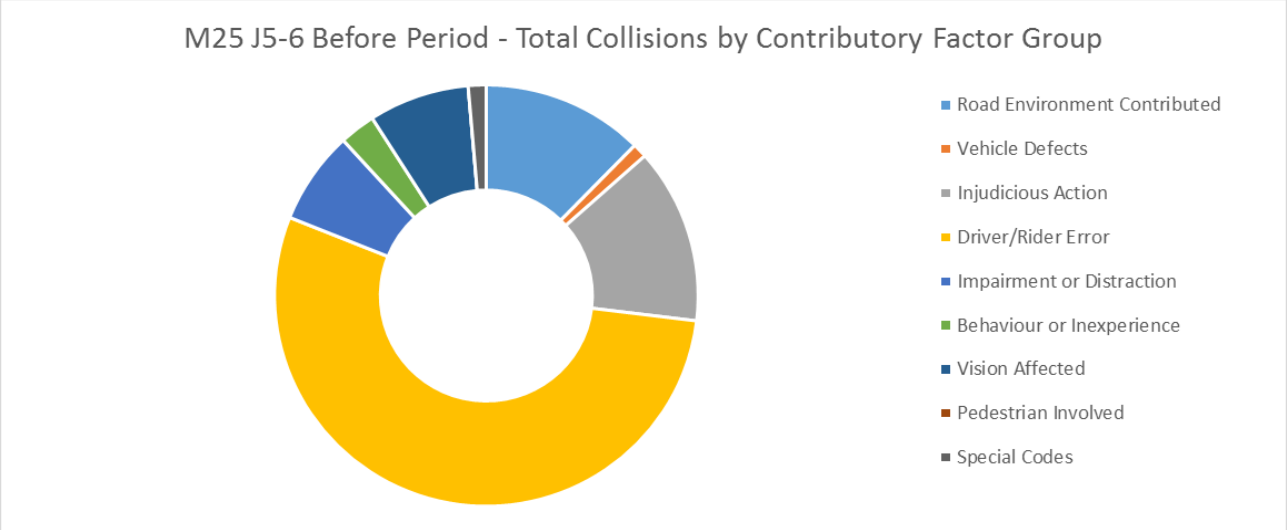
**Number of collisions by severity and collision rates**

| Period | | Fatal | Serious | *Fatal & serious* | Slight | Total |
|---|---|---|---|---|---|---|
| Before | Year 1 | 2 | 7 | 9 | 74 | 83 |
| | Year 2 | 0 | 4 | 4 | 79 | 83 |
| | Year 3 | 0 | 4 | 4 | 62 | 66 |
| | Total | 2 | 15 | 17 | 215 | 232 |
| | Collision rate (collisions per hmvm) (18.0 hmvm) | 0.111 | 0.831 | 0.942 | 11.914 | 12.856 |
| | Collision rate (collisions per mvkm) (2,906 mvkm) | 0.001 | 0.005 | 0.006 | 0.074 | 0.080 |
| After | Year 1 | 0 | 12 | 12 | 56 | 68 |
| | Year 2 | 0 | 6 | 6 | 56 | 62 |
| | Year 3 | 0 | 7 | 7 | 55 | 62 |
| | Total | 0 | 25 | 25 | 167 | 192 |
| | Collision rate (collisions per hmvm) (19.4 hmvm) | 0.000 | 1.286 | 1.286 | 8.593 | 9.879 |
| | Collision rate (collisions per mvkm) (3,128 mvkm) | 0.000 | 0.008 | 0.008 | 0.053 | 0.061 |
| % change in collision rate | | -100% | 55% | 37% | -28% | -23% |

## A.2. Contributory factors

**Contributory factors by severity Before period**

| Code | Contributory factor group | Fatal | Serious | Slight | Total |
|---|---|---|---|---|---|
| 101-109 | Road environment contributed | 1 | 9 | 35 | 45 |
| 201-206 | Vehicle defects | 0 | 0 | 4 | 4 |
| 301-310 | Injudicious action | 2 | 1 | 46 | 49 |
| 401-410 | Driver/rider error | 1 | 10 | 186 | 197 |
| 501-510 | Impairment or distraction | 0 | 1 | 25 | 26 |
| 601-607 | Behaviour or inexperience | 0 | 0 | 10 | 10 |
| 701-710 | Vision affected | 0 | 3 | 25 | 28 |
| 801-810 | Pedestrian involved | 0 | 0 | 0 | 0 |
| 901-999 | Special codes | 0 | 3 | 2 | 5 |
| Total | | 4 | 27 | 333 | 364 |



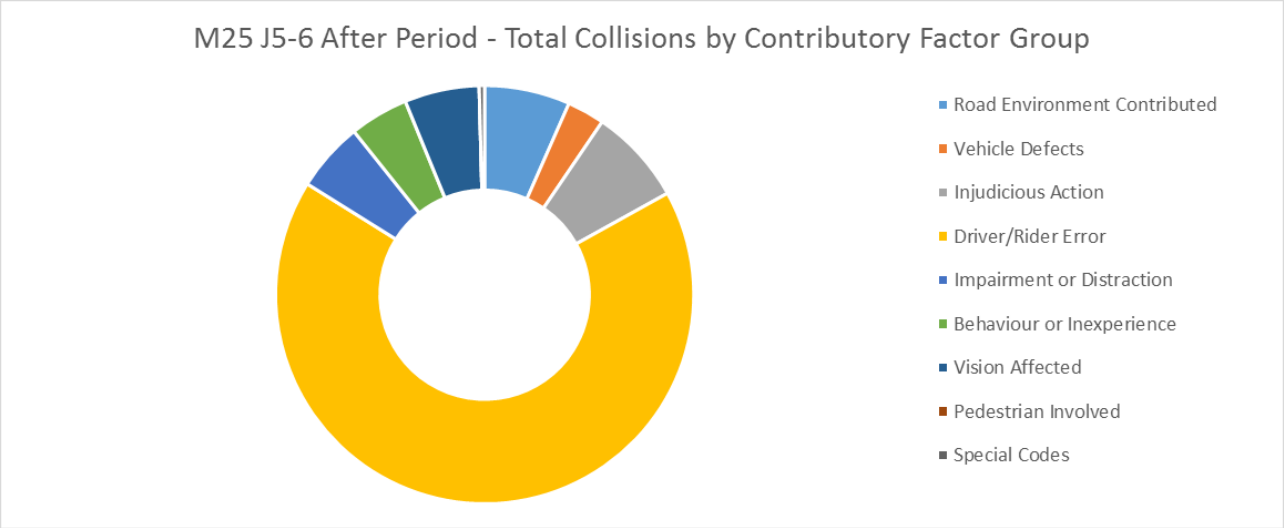
| Rank | 1 to 10 |
|---|---|
| | 11 to 15 |

| Code | Contributory factors | Fatal | Serious | Slight | Total | Rank |
|---|---|---|---|---|---|---|
| **Road environment contributed** | | **1** | **9** | **35** | **45** | |
| 101 | Poor or defective road surface | 0 | 2 | 1 | 3 | 15 |
| 102 | Deposit on road (e.g. oil, mud, chippings) | 0 | 1 | 0 | 1 | 26 |
| 103 | Slippery road (due to weather) | 1 | 6 | 32 | 39 | **3** |
| 104 | Inadequate or masked signs or road markings | 0 | 0 | 0 | 0 | |
| 105 | Defective traffic signals | 0 | 0 | 0 | 0 | |
| 106 | Traffic calming (e.g. speed cushions, road humps, chicanes) | 0 | 0 | 0 | 0 | |
| 107 | Temporary road layout (e.g. contraflow) | 0 | 0 | 0 | 0 | |
| 108 | Road layout (e.g. bend, hill, narrow carriageway) | 0 | 0 | 0 | 0 | |
| 109 | Animal or object in carriageway | 0 | 0 | 2 | 2 | 18 |
| **Vehicle defects** | | **0** | **0** | **4** | **4** | |
| 201 | Tyres illegal, defective or under-inflated | 0 | 0 | 2 | 2 | 18 |
| 202 | Defective lights or indicators | 0 | 0 | 0 | 0 | |
| 203 | Defective brakes | 0 | 0 | 0 | 0 | |
| 204 | Defective steering or suspension | 0 | 0 | 1 | 1 | 26 |
| 205 | Defective or missing mirrors | 0 | 0 | 0 | 0 | |
| 206 | Overloaded or poorly loaded vehicle or trailer | 0 | 0 | 1 | 1 | 26 |
| **Injudicious action** | | **2** | **1** | **46** | **49** | |
| 301 | Disobeyed automatic traffic signal | 0 | 0 | 0 | 0 | |
| 302 | Disobeyed 'Give Way' or 'Stop' sign or markings | 0 | 0 | 0 | 0 | |
| 303 | Disobeyed double white lines | 0 | 0 | 0 | 0 | |
| 304 | Disobeyed pedestrian crossing facility | 0 | 0 | 0 | 0 | |
| 305 | Illegal turn or direction of travel | 0 | 0 | 0 | 0 | |
| 306 | Exceeding speed limit | 1 | 0 | 0 | 1 | 26 |
| 307 | Travelling too fast for conditions | 1 | 1 | 17 | 19 | **7** |
| 308 | Following too close | 0 | 0 | 29 | 29 | **6** |
| 309 | Vehicle travelling along pavement | 0 | 0 | 0 | 0 | |
| 310 | Cyclist entering road from pavement | 0 | 0 | 0 | 0 | |
| **Driver/rider error** | | **1** | **10** | **186** | **197** | |
| 401 | Junction overshoot | 0 | 0 | 1 | 1 | 26 |
| 402 | Junction restart (moving off at junction) | 0 | 0 | 0 | 0 | |
| 403 | Poor turn or manoeuvre | 0 | 0 | 12 | 12 | **10** |
| 404 | Failed to signal or misleading signal | 0 | 0 | 2 | 2 | 18 |
| 405 | Failed to look properly | 0 | 2 | 57 | 59 | **1** |
| 406 | Failed to judge other person's path or speed | 0 | 0 | 33 | 33 | **5** |
| 407 | Passing too close to cyclist, horse rider or pedestrian | 0 | 0 | 0 | 0 | |
| 408 | Sudden braking | 0 | 2 | 39 | 41 | **2** |
| 409 | Swerved | 0 | 0 | 11 | 11 | 11 |
| 410 | Loss of control | 1 | 6 | 31 | 38 | **4** |
| **Impairment or distraction** | | **0** | **1** | **25** | **26** | |
| 501 | Impaired by alcohol | 0 | 0 | 3 | 3 | 15 |
| 502 | Impaired by drugs (illicit or medicinal) | 0 | 0 | 0 | 0 | |
| 503 | Fatigue | 0 | 1 | 16 | 17 | **9** |
| 504 | Uncorrected, defective eye sight | 0 | 0 | 0 | 0 | |
| 505 | Illness or disability, mental or physical | 0 | 0 | 2 | 2 | 18 |
| 506 | Not displaying lights at night or in poor visibility | 0 | 0 | 0 | 0 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 507 | Cyclist wearing dark clothing at night | 0 | 0 | 0 | 0 | |
| 508 | Driver using mobile phone | 0 | 0 | 1 | 1 | 26 |
| 509 | Distraction in vehicle | 0 | 0 | 2 | 2 | 18 |
| 510 | Distraction outside vehicle | 0 | 0 | 1 | 1 | 26 |
| **Behaviour or inexperience** | | **0** | **0** | **10** | **10** | |
| 601 | Aggressive driving | 0 | 0 | 0 | 0 | |
| 602 | Careless, reckless or in a hurry | 0 | 0 | 2 | 2 | 18 |
| 603 | Nervous, uncertain or panic | 0 | 0 | 1 | 1 | 26 |
| 604 | Driving too slow for conditions or slow vehicle (e.g. tractor) | 0 | 0 | 2 | 2 | 18 |
| 605 | Learner or inexperienced driver / rider | 0 | 0 | 0 | 0 | |
| 606 | Inexperience of driving to the left | 0 | 0 | 4 | 4 | 14 |
| 607 | Unfamiliar with model of the vehicle | 0 | 0 | 1 | 1 | 26 |
| **Vision affected** | | **0** | **3** | **25** | **28** | |
| 701 | Stationary or parked vehicle(s) | 0 | 0 | 0 | 0 | |
| 702 | Vegetation | 0 | 0 | 0 | 0 | |
| 703 | Road layout (e.g. bend, winding road, hill crest) | 0 | 0 | 0 | 0 | |
| 704 | Buildings, road signs, street furniture | 0 | 0 | 0 | 0 | |
| 705 | Dazzling headlights | 0 | 0 | 0 | 0 | |
| 706 | Dazzling sun | 0 | 1 | 1 | 2 | 18 |
| 707 | Rain, sleet, snow or fog | 0 | 0 | 3 | 3 | 15 |
| 708 | Spray from other vehicles | 0 | 1 | 4 | 5 | 12 |
| 709 | Visor or windscreen dirty or scratched | 0 | 0 | 0 | 0 | |
| 710 | Vehicle blind spot | 0 | 1 | 17 | 18 | **8** |
| **Pedestrian involved** | | **0** | **0** | **0** | **0** | |
| 801 | Crossing road masked by stationary or parked vehicle | 0 | 0 | 0 | 0 | |
| 802 | Failed to look properly | 0 | 0 | 0 | 0 | |
| 803 | Failed to judge vehicle's path or speed | 0 | 0 | 0 | 0 | |
| 804 | Wrong use of pedestrian crossing facility | 0 | 0 | 0 | 0 | |
| 805 | Dangerous action in carriageway (e.g. playing) | 0 | 0 | 0 | 0 | |
| 806 | Impaired by alcohol | 0 | 0 | 0 | 0 | |
| 807 | Impaired by drugs (illicit or medicinal) | 0 | 0 | 0 | 0 | |
| 808 | Careless, reckless or in a hurry | 0 | 0 | 0 | 0 | |
| 809 | Pedestrian wearing dark clothing at night | 0 | 0 | 0 | 0 | |
| 810 | Disability or illness, mental or physical | 0 | 0 | 0 | 0 | |
| **Special codes** | | **0** | **3** | **2** | **5** | |
| 901 | Stolen vehicle | 0 | 0 | 0 | 0 | |
| 902 | Vehicle in course of crime | 0 | 0 | 0 | 0 | |
| 903 | Emergency vehicle on a call | 0 | 0 | 0 | 0 | |
| 904 | Vehicle door opened or closed negligently | 0 | 0 | 0 | 0 | |
| 999 | Other | 0 | 3 | 2 | 5 | 12 |

**Contributory factors by severity After period**

| Code | Contributory factor group | Fatal | Serious | Slight | Total |
|---|---|---|---|---|---|
| 101-109 | Road environment contributed | 0 | 3 | 13 | 16 |
| 201-206 | Vehicle defects | 0 | 2 | 5 | 7 |
| 301-310 | Injudicious action | 0 | 2 | 16 | 18 |
| 401-410 | Driver/rider error | 0 | 15 | 147 | 162 |
| 501-510 | Impairment or distraction | 0 | 3 | 10 | 13 |
| 601-607 | Behaviour or inexperience | 0 | 0 | 11 | 11 |
| 701-710 | Vision affected | 0 | 2 | 12 | 14 |
| 801-810 | Pedestrian involved | 0 | 0 | 0 | 0 |
| 901-999 | Special codes | 0 | 0 | 1 | 1 |
| Total | | 0 | 27 | 215 | 242 |



| Rank | 1 to 10 |
|---|---|
| | 11 to 15 |

| Code | Contributory factors | Fatal | Serious | Slight | Total | Rank |
|---|---|---|---|---|---|---|
| **Road environment contributed** | | **0** | **3** | **13** | **16** | |
| 101 | Poor or defective road surface | 0 | 0 | 0 | 0 | |
| 102 | Deposit on road (e.g. oil, mud, chippings) | 0 | 0 | 0 | 0 | |
| 103 | Slippery road (due to weather) | 0 | 1 | 12 | 13 | **5** |
| 104 | Inadequate or masked signs or road markings | 0 | 0 | 0 | 0 | |
| 105 | Defective traffic signals | 0 | 0 | 0 | 0 | |
| 106 | Traffic calming (e.g. speed cushions, road humps, chicanes) | 0 | 0 | 0 | 0 | |
| 107 | Temporary road layout (e.g. contraflow) | 0 | 0 | 1 | 1 | 24 |
| 108 | Road layout (e.g. bend, hill, narrow carriageway) | 0 | 0 | 0 | 0 | |
| 109 | Animal or object in carriageway | 0 | 2 | 0 | 2 | 18 |
| **Vehicle defects** | | **0** | **2** | **5** | **7** | |
| 201 | Tyres illegal, defective or under-inflated | 0 | 1 | 2 | 3 | 15 |
| 202 | Defective lights or indicators | 0 | 0 | 0 | 0 | |
| 203 | Defective brakes | 0 | 1 | 1 | 2 | 18 |
| 204 | Defective steering or suspension | 0 | 0 | 1 | 1 | 24 |
| 205 | Defective or missing mirrors | 0 | 0 | 0 | 0 | |
| 206 | Overloaded or poorly loaded vehicle or trailer | 0 | 0 | 1 | 1 | 24 |
| **Injudicious action** | | **0** | **2** | **16** | **18** | |
| 301 | Disobeyed automatic traffic signal | 0 | 0 | 0 | 0 | |
| 302 | Disobeyed 'Give Way' or 'Stop' sign or markings | 0 | 0 | 0 | 0 | |
| 303 | Disobeyed double white lines | 0 | 0 | 0 | 0 | |
| 304 | Disobeyed pedestrian crossing facility | 0 | 0 | 0 | 0 | |
| 305 | Illegal turn or direction of travel | 0 | 0 | 2 | 2 | 18 |
| 306 | Exceeding speed limit | 0 | 0 | 2 | 2 | 18 |
| 307 | Travelling too fast for conditions | 0 | 1 | 8 | 9 | **8** |
| 308 | Following too close | 0 | 1 | 4 | 5 | **9** |
| 309 | Vehicle travelling along pavement | 0 | 0 | 0 | 0 | |
| 310 | Cyclist entering road from pavement | 0 | 0 | 0 | 0 | |
| **Driver/rider error** | | **0** | **15** | **147** | **162** | |
| 401 | Junction overshoot | 0 | 0 | 2 | 2 | 18 |
| 402 | Junction restart (moving off at junction) | 0 | 0 | 0 | 0 | |
| 403 | Poor turn or manoeuvre | 0 | 2 | 12 | 14 | **4** |
| 404 | Failed to signal or misleading signal | 0 | 0 | 1 | 1 | 24 |
| 405 | Failed to look properly | 0 | 5 | 59 | 64 | **1** |
| 406 | Failed to judge other person's path or speed | 0 | 5 | 41 | 46 | **2** |
| 407 | Passing too close to cyclist, horse rider or pedestrian | 0 | 0 | 0 | 0 | |
| 408 | Sudden braking | 0 | 1 | 17 | 18 | **3** |
| 409 | Swerved | 0 | 0 | 4 | 4 | 11 |
| 410 | Loss of control | 0 | 2 | 11 | 13 | **5** |
| **Impairment or distraction** | | **0** | **3** | **10** | **13** | |
| 501 | Impaired by alcohol | 0 | 0 | 4 | 4 | 11 |
| 502 | Impaired by drugs (illicit or medicinal) | 0 | 0 | 0 | 0 | |
| 503 | Fatigue | 0 | 2 | 2 | 4 | 11 |
| 504 | Uncorrected, defective eye sight | 0 | 0 | 0 | 0 | |
| 505 | Illness or disability, mental or physical | 0 | 1 | 2 | 3 | 15 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 506 | Not displaying lights at night or in poor visibility | 0 | 0 | 0 | 0 | |
| 507 | Cyclist wearing dark clothing at night | 0 | 0 | 0 | 0 | |
| 508 | Driver using mobile phone | 0 | 0 | 0 | 0 | |
| 509 | Distraction in vehicle | 0 | 0 | 1 | 1 | 24 |
| 510 | Distraction outside vehicle | 0 | 0 | 1 | 1 | 24 |
| **Behaviour or inexperience** | | **0** | **0** | **11** | **11** | |
| 601 | Aggressive driving | 0 | 0 | 4 | 4 | 11 |
| 602 | Careless, reckless or in a hurry | 0 | 0 | 5 | 5 | **9** |
| 603 | Nervous, uncertain or panic | 0 | 0 | 2 | 2 | 18 |
| 604 | Driving too slow for conditions or slow vehicle (e.g. tractor) | 0 | 0 | 0 | 0 | |
| 605 | Learner or inexperienced driver / rider | 0 | 0 | 0 | 0 | |
| 606 | Inexperience of driving to the left | 0 | 0 | 0 | 0 | |
| 607 | Unfamiliar with model of the vehicle | 0 | 0 | 0 | 0 | |
| **Vision affected** | | **0** | **2** | **12** | **14** | |
| 701 | Stationary or parked vehicle(s) | 0 | 0 | 0 | 0 | |
| 702 | Vegetation | 0 | 0 | 0 | 0 | |
| 703 | Road layout (e.g. bend, winding road, hill crest) | 0 | 0 | 0 | 0 | |
| 704 | Buildings, road signs, street furniture | 0 | 0 | 0 | 0 | |
| 705 | Dazzling headlights | 0 | 0 | 0 | 0 | |
| 706 | Dazzling sun | 0 | 0 | 0 | 0 | |
| 707 | Rain, sleet, snow or fog | 0 | 0 | 3 | 3 | 15 |
| 708 | Spray from other vehicles | 0 | 0 | 1 | 1 | 24 |
| 709 | Visor or windscreen dirty or scratched | 0 | 0 | 0 | 0 | |
| 710 | Vehicle blind spot | 0 | 2 | 8 | 10 | **7** |
| **Pedestrian involved** | | **0** | **0** | **0** | **0** | |
| 801 | Crossing road masked by stationary or parked vehicle | 0 | 0 | 0 | 0 | |
| 802 | Failed to look properly | 0 | 0 | 0 | 0 | |
| 803 | Failed to judge vehicle's path or speed | 0 | 0 | 0 | 0 | |
| 804 | Wrong use of pedestrian crossing facility | 0 | 0 | 0 | 0 | |
| 805 | Dangerous action in carriageway (e.g. playing) | 0 | 0 | 0 | 0 | |
| 806 | Impaired by alcohol | 0 | 0 | 0 | 0 | |
| 807 | Impaired by drugs (illicit or medicinal) | 0 | 0 | 0 | 0 | |
| 808 | Careless, reckless or in a hurry | 0 | 0 | 0 | 0 | |
| 809 | Pedestrian wearing dark clothing at night | 0 | 0 | 0 | 0 | |
| 810 | Disability or illness, mental or physical | 0 | 0 | 0 | 0 | |
| **Special codes** | | **0** | **0** | **1** | **1** | |
| 901 | Stolen vehicle | 0 | 0 | 0 | 0 | |
| 902 | Vehicle in course of crime | 0 | 0 | 0 | 0 | |
| 903 | Emergency vehicle on a call | 0 | 0 | 0 | 0 | |
| 904 | Vehicle door opened or closed negligently | 0 | 0 | 0 | 0 | |
| 999 | Other | 0 | 0 | 1 | 1 | 24 |

## A.3. Injury collisions by user group

**Injury collisions by user group**

| User group | Before (36 months data) | | After (36 months data) | |
|---|---|---|---|---|
| | Number | % of total casualties (295) | Number | % of total casualties (206) |
| Pedestrians | 0 | 0.0% | 0 | 0.0% |
| Motorcyclists | 8 | 2.7% | 11 | 5.3% |
| Car occupants | 262 | 88.8% | 177 | 85.9% |
| Taxi / Private hire vehicles occupants | 0 | 0.0% | 0 | 0.0% |
| Van occupants | 14 | 4.7% | 15 | 7.3% |
| HGV occupants | 8 | 2.7% | 3 | 1.5% |
| Public service vehicles | 0 | 0.0% | 0 | 0.0% |
| Road worker - On road resources (ORR) | 0 | 0.0% | 0 | 0.0% |
| Road worker - Maintenance workers | 0 | 0.0% | 0 | 0.0% |
| Emergency services | 0 | 0.0% | 0 | 0.0% |
| Private recovery organisations | 0 | 0.0% | 0 | 0.0% |
| Minibus (8-16 passenger seats) | 1 | 0.3% | 0 | 0.0% |
| Bus or Coach (17 or more passenger seats) | 0 | 0.0% | 0 | 0.0% |
| Other (type of vehicle not specified in STATS19 data) | 2 | 0.7% | 0 | 0.0% |
| Disabled drivers or passengers | 2 | 0.7% | 1 | 0.5% |
| Not classified | 0 | 0.0% | 0 | 0.0% |

## A.4. Red X compliance

**Summary of Red X events analysed**

| Duration (mins) | Total number of non-compliant vehicles | Per-lane average minutely flow during lane closure | Average minutely flow of non-compliant vehicles | Percentage non-compliance |
|---|---|---|---|---|
| 12 | 30 | 19 | 3 | 3% |
| 14 | 45 | 16 | 3 | 4% |
| 25 | 71 | 10 | 3 | 7% |
| 86 | 194 | 11 | 2 | 5% |
| 17 | 9 | 2 | 1 | 5% |
| 10 | 9 | 10 | 1 | 2% |
| 17 | 40 | 6 | 2 | 11% |
| 23 | 26 | 3 | 1 | 11% |
| 32 | 320 | 17 | 10 | 15% |
| 28 | 135 | 9 | 5 | 13% |
| 41 | 538 | 16 | 13 | 20% |
| 43 | 239 | 17 | 6 | 8% |
| 17 | 96 | 18 | 6 | 8% |

| Duration (mins) | Total number of non-compliant vehicles | Per-lane average minutely flow during lane closure | Average minutely flow of non-compliant vehicles | Percentage non-compliance |
|---|---|---|---|---|
| 15 | 43 | 14 | 3 | 5% |
| 27 | 179 | 12 | 7 | 13% |
| 6 | 7 | 3 | 1 | 11% |
| 6 | 15 | 3 | 2 | 18% |
| 11 | 61 | 15 | 6 | 9% |
| 35 | 55 | 9 | 2 | 4% |
| 38 | 51 | 6 | 1 | 6% |
| 28 | 176 | 16 | 6 | 10% |
| 8 | 21 | 11 | 3 | 6% |
| 21 | 114 | 13 | 5 | 11% |
| 10 | 11 | 17 | 1 | 2% |
| 17 | 89 | 16 | 5 | 8% |
| 17 | 119 | 17 | 7 | 10% |
| 18 | 40 | 14 | 2 | 4% |
| 25 | 269 | 16 | 11 | 17% |
| 19 | 66 | 9 | 3 | 9% |
| 28 | 266 | 19 | 9 | 13% |
| 126 | 639 | 17 | 5 | 8% |
| 20 | 51 | 14 | 3 | 5% |
| 2 | 5 | 11 | 3 | 6% |
| 15 | 56 | 15 | 4 | 6% |
| 1 | 3 | 15 | 3 | 5% |
| 13 | 134 | 19 | 10 | 14% |
| 8 | 20 | 15 | 3 | 4% |
| 26 | 276 | 17 | 11 | 15% |
| 17 | 69 | 9 | 4 | 11% |
| 27 | 284 | 22 | 11 | 12% |
| 6 | 12 | 17 | 2 | 3% |
| 51 | 72 | 16 | 1 | 2% |
| 11 | 93 | 12 | 8 | 18% |
| 8 | 63 | 13 | 8 | 15% |
| 20 | 246 | 22 | 12 | 14% |
| 1 | 6 | 13 | 6 | 12% |
| 20 | 65 | 21 | 3 | 4% |
| 20 | 87 | 17 | 4 | 6% |
| 20 | 85 | 11 | 4 | 9% |
| 45 | 81 | 13 | 2 | 4% |
| 172 | 79 | 16 | 0 | 1% |
| 15 | 46 | 17 | 3 | 5% |
| 19 | 117 | 11 | 6 | 14% |
| 24 | 63 | 3 | 3 | 20% |

| Duration (mins) | Total number of non-compliant vehicles | Per-lane average minutely flow during lane closure | Average minutely flow of non-compliant vehicles | Percentage non-compliance |
|---|---|---|---|---|
| 31 | 20 | 11 | 1 | 1% |
| 20 | 93 | 15 | 5 | 8% |
| 24 | 39 | 12 | 2 | 3% |
| 36 | 517 | 22 | 14 | 17% |
| 14 | 123 | 15 | 9 | 15% |
| 38 | 200 | 13 | 5 | 10% |
| 18 | 108 | 13 | 6 | 12% |
| 30 | 85 | 6 | 3 | 12% |
| 24 | 8 | 3 | 0 | 3% |
| 1 | 0 | 10 | 0 | 0% |
| 11 | 15 | 10 | 1 | 3% |
| 31 | 8 | 7 | 0 | 1% |
| 3 | 7 | 16 | 2 | 4% |
| 23 | 3 | 1 | 0 | 3% |
| 40 | 4 | 18 | 0 | 0% |
| 141 | 241 | 17 | 2 | 2% |
| 23 | 38 | 10 | 2 | 4% |
| 22 | 86 | 18 | 4 | 5% |
| 11 | 6 | 6 | 1 | 3% |
| 19 | 55 | 18 | 3 | 4% |
| 13 | 36 | 10 | 3 | 7% |
| 52 | 173 | 19 | 3 | 4% |
| 12 | 9 | 18 | 1 | 1% |
| 8 | 16 | 12 | 2 | 4% |
| 47 | 124 | 12 | 3 | 5% |
| 6 | 3 | 10 | 0 | 1% |
| 17 | 14 | 3 | 1 | 6% |
| 28 | 13 | 7 | 0 | 2% |
| 17 | 14 | 16 | 1 | 1% |
| 8 | 23 | 10 | 3 | 7% |
| 16 | 13 | 9 | 1 | 2% |
| 5 | 14 | 20 | 3 | 3% |
| 12 | 7 | 12 | 1 | 1% |
| 39 | 114 | 14 | 3 | 5% |
| 1 | 2 | 6 | 2 | 8% |
| 34 | 44 | 10 | 1 | 3% |
| 16 | 10 | 16 | 1 | 1% |
| 1 | 4 | 15 | 4 | 6% |
| 14 | 7 | 12 | 0 | 1% |
| 61 | 24 | 20 | 0 | 0% |
| 20 | 6 | 9 | 0 | 1% |

| Duration (mins) | Total number of non-compliant vehicles | Per-lane average minutely flow during lane closure | Average minutely flow of non-compliant vehicles | Percentage non-compliance |
|---|---|---|---|---|
| 112 | 16 | 5 | 0 | 1% |
| 13 | 10 | 11 | 1 | 2% |
| 11 | 2 | 10 | 0 | 0% |
| 22 | 2 | 3 | 0 | 1% |
| 55 | 11 | 12 | 0 | 0% |
| 2 | 2 | 18 | 1 | 1% |
| 22 | 106 | 14 | 5 | 9% |
| 13 | 3 | 12 | 0 | 0% |
| 106 | 376 | 17 | 4 | 5% |
| 15 | 9 | 13 | 1 | 1% |
| 11 | 4 | 13 | 0 | 1% |
| 73 | 189 | 19 | 3 | 3% |
| 4 | 3 | 16 | 1 | 1% |
| 1 | 1 | 19 | 1 | 1% |
| 27 | 17 | 17 | 1 | 1% |
| 24 | 2 | 7 | 0 | 0% |
| 22 | 33 | 20 | 2 | 2% |
| 3 | 5 | 8 | 2 | 6% |
| 31 | 160 | 23 | 5 | 6% |
| 2 | 1 | 14 | 0 | 1% |
| 50 | 8 | 5 | 0 | 1% |
| 22 | 7 | 15 | 0 | 1% |
| 10 | 4 | 6 | 0 | 2% |
| 16 | 9 | 13 | 1 | 1% |
| 3 | 5 | 19 | 2 | 2% |
| 11 | 18 | 16 | 2 | 3% |
| 95 | 153 | 15 | 2 | 3% |
| Average: 26 | Average: 77 | Average: 13 | Average: 3 | Average: 6% |