Smart motorways stocktake

Second year progress report 2022

Contents

Foreword

At National Highways, safety is at the forefront of every decision we make, and we are committed to the safety of everyone who uses our roads.

Our network enables people to drive to work, to visit family and friends, to do business and much more. We work hard to help drivers and their passengers be safer and feel safe on our roads. That includes our smart motorway sections which were developed to create more space so more people can travel as conveniently and reliably as possible.

It is now two years since the Transport Secretary published the ***Smart motorway stocktake and action plan*** in March 2020. Over the past year, the Transport Select Committee (TSC) completed its inquiry and published its report into the ***Rollout and safety of smart motorways***. In response to that report, the Government agreed to all the TSC's recommendations. I welcomed the TSC's scrutiny and am fully committed to National Highways playing its part in taking forward all the recommendations. These included pausing the roll out of new ALR smart motorways until five years of safety and economic data is available for schemes opened before 2020.

For the latest analysis presented in this report, and following the 2021 Office of Rail and Road (ORR) safety evidence review, we have used an extended range of metrics to understand road safety across road types. This is because robust and transparent safety data, along with the delivery of our actions, is critical in further increasing safety and confidence in our roads.

To gain further confidence in the safety conclusions of this report, we have worked closely with ORR, who undertook additional independent assurance for the supporting analysis in March 2022. Their review confirmed that we addressed the relevant recommendations relating to high-level statistics from their 2021 review; that the calculations that underpin this report are correct and reflect a strong application of the cross-government Aqua Book[01] assurance framework; and that we have taken significant steps to increase transparency.

Every road death is a tragedy and our thoughts are with those who are affected. The latest data shows that, overall, in terms of serious or fatal casualties, smart motorways are our safest roads. We are continuing our work to make them our safest roads in every way. We are doing this by making further improvements across our smart motorway network delivering the actions committed to in the 2020 Action Plan.

01 The Aqua Book is a good practice guide across government for those working with analysis and analytical models. For more information, please see here

We are providing more information to drivers aimed at increasing awareness of how to drive and stay safe on motorways. And by the end of September 2022 we will have:

- stopped vehicle detection (SVD) technology in place[02] on every existing all lane running smart motorway[03]. SVD sends alerts to our regional control rooms so our operators can close lanes, deploy traffic officers and get help to drivers and their passengers quicker
- installed additional signs to better inform drivers of the distance to the next place to stop in an emergency
- completed the upgrade of all enforcement cameras to enable the detection of Red X violations, helping to ensure the safety of drivers and their passengers in difficulty, or road workers and emergency services who need a safe space to work. We will then continue to work with the police so they can enforce using the cameras.

It remains too early to quantify the effect of these actions, but we will continue to monitor and evaluate the safety of our network over the coming years. Any death on our network is one too many, so we will continue to work hard to make our roads as safe as they possibly can be.

The different features of smart motorways work together and support each other as a system. While the technology exceeds that of other roads on our network, it still needs servicing and maintenance and, in some areas, requires updates, which we are pursuing.

I recognise that some of the public and our stakeholders continue to raise concerns about smart motorways and, in particular, the risk of breaking down in a live lane.

A very small proportion of total journeys on any road result in live lane breakdowns, and we understand this is the main concern drivers have about smart motorways. While most of these breakdowns do not lead to serious or fatal casualties, I recognise it can affect how people feel. So we are taking steps to address this.

Last year I said I believed our work was continuing to have a positive impact on the safety of drivers and their passengers. I believe that still to be the case.

We will continue to build on the work already undertaken, delivering on our actions and importantly, always putting safety first.

Nick Harris
Chief Executive
May 2022

02 This is the point in time post construction and following initial calibration where SVD alerts begin activating and are responded to within our regional control rooms. During this period we continue to calibrate the SVD system
03 With the exception of approximately 0.6mile gap on the M25 Junctions 6 to 7 which will have SVD installed after September 2022

Executive summary

Smart motorways were introduced as they increase capacity without the disruption and environmental impact of physically widening the road.

Demand for journeys on the strategic road network (SRN) has grown significantly in the past 20 years and is predicted to continue to increase. This is why smart motorways have been rolled out on some of our busiest sections of motorway across the country. Millions of people use these roads to do business, for work, leisure and much more every week.

By the end of 2020, we created almost 500 miles[04] of additional motorway capacity without building new roads and taking extra land. We also estimate that the increased capacity that has been delivered by smart motorways has so far resulted in journey time savings of over 28 million hours. Smart motorways reduce carbon emissions associated with construction compared to conventional widening.

Smart motorways have introduced and use technologies and features not present on conventional motorways which help keep drivers moving safely. Some have hard shoulders (controlled), some use the hard shoulder as a running lane at the busiest times (dynamic hard shoulder running (DHS)) and the latest type permanently converts the hard shoulder to a running lane and has a whole system of inter-related features, including emergency areas (all lane running (ALR)).

This system creates a layering effect meaning there is no over-reliance on one single feature. We recognise that some of the technology across the network is older, and this can, at times, affect its reliability. We have servicing and maintenance regimes in place to manage this. There is also scope to improve and upgrade older equipment currently in use on parts of the network. We are taking steps to do this and also further steps to improve the resilience of our technology.

Our Smart motorway stocktake first year progress report 2021[05] showed the significant progress made towards achieving the commitments set out in the Smart motorway safety evidence stocktake and action plan[06], which sought to further raise the bar on smart motorway safety.

04 500 miles includes both sides of the road
05 Referred to as the first year progress report
06 Referred to as the 2020 Stocktake or 2020 Action Plan

We have continued to listen to a wide range of stakeholders and partners. Our progress over the first year included enhancing our advice to drivers, and enhancing our infrastructure, technology and data analysis. We launched our biggest ever road safety campaign, made emergency areas more visible to road users and consulted on changes to, and enabled the publication of, updates to The Highway Code. We continued the roll out of new SVD technology. We also published several independent safety reviews and worked closely with the ORR to agree further improvements in the way safety data and evidence is presented.

This report sets out our continued progress since 2021 and the latest safety data for 2016 to 2020. It also sets out our additional commitments to further enhance the safety of, and further improve public confidence in, smart motorways following the 2021 TSC inquiry.

It should be noted that the impact of the measures we have delivered as part of the 2020 Action Plan, such as introducing more SVD and enabling increased enforcement of Red X signals, is not reflected in the latest safety data. It will not be possible to assess the impact of these measures until at least late 2023 when some of this data will start to be available.


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2020 Action Plan progress

Over the past year we have:

- installed more than 330 additional signs so that by the end of September 2022 drivers will almost always be able to see a sign informing them of the distance to the next place to stop in an emergency
- worked to put SVD technology in place[07] on over 100 miles of ALR motorway, and we are on track to complete the roll out of SVD on more than 200 miles (in total) of ALR motorway by the end of September 2022 [08]. This means every existing ALR motorway will have the technology to allow us to more quickly respond and help drivers and their passengers who stop in live lanes. SVD is designed to detect a minimum of 80% of all stopped vehicles. It works as part of a system, with a range of further technologies, to help further reduce the risks associated with live lane stops
- upgraded 96% (92) of enforcement cameras on smart motorways to enable them to be used, and enforced by the police, to detect vehicles passing under a Red X or entering a lane beyond a Red X. By the end of September 2022 we will have completed our commitment of upgrading 95 cameras. This will enable increased compliance with Red X signals and help ensure the safety of drivers and their passengers in difficulty, or road workers and emergency services who need a safe space to work
- introduced the automatic display of ‘report of obstruction’ messages on electronic overhead signs, which are triggered by SVD alerts, across 13 motorway sections. This message warns approaching drivers of a stopped vehicle up ahead
- worked with Department for Transport (DfT) and Driver and Vehicle Standards Agency (DVSA) to enable *The Highway Code* to be updated and published on 14 September 2021. This will help improve driver understanding and confidence when driving on a motorway
- provided more information to drivers aimed at increasing awareness of how to drive on motorways. The update to The Highway Code, education campaigns and launch of the *‘Driving on motorways’* hub have reached drivers up and down the country to help provide a better understanding, and help increase their confidence, when travelling on all types of roads

07 This is the point in time post construction and following initial calibration where SVD alerts begin activating and are responded to within our regional control rooms. During this period we continue to calibrate the SVD system
08 With the exception of approximately 0.6mile gap on the M25 Junctions 6 to 7 which will have SVD installed after September 2022

2021 Transport Committee Report

In 2021 the TSC completed its inquiry and, in November 2021, published its report into the *Rollout and safety of smart motorways.* In response to this detailed and carefully considered report, the Government agreed, in its January 2022 response, to all of the TSC's recommendations.

We welcomed the TSC's scrutiny and are fully committed to playing our part in taking forward all its recommendations. These included pausing the roll out of new ALR smart motorways until five years of safety and economic data is available for schemes opened before 2020. The Government response also committed to pausing the conversion of seven DHS to ALR smart motorway schemes, so that alternative operating approaches can be considered further.

We also welcomed the TSC's view that the Government was right to focus on upgrading the safety of ALR motorways, rather than reinstating the hard shoulder. The pause on new ALR motorways gives us time to continue to listen and act upon customer and stakeholder feedback, together with collecting further safety and economic data. This will enable the Government to make informed decisions about enhancing capacity on the SRN.

Smart motorways safety data and evidence

The 2020 Stocktake provided a comprehensive summary of the safety of smart motorways, considering all data sources available at the time. The report concluded *'overall, what the evidence shows is that in most ways, smart motorways are as safe as, or safer than, the conventional ones. But not in every way'.* It set out an action plan to further improve safety on the smart motorway network.

The subsequent first year progress report built on this further and concluded that in respect of fatality rates smart motorways were the safest roads in the country and drew the same conclusion as the 2020 Stocktake.

In September 2021, the ORR published an independent review on the available safety evidence for smart motorways. This review found no errors in our underlying calculations, and that the comparisons about the relative safety of ALR motorways were made in an appropriate way. The review made recommendations for enhancing the data and evidence surrounding safety on smart motorways. All relevant recommendations (those on high level statistics) have been implemented as part of this report, including using Personal Injury Collisions (PIC), Fatal and Weighted Injuries (FWI) and Killed and Serious Injuries (KSI) as the key metrics to assess safety on smart motorways.

To gain further confidence in the safety conclusions of this report, we have worked closely with ORR, who undertook additional independent assurance for the supporting analysis in March 2022. The ORR review confirmed that we have addressed the relevant recommendations relating to high-level statistics from ORR's previous review in 2021. ORR also found that:

- the underlying calculations supporting this report (such as the calculation of casualty and collision rates and five-year averages) are correct
- our assurance framework is a strong application of the cross-government Aqua Book guidance[09] and we followed these processes to ensure the evidence is reliable and the strengths, risks and uncertainties in the analysis are clearly reported
- we have taken significant steps to increase transparency, both in how we have communicated new methods (e.g. for statistical testing) and by publishing more detailed collision and casualty data alongside our report

The latest data shows that, overall, in terms of serious or fatal casualties, smart motorways are our safest roads. We are continuing our work to make them our safest roads in every way.

09 The Aqua Book is a good practice guide across government for those working with analysis and analytical models. For more information, please see here

Safety headlines - Personal Injury Collisions, Fatal and Weighted Injuries and Killed and Serious Injuries based on five-year data

- compared to other roads in England, motorways are comparatively the safest roads to travel on. However, our customer research shows that drivers' confidence does not reflect this
- safety rates across all roads have stable or improving trends
- no one motorway type performs best against all three PIC, FWI and KSI metrics, and no one type of smart motorway performs best against all these metrics
- all three smart motorway types are performing better than conventional motorways on the casualty-focused FWI and KSI rates, and much better than A-roads for both collision and casualty rates
- conventional motorways have lower PIC rates than other road types, but as their casualty rates (FWI and KSI) are higher, this suggests that when a collision occurs on a conventional motorway it is more likely that it will involve a killed or seriously injured casualty than a collision on the three smart motorway types

Stopped and moving vehicle safety

- across the SRN, most collisions occur between moving vehicles
- moving vehicle PIC rates are lowest for ALR motorways, and FWI and KSI rates are lowest on DHS motorways
- while stopped vehicle collisions remain a very small proportion of all collisions (the proportion ranges from 2.36% for controlled motorways to 2.99% for conventional motorways to 5.26% for ALR motorways), stopped vehicle collision and casualty rates are lowest for conventional and controlled motorways
- this continues to reflect the summary we included in the first year progress report that the risk of any collisions is low. The risk of an individual experiencing a live lane collision between a moving and a stopped vehicle while still rare, is greater on ALR and DHS motorways, but the risk of a collision involving only moving vehicles is lower

Live lane breakdowns

- between 2016 and 2020, 243,701 live lane breakdown incidents were reported on the SRN. Slightly more than half of these took place on conventional motorways, whereas approximately a quarter took place on motorways without a permanent hard shoulder (ALR and DHS). We have observed that live lane breakdowns on ALR and DHS motorways are identified more extensively compared to other road types, which makes direct comparisons prone to bias

- millions of drivers use our network every day. A very small proportion of total journeys on any road result in live lane breakdowns, and we understand this is the main concern drivers have about smart motorways. While most of these breakdowns do not lead to serious or fatal casualties, we recognise it can affect how people feel. So we are taking steps to address this, such as introducing SVD. We will also continue to work with drivers building on our advice, so they have more information on how to use smart motorways and what to do in an emergency

Conclusion

Smart motorways remain the most scrutinised parts of our road network and at the same time the latest data shows that, overall, in terms of serious or fatal casualties, they are our safest roads. This position remains unchanged from the first year progress report. The Government's response to the TSC's report into smart motorways published in January 2022 recognised the need to continue to address the concerns of the public and ensure drivers and their passengers are safer and feel safe on our roads.

This is why the Government agreed to take forward all the recommendations made by the TSC. This includes accepting the TSC's recommendation to pause the roll out of new ALR motorways in order to gather further safety and economic data for those sections of ALR introduced before 2020, together with evaluating the rollout of measures within the 2020 Stocktake and Action Plan. It will also enable evidence to be gathered to inform a robust assessment of options for future enhancements of capacity on the SRN as we prepare for the next Road Investment Strategy.

In the meantime we are committed to delivering the 18 actions contained in the 2020 Action Plan, the accelerated and further commitments made in the first year progress report and, more recently, the actions within the Government's response to the TSC's report. This will see over £900m being invested to further improve safety, including measures targeted at tackling collisions between stopped and moving vehicles.

We continue to make good progress in delivering the commitments made in the 2020 Action Plan. It remains too early to quantify the effect of these actions, but we will continue to monitor[10] and evaluate the safety of our network over the coming years and in doing so expect those effects, plus any other actions that we take, to be reflected in the safety data.

10 See Glossary for a definition

Going further – 2021 Transport Select Committee report

In November 2021, the TSC reported on the roll out and safety of smart motorways and made a number of recommendations. The Government, in its response published on 12 January 2022, agreed to take these recommendations forward. We are fully committed to playing our part in delivering all the recommendations.

A key recommendation of the TSC's report was to pause the roll out of new ALR motorways[11] yet to start construction until five years of safety and economic data is available on the sections opened before 2020[12]. This included pausing the conversion of seven DHS to ALR schemes. We welcome the pause; it will give us time to continue to listen and act on feedback, together with collecting further safety and economic data.

Over the coming years we will continue our work to ensure all existing motorways without a permanent hard shoulder are made as safe as they can possibly be. We will do this through the existing safety features already installed and planned, the commitments we made in the 2020 Action Plan and by responding appropriately to the outcomes of the TSC's recommendations.

11 At some of these locations, we will continue to invest in additional safety measures by making improvements to the central reservation

12 A map is included at Annex A showing the current, as of March 2022, status of all smart motorways

Safety features

The technology currently used on smart motorways, all focussed on drivers, is a system of inter-related features creating a layering effect. This means that there is no over-reliance on one single feature. It includes:

- variable speed limits to help keep traffic moving, reducing frustrating stop-start traffic and making journeys quicker
- clearly signed and orange-coloured emergency areas set back from the road and with telephones linking directly to our regional control rooms
- detection systems to monitor[13] traffic for changes in flows and speeds
- CCTV cameras that our operators are able to remotely move and zoom to monitor[13] and manage congestion and incidents, where notified. The system has the ability to see 100% of the carriageway[14]
- signs and signals to provide better information, and that can alert drivers to hazards ahead and display Red X signals to close lanes to other traffic when a stopped vehicle is identified
- enforcement cameras to deter the minority who break speed limits and ignore Red X signals

We recognise that some of the technology across the network is older, and this can, at times, affect its reliability. We have servicing and maintenance regimes in place to manage this. There is also scope to improve and upgrade older equipment currently in use on parts of the network. We are taking steps to do this and also further steps to improve the resilience of our technology.

We are also rolling out a relatively new technology, a radar-based SVD system, on ALR sections of smart motorway which will allow us to detect stopped vehicles. This technology does not exist on other high-speed roads. On ALR sections, it adds to the system of inter-related features to help further reduce the risks associated with live lane stops. We have defined processes for calibrating SVD, which means it is finely adjusted to suit the particular environment of the road where it has been installed. But there is no one technology on the market which can detect all incidences of stopped vehicles on the network. Current SVD technology uses radars and is designed to detect a minimum of 80% of all stopped vehicles.

13 See the Glossary for a definition
14 There is a CCTV coverage design requirement for ALR motorways, which means there are no blind spots. This is achieved through the location underneath a camera being designed to be seen by an adjacent camera

It remains too early to quantify the effect of SVD, but the pause of the roll out of new ALR motorways provides us the opportunity to continue to monitor and evaluate the impact of SVD and the other inter-related features in operation to understand how they contribute to the safety of our network over the coming years.

Further safety enhancements

We will continue to make enhancements to our smart motorway network and in response to the TSC report we are also:

- delivering a £390 million programme to build more places to stop in an emergency on ALRs in operation and construction. This means drivers, over the duration of the second Road Investment Strategy (by 2025), will see over 150 additional emergency areas. In comparison to January 2022, this is around 50% more emergency areas
- replacing the existing central reservation barriers with concrete ones on sections of mostly conventional motorway where ALR schemes have been paused, to improve safety on those sections[15], where they are not already in place
- installing safety improvements such as concrete central reservation barriers and new signs, on DHS sections where required. We have also started identifying the most appropriate solution for detecting stopped vehicles on DHS sections
- building on our advice to drivers so they have more information on how to use smart motorways and what to do in an emergency. We will work with stakeholders and partners to deliver driver education, targeting key groups and behaviours. Campaigns will include further advice on what to do in a breakdown and raising awareness of the issues of tailgating
- further investigating the emergency corridor proposal for The Highway Code. A full impact assessment, safety risk assessment and stakeholder consultation on the concept will be completed by late 2022
- considering alternative ways in which to operate the DHS motorways so there is more regularity for drivers and so that drivers can become more familiar with the operation of the road

15 *With the exception of M25 Junctions 10 to 16*

DfT led recommendations

In addition to the recommendation undertaken by National Highways, DfT will lead on some key areas:

- DfT will consider alternative options for enhancing capacity on the SRN. We will support DfT through our route-based strategies to look at opportunities for each route. These will drive the strategic planning of the SRN, to be used for future road periods and operational priorities
- DfT will revisit the case for controlled motorways and how they compare with ALR motorways, and will aim to publish an initial report later this year. This will be updated as further data is collected on ALR motorways
- DfT has commissioned the ORR to independently evaluate the effectiveness of SVD technology, and other measures in place, and how successful the 2020 Action Plan has been in: reducing live lane breakdowns on ALR, reducing the time for which people who break down or stop in a live lane are at risk; and educating drivers on what to do if they break down in a live lane. At the time of publication, the ORR are independently defining the scope of the evaluation. It is understood that it will cover a range of matters associated with SVD, such as the standards and requirements, its performance and its end to end operation in reducing the time it takes to become aware of a stopped vehicle and subsequently the actions which are then taken (such as setting Red X)
- the Government has also committed to further investigating the benefits of a health and safety assessment being undertaken by ORR before changes to design or operational standards are implemented on the SRN. DfT has started this work and we are working with them to progress it

Giving clarity to drivers

We know from feedback that drivers want to know more about smart motorways, how they operate and how they should drive on them.

A number of commitments were made in the 2020 Action Plan to give clarity to drivers. Over the past year we have provided more information to drivers and delivered a range of activities aimed at increasing awareness, to help drivers gain a better understanding and increase their confidence. We believe these education campaigns have helped all drivers, with the majority of messages and advice transferable to all road types.

We are committed to providing even more information that is consolidated and highly accessible to drivers. Our aim is to help them feel safe and be safer on all our roads, including smart motorways.

We have continued to deliver our multi-media[16] *'Go Left' campaign*, providing advice to drivers on what to do in the event of a breakdown on a high-speed road, including smart motorways. We have set out here our advice for what to do in the event of a breakdown.

If your vehicle has a problem, or you get into trouble on a motorway, stay calm and try to exit at the next junction or motorway service area. If that's not possible:

- put your left indicators on
- move into the left lane
- enter the next emergency area, or hard shoulder
- put your hazard lights on
- get behind a safety barrier where there is one - keep well away from moving traffic
- call National Highways on 0300 123 5000, then a breakdown provider for help. If you are unable to exit your vehicle and get to a safe place, have stopped in a live traffic lane or feel your life is in danger, **stay in your vehicle with your seatbelts and hazard lights on and call 999 immediately**.

We've gone further by launching our 'Driving on Motorways hub' which includes information and videos on how smart motorways work, their features and breakdown advice. And by working with drivers and collaborating with our partners, including the recovery industry and DVLA, we continue to raise awareness of how to drive on smart motorways, helping ensure they are as safe as they can possibly be. Through our Roads for All forum, we have also spoken to a wide range of organisations which represent or provide services to disabled road users.

16 Which includes the use of advertising, radio, billboards, social media, use of digital and press coverage

We have continued to work closely with our emergency service partners and UK Road Offender Education to deliver the National Driver Offender Retraining Scheme and National Motorway Awareness Course. To date over 300,000 drivers have attended them for a range of motorway offences, including Red X violations.

The table below sets out the actions we have completed, progress we have made over the past year and the status of our ongoing actions, as well as new commitments made in response to the TSC report.

Action	Updates since the 2020 Stocktake	What will happen next?
Communicating with drivers: we committed to an additional £5 million for national and targeted communications campaigns.	We have continued to listen to public concerns and have tailored our public information campaigns to focus on specific elements of motorway driving, continuing to raise awareness and provide clarity to drivers. In November 2021 and February 2022, we delivered the second and third waves of our 'Go Left' campaign, providing advice to drivers on what to do in the event of a breakdown. We worked with social media influencers and partners to help highlight our safety messages and target different audiences. We launched our 'Driving on Motorways' hub on our website in January 2022, which provides a central point for all our information and advice on motorway driving. The hub was launched alongside a multi-media campaign and radio day, with content featured on over 450 stations reaching over 6 million listeners.	We will continue to lead a programme of ongoing driver education, targeting key groups and behaviours. The aim of these is to increase driver awareness of how smart motorways work, and how to drive on them. Campaigns will include further advice to drivers on how to carry out vehicle checks, which is planned for Summer 2022, and raising awareness of issues such as tailgating and what to do in the event of a breakdown. We will engage with national, consumer and trade media to raise awareness of our safety messages. We will continue to engage with a wide range of stakeholders providing regular updates and listen to their feedback.

Action	Updates since the 2020 Stocktake	What will happen next?
	We have also co-ordinated a wider programme of road safety campaigns addressing issues which can lead to incidents. These included advice to drivers about the importance of carrying out vehicle checks before setting off, and about the dangers of tailgating. The campaigns were delivered through traditional, digital and social media.	
Making journeys easier: we committed to ending the use of DHS smart motorways, so that all existing DHS smart motorways would be converted to ALR by the end of March 2025. Following the TSC's report, this 2020 Action Plan commitment has been paused.	Following recommendations from the TSC's inquiry into smart motorways we have paused plans to convert DHS sections to ALR. The locations are: - M42 Junctions 3a to 7 - M1 Junctions 10 to 13 - M4 Junctions 19 to 20/M5 Junctions 15 to 17 - M6 Junctions 4 to 10a - M62 Junctions 25 to 30 All schemes have completed their preliminary design work.	We will consider alternative ways for operating DHS motorways so there is more regularity for drivers and so that drivers can become more familiar with the operation of the road. We will also continue to collect data and analyse the safety performance of smart motorways (including DHS) to help inform our thinking. We will continue to invest in safety improvements on these motorways. In 2022 we will continue a programme of work installing further safety measures, where required, on DHS motorways that are in operation. This includes concrete central reservation barriers and new signs. In parallel we have started work on identifying the most appropriate solution for detecting stopped vehicles on DHS smart motorways.

Action	Updates since the 2020 Stocktake	What will happen next?
Improving guidance: we committed to work with DfT and DVSA to update The Highway Code to provide more guidance for motorists driving on high-speed roads, including smart motorways.	We worked with DfT and DVSA to update The Highway Code, which was amended on 14 September 2021. It provides more guidance for motorists driving on high-speed roads, including smart motorways. This was ahead of our original commitment of March 2022. The 90th edition of The Highway Code was published in April 2022.	We will continue to work with DfT and DVSA in the future to update The Highway Code to best represent the needs of all road users.
Working with partners: we committed to working closer with the recovery industry to work safely on our network in a standardised way.	In July 2021, National Highways signed two further unifying strategic agreements with the National Tyre Distributers Association and the independent recovery industry work providers. These additional agreements demonstrate our commitment to work together to improve communications and achieve best practice across the industry. They also encourage Vehicle Recovery Operators (VROs) and commercial tyre technicians to always work safely on the network, including smart motorways.	We will continue to build on the constructive and positive dialogue with all parts of the recovery industry through our executive level committee and regional groups so that the recovery industry is represented and included in the consultation of changes to ways we build and operate our network. We will work to identify opportunities to further educate and support the recovery sector to improve the knowledge of recovery operators working on the SRN.

Action	Updates since the 2020 Stocktake	What will happen next?
	We have reviewed and updated existing roadside working practice and protocols for the safe attendance and recovery of HGVs broken down within emergency areas. We have also created agreed joint working protocols between VROs and traffic officers. We have invested £200,000 in new equipment (battery boosters and skates) and training for all of our traffic officers to help speed up the time it takes to move "non-rolling" broken down vehicles – including electric vehicles – to a safe place and keep traffic moving.	
Increasing visibility: DfT committed to review the use of red flashing lights.	In June 2021, the Transport Secretary agreed to additional research to implement the recommendations from an external and independent review. This included off-road trials of red flashing lamps on roadside recovery vehicles. DfT appointed an independent contractor to undertake the additional research, and the report is due in November 2022.	The off-road trials of red flashing lamps on roadside recovery vehicles will help DfT and industry understand the road safety benefits and, crucially, any potential unintended effects on road safety from extending the use of red flashing lamps to recovery vehicles.

Action	Updates since the 2020 Stocktake	What will happen next?
Increasing visibility: DfT committed to review the use of red flashing lights.	In addition, the Transport Secretary agreed that DfT would work with the recovery industry to develop guidance on vehicle warning lamps. This will highlight to operators the range of lighting functions currently available under existing laws and help improve the visibility of both the recovery vehicle and the recovery operator when they are working at the roadside. We have worked closely with DfT and members of our recovery executive committee to ensure that representatives from across all parts of the recovery industry are part of this ongoing review.	

Finding a safe place to stop

We want drivers and their passengers to be safer and feel safe on all our roads. We have listened to the concerns raised by the public about the spacing of places to stop in an emergency.

Emergency areas are safer than hard shoulders, where one in 14 motorway fatalities happen. They are orange, set back from live traffic lanes and have an emergency phone which connects directly to our regional control rooms so help can be arranged. Between 2016 and 2020, there have not been any fatalities in emergency areas.

The table overleaf sets out the actions we have completed, progress we have made over the past year and the status of our ongoing actions, as well as new commitments made in response to the TSC report.

Action	Updates since the 2020 Stocktake	What will happen next?
More places to stop: we committed to installing 10 additional emergency areas on the M25 and monitoring their impact on the level of live lane stops.	We installed 10 additional emergency areas on the M25 and all were open to traffic by early December 2020. Following the installation of the 10 additional emergency areas, we committed in the first year progress report to monitor their impact to understand if they have reduced the level of live lane stops. We committed to doing this six months earlier than planned. We completed the monitoring for the period January to July 2021. In line with our accelerated commitment in the first year progress report, we issued our monitoring report to DfT in August 2021. Due to the impact of Covid restrictions on traffic levels, we completed a further six months of monitoring until December 2021 and issued a further report to DfT in March 2022. Both monitoring reports drew the conclusion that there was not a strong link between the spacing of emergency areas and the number of live lane stops. However the amount of data was limited meaning further monitoring will continue. We also recognise the monitoring that was conducted didn't include any assessments of perception of safety, e.g. whether the emergency areas increase drivers' feelings of safety (or reduce any potential feelings of unsafety). How drivers feel is important to us, which is why the monitoring of the emergency area retrofit programme will reflect this.	We will continue to monitor the impact of all additional emergency areas through the emergency area retrofit programme. This is in addition to monitoring whether additional emergency areas influence the experience of drivers and to help us understand how these emergency areas are used.

Action	Updates since the 2020 Stocktake	What will happen next?
More places to stop: we committed to consider, by April 2022, a national programme to install more emergency areas on existing smart motorways where places to stop in an emergency are more than one mile apart.	In taking forward the TSC recommendations, the Government announced in January 2022, three months earlier than planned, it is committing £390 million to install over 150 additional emergency areas, over the duration of the second Road Investment Strategy (by 2025), on ALR motorways in operation and construction. This means drivers will have more places to stop if they get into difficulty. In comparison to January 2022, this is around 50% more emergency areas, giving drivers added reassurance. We have also started work to assess the potential for the removal of nearside barriers where they are not required for safety purposes. The safety purposes could include protecting vehicles (and their occupants) from any hazards that exist in the verge, such as steep slopes.	Additional emergency areas have been added to the design of two schemes that were already in construction when the pause to new ALR schemes was announced. When these schemes open, there will be five more emergency areas than in the original plans on the M6 between Junctions 13 and 15 this summer and eight additional emergency areas compared with the original plans on the M1 between Junctions 13 and 16 in spring 2023. The emergency area programme, setting out the details of the retrofit, will be available later this year. This will show where and when drivers will see the additional emergency areas. We will assess the existing barrier provision as part of the emergency area retrofit programme and take the opportunity, where appropriate, to combine barrier removal works with emergency area installations.

Action	Updates since the 2020 Stocktake	What will happen next?
		A decision on whether to retrofit across the remainder of ALR smart motorways will be considered as part of the formulation of the third Road Investment Strategy. This will be based on evidence of benefits and considering whether the additional emergency areas help drivers to feel safer. If it is decided to install further emergency areas during the third Road Investment Strategy, this will add a total of around 400 emergency areas which will take the average spacing to no more than one mile.
Better signage: we committed to installing clearer, easier to understand and more frequent approach signs showing the distance to the next place to stop in an emergency.	Work has progressed well this year and as of mid-April 2022, we have installed more than 330 additional signs on sections of the M4, M6, M23, M1, M5, M62 and M27. This means drivers using these sections of smart motorway will almost always be able to see a sign informing them of the distance to the next place to stop in an emergency.	We remain on track to install the remaining additional signs by the end of September 2022 so drivers will almost always be able to see a sign informing them of the distance to the next place to stop in an emergency.
Easier to find: we committed to sharing information with sat nav companies that showed places to stop in an emergency on sat navs.	We launched our Open Data Site in March 2021. This site enables sat nav companies to access National Highways geographical datasets, including the location of all emergency areas. We have informed sat nav companies of the available data and completed discussions with them and DfT to understand uptake.	We will continue to work with sat nav providers to see what other information we can provide to help drivers feel safe and be safer on all our roads.

Action	Updates since the 2020 Stocktake	What will happen next?
Places to stop: we committed to reviewing existing emergency areas where the width is less than the current standard, if feasible and appropriate.	We previously completed an independent review of the widths of 249 emergency areas, identifying 13 emergency areas that are less than 4.4 metres wide. In September 2021 we published a copy of the independent investigation report and our response to the independent review.	We will continue widening work on two emergency areas on the M1 and M25. All work to widen the emergency areas is on track to be completed by the end of March 2023. We will update our plans as soon as possible for re-examining the seven emergency areas on the DHS sections.
Frequent places to stop: we committed to a new standard for spacing of places to stop in an emergency.	We published a new standard for smart motorways which means there will be more places to stop in an emergency. GD 301 – Smart Motorways was published ahead of target in October 2020. This standard requires places to stop in an emergency to be three-quarter miles apart where feasible, with a maximum of one mile. There are some exceptions where not feasible to construct additional emergency areas, such as where junctions intersect or on bridges.	The new standard will be adopted on schemes entering the design phase and will be used to design the emergency area retrofit programme.
Easier to see: we committed to make emergency areas more visible.	We completed the work to make over 300 emergency areas more visible in May 2020. All existing emergency areas now have clearly visible orange surfacing and marked stopping areas with clearer, easier to understand and more frequent signage.	These emergency area enhancements are now standard on all existing and new smart motorways designed and constructed.

Being safer in moving traffic

Technology is one of the ways smart motorways are different from conventional motorways, and it is this technology which can help keep drivers safer in moving traffic.

Smart motorways have a whole system of inter-related safety features, working together to help keep drivers and their passengers moving safely. This includes additional signs and signals which can provide extra information to drivers. They also have a system called MIDAS that identifies queuing traffic via detecting changes in traffic speed and flow using radars and loops in the road. In addition, ALR motorways also have SVD, which is a relatively new technology and is being rolled out to all existing ALR schemes[17] by September 2022 and we have committed that no new ALR schemes will open without it. This technology does not exist on other high-speed roads.

It adds to the system of inter-related features to help further reduce the risks associated with live lane stops. It does this through identifying a stopped vehicle, providing an alert to our regional control room (and at the same time sets a message sign to warn of a report of obstruction whilst the alert is verified by an operator), allowing us to respond quicker through the setting of a Red X signal to close one or more lanes, adjust speed limits and deploy traffic officers.

We have defined processes for calibrating SVD, which means it is finely adjusted to suit the particular environment of the road where it has been installed. But there is no one technology on the market which can detect all incidences of stopped vehicles on the network. Current SVD technology uses radars and is designed to detect a minimum of 80% of all stopped vehicles. Driver assistance technologies within vehicles can also play a role in supporting safe driving when used correctly.

It remains too early to quantify the effect of SVD, but the pause of the roll out of new ALR motorways provides us the opportunity to continue to monitor and evaluate the impact of SVD and the other inter-related features in operation to understand how they contribute to the safety of our network over the coming years.

We recognise that drivers want help to arrive quickly when they are stopped in a live traffic lane. Overleaf we set out the actions we are taking to achieve this. This is in addition to the actions that drivers can take themselves on all high-speed roads, and which follows our breakdown advice: if a driver is unable to exit their vehicle and get to

17 With the exception of approximately 0.6mile gap on the M25 Junctions 6 to 7 which will have SVD installed after September 2022

a safe place, have stopped in a live traffic lane or feel their life is in danger, they should stay in their vehicle with their seatbelts and hazard lights on and call 999 immediately.

The ORR has been asked by DfT, following the TSC report, to evaluate the success of our actions to deliver the 2020 Action Plan. This evaluation is specifically in relation to reducing the incidences of live lane stops including breakdowns, reducing the time for which people are at risk and educating drivers on what to do. DfT has asked ORR to report on this annually, starting later this year.

The table below sets out the actions we have completed, progress we have made over the past year and the status of our ongoing actions, as well as new commitments made in response to the TSC report.

Action	Updates since the 2020 Stocktake	What will happen next?
Identifying stopped drivers quicker: we committed to radar SVD technology being in place on all existing ALR schemes by September 2022 and that no new schemes will open without it.	As of mid-April 2022, radar SVD technology is in place[18] on: ▪ the M25, Junctions 5 to 6 and Junctions 23 to 27, where it was originally trialled and remains in place ▪ M3 Junctions 2 to 4a ▪ M20 Junctions 3 to 5 ▪ M1 Junction 13 to Newport Pagnell services ▪ M1 Junctions 30 to 31 ▪ M1 Junctions 32 to 35a ▪ M1 Junctions 39 to 42 ▪ M4 Junctions 8/9 to 12 ▪ M5 Junctions 4a to 6 ▪ M6 Junctions 2 to 4 ▪ M23 Junctions 8 to 10 ▪ M62 Junctions 10 to 12	We are on track to complete the retrofit of radar SVD technology onto the following existing sections of ALR by the end of September 2022: ▪ M1 Junctions 16 to 19 ▪ M1 Junctions 24 to 25 ▪ M1 Junctions 28 to 30 ▪ M6 Junctions 11a to 13 ▪ M6 Junctions 16 to 19 ▪ M62 Junctions 18 to 20 The following schemes will, when they finish construction, open with SVD in place: ▪ M4 Junctions 3 to 8/9 ▪ M1 Newport Pagnell services to Junction 16 ▪ M56 Junctions 6 to 8 ▪ M6 Junctions 13 to 15 ▪ M6 Junctions 21a to 26 ▪ M27 Junctions 4 to 11

18 This is the point in time post construction and following initial calibration where SVD alerts begin activating and are responded to within our regional control rooms. During this period we continue to calibrate the SVD system

Action	Updates since the 2020 Stocktake	What will happen next?
	This means over 100 miles of ALR motorway with SVD in place. The technology is able to send alerts to our regional control rooms which are then investigated by our operators. Following our commitment in the first year progress report, SVD will be in place when construction completes on those schemes currently being upgraded. We are also working collaboratively with the police to understand how we improve the transfer of incident information received via 999 calls to our regional control rooms.	This means we will have more than 200 miles (in total) of SVD in place on ALR motorways and also means every existing ALR section[19] will have this technology to help drivers who stop in live lanes. We have also made an additional commitment, in response to the TSC's report, that we will add a way of spotting stopped vehicles on DHS motorways.[20] SVD is an enhancement which complements the existing systems that work together to make motorways without a hard shoulder as safe as, or safer than, conventional ones. As recommended by the TSC, we are engaging with ORR to assess the effectiveness of SVD, and other measures in place. We are working collaboratively with DfT and ORR to develop an approach to addressing this recommendation, and expect that an initial ORR report will be available later this year. In line with our company approach for continuous improvement, we will continue to review and, where possible, improve how we identify stopped vehicles.

19 With the exception of approximately 0.6mile gap on the M25 Junctions 6 to 7 which will have SVD installed after September 2022

20 This will include adding a way of spotting stopped vehicles on stretches within DHS sections where the hard shoulder has been converted to a permanent running lane

Action	Updates since the 2020 Stocktake	What will happen next?
Warning approaching drivers: we committed to automatically displaying a 'report of obstruction' message on electronic overhead signs on the motorway, to warn approaching drivers of a stopped vehicle ahead.	Our SVD system sends an alert to our regional control rooms. At the same time, it can also automatically display a message on motorway electronic overhead signs displaying 'report of obstruction'. This warns approaching drivers of a stopped vehicle ahead, until it is verified and categorised by one of our regional control room operators. 'Report of obstruction' messages are being displayed, when required, on the: ▪ M25 Junctions 5 to 6 ▪ M25 Junction 23 to 27 ▪ M20 Junctions 3 to 5 ▪ M23 Junction 8 to 10 ▪ M3 Junctions 2 to 4a ▪ M4 Junctions 8/9 to 12 ▪ M5 Junctions 4a to 6 ▪ M6 Junctions 2 to 4 ▪ M62 Junctions 10 to 12 ▪ M1 Junction 13 to Newport Pagnell services ▪ M1 Junctions 30 to 31 ▪ M1 Junctions 32 to 35a ▪ M1 Junctions 39 to 42	We are on target to deliver automated display of 'report of obstruction' messages by March 2023.

Action	Updates since the 2020 Stocktake	What will happen next?
Warning approaching drivers: we committed to automatically displaying a 'report of obstruction' message on electronic overhead signs on the motorway, to warn approaching drivers of a stopped vehicle ahead.	We do this instead of automatically setting a Red X to reflect that the 'report of obstruction' is 'unverified', i.e. we're aware there is potentially an obstruction, but we need to investigate to confirm. This means we can warn approaching drivers of a potential stopped vehicle ahead, and then in parallel, our regional control room will investigate and validate the report. When confirmed, they will set a Red X to close the appropriate lanes.	

Action	Updates since the 2020 Stocktake	What will happen next?
Getting help to drivers faster: we committed to faster attendance by more National Highways traffic officer patrols where emergency areas are more than a mile apart.	Our traffic officers play an important role in keeping drivers safe and traffic moving across the patrolled sections of the SRN. As part of the 2020 Action Plan we committed, by July 2021, to reducing the average time it takes traffic officers to attend incidents from 17 to 10 minutes where emergency areas are more than one mile apart. This average response time compares favourably with the 15-minute police response time. We've made considerable progress in reducing our national average response from 17 minutes to 10 minutes 21 seconds in February 2022 and 10 minutes 42 seconds in March 2022 (the latest available figures). While this is a national average, we recognise there are a small number of incidences across the country which are higher than the average. We are working to reduce these. We have purchased new traffic officer patrol vehicles and are recruiting more traffic officers. We have also introduced satellite traffic officer outstations around our busiest ALR sections of motorway.	We remain committed to further reducing the average time down to 10 minutes and we will continue to implement a programme of initiatives to help us meet this. We expect to achieve our aim to meet the 10 minute average response time by the end of September 2022. We will continue to monitor our performance and adjust our plans as appropriate.

Action	Updates since the 2020 Stocktake	What will happen next?
Getting help to drivers faster: we committed to work with the Society of Motor Manufacturers and Traders (SMMT) to jointly understand the range of eCall and bCall functions in newer cars, and to communicate the benefits to drivers.	We worked with stakeholders to agree the key messages for a public information campaign, launching England's first major eCall awareness campaign in September 2021. This was on digital channels, including a dedicated campaign page on our external website. The Highway Code also now advises the use of eCall to contact police and communicate a location directly to a 999 operator under The Highway Code rules 275, 278 and 283. In November 2021, we delivered the second wave of the eCall awareness campaign. The eCall explainer highlighted the safety messages to raise awareness of how and when to use eCall in newer vehicles. This is available on YouTube. The campaign had an estimated reach of over 700,000, with more than 6,000 social media views, generating more than 300 engagements through likes, comments and shares. Between 2020 and 2022 more people used eCall correctly: the percentage increased from 22% to 29%. For drivers whose cars do not have this feature, we have also made guidance available on our website on what to do if your vehicle has a problem or you get into trouble on a motorway.	We recognise the number of drivers who own a vehicle with this in-built safety feature will increase steadily over the next few years, with over 90% of top-selling cars having eCall. We will continue to work with stakeholders to raise road users' knowledge of using eCall, so they feel capable and can comfortably use the safety feature if they are unable to leave their vehicle safely. The aim is to continue increasing driver awareness and understanding of the eCall or 'SOS' button by encouraging drivers to acknowledge if their vehicle has an emergency-call system installed. We will engage with national, local, consumer and trade media to raise awareness of the eCall safety messages further.

Action	Updates since the 2020 Stocktake	What will happen next?
Improving compliance: we committed to upgrade enforcement cameras by September 2022 to support improved compliance with Red X signals.	As of mid April 2022, we have upgraded 96% (92) of enforcement cameras on smart motorways to enable them to be used by the police to detect vehicles passing under a Red X or entering a lane beyond a Red X. In conjunction with the technology upgrades, we have also worked with police forces to raise awareness of Red X signals and enforcement measures. This is so that drivers know they must not drive in lanes closed by a Red X.	We are on track to have upgraded all 95 cameras by the end of September 2022. It is illegal to ignore Red X signals. We will continue to work with police forces with the aim of further increasing enforcement.
Working with fleet operators: we committed to use the 'Driving for Better Business' programme to raise awareness of the benefits of using Automatic Driver Assistance Systems, with a particular focus on Advanced Emergency Braking systems. We also committed to working with DfT to explore whether to make it illegal to switch off Advanced Emergency Braking without good reason.	We have worked with fleet operators and drivers to understand the full scope of Advanced Emergency Braking System issues. We have used this knowledge to develop an awareness package, released on 18 February 2022 using the Driving for Better Business programme, to help improve compliance with current legislation and guidance. The package equips drivers and operators with all they need to know for safe use of Advanced Emergency Braking Systems. It includes short animations for both drivers and transport managers, a factsheet for transport managers and a poster for staff noticeboards.	We will continue to promote and raise awareness via the Driving for Better Business programme. The DfT is continuing to explore options for changes in policy or regulation.

Action	Updates since the 2020 Stocktake	What will happen next?
	The resources explain: ▪ what an Advanced Emergency Braking System is ▪ system capabilities and limitations ▪ tips for drivers ▪ tips for Transport Managers DfT, along with international partners, are working to amend the corresponding global regulations that would mean new Advanced Emergency Braking could only be deactivated under more constrained circumstances.	
Investigating safety performance: we committed to look further at clusters of incidents on sections of the M6 and M1 smart motorways.	The 2020 Action Plan committed to look further at clusters of incidents on sections of the M6 and M1 smart motorways, specifically: ▪ M6 Junctions 5 to 6 (Bromford viaduct)[21] ▪ M1 Junctions 10 to 13 ▪ M1 Junctions 30 to 35 ▪ M1 Junctions 39 to 42 We commissioned independent investigations of these sections of smart motorway. In September 2021 we published a copy of the independent investigation reports and our response to the independent review, which included our delivery programme of extra measures. We have already acted on several of the issues identified by the independent safety reviews.	We are on track to complete all the actions by March 2023, with the exception of those that were due to be taken forward as part of the DHS to ALR conversion works. We will update our plans as soon as possible for the measures that were due to be delivered through the DHS to ALR conversion work.

21 We committed in our published response to implement an interim arrangement, at Bromford Viaduct, to more quickly identify stopped vehicles. This will be solely focussed on spotting stranded vehicles

Action	Updates since the 2020 Stocktake	What will happen next?
	For example, on the M1 we've reduced flooding hotspots, which could increase skidding risk and are working to install technology to detect stopped vehicles. And on the M6 we have adjusted the opening and closing procedures for the hard shoulder, so it is kept open only when it is needed, maximising the time when the hard shoulder is available. We set out that some of our measures would be delivered as a result of the DHS to ALR motorway conversion by the end of March 2025. As the DHS to ALR conversion work has been paused following the TSC report, we are reviewing our plans for delivering these measures.	
Identifying stopped drivers quicker: we committed to complete a large-scale trial of CCTV analytics.	We completed this work, on the M4 near Bristol, to trial an alternative system that analyses CCTV images to identify stopped vehicles.	We remain committed to installing radar SVD technology as our primary approach for stopped vehicle detection on existing ALR schemes by end of September 2022. In line with our company approach for continuous improvement, we will continue to review and, where possible, improve how we identify stopped vehicles.

Action	Updates since the 2020 Stocktake	What will happen next?
Getting help to drivers faster: we have committed through the TSC report response to consider the Emergency Corridor concept.	Other countries have adopted emergency corridor rules to provide a system to assist emergency services access to incidents where no hard shoulder exists. The Government's response to the TSC also agreed in principle to introduce the emergency corridor manoeuvre, subject to the successful outcome of research, consultation, and feasibility trials. We will be working collaboratively with multiple stakeholders to progress the consideration of the emergency corridor manoeuvre. The initial research was completed in Spring 2022. Currently, if an incident takes place on a smart motorway, we can use the overhead electronic signals to close any lane and create an emergency access route using the Red X signals, with the message 'Lane closed for incident access'. We can also use improved CCTV coverage to provide better information to the emergency services. Even in heavy congestion some traffic is usually able to pass the scene, creating enough space for drivers to pull over and allow the emergency services to pass between lanes. This is the approach taken on dual carriageways and other sections of motorway with a discontinuous hard shoulder.	A full impact assessment, safety risk assessment and stakeholder consultation on the concept will be complete by late 2022.

Action	Updates since the 2020 Stocktake	What will happen next?
Getting help to drivers faster: we have committed through the TSC report response to consider the Emergency Corridor concept.	If all access to an incident is blocked, there are procedures to allow emergency access from the next junction along by driving in the reverse direction down the carriageway, once the road has been physically closed. 'Blue Light Aware' is a web-based resource, supported by National Highways, and which provides more information on behalf of the emergency services. Based on guidance contained within The Highway Code, it contains short videos and animations. One of the videos explains what to do on a smart motorway to create space for emergency service vehicles.	

Updated safety evidence

This section of our report supplements the high-level statistics presented in the 2020 Stocktake and first year progress report with the latest available road safety statistics. As outlined in the Government's response to the TSC's report, it is important to continue monitoring safety performance across our smart motorways. Through monitoring and evaluation activities, we will continue to assess the safety of our roads and identify opportunities to make them even safer.

The latest data shows that, overall, in terms of serious or fatal casualties, smart motorways are our safest roads. We are continuing our work to make them our safest roads in every way.

It should be noted that the impact of the measures we have delivered as part of the 2020 Action Plan, such as introducing more SVD and enabling increased enforcement of Red X signals, is not reflected in the latest safety data. It will not be possible to assess the impact of these measures until at least late 2023 when some of this data will start to be available. The pause on new ALR motorways gives us time to continue collecting further safety and economic data and will enable the Government to make an informed decision about enhancing capacity on the SRN.

To gain further confidence in the safety conclusions of this report, we have worked closely with ORR, who undertook additional independent assurance for the supporting analysis in March 2022. The ORR review confirmed that we have addressed the relevant recommendations relating to high-level statistics from ORR's previous review in 2021. ORR also found that:

- the underlying calculations supporting this report (such as the calculation of casualty and collision rates and five-year averages) are correct
- our assurance framework is a strong application of the cross-government Aqua Book guidance[22] and we followed these processes to ensure the evidence is reliable and the strengths, risks and uncertainties in the analysis are clearly reported
- we have taken significant steps to increase transparency, both in how we have communicated new methods (e.g. for statistical testing) and by publishing more detailed collision and casualty data alongside our report

22 The Aqua Book is a good practice guide across government for those working with analysis and analytical models. For more information, please see here

Key methodology considerations

Before considering the updated safety evidence, it is important to outline three key considerations that have an impact on safety performance data, both for 2020 and historically. For more information please see Annex B – Methodology.

- the coronavirus pandemic (Covid-19) and associated travel restrictions affected road safety in 2020. For example, due to varying restrictions across regions and therefore varying traffic flows across road types, 2020 casualty and collision rate comparisons between road types may not be like-for-like. While this report reflects collisions and casualties across road types year-on-year, it reflects trends over time and considers 5-year averages. This partially mitigates the impact from external events, such as Covid-19
- since 2012, many police forces have changed the way they collect STATS19 data[23]. These changes mean casualty severity is now categorised automatically based on the most severe injury, rather than the judgement of an attending police officer. Police forces using the new systems, called injury-based severity reporting systems, (also known as CRaSH and COPA) report more seriously injured casualties than those which don't. DfT analytical guidance was updated in October 2021 to further strengthen the advice on including injury-based adjusted figures where possible. The injury figures in this report are adjusted to take account of changes in the reporting of injury severity by some police forces in recent years. This will be referred to in this report as injury-based reporting changes
- in 2020, the way in which the CRaSH system used by a majority of police forces to calculate casualty severity changed. DfT decided to revise reported casualty severities from 2012 to 2019 in forces using CRaSH in order to make the data consistent with 2020 and future years. These will be referred to in this report as historical changes in STATS19 data

These considerations are important as they have resulted in data and methodology updates, enabling better alignment with police reporting and DfT guidance. As such any comparison with previous publications should consider those updates.

23 STATS19 database is a collection of all road traffic accidents that resulted in a personal injury and were reported to the police within 30 days of the accident. More information can be found here

In addition, in ORR's September 2021 safety data review, it made a recommendation that high-level statistics should be reported against a defined set of headline metrics. In line with this recommendation, we have moved from the measures reported in the first year progress report (such as 5-year averages for fatal, serious or slight casualty rates) to the 5-year average (2016-2020) for three key metrics (considering both absolute values and rates):

- Personal Injury Collisions (PIC). These are the number of collisions which have resulted in a person sustaining an injury. PICs do not reflect the number of people injured in each collision (casualties) and are not influenced by significant events (e.g. coach incidents). PIC rate per hundred million vehicle miles (hmvm) is the rate calculated using the number of personal injury collisions and the total miles travelled on a road section or type
- Fatal and Weighted Injuries (FWI). This metric weights and aggregates the number of people that have been injured in collisions. This gives a fatality 10 times the weight of a serious casualty, and a serious casualty 10 times the weight of a slight casualty. While FWI recognises all injuries, it acknowledges that not all injuries are equal. FWI rate per hmvm is the rate calculated using the aggregate FWI and the total miles travelled on a road section or type
- Killed and Serious Injuries (KSI). The number of people killed or seriously injured in road traffic collisions. This metric is non-weighted but does not pick up all injuries (e.g. slight casualties). KSI rate per hmvm is the rate calculated using the number of people who are killed or seriously injured, and the total miles travelled on a road section or type

Presenting both the absolute values and rates (per hmvm) means that while every collision and casualty matters independently (absolute values), metrics are accounting for differences in traffic flows across the SRN (rates). Usually rates are more meaningful for safety comparisons between road types as they account for variances in traffic flows. However for transparency it is appropriate to present both absolute values and rates.

In addition, considering multi-year averages instead of individual years can reduce some of the uncertainty caused by external events, such as Covid-19. For more information on why these metrics are selected, please see Annex B – Methodology (sub-section 'Headline metrics').

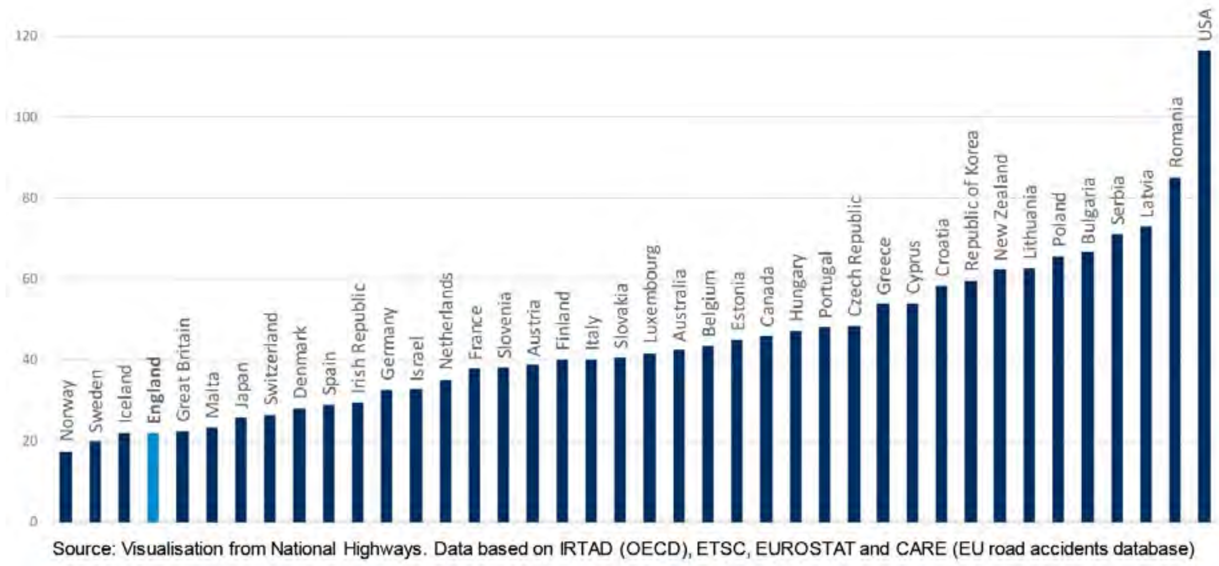
Safety on the strategic road network

As we did in the first year progress report, before comparing the safety performance of different road types, it is useful to first understand the latest overall safety of England's roads. This information is reported for the most recent calendar year for which data is available. Across all road classifications, England has some of the safest roads in the world. In light of latest international safety data consolidated by DfT, only Norway, Sweden and Iceland continue to perform better than England.[24]

24 This is based on fatality rates as non-fatal casualties are measured inconsistently across nations

Figure 1
Description: England is in the top safety performing countries internationally

Data: Road deaths per million population in 2020



Source: Visualisation from National Highways. Data based on IRTAD (OECD), ETSC, EUROSTAT and CARE (EU road accidents database).[25]

Whilst England has amongst the best performing road networks internationally, there is always scope for further improvement. We take road safety very seriously and have a strategic ambition that nobody should be harmed when using or working on the SRN. This is reflected in our stretching target to reduce the number of people killed or seriously injured on our roads by 50%[26] by 2025 and in our vision that no one should be killed or injured on our network.

Compared to other roads, motorways are comparatively the safest roads to travel on. SRN motorways had the lowest fatality rate of any road type in England in 2020 at 0.14 fatalities per hmvm[27] and the most recent Road Safety Foundation EuroRAP Route Results covering the 2017 to 2019 period rated the majority of our motorways as Low Risk (here). Any move towards increasing capacity on our most safe roads, provides safer overall capacity for drivers on the road. That is because the extra capacity draws traffic from less safe roads where there are tragically more deaths and injuries.[28]

In England there were 1,246 fatal casualties in 2020 with 1,108 (88.92%) of them taking place outside of the SRN. Out of the 138 (11.08%) fatalities on the SRN, 74 (5.94%) took place on A-roads and 64 (5.14%) on motorways.

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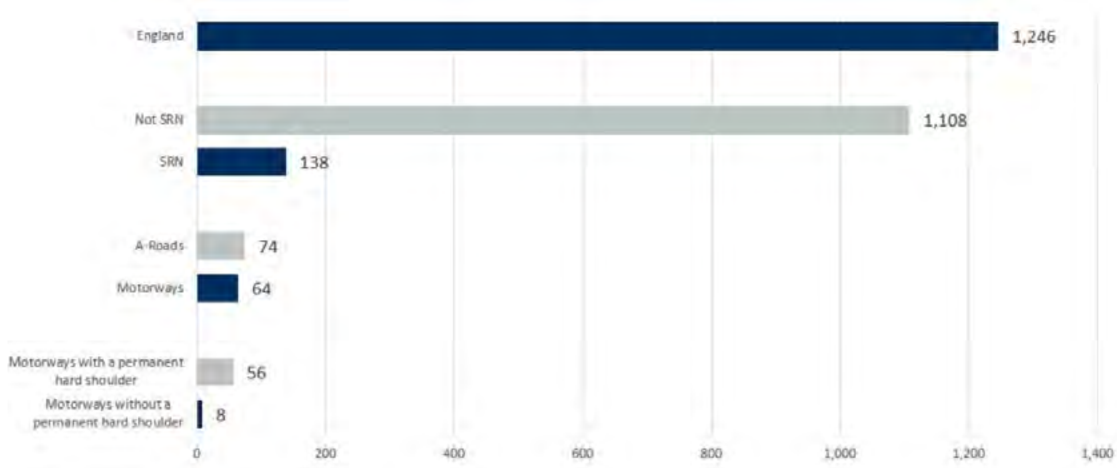
25 Data summarised and released by DfT RAS52001 here
26 Against the 2005 to 2009 average baseline
27 Fatalities per hmvm in 2020: A-roads (on SRN) (0.28), non-SRN motorways (3.00), principal A-roads (0.99) and minor roads (0.62.)
28 This is evidenced through Post Opening Project Evaluation reports. The methodology and process supporting these reports was reviewed by ORR in 2020 here

Out of the total fatalities in England in 2020, eight (0.64%) took place on motorways without a permanent hard shoulder, that is ALR and DHS carrying 3.29% of all traffic in England. This is in comparison to 56 (4.49%) on motorways with a permanent hard shoulder, that is conventional and controlled motorways carrying 15.95% of all traffic in England.

Figure 2

Description: Less than 1% of fatalities in England took place on motorways without a permanent hard shoulder (ALR and DHS) in 2020

Data: Fatalities by road type in England in 2020



Source: Visualisation from National Highways. Data based on STATS19[29]

In terms of fatality rates, smart motorways continue to be the safest roads in the country. Between 2016-2020, conventional motorways had a 5-year average of 0.15 fatal casualty rate per hmvm, while ALR, DHS and controlled motorways had a fatal casualty rate per hmvm of 0.12, 0.09 and 0.07 respectively. All of the above motorways performed better than A-roads which had a 5-year average fatal casualty rate of 0.41 for the same period.

29 STATS19 data released by DfT RAS30032 & RAS30081 here

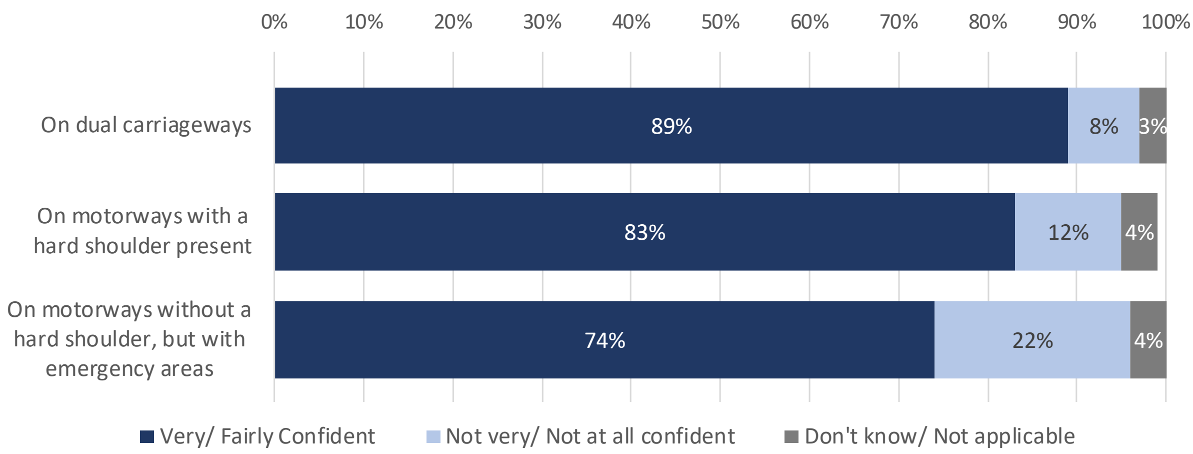
Perception of safety
We know the perception of safety is also important when it comes to smart motorways. While National Highways' ongoing customer experience tracker survey (HighView) and the Strategic Road User Satisfaction Survey (SRUS) both report that the vast majority of those driving on our network felt safe on their last journey, we know some may not feel as safe using parts of the network.

A National Highways survey considering feelings of safety found that the vast majority of drivers reported feeling comfortable driving on motorways, and even more comfortable using major A-roads. Drivers are more likely to say they feel confident, relaxed and happy on dual carriageway and A-roads (on SRN) than on motorways. Drivers are also more confident driving on motorways with hard shoulders than without, with approximately one in five drivers (22%) saying they do not feel confident driving on motorways without a hard a shoulder but with emergency areas.

While the survey suggests that drivers' comfort, ease and confidence is higher on dual carriageway and A-roads (on SRN), risks are higher on these roads than motorways. We want drivers to feel safe and be safer, with the skills and knowledge to drive appropriately in varying conditions and feel confident in doing so (see Giving clarity to drivers section of this report). We will continue undertaking research to further understand what users of the SRN think, feel and do.

Figure 3
Description: Drivers feel most confident on the least safe roads

Data: Driver confidence by road type in 2021[30]



Source: Data from Ipsos Mori based on fieldwork undertaken in 2021 (sample of 1,198 SRN drivers). Visualisation from National Highways.

30 *Total figures may not add up to 100% due to rounding*

Safety update on smart motorways[31]

The 2020 Stocktake provided a comprehensive summary of the safety of smart motorways, considering all data sources available at the time. The report concluded that, *"overall, smart motorways are in most ways as safe as, or safer than, the conventional ones. But not in every way"*. It set out an action plan to further improve safety on the smart motorway network.

The first year progress report drew the same conclusion as the 2020 Stocktake. It built on this further and concluded that in respect of fatality rates smart motorways were the safest roads in the country.

It should also be noted that the impact from the 2020 Action Plan is not reflected yet on the SRN as the data presented here covers the years up to and including 2020. Through the actions we have already taken and will continue to take, we are determined to do all we can to make drivers both feel safe and be safer on our roads. Through monitoring and evaluation activities, we will continue to assess the safety of our roads and identify opportunities to make them even safer.

Safety headlines (PIC/ FWI/ KSI)

Based on the headline metrics:

- no one motorway type performs best against all metrics and no one smart motorway type performs best against all metrics
- all three smart motorway types are safer than conventional motorways in terms of casualty- focused metrics i.e. FWI and KSI
- conventional motorways have lower personal injury collision (PIC) rates than other road types. But as their casualty rates (FWI and KSI) are higher, this suggests that when a collision occurs on a conventional motorway it is more likely that it will involve a killed or seriously injured casualty than a collision on the three smart motorway types

These headline metrics support that smart motorways continue to be as safe as, or safer than conventional ones for casualty-focused headline (FWI and KSI) metrics[32].

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31 The 2020 Stocktake considered smart motorways to include ALR, DHS and controlled motorways. Since the first year progress report, National Highways has disaggregated to report on each road type individually. This is in line with ORR's recommendation in the safety data review undertaken in 2021

32 In many cases, making comparisons between small collision and casualty numbers and rates can be challenging due to their underlying variability. To help us make some of these comparisons even more meaningful, since the first year progress report we have developed a statistical methodology to compare certain collision and casualty metrics. For more information, please see Annex B – Methodology (sub-section 'Statistical significance testing')

Table 1
Description: Smart motorways perform better against FWI and KSI metrics. Conventional motorways have lower PIC rates and higher FWI and KSI rates which suggests that when a collision occurs on conventional motorways it is more likely that it will involve a higher severity casualty

Data: Headline 5-year average (2016-2020) injury-adjusted metrics per road type

	PIC	PIC per hmvm	FWI	FWI per hmvm	KSI	KSI per hmvm
Conventional	2,738	6.12	164	0.37	646	1.45
ALR	299	6.24	16	0.33	68	1.38
DHS	240	7.92	10	0.32	35	1.17
Controlled	588	8.46	22	0.32	90	1.30
A-roads (on SRN)	4,412	13.59	297	0.91	1,191	3.66

Source: Analysis from National Highways. Data based on STATS19 with minor amendment[33].

The impact of the measures we have delivered as part of the 2020 Action Plan is not reflected in the latest safety data. It will not be possible to assess the impact of these measures until at least late 2023 when some of this data will start to be available.

Reducing the number of personal injury collisions is an integral part of reducing the number of casualties taking place on our roads. If we are to achieve the zero-harm vision on our network, we will need to reduce the number of PICs across the network. This makes it a concern for all road types.

We will continue monitoring safety performance across our network and seek to understand what is driving differences in metrics across the network, to help identify appropriate and targeted actions towards our zero-harm vision.

Safety trends (PIC/ FWI/ KSI rates)
Building on the principles of the first year progress report, we have also undertaken trend analysis of casualty and collision rates[34]. Importantly, accounting for traffic flows, PIC, KSI and FWI rates across all smart motorways have stable or improving trends.

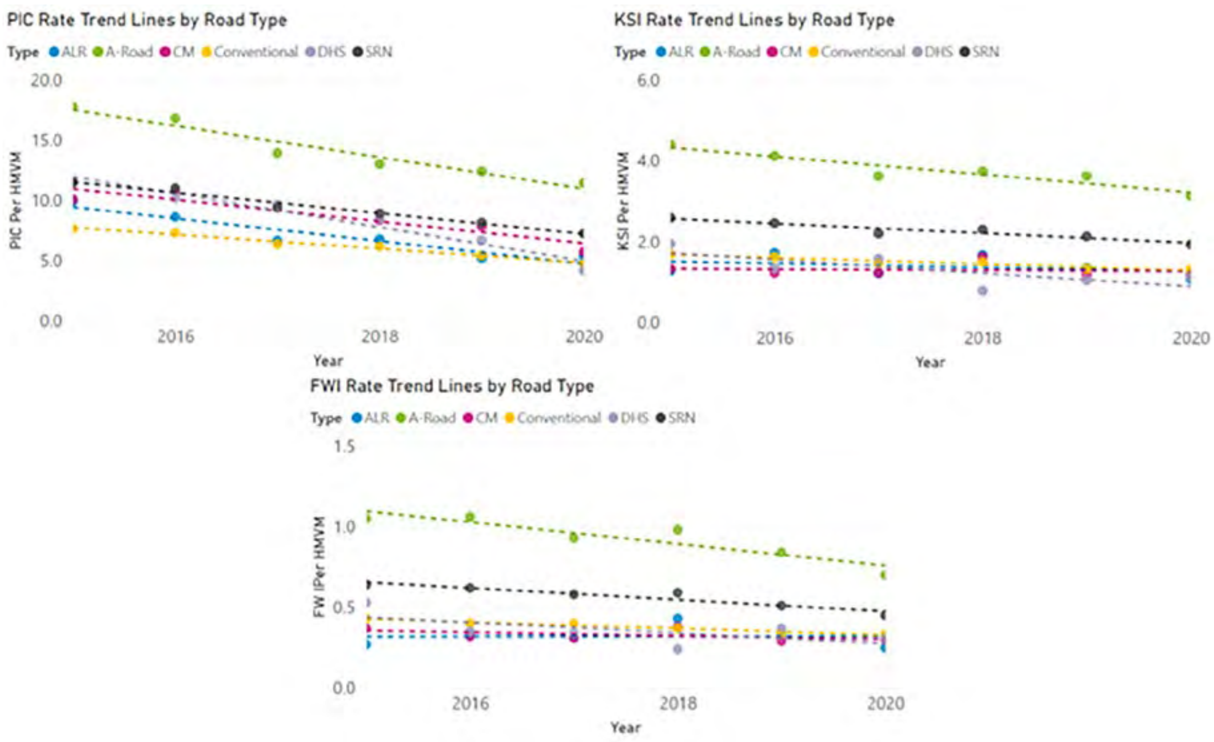
Considering smoothened (fitted) trends over several years addresses fluctuations in annual data due to collisions and casualties being uncertain events. As linear trends are influenced by outliers, they should only be considered as indicative of a metric's trajectory. For each metric's detailed year-on-year rates, please see Annex D – SRN collision and casualty statistics 2015-2020 [Adjusted for injury-based reporting].

33 One smart motorway fatality has historically been omitted from STATS19. This was manually added in the 2020 Stocktake and first year progress report and will continue to be added in subsequent overall smart motorways reporting

34 This reflects all available data since 2015. In the future this analysis will evolve to reflect the 5-year rolling average metrics

Figure 4
Description: Accounting for traffic flows, PIC, KSI and FWI rates across all roads have stable or improving trends

Data: PIC, KSI and FWI injury-adjusted rates per hmvm and linear trend lines by road type between 2015-2020



Source: Visualisation from National Highways. Data based on STATS19 with minor amendment. Road traffic statistics from DfT on the SRN.

Contributory factors
Following the first year progress report, using STATS19 data, we have undertaken contributory factor analysis to help us further understand which collisions were caused by which factors: environment, driver or vehicle.

It should be noted that for every collision the investigating police officer can assign between zero and six contributory factors from a list of 78 factors (STATS19) which they believe influenced the collision occurring.

These collisions have been grouped into three overarching categories: collisions involving at least one driver factor, collisions involving at least one environment factor and collisions involving at least one vehicle factor. Driver factors include issues such as following too close or failing to look properly. Environment factors include issues such as slippery road due to weather or deposit on road. Vehicle factors include issues such as defective brakes, defective steering or suspension. Some collisions belong to more than one group. This means that contributory factors in most cases overlap.[35]

Across all road types collisions caused due to driver factors are most prominent. Collisions caused due to environment or vehicle factors vary depending on road type. All smart motorways have a higher percentage of vehicle factors, but lower percentage of environment factors compared to conventional motorways. For more information, please see Annex H – SRN contributory factors.

We will continue to make enhancements to our smart motorway network and in response to the TSC report we are also building on our advice to drivers so they have more information on how to use smart motorways and what to do in an emergency. We will work with stakeholders and partners to deliver driver education, targeting key groups and behaviours.

Table 2

Description: Across all road types collisions caused due to driver factors are most prominent. All smart motorways have a higher percentage of vehicle factors, but lower percentage of environment factors compared to conventional motorways

Data: Total collisions by contributory factor group by road type between 2016-2020

	Driver factors	Vehicle factors	Environment factors	N/A[36]
Conventional	72.79%	4.43%	12.41%	22.28%
ALR	71.23%	6.64%	11.00%	23.86%
DHS	52.57%	6.50%	4.89%	43.80%
Controlled	71.74%	5.82%	7.74%	25.11%
A-roads (on SRN)	71.12%	3.20%	13.77%	25.12%

Source: Data based on STATS19[37].

35 A collision can have multiple factors attributed to it and from more than one grouping. The result is that when driver, vehicle, environment and N/A factor percentages are added together the total percentages exceed 100%. See Annex B – Methodology for more information on contributory factor analysis. For a detailed view of the STATS19 contributory factors, please see here

36 N/A includes collisions where there are no specified contributory factors and collisions where the only specified factors are special factors and pedestrian factors

37 One smart motorway fatality has historically been omitted from STATS19. This was manually added in the 2020 Stocktake and first year progress report and will continue to be added in subsequent overall smart motorways reporting. However, as the fatality is omitted in STATS19, there is no further official information available on the detailed conditions of the collision. For this reason, the detailed analysis in this report (such as contributory factor analysis) does not reflect this incident

During this exercise we observed that contributory factors for DHS roads are not captured by some police forces as extensively as they are captured for other road types. This means that currently it is not possible to make robust like-for-like comparisons between DHS and other road types. When police forces with over 50% of collisions meeting the N/A criteria are removed from the dataset, DHS tentatively has a similar contributory factor profile to controlled motorways. While this contributory factor issue will be at least partially resolved through the STATS19 review (here), we will be engaging with DfT to better understand and address potential local reporting issues.

On almost all roads (apart from DHS), the only contributory factor related to environment which appears consistently in the top 10 contributory factors is slippery roads due to adverse weather conditions. For more information, please see Annex H – SRN contributory factors.

While collisions may involve different levels of casualty severity (fatal, serious or slight), here we have focused on collisions only as this is in line with DfT guidance on analysing contributory factors. Any comparisons between different road types should be made in line with the notes included in Annex B – Methodology (sub-section 'Data Sources'). We will also work with DfT to better understand why contributory factors relating to vehicles are higher on smart motorways than conventional motorways and A-roads.

Stopped and moving vehicle safety

In the first year progress report, we summarised that the risk of a live lane collision between a moving vehicle and a stopped vehicle is greater on ALR and DHS motorways, but the risk of a collision involving only moving vehicles is lower. This is because ALR and DHS motorways have variable mandatory speed limits to smooth traffic flow, and electronic signs and signals to warn drivers of incidents ahead. This means less speeding, tailgating and fewer rapid changes of speed, which gives drivers more time to react if something happens.

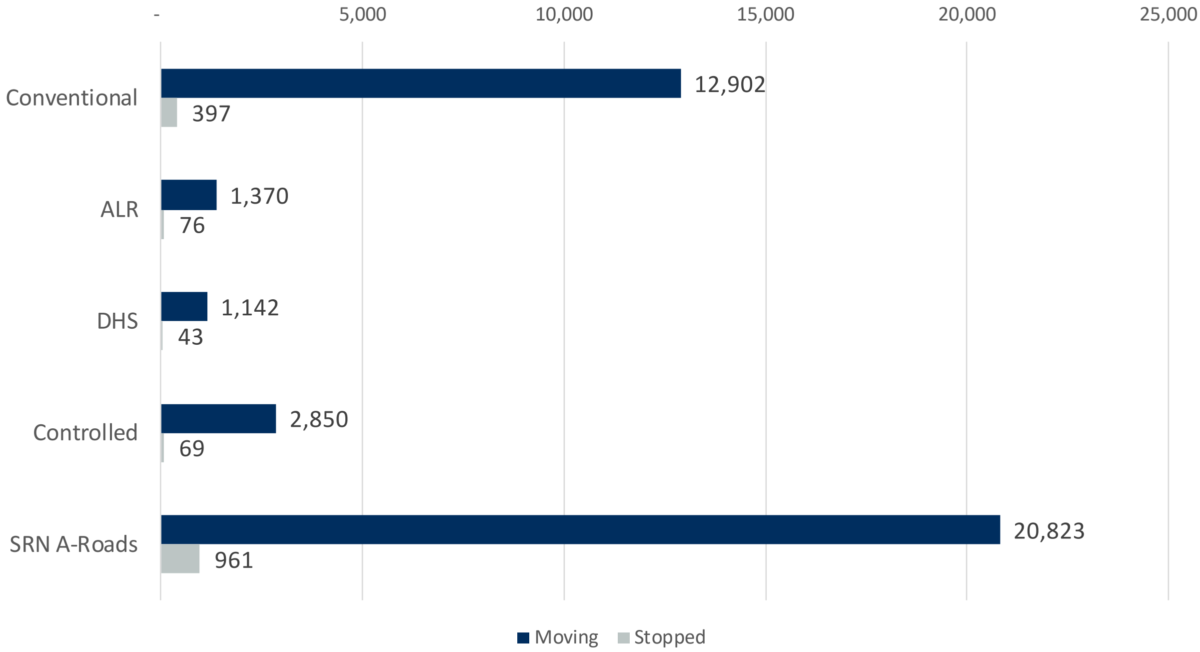
When considering collisions across the SRN, most collisions occur between moving[38] rather than stopped vehicles.

38 A moving vehicle collision has been defined as a collision which involves no vehicles recorded as 'parked' on STATS19, see Annex B – Methodology for further detail

Figure 5

Description: Across the SRN most collisions occur between moving vehicles

Data: Total moving vs. stopped vehicle collisions per road type between 2016-2020



Source: Analysis from National Highways. Data based on STATS19 with minor amendment.

In terms of the five-year average between 2016-2020, moving vehicle FWI and KSI rates, all types of smart motorways perform better than conventional motorways. ALR motorways have the lowest rate in terms of PIC, with DHS motorways having the lowest rates for FWI and KSI.

Table 3

Description: Moving vehicle PIC rates are lowest for ALR motorways, while FWI and KSI rates are the lowest on DHS motorways[39]

Data: Moving vehicle 5-year average (2016-2020) injury-adjusted metrics per road type

	PIC	PIC per hmvm	FWI	FWI per hmvm	KSI	KSI per hmvm
Conventional	2,658	5.94	150	0.34	604	1.36
ALR	283	5.91	14	0.28	59	1.19
DHS	231	7.62	8	0.27	30	1.00
Controlled	574	8.26	21	0.30	85	1.23
A-roads (on SRN)	4,218	12.99	269	0.83	1,111	3.42

Source: Analysis from National Highways. Data based on STATS19.

39 PIC, FWI and KSI figures are rounded to the nearest whole numbers. As a result, the sum of PICs and FWIs for moving and stopped collisions may differ from total collisions

While stopped collisions are a small proportion of all collisions across all roads (from 2.36% for controlled motorways to 2.99% for conventional motorways to 5.26% for ALR motorways), ALR and DHS motorways, which do not have a permanent hard shoulder, have higher PIC, FWI and KSI rates for stopped vehicle collisions than conventional and controlled motorways, which do have a permanent hard shoulder.

Stopped vehicle PIC rates are lowest for conventional motorways, while FWI and KSI rates are lowest for controlled motorways. This continues to reflect the summary we included in the first year progress report, that the risk of a live lane collision between a moving and a stopped vehicle is greater on ALR and DHS motorways, but the risk of a collision involving only moving vehicles is lower.

Table 4

Description: Stopped vehicle PIC, FWI and KSI rates are lower on motorways with a permanent hard shoulder than motorways without a permanent hard shoulder.[40]

Data: Stopped vehicle 5-year average (2016-2020) injury-adjusted metrics per road type

	PIC	PIC per hmvm	FWI	FWI per hmvm	KSI	KSI per hmvm
Conventional	81	0.18	14	0.03	41	0.09
ALR	16	0.33	3	0.05	9	0.19
DHS	9	0.29	2	0.05	5	0.17
Controlled	14	0.20	1	0.02	5	0.06
A-roads (on SRN)	195	0.60	28	0.09	80	0.25

Source: Analysis from National Highways. Data based on STATS19.

Small datasets can be disproportionately sensitive to small changes. Such volatility is an issue as it can obscure meaningful conclusions that can be drawn from the data. As stopped collisions are a small proportion of all collisions across all roads, these should always be considered alongside a broader context.

The impact of the measures we have delivered as part of the 2020 Action Plan is not reflected in the latest safety data. It will not be possible to assess the impact of these measures until at least late 2023 when some of this data will start to be available.

40 *Stopped vehicle collisions include one fatal collision on a smart motorway omitted from STATS19*

Hard shoulder safety
We recognise the importance of being able to stop in a place of relative safety at the time of an emergency. The hard shoulder is perceived to be a place of safety but, in reality, it does not provide a completely safe place to stop.

Between 2016 and 2020 there were 28 fatal casualties (out of a total of 403 fatal casualties on motorways) resulting from a motorway collision which involved a vehicle recorded as entering, leaving or on a hard shoulder, which is one out of every 14 fatal casualties. Of these fatalities, 26 occurred on conventional motorways, two on controlled motorways and none on a DHS motorway. There were two additional fatal casualties on DHS motorways which occurred when the hard shoulder was operating as a live lane and as per STATS20 guidance the collisions are categorised as live lane collisions and included in the DHS live lane data.

For more information, please see Annex J – SRN casualty data per lane and vehicle movement status 2015-2020.

Emergency area safety
On smart motorways without a permanent hard shoulder, we are introducing additional emergency areas which are wider than a hard shoulder and set back from live traffic lanes. Between 2016- 2020, there have not been any fatalities in emergency areas.

For motorways without a permanent hard shoulder, we will continue to monitor the impact of all additional emergency areas through the emergency area retrofit programme.

Live lane breakdowns
Between 2016-2020, 243,701 live lane breakdown incidents were reported on the SRN. Slightly more than half of these took place on conventional motorways, whereas approximately a quarter took place on motorways without a permanent hard shoulder (ALR and DHS).

Over time we have observed that live lane breakdowns which occur on ALR and DHS motorways are identified more extensively compared to other road types. There are many reasons that may influence our knowledge of live lane breakdowns on different roads. For example, ALR motorways include increased use of technology which helps our operators manage traffic flows and incidents and detect stopped vehicles (where in place) faster. The bias in this data means that comparisons of the number of breakdown incidents between different road types are inappropriate and is not a reliable indicator of actual safety. For more information, please see Annex B – Methodology. To address these reporting differences we will work with our partners, such as recovery organisations, to seek access to relevant data.

Reflecting on the latest RAC Foundation analysis[41] on vehicle breakdowns, the largest category of breakdown cause was 'wheels, tyres and punctures' at 26%. The second largest category was 'engine mechanical' at 18% and the third largest category was 'engine management'[42] at 8%. Running out of fuel accounts for 3% of all SRN breakdowns.

We recognise that the risk of having a live lane breakdown has increased with ALR motorways. Albeit only a very small proportion of total journeys on any road result in live lane breakdowns. However we understand this is the main concern drivers have about smart motorways. While most of these breakdowns do not lead to serious or fatal casualties, we recognise it can affect how people feel. So we are taking steps to address this. The impact of the measures we have delivered as part of the 2020 Action Plan is not reflected in the latest safety data. It will not be possible to assess the impact of these measures until at least late 2023 when some of this data will start to be available. We are taking reasonable steps to reduce this risk and we would also like drivers on the SRN to follow our guidance and check their vehicles to ensure they are fit-for-purpose before driving and know what to do in the rare situation of a breakdown.

We will also continue to collect data and analyse the safety performance of smart motorways (including ALR and DHS) as part of our ongoing assessment of risks to help inform our thinking.

Summary
The latest data shows that, overall, in terms of serious or fatal casualties, smart motorways are our safest roads. We are continuing our work to make them our safest roads in every way.

Safety headlines

- compared to other roads in England, motorways are comparatively the safest roads to travel on. However, our customer research shows that drivers' confidence does not reflect this
- safety rates across all roads have stable or improving trends
- no one motorway type performs best against all three PIC, FWI and KSI metrics, and no one type of smart motorway performs best against all these metrics
- all three smart motorway types are performing better than conventional motorways on the casualty-focused FWI and KSI rates, and much better than A-roads for both collision and casualty rates
- conventional motorways have lower personal injury collision (PIC) rates than other

41 For more information, please see here
42 The engine management system is an engine's electronic 'brain'. This controls elements such as the fuel and air mixture and the ignition timing to help a vehicle's engine run smoothly

road types, but as their casualty rates (FWI and KSI) are higher, this suggests that when a collision occurs on a conventional motorway it is more likely that it will involve a killed or seriously injured casualty than a collision on the three smart motorway types

Stopped and moving vehicle safety

- across the SRN, most collisions occur between moving vehicles
- moving vehicle PIC rates are lowest for ALR motorways, and FWI and KSI rates are lowest on DHS motorways
- while stopped vehicle collisions remain a very small proportion of all collisions (from 2.36% for controlled motorways to 2.99% for conventional motorways to 5.26% for ALR motorways), stopped vehicle collision and casualty rates are lowest for conventional and controlled motorways
- this continues to reflect the summary we included in the first year progress report that the risk of any collision is low. The risk of a live lane collision between a moving and a stopped vehicle while still rare, is greater on ALR and DHS motorways, but the risk of a collision involving only moving vehicles is lower

Live lane breakdowns

- between 2016-2020, 243,701 live lane breakdown incidents were reported on the SRN. Slightly more than half of these took place on conventional motorways, whereas approximately a quarter took place on motorways without a permanent hard shoulder (ALR and DHS). We have observed that live lane breakdowns on ALR and DHS motorways are identified more extensively compared to other road types, which makes direct comparisons prone to bias
- millions of drivers use our network every day. A very small proportion of total journeys on any road result in live lane breakdowns, and we understand this is the main concern drivers have about smart motorways. While most of these breakdowns do not lead to serious or fatal casualties, we recognise it can affect how people feel. So we are taking steps to address this, such as introducing SVD. We will also continue to work with drivers building on our advice, so they have more information on how to use smart motorways and what to do in an emergency

Further considerations

To gain further confidence in the safety conclusions of this report, we have worked closely with ORR, who undertook additional independent assurance for the supporting analysis in March 2022. The ORR review confirmed that we have addressed the relevant recommendations relating to high-level statistics from ORR's previous review in 2021. ORR also found that:

- the underlying calculations supporting this report (such as the calculation of casualty and collision rates and five-year averages) are correct
- our assurance framework is a strong application of the cross-government Aqua Book guidance[43] and we followed these processes to ensure the evidence is reliable and the strengths, risks and uncertainties in the analysis are clearly reported
- we have taken significant steps to increase transparency, both in how we have communicated new methods (e.g. for statistical testing) and by publishing more detailed collision and casualty data alongside our report

It is important to acknowledge that comparing safety metrics across road types is only one element of the analyses we undertake in National Highways. Additionally, we undertake:

- intervention data monitoring and evaluation – understanding whether implemented actions are effective and/or achieve their outcomes
- before vs. after analysis – undertaking Post Opening Project Evaluations to capture the safety benefits from traffic transferring from less safe roads to the SRN
- customer research – understanding what impacts driver experience
- safety reviews – understanding which road type elements are important for mitigations or future road development

For more information, on such analyses undertaken over the last 12 months, please see Annex M – Relevant analyses and reports.

Also, as we committed in the 2021 ORR safety data review (here), we will complete an overarching before vs. after analysis for ALR and DHS motorway schemes before Winter 2022. Following advice by the ORR review team, this updated overarching report will:

- reflect scheme-specific data (similar to the *'Smart Motorway All Lane Running Overarching Safety Report 2019'*)
- consider up-to-date data for all schemes (in line with the latest road casualty statistics)
- expand the list of schemes to include both ALR and DHS schemes
- incorporate the updated significance testing methodology.

43 The Aqua Book is a good practice guide across government for those working with analysis and analytical models. For more information, please see here

Conclusion and next steps

The first year progress report concluded that in respect of fatality rates, smart motorways were the safest roads in the country and that *'overall, the evidence showed that smart motorways were as safe as, or safer than, the conventional motorways they replaced. But not in every way'.*

The latest data shows that, overall, in terms of serious or fatal casualties, smart motorways are our safest roads. We are continuing our work to make them our safest roads in every way.

The risk of a live lane collision between a moving and a stopped vehicle is greater when compared to conventional motorways. This continues to reflect the summary we included in the first year progress report: that the risk of a collision between a moving and a stopped vehicle is greater on ALR and DHS motorways. However we recognise the risk of a collision involving only moving vehicles is lower. We also recognise that the overall injury collision rates for all smart motorway types are higher than conventional motorways.

This is why we are committed to delivering the 18 actions contained in the 2020 Action Plan, the accelerated and further commitments made in the first year progress report and more recently the actions within the Government's response to the TSC's report. This will see over £900m being invested to further improve safety, including measures targeted at reducing collisions between stopped and moving vehicles. It will also include collecting and considering further safety and economic data to enable the Government to make informed decisions about enhancing capacity on the SRN.

Over the past year we have continued to deliver against the commitments in the 2020 Action Plan, undertaking a wide range of activities to further improve safety of smart motorways and are on track to complete many of the actions by September 2022. This includes completing the roll out of SVD technology across every existing ALR smart motorway in operation and completing the upgrade of enforcement cameras to enable the detection of vehicles that pass under a Red X or enter a lane beyond a Red X. These measures will help improve the safety of drivers who breakdown in a live lane.

We have also continued to undertake public information campaigns so that drivers are better informed about how to drive on motorways and how smart motorways work. This includes launching our 'Driving on motorways hub' and providing a range of driver education campaigns including our 'Go Left' breakdown advice.

Smart motorways have greatly increased the capacity of the country's most important roads. They reduce congestion, make journeys smoother and support the economy; doing so in a way that has a reduced impact on the environment.

We recognise, however, that people still have concerns about driving on smart motorways and we are committed to going further. The scrutiny of smart motorways over the last two years has enabled us to react to the challenges presented to us by our stakeholders and Government. The ORR oversight should help provide additional reassurance to drivers.

We will continue to further enhance the safety of our network until we reach our vision that no one should be killed or injured when travelling or working on the SRN.

To do this we must be a listening organisation, open to the suggestions of drivers, partners and stakeholders. We are absolutely committed to continuing to make our network, including smart motorways, as safe as it can possibly be. We also recognise that many people have a role to play in road safety.

We are committed to playing our part and will continue to work with others, whose actions can further improve the safety of the network.

Annex A – Smart motorways map (correct as of March 2022)

ALR motorway

Scheme name

- 4 M1 Junction 16 - 19
- 6 M1 Junction 24 - 25
- 8 M1 Junction 28 - 31
- 10 M1 Junction 32 - 35a
- 11 M1 Junction 39 - 42
- 12 M3 Junction 2 - 4a
- 16 M5 Junction 4a - 6
- 17 M6 Junction 2 - 4
- 22 M6 Junction 11a - 13
- 24 M6 Junction 16 - 19
- 26 M20 Junction 3 - 5
- 28 M23 Junction 8 - 10
- 30 M25 Junction 5 - 6
- 35 M25 Junction 23 - 27
- 43 M62 Junction 10 - 12
- 44 M62 Junction 18 - 20

Controlled motorway

Scheme name

- 1 M1 Junction 6a - 10
- 5 M1 Junction 23a - 24
- 7 M1 Junction 25 - 28
- 9 M1 Junction 31 - 32
- 21 M6 Junction 10a - 11a
- 27 M20 Junction 5 - 7
- 29 M25 Junction 2 - 3
- 31 M25 Junction 6 - 7
- 32 M25 Junction 7 - 10
- 34 M25 Junction 16 - 23
- 36 M25 Junction 27 - 30
- 40 M42 Junction 7 - 9
- 42 M60 Junction 8 - 18

England's strategic road network (SRN)

- Motorway
- All purpose trunk road
- Toll roads

Smart motorway scheme status

- 88 ALR motorway
- 88 Controlled motorway
- 88 DHS motorway
- 88 In construction
- 88 Paused

DHS motorway conversion to ALR paused

Scheme name

- 2 M1 Junction 10 - 13
- 15 M4 - M5 interchange *
- 18 M6 Junction 4 - 5
- 19 M6 Junction 5 - 8
- 20 M6 Junction 8 - 10a
- 39 M42 Junction 3a - 7
- 46 M62 Junction 25 - 30 **

* Scheme full name
M4 Junction 19 - 20 and M5 Junction 15 - 17

** All Lane Running:
Junction 25 to 26 and Junction 29 to 30 (westbound)
Dynamic Hard Shoulder:
Junction 26 to 28 and Junction 29 to 30 (eastbound)
Controlled Motorway:
Junction 28 to 29

ALR schemes in construction

Scheme name

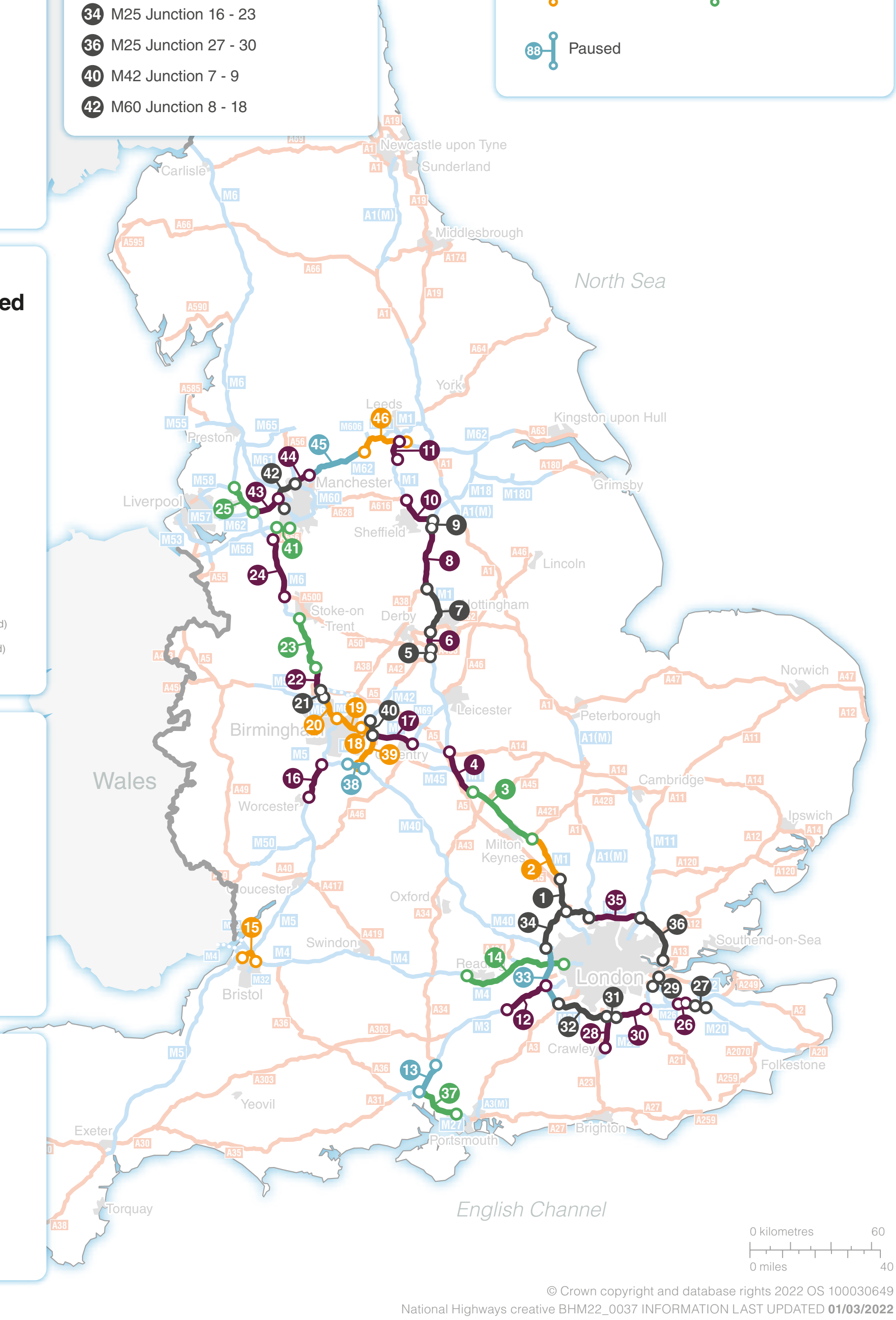
- 3 M1 Junction 13 - 16
- 14 M4 Junction 3 - 12
- 23 M6 Junction 13 - 15
- 25 M6 Junction 21a - 26
- 37 M27 Junction 4 - 11
- 41 M56 Junction 6 - 8

ALR schemes paused

Scheme name

- 13 M3 Junction 9 - 14
- 33 M25 Junction 10 - 16 ***
- 38 M40 - M42 interchange
- 45 M62 Junction 20 - 25

*** Paused controlled motorway schemes
Junction 10 to 15



National Highways creative BHM22_0037 INFORMATION LAST UPDATED **01/03/2022**

Annex B – Methodology

Data sources

Data on road traffic casualties on the roads in Great Britain are collected via the STATS19 process. These statistics are collected by police forces, either through officers attending the scene of incidents, from members of the public reporting the incident in police stations after the incident, or more recently online and then validated and published annually by DfT. The collision and casualty analysis presented here is developed by National Highways using STATS19 data (unless stated otherwise).

STATS19 road traffic collision and casualty data is published annually by DfT in the Autumn and provides details of the previous calendar year (for example, DfT published the 2020 calendar year dataset at the end of September 2021).

Casualty data can change considerably from year to year, depending on circumstances in any given year, and casualty rates can be sensitive to small changes in the absolute number of casualties. Such changes can be more prominent for specific schemes or parts of the SRN, and less so for wider geographical areas, for example the full SRN or Great Britain. Volatility is an issue as it can obscure more meaningful conclusions that can be drawn from the data. When considering casualty statistics, looking at the average over a recent set of years reduces the impact of volatility and helps identify trends. This report uses the last six years of available data (2015-2020).

STATS19 data as provided by DfT reflects the situation at the time the annual statistics are produced. Subsequently, further information may become available which may suggest that some incidents should have been either in or out of scope. Every road accident is important. STATS19 database is a collection of all road traffic accidents that resulted in a personal injury and were reported to the police within 30 days of the accident. The analysis supporting this report reflects the same threshold of 30 days.

One smart motorway fatality has historically been omitted from STATS19. This was manually added in the 2020 Stocktake and first year progress report and will continue to be added in subsequent overall smart motorways reporting. This means that while this is added in summary tables, detailed analysis (such as contributory factor analysis) excludes this incident as the supporting information is not available on STATS19. To reflect this, relevant table clarifications and footnotes have been added throughout this report.

Breakdown data (unless stated otherwise) reflects breakdown incidents recorded on National Highways' Incident Management system (ControlWorks). This system records incidents that National Highways has been informed of and its primary purpose is to enable operational teams to manage these incidents. National Highways adopted ControlWorks in September 2016, replacing the previous incident management system.

Over time we have observed that live lane breakdowns which occur on ALR and DHS motorways are identified more extensively compared to other road types. There are many reasons that may influence our knowledge of live lane breakdowns on different roads. For example, ALR motorways include increased use of technology which help our operators manage traffic flows and incidents and detect stopped vehicles faster. This means that ALR motorways are likely to have more and/or better information captured for breakdowns compared to other road types. This means that comparisons on breakdown data per road type should be made with caution, as smart motorways are likely to have considerably better reporting of breakdown incidents.

Live lane breakdowns are all breakdown incidents recorded on ControlWorks where the location has been categorised as being in a live lane. Breakdowns where location is not specified or recorded as not being in a live lane, are excluded.

The methodology used to provide the data in this report is consistent with that used to produce the 2020 Stocktake and first year progress report. This methodology, and its subsequent outputs may differ to methodologies used in different analyses at different points in time. This is due to continuous improvements of data mapping, capture and quality. As these factors evolve over time any comparison with earlier data or data from other sources, should be interpreted with caution.

Headline metrics

ORR suggested in their 2021 safety data review that "*a smaller number of 'headline' metrics should be used to communicate safety*". In discussions with the ORR review team, it was acknowledged that selecting a single safety metric may be subject to challenge as each metric will have its own limitations. For this reason, this report uses a set of headline metrics:

Personal Injury Collisions (PIC) – These are the number of road traffic collisions which have resulted in a person sustaining an injury. PICs do not reflect the number of people injured in each collision (casualties). This metric has certain benefits, such as not including uncertainty from (i) random effects, for example a coach accident leading to multiple casualties and (ii) non-random effects on vehicle type and vehicle occupancy, such as socio-demographic effects. On the other hand, collisions do not reflect the number of injured people involved.

PIC rates accounting for traffic flow – A rate calculated using the number of personal injury collisions and the total miles travelled on a road section or type. This measure allows roads with heavy traffic or span a long distance to be compared against roads which carry less traffic or span a shorter distance. The rate is presented as the number of collisions per hundred million vehicle miles.

Fatal and Weighted Injuries (FWI) – A measure which weights and aggregates the number of people that have been injured in road traffic collisions. Like other transport authorities (such as the Rail Safety and Standards Board RSSB - here), a metric to assess the safety of roads is Fatal and Weighted Injuries (FWI). This gives a fatality 10 times the weight of a serious casualty, and a serious casualty 10 times the weight of a slight casualty. This is calculated as following: Fatal and Weighted Injuries = Fatal casualties + Serious Casualties * 0.1 + Slight Casualties * 0.01. In its safety data review, ORR highlighted that "*the methodology was derived from that used by RSSB. RSSB has since adopted new weightings for calculating FWI, but we consider that the weightings used by Highways England were appropriate*". While FWI recognises all injuries, it acknowledges that not all injuries are equal.

FWI rates accounting for traffic flow – A rate calculated using the aggregate FWI and the total miles travelled on a road section or type. This measure allows roads with heavy traffic or span a long distance to be compared against roads which carry less traffic or span a shorter distance. The rate is presented as the aggregate FWI per hundred million vehicle miles.

Killed and Seriously Injured (KSI) casualties – The severity-adjusted number of people killed or seriously injured in road traffic collisions. KSI casualties are a simple aggregation of fatal and serious casualties. While this means that the metric's methodology is transparent, KSIs do not account for casualties sustaining slight injuries. Therefore reporting only this metric may undermine the importance of slight casualties.

KSI rates accounting for traffic flow – A rate calculated using the number of people who are killed or seriously injured, and the total miles travelled on a road section or type. This metric allows roads with heavy traffic or span a long distance to be compared against roads which carry less traffic or span a shorter distance. The rate is presented as the severity-adjusted number of KSI casualties per hundred million vehicle miles.

Adopting all the above metrics means that safety can be measured both in absolute and relative terms (considering both number of collisions and casualties and rates normalised per traffic flows).

Averages

Millions of drivers use our network every day. Road traffic collisions which result in injuries are rare events. As a result collision numbers, and the number of casualties resulting from those collisions, are subject to a degree of fluctuation, particularly when being reviewed at a localised level, such as on specific schemes. To be more certain that the differences, if any, we see are due to a change in safety rather than within what could be seen as the normal range of fluctuation, it is preferable to capture as many data points as possible. A minimum of three years of data is required to be considered sufficiently robust to assess the safety performance of the network.

Data for a single year or averages over shorter periods, such as three-year averages, are likely to be impacted more by external rare systemic events, such as Covid-19. Such events can skew the data and increase analytical uncertainty. For example, if a three-year average was selected, then the impact of reduced traffic flows in 2020 would be greater. In future progress reports, this uncertainty would increase even further as Covid-19 had an impact both during 2020 and 2021 so a three-year average between 2019-2021 would be even more impacted.

Use of a wider data range, such as the five-year average selected in this report, helps reduce the impact on the data of rare systemic events, such as Covid-19.

The average used in this and previous reports, such as the 2020 Stocktake and the first year progress report, takes into account the relative importance of traffic flows (weighted average). This is calculated as the: sum ([PIC/ FWI / KSI] for calendar year * HMVM traffic for that year)/ sum (HMVM traffic for five-year period). A weighted average is sometimes more accurate than a simple average, as it accounts for changes in traffic flows over a period of time.

Considering a five-year average, rather than an average for all available years, means that in the future this analysis will evolve to reflect the five-year rolling average metrics, which is in line with good reporting practices.

Covid-19 effect

The STATS19 dataset for 2020 road traffic collisions is heavily influenced by the rare event of the Covid-19 pandemic, which caused three national lockdowns and various regional restrictions throughout the year. The peak impact of the pandemic saw a significant reduction in traffic in April 2020 compared to the same period the year before (see here). This is likely to have impacted collisions and casualties in two ways: (i) rates per hmvm are likely to have been influenced by changes in traffic flows and (ii) less congestion on various roads may have impacted driver behaviour. The former is reflected in this report and mitigated through the use of five-year average metrics, i.e., one out of five years is impacted by Covid-19. The latter is not considered within the scope of this report.

Road length and traffic statistics

This analysis is using DfT road length and traffic statistics with inputs provided by National Highways. This report reflects minor changes in road lengths over time due to detailed information added at a scheme level. For example, this includes reflecting more accurately sections of the network that include multiple road types between junctions, such as on the M62. Where there are mixed scheme types within a section, for the purposes of this report, the section is categorised based on the dominant type of smart motorway. For example, the M25 between Junctions 6 and 7 is a combination of controlled and ALR smart motorway, but with controlled making up the majority of the link. Therefore it has been categorised as controlled for the purpose of this report. It is also worth noting that the characteristics of a smart motorway may not be present for the entirety of a section i.e., a hard shoulder may be present on parts of an ALR section.

Traffic statistics are usually published by DfT as an annual average. In line with the 2020 Stocktake and first year progress report, DfT has apportioned the road lengths and traffic flows depending on the month and year that each scheme opened. Additionally, the traffic statistics produced for this report reflect the SRN at the end of each calendar year. For more information, please see here.

Scheme road length (miles)[44] [45]

Motorway Section	Scheme type	Open for traffic	Closed for traffic	Road length (miles)					
				2015	**2016**	**2017**	**2018**	**2019**	**2020**
M1 J6a-10	Controlled motorway	01/12/2008		10.3	10.3	10.3	10.3	10.3	10.3
M1 J10-13	Dynamic hard shoulder	01/12/2012		15.2	15.2	15.2	15.0	15.0	15.0
M1 J16-17	All lane running[46]	29/01/2018		-[47]	-	-	8.6	8.6	8.6
M1 J17-18	All lane running	29/01/2017		-	-	2.0	2.0	2.0	2.0
M1 J18-19	All lane running	29/01/2018		-	-	-	3.9	3.9	3.9
M1 J23a-24	Controlled motorway	13/12/2018		-	-	-	1.9	1.9	1.9
M1 J24-25	All lane running	26/02/2019		-	-	-	-	5.3	5.3
M1 J25-28	Controlled motorway	01/05/2010		15.2	15.2	15.2	15.2	15.2	15.2
M1 J28-31	All lane running	31/03/2016		-	20.1	20.1	20.1	20.1	20.1
M1 J31-32	Controlled motorway	21/11/2014		3.3	3.3	3.3	3.3	3.3	3.3
M1 J32-34	All lane running	29/03/2017		-	-	5.9	5.9	5.9	5.9
M1 J34-35a	All lane running	29/03/2017		-	-	4.5	4.5	4.5	4.5
M1 J39-41	All lane running	01/01/2016		-	5.3	5.3	5.3	5.3	5.3
M1 J41-42	All lane running	01/01/2016		-	1.4	1.4	1.4	1.4	1.4
M3 J2-4a	All lane running	30/06/2017		-	-	13.6	13.6	13.6	13.6
M5 J15-17	Dynamic hard shoulder	01/01/2014		3.2	3.2	3.2	3.2	3.2	3.2
M4 J19-20	Dynamic hard shoulder	01/01/2014		3.1	3.1	3.1	3.1	3.1	3.1
M5 J4a-5	All lane running	25/05/2017		-	-	4.9	4.9	4.9	4.9

44 National Highways schemes open at different points during the year, however DfT data on road length is based on a snapshot from April in each year. This means that in the year that a scheme opens, all of the existing road length is assigned to the scheme, even if the scheme opens after the April snapshot

45 The length of road for each scheme represents the length of road that was converted from conventional motorway

46 Following a review by the TSC, all new ALR schemes have been paused as of January 2022.

47 Where a dash (-) is present, this indicates that road length data is not applicable before the scheme opened, or after it closed

M5 J5-6	All lane running	25/05/2017		-	-	6.1	6.1	6.1	6.1
M6 J2-4	All lane running	17/04/2020		-	-	-	-	-	12.4
M6 J4-5	Dynamic hard shoulder	01/11/2009		5.0	5.0	5.0	5.0	5.0	5.0
M6 J5-8	Dynamic hard shoulder	01/05/2014		9.6	9.6	9.6	9.6	9.6	9.6
M6 J8-10a	Dynamic hard shoulder	01/03/2011		6.6	6.6	6.6	6.6	6.8	6.8
M6 J10a-11a	Controlled motorway	07/02/2016		-	3.2	3.2	3.2	3.2	3.2
M6 J11a-13	All lane running	07/02/2016		-	6.9	6.9	6.9	6.9	6.9
M6 J16-17	All lane running	20/03/2019		-	-	-	-	6.1	6.1
M6 J17-18	All lane running	08/03/2019		-	-	-	-	3.7	3.7
M6 J18-19	All lane running	28/01/2019		-	-	-	-	8.1	8.1
M20 J3-5	All lane running	12/05/2020		-	-	-	-	-	5.5
M20 J4-5[48]	Controlled motorway	01/10/2011	12/05/2020	2.7	2.7	2.7	2.7	2.7	-
M20 J5-7	Controlled motorway	01/10/2011		3.2	3.2	3.2	3.2	3.2	3.2
M23 J8-10	All lane running	16/09/2020		-	-	-	-	-	9.5
M25 J2-3	Controlled motorway	09/05/2012		3.3	3.3	3.3	3.3	3.3	3.3
M25 J5-6	All lane running	01/04/2014		9.6	9.6	9.6	9.6	9.6	9.6
M25 J6-7	Controlled motorway	01/04/2014		3.0	3.0	3.0	3.0	3.0	3.0
M25 J7-10	Controlled motorway	01/04/2011		16.3	16.3	16.3	16.3	16.3	16.3
M25 J10-16	Controlled motorway	01/01/1995		19.2	19.2	19.2	19.2	19.3	19.3
M25 J16-23	Controlled motorway	01/05/2012		22.1	22.1	22.1	22.1	22.1	22.1
M25 J23-25	All lane running	01/11/2014		8.2	8.2	8.2	8.2	8.2	8.2
M25 J25-27	All lane running	01/11/2014		7.9	7.9	7.9	7.9	7.9	7.9
M25 J27-30	Controlled motorway	01/05/2012		16.0	16.0	16.0	16.0	16.0	16.0
M42 J3a-7	Dynamic hard shoulder	12/09/2006		10.8	10.8	10.8	10.8	10.8	10.8
M42 J7-9	Controlled motorway	01/11/2009		6.2	6.2	5.7	5.7	5.7	5.7
M60 J8-15	Controlled motorway	01/12/2017		-	-	7.1	7.1	7.3	7.3
M60 J15-18	Controlled motorway	01/12/2017		-	-	4.7	4.8	4.8	4.8
M62 J10-12	All lane running	13/01/2021		-	-	-	-	-	-
M62 J18-20	All lane running	01/12/2017		-	-	5.2	5.2	5.2	5.2

48 The M20 J4-5 controlled motorway scheme was in operation from 1 October 2011 but was converted into ALR with the opening of the M20 J3-5 scheme on 12 May 2020

M62 J25-26	All lane running	01/10/2013		3.2	3.2	3.2	3.2	3.2	3.2
M62 J26-28	Dynamic hard shoulder	01/10/2013		7.6	7.6	7.6	7.6	7.6	7.6
M62 J28-29	Controlled motorway	01/10/2013		2.8	2.8	2.8	2.9	2.9	2.9
M62 J29-30	Dynamic hard shoulder	01/10/2013		2.2	2.2	2.2	2.4	2.4	2.4
	Conventional Motorway[49]			1,657.0	1,617.0	1,583.0	1,581.0	1,564.0	1,540.0

Source: DfT road length and road traffic statistics, National Highways scheme management information

Scheme traffic (100 million vehicle miles)[50]

Motorway section	Scheme type	Open for traffic	Closed for traffic	Motor vehicle traffic (100 million vehicle miles)					
				2015	**2016**	**2017**	**2018**	**2019**	**2020**
M1 J6a-10	Controlled motorway	01/12/2008		6.4	6.5	6.1	6.7	6.2	5.8
M1 J10-13	Dynamic hard shoulder	01/12/2012		6.9	6.9	7.0	7.6	8.0	6.5
M1 J16-17	All lane running[51]	29/01/2018		-[52]	-	-	3.2	3.8	2.9
M1 J17-18	All lane running	29/01/2017		-	-	0.7	0.7	0.7	0.5
M1 J18-19	All lane running	29/01/2018		-	-	-	1.3	1.5	1.1
M1 J23a-24	Controlled motorway	13/12/2018		-	-	-	-	1.1	0.7
M1 J24-25	All lane running	26/02/2019		-	-	-	-	2.1	1.7
M1 J25-28	Controlled motorway	01/05/2010		6.5	6.6	6.7	6.5	7.3	5.3
M1 J28-31	All lane running	31/03/2016		-	6.4	8.6	8.6	9.3	7.0
M1 J31-32	Controlled motorway	21/11/2014		1.3	1.3	1.4	1.4	1.5	1.1
M1 J32-34	All lane running	29/03/2017		-	-	1.8	2.4	2.6	1.8
M1 J34-35a	All lane running	29/03/2017		-	-	1.4	1.8	1.9	1.5
M1 J39-41	All lane running	01/01/2016		-	2.4	2.5	2.3	2.4	1.9
M1 J41-42	All lane running	01/01/2016		-	0.7	0.7	0.7	0.7	0.7
M3 J2-4a	All lane running	30/06/2017		-	-	2.9	6.1	6.3	4.8
M5 J15-17	Dynamic hard shoulder	01/01/2014		1.4	1.4	1.4	1.4	1.4	1.1
M4 J19-20	Dynamic hard shoulder	01/01/2014		1.5	1.4	1.5	1.4	1.6	1.2
M5 J4a-5	All lane running	25/05/2017		-	-	1.3	2.1	2.2	1.6
M5 J5-6	All lane running	25/05/2017		-	-	1.5	2.4	2.4	1.8
M6 J2-4	All lane running	17/04/2020		-	-	-	-	-	2.8
M6 J4-5	Dynamic hard shoulder	01/11/2009		2.1	2.1	2.2	2.2	2.2	2.0
M6 J5-8	Dynamic hard shoulder	01/05/2014		3.9	4.0	4.7	4.8	5.2	4.7
M6 J8-10a	Dynamic hard shoulder	01/03/2011		3.0	3.0	3.3	3.2	3.4	3.1

49 Due to rounding, aggregating scheme level and conventional motorway figures will not exactly match the figures in the summary tables
50 National Highways schemes open at different points during the year, therefore, in the year that a scheme opens, a proportion of the annual traffic will be assigned to the scheme by using the proportion of days that a scheme has been open in the given calendar year
51 Following a review by the TSC, all new ALR schemes have been paused as of January 2022.
52 Where a dash (-) is present, this indicates that traffic data is not applicable before the scheme opened

M6 J10a-11a	Controlled motorway	07/02/2016		-	0.9	1.0	1.0	0.9	0.9
M6 J11a-13	All lane running	07/02/2016		-	2.4	2.7	2.7	2.6	2.0
M6 J16-17	All lane running	20/03/2019		-	-	-	-	2.0	1.9
M6 J17-18	All lane running	08/03/2019		-	-	-	-	1.3	1.2
M6 J18-19	All lane running	28/01/2019		-	-	-	-	3.2	2.7
M20 J3-5	All lane running	12/05/2020		-	-	-	-	-	1.1
M20 J4-5[53]	Controlled motorway	01/10/2011	12/05/2020	1.2	1.3	1.3	1.1	1.1	0.3
M20 J5-7	Controlled motorway	01/10/2011		1.4	1.4	1.4	1.4	1.3	1.2
M23 J8-10	All lane running	16/09/2020		-	-	-	-	-	0.6
M25 J2-3	Controlled motorway	09/05/2012		1.6	1.5	1.4	1.4	1.6	1.4
M25 J5-6	All lane running	01/04/2014		4.7	4.8	4.5	4.5	4.6	3.4
M25 J6-7	Controlled motorway	01/04/2014		1.5	1.5	1.6	1.6	1.6	1.1
M25 J7-10	Controlled motorway	01/04/2011		9.3	9.3	9.1	9.3	9.1	7.3
M25 J10-16	Controlled motorway	01/01/1995		13.3	13.1	13.3	13.4	13.3	11.2
M25 J16-23	Controlled motorway	01/05/2012		12.4	12.5	12.7	12.8	12.6	10.7
M25 J23-25	All lane running	01/11/2014		4.5	4.4	4.4	4.5	4.4	3.5
M25 J25-27	All lane running	01/11/2014		3.7	3.9	4.0	4.0	4.1	3.4
M25 J27-30	Controlled motorway	01/05/2012		7.3	7.7	7.9	7.9	8.2	7.4
M42 J3a-7	Dynamic hard shoulder	12/09/2006		5.6	5.8	5.8	5.8	5.7	3.8
M42 J7-9	Controlled motorway	01/11/2009		1.9	2.0	1.6	1.4	1.4	0.9
M60 J8-15	Controlled motorway	01/12/2017		-	-	0.3	3.4	3.6	2.9
M60 J15-18	Controlled motorway	01/12/2017		-	-	0.2	2.7	3.0	2.7
M62 J10-12	All lane running	13/01/2021		-	-	-	-	-	-
M62 J18-20	All lane running	01/12/2017		-	-	0.2	2.3	2.5	2.1
M62 J25-26	All lane running	01/10/2013		1.5	1.6	1.6	1.5	1.6	1.2
M62 J26-28	Dynamic hard shoulder	01/10/2013		3.7	3.9	3.8	3.8	4.0	3.2
M62 J28-29	Controlled motorway	01/10/2013		1.3	1.4	1.4	1.4	1.4	1.2
M62 J29-30	Dynamic hard shoulder	01/10/2013		0.9	0.9	0.8	0.9	0.9	0.7
	Conventional Motorway[54]			481.0	476.2	470.3	451.9	451.3	323.8

Source: DfT road length and road traffic statistics, National Highways scheme management information

53 The M20 J4-5 controlled motorway scheme was in operation from 1 October 2011 but was converted into ALR with the opening of the M20 J3-5 scheme on 12 May 2020

54 Due to rounding, aggregating scheme level and conventional motorway figures will not exactly match the figures in the summary tables

Injury-based reporting in STATS19 data

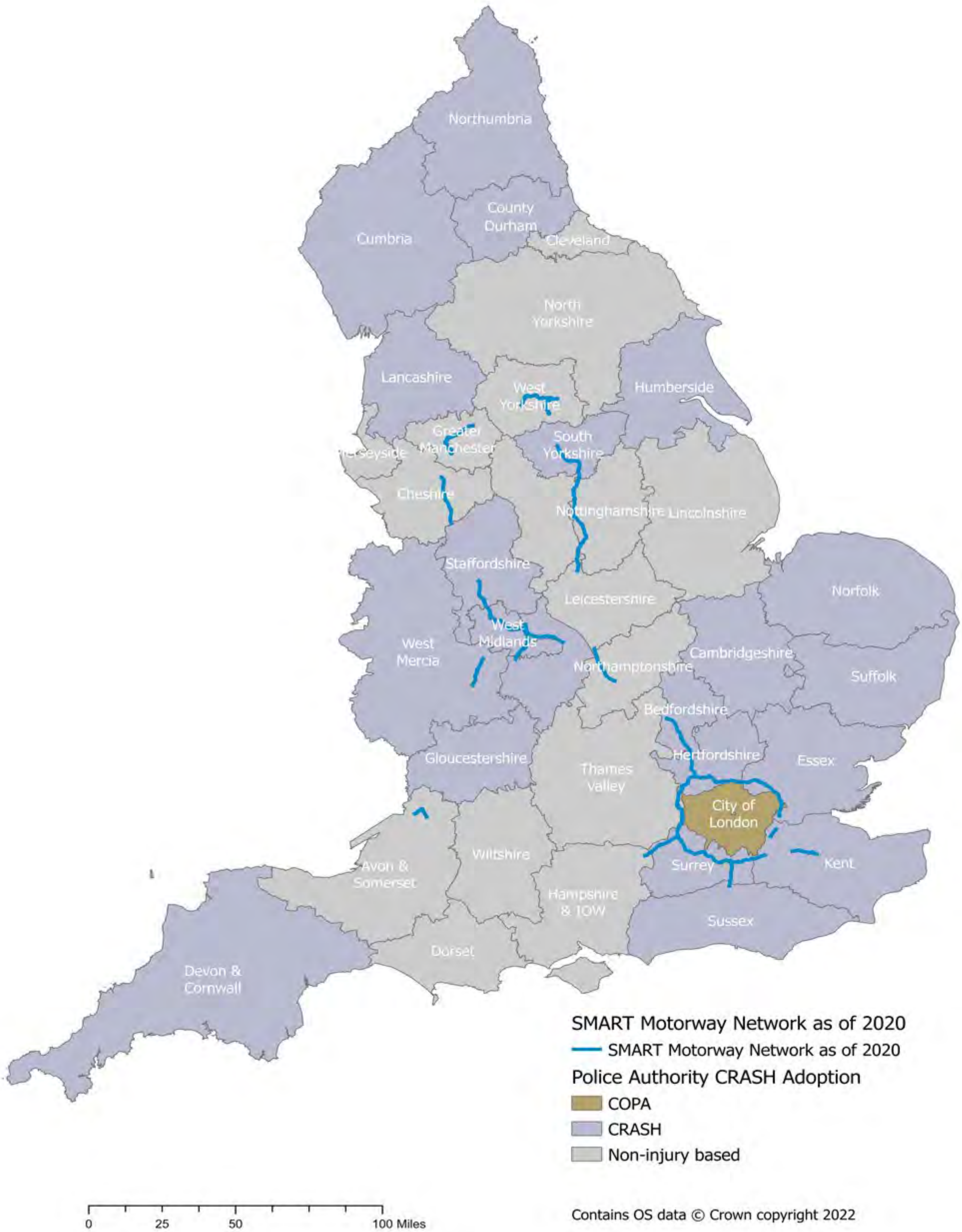
Since 2012, many police forces have changed the way they collect STATS19 data (for more information see here). These changes mean casualty severity is now categorised automatically based on the most severe injury, rather than the judgement of an attending police officer. Police forces using the new systems, called injury-based severity reporting systems, (also known as CRaSH and COPA) report more seriously injured casualties than those which don't.

These changes make it particularly difficult to monitor trends in the number of killed and seriously injured casualties over time, or between different police forces.
In response to these challenges, DfT and the Office for National Statistics (ONS) have developed an approach to adjust the data collected from those police forces not currently using injury-based reporting systems. These adjustments are estimates for how casualty severity may have been recorded had the new injury-based reporting system been used. These adjusted estimates apply retrospectively from 2004 and adjust historical data to show casualty severity 'as if' this was recorded under the new injury-based system. Until all police forces have started using the new systems, these historical adjustments will continue to be updated every year. Using these adjusted totals allows for more consistent and comparable reporting when tracking casualty severity over time, across a region, or nationally. While there is no impact on total casualties or collisions, and no impact on total fatalities, these adjustments do impact serious and slight casualties and collisions.

DfT analytical guidance was updated in October 2021 to further strengthen advice on including injury-based adjusted figures where possible. This means that the casualty figures reported in the main part of the report are adjusted (i.e. KSI and FWI, but not PIC as the latter is not influenced by these adjustments), while they were unadjusted in the first year progress report. For more information, please see here.

The map below shows the smart motorway network as of 31 December 2020. It highlights non-injury-based reporting police forces, CRaSH (Collision Reporting and Sharing) adopted forces and the Metropolitan Police area which has adopted COPA (Case Overview Preparation Application). The map below outlines the variances in the collection and reporting of data across individual police forces and highlights the need for a more consistent comparison, therefore supporting the application of injury-based reporting adjustments. For more information, please see here.

Figure 6
Data: Smart motorway network across police forces per injury-based reporting status



Source: Visualisation from National Highways.

Historical changes in STATS19 data
The way in which the CRaSH system used by a majority of police forces calculated severity changed in 2020. This is because as from 2020 the Casualty Admitted to Hospital field no longer plays a part in determining casualty severity, and consequently has no effect on collision severity. DfT decided to revise reported casualty severities from 2012 to 2019 in forces using CRaSH in order to make those data consistent with 2020 and future years. Full details of the change can be found here. In turn, we have updated in this report the respective historical data between 2015- 2019 to reflect the historical changes in STATS19 data.

Statistical significance testing
The ORR safety data review (see here) noted that: (i) "*undertaking significance testing on the headline figures [casualty rates] in future would help explain the levels of uncertainty around the results. We recommend that this is developed*" and (ii) "*including information about the level of uncertainty associated with the high-level statistics [overall casualty rates for different road types], through statistical significance testing, would add important context to any conclusions.*"

National Highways has been developing methods to calculate confidence intervals and to compare using hypothesis tests for road traffic collision and casualty rates. We now welcome feedback on the methods and their use from the wider statistical community, before we finalise these.

These methods are still new and we want these to be scrutinised and reviewed by the statistical community. However, in the meantime we have applied the methods to some of the high-level statistics described in this report to generate interim conclusions. We feel there is benefit in sharing these interim conclusions to highlight the progress we have made in this area.

Previously, methods existed to compare collision rates using an approximate Z-test, but there was no robust method for quantifying the uncertainty in a casualty rate (see here), as far as we are aware. No confidence intervals were calculated for the statistics reported in the 2020 Stocktake or the first year progress report.

The methods have currently only been applied to five-year average PIC rates (using data from 2016–2020) and five-year average all casualty rates (again, using data from 2016–2020). We cannot apply the methods to KSI rates, as KSI counts are currently adjusted by DfT due to the move of some police forces to injury-based severity reporting. This means that KSI counts are not currently whole numbers, and we cannot analyse the distribution of the number of KSI casualties per collision (which is needed for this method). Once all police forces have moved to injury-based severity reporting and KSI counts are no longer adjusted, we will be able to apply these methods to KSI rates. We do not currently apply the methods to rates based on counterfactual numbers of collisions or casualties. This is because there are likely other sources of uncertainty in the counterfactual estimate which are not taken into account here.

Traditionally, when undertaking a formal hypothesis test, practitioners have compared the calculated p-value to a threshold of 0.05. From this, they have either rejected the null hypothesis when the calculated p-value is smaller than the threshold or not when it is larger. It is now established that using a, somewhat arbitrary, threshold to draw binary conclusions is not appropriate and that a p-value of 0.049 should not lead to such a different conclusion to a p-value of 0.051. We report p-values as they are calculated, rather than only in comparison to a threshold, and interpreting them on a continuous scale from zero to one.

Statistical hypothesis testing can only identify statistical differences, not practical differences. Very small differences can lead to small p-values when there is a large volume of data. Therefore, we need to be careful over interpreting the importance and meaning of statistical differences. Confidence intervals and hypothesis testing are statistical methods which do not take into account the subject area and what is considered a practical, important difference in collision or casualty rates. This requires subject matter expertise as well as statistical proficiency.

Finally, we assume that the traffic estimates which have been used to calculate the rates are reasonably accurate and not biased by different road types. If we did have reason to believe the traffic estimates may be biased by road type, we could undertake a sensitivity analysis on these results as described in the methods document.

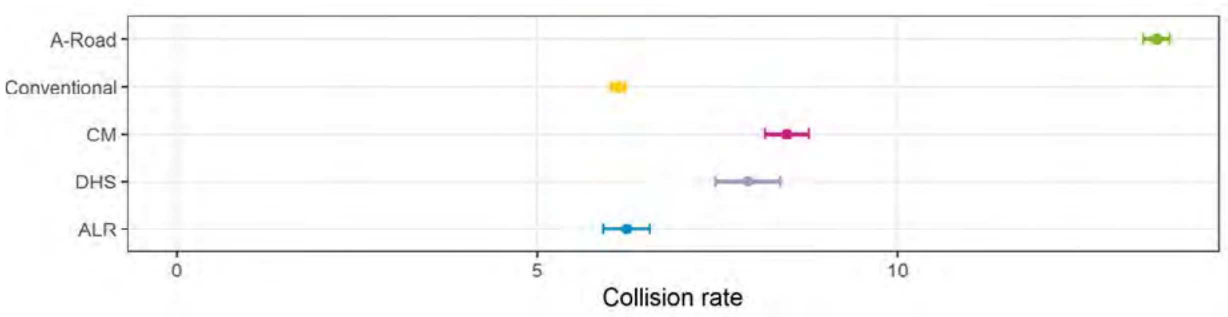
1. Personal Injury Collision (PIC) rates

In this section we compare the PIC rates for all road types, using a maximum likelihood test as described in the methods document published here. In brief, we assume that road traffic collisions occur according to a non-homogeneous Poisson process with underlying rate dependent on the measured road traffic. From this assumption, we use maximum likelihood techniques to calculate confidence intervals and to formally compare the underlying collision rates through a p-value calculated using a Monte-Carlo approach.

1.1 PIC rate confidence intervals

Confidence intervals can be used to informally compare the underlying collision rates between roads, Figure 7 shows the 95% confidence intervals for all road types. There is some variation in the location and size of the confidence intervals, which suggests variation in the underlying PIC rates of the different road types. We formally test this hypothesis in Section 1.2 below.

Figure 7
Data: Confidence intervals for the five-year average PIC rates for all road types



Source: Visualisation from National Highways. Data based on STATS19 with a minor amendment. Road traffic statistics from DfT on the SRN.

We also notice that the confidence interval for conventional motorways is noticeably narrower than that of, say, DHS motorways. This is due to the higher traffic volumes on conventional motorways.

1.2 PIC rates for all road types

Here, we consider whether there is sufficient evidence to suggest that the PIC rates among all roads are different. We test the following hypotheses:

H_0 : Underlying PIC rates are the same for all road types
H_1 : Underlying PIC rates are not the same for all road types

The computed p-value is 0.00000 shown to five decimal places. The p-value is very close to zero. Therefore, we confidently reject the null hypothesis and conclude that the underlying PIC rates are not the same for all road types. Comparing all road types in this way is not particularly informative as given the spread of the locations of the confidence intervals in Figure 7, it is not surprising that the formal hypothesis test suggests some differences.

The largest difference in collision rates is due to the relatively high collision rate for A-roads. The smallest differences in collision rates are observed between ALR and conventional motorways, followed by controlled and DHS motorways. Therefore, we conduct those two formal hypothesis tests to understand how the observed differences in collision rates contribute to the small overall p-value. Finally, the confidence intervals suggest the ALR rates are lower than the DHS and controlled motorways. We are confident that the underlying rates are different and for this reason we considered there was no need to formally test ALR rates with DHS or controlled motorway rates.

1.3 PIC rates for ALR and conventional motorways

Here, we formally test whether there is a difference in the underlying PIC rate for ALR and conventional motorways with the following hypotheses:

H_0 : Underlying PIC rates are the same for ALR and conventional motorways
H_1 : Underlying PIC rates are not the same for ALR and conventional motorways

The computed p-value is 0.247 shown to three decimal places. The p-value is not particularly close to zero. Therefore, we do not reject the null hypothesis and there is insufficient evidence to conclude that the underlying PIC rates for ALR and conventional motorways are different.

1.4 PIC rates for conventional motorways and DHS

Here, we formally test whether there is a difference in the underlying PIC rate for controlled and DHS motorways with the following hypotheses:

H_0 : Underlying PIC rates are the same for controlled and DHS motorways
H_1 : Underlying PIC rates are not the same for controlled and DHS motorways

The computed p-value is 0.027 shown to three decimal places. The p-value is close to zero. Therefore, we reject the null hypothesis and conclude there is some evidence suggesting that the underlying PIC rates for controlled and DHS motorways are not the same. In particular, there is some evidence to suggest the underlying PIC rate for DHS motorways is slightly smaller than that of controlled motorways.

2. Casualty rates

The total number of casualties is dependent on the total number of collisions and the number of casualties that result from each collision.

2.1 Casualty rate confidence intervals

We first calculate confidence intervals for the underlying casualty rates for all road types to informally compare them. We use a two-step process to reflect the dependence on the number of collisions and the casualties resulting from those collisions. The number of casualties are simulated by first simulating the number of collisions from a Poisson distribution and then the number of casualties per collision by sampling from the observed distribution.

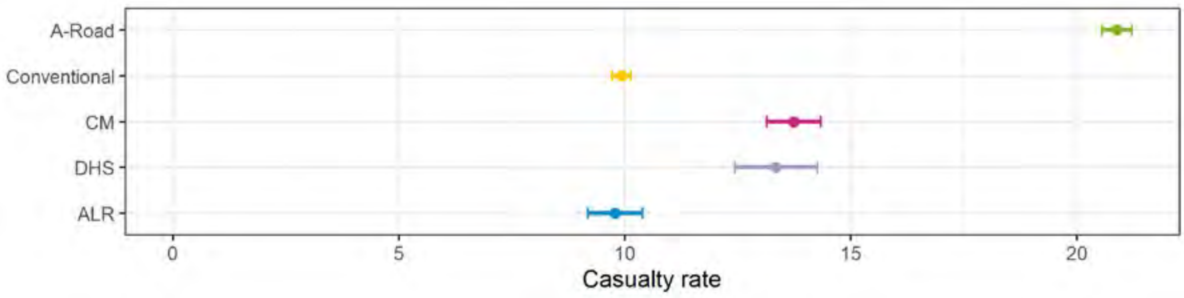
Figure 8 shows the 95% confidence intervals for the underlying casualty rates for all road types. The size of the confidence intervals are larger than that of the confidence intervals for PIC rates due to the additional variability arising from the two-step process. The locations of the casualty rate estimates are greater than the estimates of the PIC rate due to at least one casualty resulting from each collision.

The variation in the location of the confidence intervals suggests that the underlying casualty rates vary between road types. We formally consider this in Section 2.2.

The confidence intervals for the underlying casualty rate for ALR motorways contains that of conventional motorways, and similarly the DHS confidence interval contains that of controlled motorways. Therefore, we formally consider differences in the underlying casualty rates between ALR and conventional motorways in Section 2.3 and between controlled and DHS motorways in Section 2.4.

Figure 8

Data: Confidence intervals for the underlying casualty rate for all road types



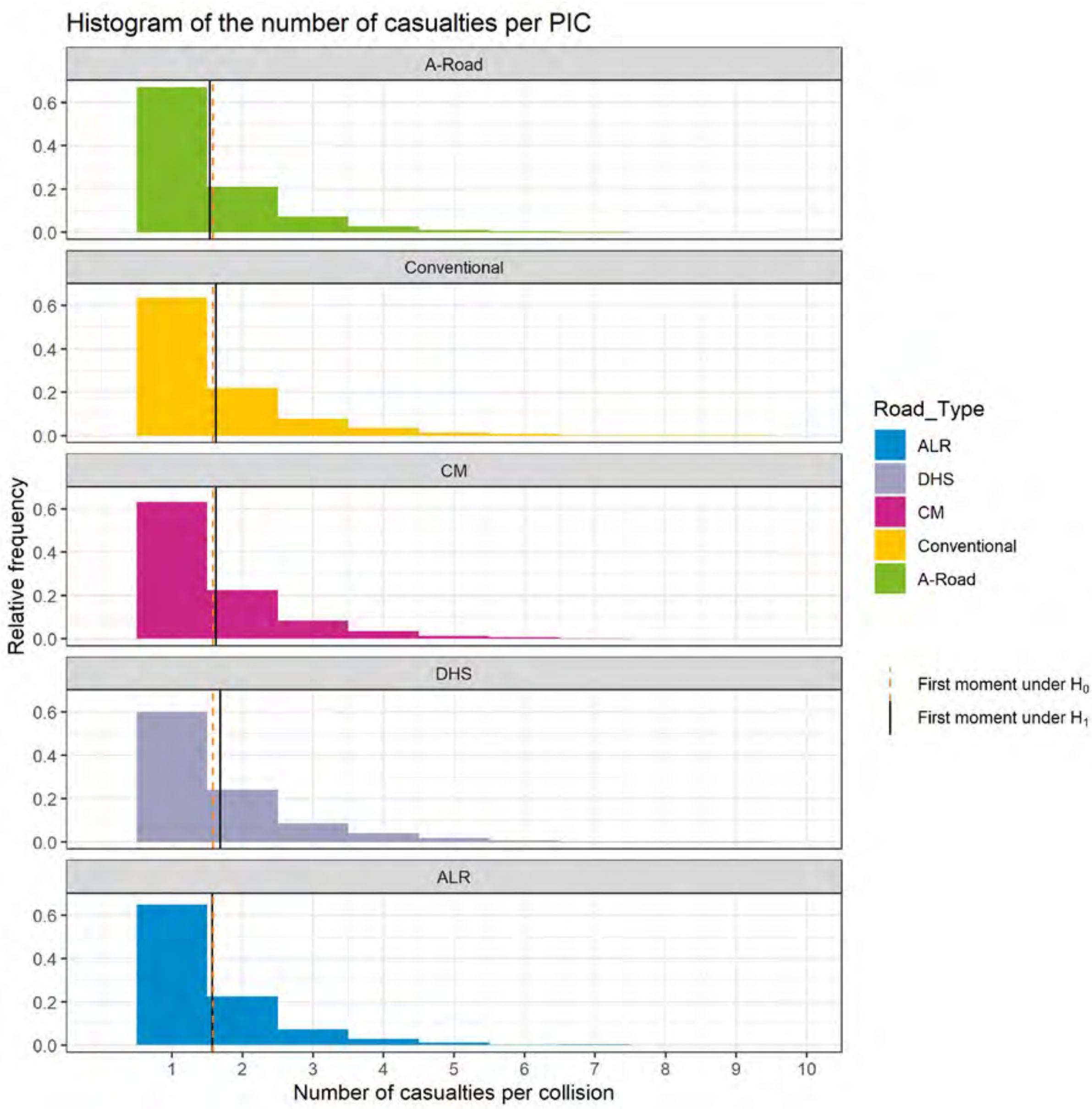
Source: Visualisation from National Highways. Data based on STATS19 with a minor amendment. Road traffic statistics from DfT on the SRN

Histograms for the number of casualties that result from each PIC are shown in Figure 9. The mean number of casualties per collision observed on each road type is shown by the solid black vertical line in Figure 9. The mean across all road types is shown by the dashed orange vertical line. By-eye, the shapes of the histograms appear similar. Note, the histograms are truncated at 10 for ease of visualisation. The supporting table shows the data not shown in Figure 9.

In the following sections we will formally test for a difference in the first moment (mean) of the number of casualties per collision amongst the road types. Then, we will combine the results that follow with the results obtained in Section 2 to determine whether there is sufficient evidence to suggest that the underlying casualty rates vary amongst the road types.

Figure 9

Data: Histograms of the number of casualties per collision for all road types. The solid black vertical lines show the mean number of casualties per collision for each road type. The orange dashed vertical lines show the mean number of casualties per collision across all road types. The number of casualties per collision not shown in the histogram (these are shown on the table below).



Source: Visualisation from National Highways. Data based on STATS19 with minor amendments. Road traffic statistics from DfT on the SRN.

Road type	Number of casualties per collision	Number of times observed
A-roads (on SRN)	11	2
A-roads (on SRN)	12	2
A-roads (on SRN)	13	1
A-roads (on SRN)	14	1
A-roads (on SRN)	15	1
A-roads (on SRN)	20	1
A-roads (on SRN)	23	2
ALR	13	1
Controlled	13	1
Conventional	11	1
Conventional	12	2
Conventional	13	1
Conventional	14	3
Conventional	33	1
DHS	11	1
DHS	12	1

2.2 Casualty rates for all road types

It should be noted that a casualty rate depends on both the number of collisions given the level of road traffic and the number of casualties that result from each collision. To determine whether there is sufficient evidence to suggest that the underlying casualty rates are different, we combine the analysis of PIC rates from Section 1.2 with additional analysis of the following hypotheses:

H_0 : First moments of the distribution for the number of casualties per collision are the same for all road types

H_1 : First moments of the distribution for the number of casualties per collision are not the same for all road types.

The computed p-value is 0.00000 to five decimal places. The p-value is very close to zero. Therefore, we confidently reject the null hypothesis and conclude that the first moment of the number of casualties per collision is not the same for all road types.

Combining the conclusions from the PIC rate analysis and first moment of the distribution for the casualties per collision we confidently conclude the underlying casualty rates are not the same for all road types.

2.3 Casualty rates for ALR and conventional motorways

To determine whether there is sufficient evidence to suggest that the underlying casualty rates for ALR and conventional motorways are different, we combine the analysis of PIC rates from section 1.3 with additional analysis of the following hypotheses:

H_0 : First moments of the distribution for the number of casualties per collision are the same for ALR and conventional motorways

H_1: First moments of the distribution for the number of casualties per collision are not the same for ALR and conventional motorways.

The computed p-value is 0.084 to three decimal places. The p-value is close to zero, but we cannot outright reject the null hypothesis. We instead conclude there may be some evidence that the underlying first moment of the distribution for the number of casualties per collision are not the same. In particular, there may be some evidence that suggests the underlying first moment of the distribution for the number of casualties per collision for ALR motorways is slightly smaller than that of conventional motorways.

Considering that the computed p-value from the PIC rate analysis is 0.247, there is insufficient evidence to conclude that the underlying PIC rates for ALR and conventional motorways are different.

Taking these two conclusions into account, along with the small magnitude of the difference in the observed first moment of the casualties per collision, we conclude there is insufficient evidence of a difference in the underlying casualty rates.

2.4 Casualty rates for controlled motorways and DHS motorways

To determine whether there is sufficient evidence to suggest that the underlying casualty rates for controlled and DHS motorways are different, we combine the analysis of PIC rates from Section 1.4 with additional analysis of the following hypotheses:

H_0 : First moments of the distribution for the number of casualties per collision are the same for controlled motorways and DHS motorways

H_1 : First moments of the distribution for the number of casualties per collision are not the same for controlled motorways and DHS motorways

The computed p-value is 0.107 to three decimal places. The p-value is somewhat close to zero, but we cannot outright reject the null hypothesis. We instead conclude there may be some evidence that the underlying first moment of the distribution for the number of casualties per collision are not the same. In particular, there may be some evidence that suggests the underlying first moment of the distribution for the number of casualties per collision for controlled motorways is slightly smaller than that of DHS motorways.

Considering that the computed p-value from the PIC rate analysis was 0.027, there is some evidence suggesting that the underlying PIC rate for DHS motorways is slightly smaller than that of controlled motorways.

Whilst the observed PIC rate for DHS is lower than that of controlled, the observed first moment of the distribution for the casualties per collisions is lower for controlled than DHS motorways. Therefore, these combine to give estimates of the casualty rates that are similar, see Figure 8. Therefore, whilst there is some evidence to suggest that both the underlying PIC rate and the first moment for the distribution of the casualties per collision are different, there is however insufficient evidence to suggest that the casualty rates are different.

The tests undertaken in this report are not exhaustive. As the methodology evolves further, we will explore opportunities to undertake further statistical tests as appropriate.

Annex C – Length and traffic data 2015-2020[55]

Road type	Road length (miles)					
	2015	**2016**	**2017**	**2018**	**2019**	**2020**
Conventional	1,657	1,617	1,583	1,581	1,564	1,540
ALR	29	63	105	118	141	168
DHS	63	63	63	63	63	63
Controlled	124	127	138	140	141	138
A-roads (on SRN)	2,570	2,563	2,578	2,611	2,608	2,633

Road type	Motor vehicle traffic (billion vehicle miles)					
	2015	**2016**	**2017**	**2018**	**2019**	**2020**
Conventional	48.1	47.6	47.0	45.2	45.1	32.4
ALR	1.4	2.7	3.9	5.1	6.2	5.3
DHS	2.9	2.9	3.0	3.1	3.3	2.6
Controlled	6.5	6.7	6.7	7.4	7.5	6.2
A-roads (on SRN)	30.8	32.2	33.4	34.0	34.7	26.0

55 *Length and traffic flow data have been refined to reflect latest network information. This may result in minor changes for historical data*

Annex D – SRN collision and casualty statistics 2015-2020 [Adjusted for injury-based reporting]

As per Annex B – Methodology, the figures below are the statistics used in this report. These reflect DfT's latest guidance on injury-based reporting, i.e., using adjusted STATS19 data where possible and the historical changes of STATS19 data.

It should be noted that these adjustments influence (i) casualties (but not total collisions reported here) and (ii) serious and slight severities (not fatal). In addition, as these are based on a probabilistic model developed and used by ONS and DfT, adjusted figures are no longer whole numbers, but are decimal values.

Road type	Personal injury collisions					
	2015	2016	2017	2018	2019	2020
Conventional	3,688	3,492	3,002	2,805	2,464	1,536
ALR	142	229	258	347	325	287
DHS	338	300	294	263[56]	218	111
Controlled	659	723	637	616	587	356
A-roads (on SRN)	5,472	5,414	4,652	4,430	4,311	2,977

Road type	Personal injury collision rates per HMVM					
	2015	2016	2017	2018	2019	2020
Conventional	7.67	7.33	6.38	6.21	5.46	4.74
ALR	9.93	8.64	6.67	6.78	5.23	5.38
DHS	11.66	10.20	9.67	8.46	6.71	4.20
Controlled	10.08	10.77	9.45	8.38	7.83	5.74
A-roads (on SRN)	17.77	16.81	13.93	13.03	12.42	11.45

Road type	Injury based reporting - adjusted KSI casualties					
	2015	2016	2017	2018	2019	2020
Conventional	811.63	769.82	685.70	679.62	598.87	423.03
ALR	18.30	45.50	47.15	85.38	84.18	56.96
DHS	56.22	39.59	47.93	24.49[57]	33.74	29.55
Controlled	86.68	82.66	82.99	119.40	88.50	74.61
A-roads (on SRN)	1,354.72	1,325.15	1,208.35	1,270.12	1,255.14	812.71

56 See Annex B – Methodology (sub-section 'Data sources')
57 See Annex B – Methodology (sub-section 'Data sources')

Road type	Injury based reporting - adjusted KSI casualty rates per HMVM					
	2015	2016	2017	2018	2019	2020
Conventional	1.69	1.62	1.46	1.50	1.33	1.31
ALR	1.28	1.72	1.22	1.67	1.35	1.07
DHS	1.94	1.35	1.58	0.79	1.04	1.12
Controlled	1.33	1.23	1.23	1.62	1.18	1.20
A-roads (on SRN)	4.40	4.12	3.62	3.74	3.62	3.13

Road type	Injury based reporting - adjusted FWI casualties					
	2015	2016	2017	2018	2019	2020
Conventional	207.00	191.42	186.09	166.82	152.18	105.77
ALR	3.92	8.74	11.99	21.93	20.68	13.27
DHS	15.26	10.31	10.28	7.47[58]	12.17	8.12
Controlled	24.00	21.21	20.71	28.07	21.93	18.30
A-roads (on SRN)	324.61	342.19	312.06	331.53	290.95	183.19

Road type	Injury based reporting - adjusted FWI casualty rates per HMVM					
	2015	2016	2017	2018	2019	2020
Conventional	0.43	0.40	0.40	0.37	0.34	0.33
ALR	0.27	0.33	0.31	0.43	0.33	0.25
DHS	0.53	0.35	0.34	0.24	0.37	0.31
Controlled	0.37	0.32	0.31	0.38	0.29	0.30
A-roads (on SRN)	1.05	1.06	0.93	0.98	0.84	0.70

58 *See Annex B – Methodology (sub-section 'Data sources')*

Annex E – SRN collision and casualty statistics 2015-2020 [unadjusted for injury- based reporting]

Earlier in the report we highlighted that the analysis reported in the data section is based on the injury-based reporting adjustments. In the annexes we have also included all respective unadjusted figures for completeness and transparency.

Road type	Personal injury collisions					
	2015	2016	2017	2018	2019	2020
Conventional	3,688	3,492	3,002	2,805	2,464	1,536
ALR	142	229	258	347	325	287
DHS	338	300	294	263[59]	218	111
Controlled	659	723	637	616	587	356
A-roads (on SRN)	5,472	5,414	4,652	4,430	4,311	2,977

Road type	Unadjusted KSI casualties					
	2015	2016	2017	2018	2019	2020
Conventional	596	645	574	574	535	388
ALR	11	41	43	82	79	50
DHS	49	36	46	23[60]	32	28
Controlled	69	76	80	114	82	71
A-roads (on SRN)	1,052	1,181	1,091	1,163	1,163	751

Road type	Unadjusted FWI casualties					
	2015	2016	2017	2018	2019	2020
Conventional	187.59	180.19	176.04	157.31	146.43	102.62
ALR	3. 26	8.33	11.62	21.63	20.21	12.64
DHS	14.61	9.99	10.11	7.34[61]	12.01	7.98
Controlled	22.41	20.61	20.44	27.58	21.35	17.97
A-roads (on SRN)	297.37	329.22	301.50	321.89	282.66	177.64

59 *See Annex B – Methodology (sub-section 'Data sources')*
60 *See Annex B – Methodology (sub-section 'Data sources')*
61 *See Annex B – Methodology (sub-section 'Data sources')*

Annex F – SRN collision and casualty data 2015-2020 [Adjusted for injury-based reporting]

Road type	Fatal collisions					
	2015	2016	2017	2018	2019	2020
Conventional	73	69	62	58	62	48
ALR	0	1	4	8	8	4
DHS	3	2	1	1[62]	6	3
Controlled	6	2	2	8	5	7
A-roads (on SRN)	120	139	134	147	118	69

Road type	Fatal casualties					
	2015	2016	2017	2018	2019	2020
Conventional	81	72	83	67	65	49
ALR	0	1	4	10	9	4
DHS	5	2	1	1[63]	6	4
Controlled	6	2	3	8	5	7
A-roads (on SRN)	132	154	145	165	125	74

Road type	Injury based reporting - adjusted serious collisions					
	2015	2016	2017	2018	2019	2020
Conventional	618.97	594.18	502.93	527.93	448.81	311.90
ALR	15.54	38.14	33.70	65.03	63.42	46.74
DHS	38.50	29.12	34.67	23.42	19.56	21.36
Controlled	77.63	74.75	73.95	89.15	80.14	65.21
A-roads (on SRN)	1,047.59	977.47	882.59	912.80	948.45	640.24

62 See Annex B – Methodology (sub-section 'Data sources')
63 See Annex B – Methodology (sub-section 'Data sources')

Road type	Injury based reporting - adjusted serious casualties					
	2015	2016	2017	2018	2019	2020
Conventional	730.63	697.82	602.70	612.62	533.87	374.03
ALR	18.30	44.50	43.15	75.38	75.18	52.96
DHS	51.22	37.59	46.93	23.49	27.74	25.55
Controlled	80.68	80.66	79.99	111.40	83.50	67.61
A-roads (on SRN)	1,222.72	1,171.15	1,063.35	1,105.12	1,130.14	738.71

Road type	Injury based reporting - adjusted slight collisions					
	2015	2016	2017	2018	2019	2020
Conventional	2,996.03	2,828.82	2,437.07	2,219.07	1,953.19	1,176.10
ALR	126.46	189.86	220.30	273.97	253.58	236.26
DHS	296.50	268.88	258.33	238.58	192.44	86.64
Controlled	575.37	646.25	561.05	518.85	501.86	283.79
A-roads (on SRN)	4,304.41	4,297.53	3,635.41	3,370.20	3,244.55	2,267.76

Road type	Injury based reporting - adjusted slight casualties					
	2015	2016	2017	2018	2019	2020
Conventional	5,293.37	4,964.18	4,282.30	3,855.38	3,379.13	1,936.97
ALR	208.70	328.50	367.85	439.62	415.82	397.04
DHS	513.78	455.41	459.07	412.51	339.26	156.45
Controlled	993.32	1,114.34	971.01	892.60	858.50	453.39
A-roads (on SRN)	7,034.28	7,107.85	6,072.65	5,601.88	5,293.86	3,532.29

Annex G – SRN collision and casualty data 2015-2020 [Unadjusted for injury-based reporting]

Road type	Fatal collisions					
	2015	2016	2017	2018	2019	2020
Conventional	73	69	62	58	62	48
ALR	0	1	4	8	8	4
DHS	3	2	1	1[64]	6	3
Controlled	6	2	2	8	5	7
A-roads (on SRN)	120	139	134	147	118	69

Road type	Fatal casualties					
	2015	2016	2017	2018	2019	2020
Conventional	81	72	83	67	65	49
ALR	0	1	4	10	9	4
DHS	5	2	1	1[65]	6	4
Controlled	6	2	3	8	5	7
A-roads (on SRN)	132	154	145	165	125	74

Road type	Unadjusted serious collisions					
	2015	2016	2017	2018	2019	2020
Conventional	432	483	407	438	394	281
ALR	9	34	31	62	59	41
DHS	32	26	33	22	18	20
Controlled	61	69	71	84	74	62
A-roads (on SRN)	781	851	781	822	871	585

64 *See Annex B – Methodology (sub-section 'Data sources')*
65 *See Annex B – Methodology (sub-section 'Data sources')*

Road type	Unadjusted serious casualties					
	2015	2016	2017	2018	2019	2020
Conventional	515	573	491	507	470	339
ALR	11	40	39	72	70	46
DHS	44	34	45	22	26	24
Controlled	63	74	77	106	77	64
A-roads (on SRN)	920	1,027	946	998	1,038	677

Road type	Unadjusted slight collisions					
	2015	2016	2017	2018	2019	2020
Conventional	3,183	2,940	2,533	2,309	2,008	1,207
ALR	133	194	240	277	258	242
DHS	303	272	260	240	194	88
Controlled	1,011	1,121	974	898	865	287
A-roads (on SRN)	4,571	4,424	3,737	3,461	3,461	2,323

Road type	Unadjusted slight casualties					
	2015	2016	2017	2018	2019	2020
Conventional	5,509	5,089	4,394	3,961	3,443	1,972
ALR	216	333	372	443	421	404
DHS	521	459	461	414	341	158
Controlled	1,011	1,121	974	898	865	457
A-roads (on SRN)	7,337	7,252	6,190	5,709	5,386	3,594

Annex H – SRN contributory factors

Collision Data per Contributory Factor Groups 2015-2020

Road type	Collisions with an environment factor					
	2015	2016	2017	2018	2019	2020
Conventional	457	401	336	342	308	264
ALR	14	23	32	32	30	42
DHS	17	20	16	7	6	9
Controlled	45	54	49	28	47	48
A-roads (on SRN)	748	733	582	618	590	476

Road type	Collisions with a driver factor					
	2015	2016	2017	2018	2019	2020
Conventional	2,893	2,578	2,294	2,000	1,746	1.063
ALR	108	163	179	251	241	196
DHS	258	152	175	145	96	55
Controlled	449	533	479	444	406	232
A-roads (on SRN)	4,250	3,840	3,310	3,099	3,168	2,075

Road type	Collisions with a vehicle factor					
	2015	2016	2017	2018	2019	2020
Conventional	203	177	108	132	103	69
ALR	18	19	19	14	26	18
DHS	36	23	16	18	16	4
Controlled	66	44	37	36	36	17
A-roads (on SRN)	205	159	156	141	151	91

Top 10 Contributory Factor Types by Road Type 2015-2020

Top 10 conventional motorway contributory factors				
#	CF code	CF name	CF grouping	Collisions featured
1	405	Failed to look properly	Driver Factor	4,309
2	406	Failed to judge other person's path or speed	Driver Factor	4,224
3	410	Loss of control	Driver Factor	2,469
4	308	Following too close	Driver Factor	2,030
5	408	Sudden braking	Driver Factor	1,566
6	602	Careless, reckless or in a hurry	Driver Factor	1,507
7	103	Slippery road (due to weather)	Environment Factor	1,280
8	307	Travelling too fast for conditions	Driver Factor	1,274
9	403	Poor turn or manoeuvre	Driver Factor	1,240
10	503	Fatigue	Driver Factor	927

Top 10 ALR motorway contributory factors				
#	**CF code**	**CF name**	**CF grouping**	**Collisions featured**
1	405	Failed to look properly	Driver Factor	445
2	406	Failed to judge other person's path or speed	Driver Factor	360
3	410	Loss of control	Driver Factor	178
4	602	Careless, reckless or in a hurry	Driver Factor	150
5	308	Following too close	Driver Factor	146
6	403	Poor turn or manoeuvre	Driver Factor	118
7	408	Sudden braking	Driver Factor	111
8	103	Slippery road (due to weather)	Environment Factor	102
9	710	Vehicle blind spot	Vehicle Factor	82
10	307	Travelling too fast for conditions	Driver Factor	76

Top 10 DHS motorway contributory factors				
#	**CF code**	**CF name**	**CF grouping**	**Collisions featured**
1	405	Failed to look properly	Driver Factor	464
2	406	Failed to judge other person's path or speed	Driver Factor	355
3	308	Following too close	Driver Factor	169
4	408	Sudden braking	Driver Factor	156
5	403	Poor turn or manoeuvre	Driver Factor	129
6	710	Vehicle blind spot	Vehicle Factor	97
7	602	Careless, reckless or in a hurry	Driver Factor	85
8	307	Travelling too fast for conditions	Driver Factor	80
9	410	Loss of control	Driver Factor	68
10	409	Swerved	Driver Factor	44

Top 10 controlled motorway contributory factors				
#	**CF code**	**CF name**	**CF grouping**	**Collisions featured**
1	405	Failed to look properly	Driver Factor	1,142
2	406	Failed to judge other person's path or speed	Driver Factor	819
3	308	Following too close	Driver Factor	379
4	408	Sudden braking	Driver Factor	312
5	403	Poor turn or manoeuvre	Driver Factor	311
6	602	Careless, reckless or in a hurry	Driver Factor	305
7	410	Loss of control	Driver Factor	301
8	103	Slippery road (due to weather)	Environment Factor	177
9	710	Vehicle blind spot	Vehicle Factor	175
10	307	Travelling too fast for conditions	Driver Factor	174

Top 10 A-road (on SRN) contributory factors				
#	**CF code**	**CF name**	**CF grouping**	**Collisions featured**
1	405	Failed to look properly	Driver Factor	7,884
2	406	Failed to judge other person's path or speed	Driver Factor	6,291
3	410	Loss of control	Driver Factor	3,238
4	602	Careless, reckless or in a hurry	Driver Factor	3,127
5	403	Poor turn or manoeuvre	Driver Factor	2,678
6	308	Following too close	Driver Factor	2,476
7	408	Sudden braking	Driver Factor	2,194
8	103	Slippery road (due to weather)	Environment Factor	1,879
9	307	Travelling too fast for conditions	Driver Factor	1,629
10	409	Swerved	Driver Factor	1,159

Annex I – SRN moving and stopped collision data 2015-2020

Moving Vehicle Collision Data [Adjusted for Injury- Based Reporting]

Road type	Moving vehicle fatal collisions					
	2015	2016	2017	2018	2019	2020
Conventional	64	61	54	51	54	41
ALR	0	0	4	6	6	4
DHS	2	2	0	0	5	2
Controlled	5	2	1	8	5	5
A-roads (on SRN)	106	122	116	123	103	56

Road type	Injury based reporting - adjusted moving vehicle serious collisions					
	2015	2016	2017	2018	2019	2020
Conventional	593.04	569.21	481.41	500.72	427.87	292.96
ALR	15.44	34.92	27.39	58.86	58.29	43.00
DHS	37.31	27.78	31.40	20.42	16.56	20.30
Controlled	73.55	71.69	72.90	85.10	74.05	62.21
A-roads (on SRN)	999.24	930.39	828.14	861.56	897.16	607.86

Road type	Injury based reporting - adjusted moving vehicle slight collisions					
	2015	2016	2017	2018	2019	2020
Conventional	2,938.96	2,775.79	2,385.59	2,164.28	1,901.13	1,142.04
ALR	124.56	184.08	207.61	265.14	244.71	226.00
DHS	288.69	261.22	249.60	231.58	190.44	83.70
Controlled	571.45	633.31	548.10	508.90	492.95	279.79
A-roads (on SRN)	4,172.76	4,110.61	3,505.86	3,244.44	3,133.84	2,183.14

Stopped Vehicle Collision Data [Adjusted for Injury-Based Reporting]

Road type	Stopped vehicle fatal collisions					
	2015	2016	2017	2018	2019	2020
Conventional	9	8	8	7	8	7
ALR	0	1	0	2	2	0
DHS	1	0	1	1[66]	1	1
Controlled	1	0	1	0	0	2
A-roads (on SRN)	14	17	18	24	15	13

Road type	Injury based reporting - adjusted stopped vehicle serious collisions					
	2015	2016	2017	2018	2019	2020
Conventional	25.94	24.96	21.52	27.21	20.94	18.94
ALR	0.11	3.22	6.32	6.17	5.12	3.74
DHS	1.18	1.34	3.27	3.00	3.00	1.06
Controlled	4.08	3.06	1.04	4.04	6.08	3.00
A-roads (on SRN)	48.35	47.07	54.45	51.24	51.29	32.38

Road type	Injury based reporting - adjusted stopped vehicle slight collisions					
	2015	2016	2017	2018	2019	2020
Conventional	57.06	53.04	51.48	54.79	52.06	34.06
ALR	1.89	5.78	12.68	8.83	8.88	10.26
DHS	7.82	7.66	8.73	7.00	2.00	2.94
Controlled	3.92	12.94	12.96	9.96	8.92	4.00
A-roads (on SRN)	131.65	186.93	129.55	125.76	110.71	84.62

66 *Includes a fatal collision not recorded in STATS19*

Moving Vehicle Collision Data [Unadjusted for Injury-Based Reporting]

Road type	Moving vehicle fatal collisions					
	2015	2016	2017	2018	2019	2020
Conventional	64	61	54	51	54	41
ALR	0	0	4	6	6	4
DHS	2	2	0	0	5	2
Controlled	5	2	1	8	5	5
A-roads (on SRN)	106	122	116	123	103	56

Road type	Unadjusted moving vehicle serious collisions					
	2015	2016	2017	2018	2019	2020
Conventional	410	461	388	413	374	263
ALR	9	31	25	56	54	38
DHS	31	25	30	19	15	19
Controlled	57	66	70	80	68	59
A-roads (on SRN)	743	811	730	774	823	555

Road type	Unadjusted moving vehicle slight collisions					
	2015	2016	2017	2018	2019	2020
Conventional	3,122	2,884	2,479	2,252	1,955	1,172
ALR	131	188	210	268	249	231
DHS	295	264	251	233	192	85
Controlled	588	639	551	514	499	283
A-roads (on SRN)	4,429	4,230	3,604	3,332	3,208	2,236

Stopped Vehicle Collision Data [Unadjusted for Injury-Based Reporting]

Road type	Stopped vehicle fatal collisions					
	2015	2016	2017	2018	2019	2020
Conventional	9	8	8	7	8	7
ALR	0	1	0	2	2	0
DHS	1	0	1	1[67]	1	1
Controlled	1	0	1	0	0	2
A-roads (on SRN)	14	17	18	24	15	13

Road type	Unadjusted stopped vehicle serious collisions					
	2015	2016	2017	2018	2019	2020
Conventional	22	22	19	25	20	18
ALR	0	3	6	6	5	3
DHS	1	1	3	3	3	1
Controlled	4	3	1	4	6	3
A-roads (on SRN)	38	40	51	48	48	30

Road type	Unadjusted stopped vehicle slight collisions					
	2015	2016	2017	2018	2019	2020
Conventional	61	56	54	57	53	35
ALR	2	6	13	9	9	11
DHS	8	8	9	7	2	3
Controlled	4	13	13	10	9	4
A-roads (on SRN)	142	194	133	129	114	87

67 *See Annex B – Methodology (sub-section 'Data sources')*

Annex J – SRN casualty data per lane and vehicle movement status 2015-2020

Live lane moving vs. stopped vehicle collision and casualty data [adjusted for injury based reporting]

Road type	Live lane stopped fatal casualties					
	2015	2016	2017	2018	2019	2020
Conventional	7	2	12	5	6	5
ALR	0	1	0	3	3	0
DHS	0	0	1	1[68]	1	2
Controlled	0	0	2	0	0	1
A-roads (on SRN)	7	11	10	16	11	4

Road type	Live lane moving fatal casualties					
	2015	2016	2017	2018	2019	2020
Conventional	69	63	66	57	54	40
ALR	0	0	4	7	6	4
DHS	2	2	0	0[69]	5	2
Controlled	5	1	1	8	5	5
A-roads (on SRN)	115	136	124	136	109	60

Road type	Injury based reporting - adjusted live lane stopped serious casualties					
	2015	2016	2017	2018	2019	2020
Conventional	24.10	23.53	19.95	28.43	21.34	15.40
ALR	0.11	5.32	8.89	7.17	8.28	4.87
DHS	1.11	1.35	5.35	3.00	5.00	1.00
Controlled	3.07	1.15	1.04	2.04	4.08	2.00
A-roads (on SRN)	48.94	41.22	51.72	48.37	51.74	29.33

68 *See Annex B – Methodology (sub-section 'Data sources')*
69 *See Annex B – Methodology (sub-section 'Data sources')*

Road type	Injury based reporting - adjusted live lane moving serious casualties					
	2015	2016	2017	2018	2019	2020
Conventional	688.82	663.35	561.49	571.13	499.69	338.88
ALR	18.19	39.18	34.26	65.21	65.90	48.10
DHS	48.96	36.23	35.53	20.49	18.74	22.46
Controlled	76.60	75.42	78.95	104.36	76.36	62.61
A-roads (on SRN)	1,151.04	1,112.06	982.79	1,035.54	1,056.48	680.75

Road type	Injury based reporting – adjusted live lane stopped slight casualties					
	2015	2016	2017	2018	2019	2020
Conventional	74.90	86.47	74.05	89.57	91.66	51.60
ALR	2.89	10.68	27.11	11.83	24.72	19.13
DHS	6.89	15.65	13.65	10.00	4.00	3.00
Controlled	4.93	26.85	18.96	11.96	21.92	4.00
A-roads (on SRN)	184.06	275.78	173.28	171.63	172.26	120.67

Road type	Injury based reporting – adjusted live lane moving slight casualties					
	2015	2016	2017	2018	2019	2020
Conventional	5,159.18	4,829.65	4,158.51	3,721.87	3,233.31	1,836.12
ALR	205.81	316.82	339.74	426.79	389.10	375.90
DHS	498.04	434.77	434.47	383.51	325.26	148.54
Controlled	986.40	1,080.58	946.05	866.64	825.64	438.39
A-roads (on SRN)	6,736.96	6,733.94	5,796.21	5,333.46	5,035.52	3,357.25

Non live lane moving vs. stopped vehicle casualty data [adjusted for injury based reporting]

Road type	Non live lane stopped fatal casualties					
	2015	2016	2017	2018	2019	2020
Conventional	3	6	3	4	2	2
ALR	0	0	0	0	0	0
DHS	3	0	0	0	0	0
Controlled	1	0	0	0	0	1
A-roads (on SRN)	8	7	10	13	4	9

Road type	Non live lane moving fatal casualties					
	2015	2016	2017	2018	2019	2020
Conventional	2	1	2	1	3	2
ALR	0	0	0	0	0	0
DHS	0	0	0	0	0	0
Controlled	0	1	0	0	0	0
A-roads (on SRN)	2	0	1	0	1	1

Road type	Injury based reporting - adjusted non live lane stopped serious casualties					
	2015	2016	2017	2018	2019	2020
Conventional	12.07	8.71	13.77	7.67	8.13	10.44
ALR	0	0	0	2.00	0	0
DHS	1.07	0.02	2.06	0	2.00	0.06
Controlled	1.02	3.08	0.00	2.00	2.00	1.00
A-roads (on SRN)	9.64	11.73	19.72	15.74	13.83	17.34

Road type	Injury based reporting - adjusted non live lane moving serious casualties					
	2015	2016	2017	2018	2019	2020
Conventional	5.65	2.23	7.49	5.39	4.71	9.30
ALR	0	0	0	1.00	1.00	0
DHS	0.08	0	4.00	0	2.00	2.02
Controlled	0	1.00	0	3.00	1.05	2.00
A-roads (on SRN)	13.10	6.14	9.13	5.48	8.09	11.29

Road type	Injury based reporting - adjusted non live lane stopped slight casualties					
	2015	2016	2017	2018	2019	2020
Conventional	24.93	20.29	27.23	24.33	16.87	21.56
ALR	0	1.00	0	1.00	0	0
DHS	3.93	1.98	6.94	16.00	2.00	0.94
Controlled	0.98	5.92	6.00	9.00	1.00	5.00
A-roads (on SRN)	44.36	62.27	57.28	63.26	33.17	29.66

Road type	Injury based reporting - adjusted non live lane moving slight casualties					
	2015	2016	2017	2018	2019	2020
Conventional	34.35	27.77	22.51	19.61	37.29	27.70
ALR	0	0	1.00	0	2.00	2.00
DHS	4.92	3.00	4.00	3.00	8.00	3.98
Controlled	1.00	1.00	0	5.00	9.95	6.00
A-roads (on SRN)	68.90	35.86	45.87	33.52	52.91	24.71

Live lane moving vs. stopped vehicle casualty data [unadjusted for injury based reporting]

Road type	Live lane stopped fatal casualties					
	2015	2016	2017	2018	2019	2020
Conventional	7	2	12	5	6	5
ALR	0	1	0	3	3	0
DHS	0	0	1	1[70]	1	2
Controlled	0	0	2	0	0	1
A-roads (on SRN)	7	11	10	16	11	4

Road type	Live lane moving fatal casualties					
	2015	2016	2017	2018	2019	2020
Conventional	69	63	66	57	54	40
ALR	0	0	4	7	6	4
DHS	2	2	0	0[71]	5	2
Controlled	5	1	1	8	5	5
A-roads (on SRN)	115	136	124	136	109	60

70 See Annex B – Methodology (sub-section 'Data sources')
71 See Annex B – Methodology (sub-section 'Data sources')

Road type	Unadjusted live lane stopped serious casualties					
	2015	2016	2017	2018	2019	2020
Conventional	20	20	17	26	20	14
ALR	0	5	8	7	8	4
DHS	1	1	5	3	5	1
Controlled	3	1	1	2	4	2
A-roads (on SRN)	39	34	48	45	49	27

Road type	Unadjusted live lane moving serious casualties					
	2015	2016	2017	2018	2019	2020
Conventional	480	544	454	469	438	306
ALR	11	35	31	62	61	42
DHS	42	33	34	19	17	21
Controlled	59	69	76	99	70	59
A-roads (on SRN)	865	977	871	933	969	622

Road type	Unadjusted live lane stopped slight casualties					
	2015	2016	2017	2018	2019	2020
Conventional	79	90	77	92	93	53
ALR	3	11	28	12	25	20
DHS	7	16	14	10	4	3
Controlled	5	27	19	12	22	4
A-roads (on SRN)	194	283	177	175	175	123

Road type	Unadjusted live lane moving slight casualties					
	2015	2016	2017	2018	2019	2020
Conventional	5,368	4,949	4,266	3,824	3,295	1,869
ALR	213	321	343	430	394	382
DHS	505	438	436	385	327	150
Controlled	1,004	1,087	949	872	832	442
A-roads (on SRN)	7,023	6,869	5,908	5,436	5,123	3,416

Non live lane moving vs. stopped vehicle casualty data [unadjusted for injury based reporting]

Road type	Non live lane stopped fatal casualties					
	2015	2016	2017	2018	2019	2020
Conventional	3	6	3	4	2	2
ALR	0	0	0	0	0	0
DHS	3	0	0	0	0	0
Controlled	1	0	0	0	0	1
A-roads (on SRN)	8	7	10	13	4	9

Road type	Non live lane moving fatal casualties					
	2015	2016	2017	2018	2019	2020
Conventional	2	1	2	1	3	2
ALR	0	0	0	0	0	0
DHS	0	0	0	0	0	0
Controlled	0	1	0	0	0	0
A-roads (on SRN)	2	0	1	0	1	1

Road type	Unadjusted non live lane stopped serious casualties					
	2015	2016	2017	2018	2019	2020
Conventional	11	8	13	7	8	10
ALR	0	0	0	2	0	0
DHS	1	0	2	0	2	0
Controlled	1	3	0	2	2	1
A-roads (on SRN)	7	11	19	15	13	17

Road type	Unadjusted non live lane moving serious casualties					
	2015	2016	2017	2018	2019	2020
Conventional	4	1	7	5	4	9
ALR	0	0	0	1	1	0
DHS	0	0	4	0	2	2
Controlled	0	1	0	3	1	2
A-roads (on SRN)	9	5	8	5	7	11

Road type	Unadjusted non live lane stopped slight casualties					
	2015	2016	2017	2018	2019	2020
Conventional	26	21	28	25	17	22
ALR	0	1	0	1	0	0
DHS	4	2	7	16	2	1
Controlled	1	6	6	9	1	5
A-roads (on SRN)	47	63	58	64	34	30

Road type	Unadjusted non live lane moving slight casualties					
	2015	2016	2017	2018	2019	2020
Conventional	36	29	23	20	38	28
ALR	0	0	1	0	2	2
DHS	5	3	4	3	8	4
Controlled	1	1	0	5	10	6
A-roads (on SRN)	73	37	47	34	54	25

Annex K – SRN casualty data per light condition 2015-2020

Daylight and darkness casualty data [adjusted for injury based reporting]

Road type	Daylight fatal casualties					
	2015	2016	2017	2018	2019	2020
Conventional	41	29	35	32	30	24
ALR	0	0	2	1	4	1
DHS	1	1	1	0	3	1
Controlled	2	0	1	3	3	4
A-roads (on SRN)	80	81	72	90	65	41

Road type	Darkness fatal casualties					
	2015	2016	2017	2018	2019	2020
Conventional	40	43	48	35	35	25
ALR	0	1	2	9	5	3
DHS	4	1	0	0	3	3
Controlled	4	2	2	5	2	3
A-roads (on SRN)	52	73	73	75	60	33

Road type	Injury based reporting - adjusted daylight serious casualties					
	2015	2016	2017	2018	2019	2020
Conventional	477.18	456.92	366.90	409.97	352.92	233.46
ALR	11.70	25.75	14.75	37.02	43.65	30.35
DHS	30.69	17.59	18.56	16.21	11.16	13.84
Controlled	52.14	43.17	57.02	60.00	56.65	40.54
A-roads (on SRN)	857.16	814.43	731.47	767.78	758.38	498.16

Road type	Injury based reporting - adjusted darkness serious casualties					
	2015	2016	2017	2018	2019	2020
Conventional	253.46	240.90	235.79	202.65	180.95	140.56
ALR	6.60	18.75	28.40	38.36	31.52	22.61
DHS	20.53	20.01	28.38	7.27	16.58	11.71
Controlled	28.54	37.49	22.97	51.40	26.84	27.07
A-roads (on SRN)	365.56	356.71	331.88	337.34	371.76	240.56

Road type	Injury based reporting – adjusted daylight slight casualties					
	2015	2016	2017	2018	2019	2020
Conventional	3,803.82	3,456.08	2,861.10	2,785.03	2,339.08	1,335.54
ALR	133.30	190.25	226.25	292.98	280.35	249.65
DHS	371.31	286.41	306.44	289.79	216.84	95.16
Controlled	697.86	747.83	719.98	585.00	571.35	299.46
A-roads (on SRN)	5,226.84	5,290.57	4,374.53	4,210.22	3,835.62	2,522.84

Road type	Injury based reporting – adjusted darkness slight casualties					
	2015	2016	2017	2018	2019	2020
Conventional	1,489.54	1,508.10	1,421.21	1,070.35	1,040.05	601.44
ALR	75.40	138.25	141.60	146.64	135.48	147.39
DHS	142.47	168.99	152.62	122.73	122.42	61.29
Controlled	295.46	366.51	251.03	307.60	287.16	153.93
A-roads (on SRN)	1,807.44	1,816.29	1,698.12	1,391.66	1,458.24	1,009.44

Daylight and darkness casualty data [unadjusted for injury based reporting]

Road type	Daylight fatal casualties					
	2015	2016	2017	2018	2019	2020
Conventional	41	29	35	32	30	24
ALR	0	0	2	1	4	1
DHS	1	1	1	0	3	1
Controlled	2	0	1	3	3	4
A-roads (on SRN)	80	81	72	90	65	41

Road type	Darkness fatal casualties					
	2015	2016	2017	2018	2019	2020
Conventional	40	43	48	35	35	25
ALR	0	1	2	9	5	3
DHS	4	1	0	0	3	3
Controlled	4	2	2	5	2	3
A-roads (on SRN)	52	73	73	75	60	33

Road type	Unadjusted daylight serious casualties					
	2015	2016	2017	2018	2019	2020
Conventional	331	377	301	338	311	212
ALR	7	23	13	35	41	27
DHS	26	15	18	15	10	13
Controlled	41	39	55	56	53	39
A-roads (on SRN)	645	714	653	692	695	456

Road type	Unadjusted darkness serious casualties					
	2015	2016	2017	2018	2019	2020
Conventional	184	196	190	169	159	127
ALR	4	17	26	37	29	19
DHS	18	19	27	7	16	11
Controlled	22	35	22	50	24	25
A-roads (on SRN)	275	313	293	306	343	221

Road type	Unadjusted daylight slight casualties					
	2015	2016	2017	2018	2019	2020
Conventional	3,950	3,536	2,927	2,857	2,381	1,357
ALR	138	193	228	295	283	253
DHS	376	289	307	291	218	96
Controlled	709	752	722	589	575	301
A-roads (on SRN)	5,439	5,391	4,453	4,286	3,899	2,565

Road type	Unadjusted darkness slight casualties					
	2015	2016	2017	2018	2019	2020
Conventional	1,559	1,553	1,467	1,104	1,062	615
ALR	78	140	144	148	138	151
DHS	145	170	154	123	123	62
Controlled	302	369	252	309	290	156
A-roads (on SRN)	1,898	1,860	1,737	1,423	1,487	1,029

Annex L – SRN driver / rider age and sex record data 2015-2020

Vehicle driver / rider age record groupings

Road type	Recorded driver ages by grouping										
	0-5	6-10	11-15	16-20	21-25	26-35	36-45	46-55	56-65	66-75	75+	Unknown
Conventional	1	0	2	1,509	4,167	9,167	7,610	7,177	4,168	1,517	525	2,329
ALR	0	0	1	121	376	878	735	758	395	133	43	247
DHS	0	0	0	111	390	899	753	737	419	111	25	353
Controlled	0	0	0	269	813	2,069	1,797	1,647	940	280	73	574
A-roads (on SRN)	0	1	39	3,212	6,284	12,558	10,238	10,571	6,608	3,094	1,564	3,243

Vehicle driver / rider record sex

Road type	Recorded driver sex			
	Female	Male	Not traced	Unknown
Conventional	9,532	26,957	1,681	2
ALR	842	2,621	224	0
DHS	873	2,730	195	0
Controlled	2,001	6,025	436	0
A-roads (on SRN)	16,116	39,090	2,198	8

Annex M – Relevant analyses and reports

As highlighted in the data section, it is important to acknowledge that comparing safety metrics across road types is only one element of the analyses we undertake in National Highways. Additionally, we undertake:

- intervention data monitoring and evaluation – understanding whether implemented actions are effective and/or achieve their outcomes
- before vs. after analysis– undertaking Post Opening Project Evaluations to capture the safety benefits from traffic transferring from less safe roads to the SRN
- customer research – understanding what impacts driver experience
- safety reviews – understanding which road type elements are important for mitigations or future road development

Over the last 12 months, we have assessed whether additional areas influence drivers' experience (intervention data monitoring and evaluation). We will continue to monitor the impact of all additional emergency areas through the emergency area retrofit programme, which will help us understand how these emergency areas are used. It should be noted that data is likely to be impacted by external rare systemic events, such as Covid-19.

Since the first year progress report we have also published three Post Opening Project Evaluations (before vs. after analyses):

- M1 Junctions 28 to 31 and Junctions 32 to 35a all lane running and M1 Junctions 31 to 32 controlled motorway - One year post opening evaluation (see here)
- M1 Junctions 10 to 13 hard shoulder running and junction improvements - Five year post-opening project evaluation (see here)
- M3 Junctions 2 to 4a all lane running - One-year post opening project evaluation (see here)

The more recent Post Opening Project Evaluations are available from here, with pre-2020 reports available from here. Beyond targeted social research projects, on an ongoing basis we have monitored National Highways' customer experience tracker survey (HighView).

Additionally, over the last 12 months we have published incident and infrastructure investigations (safety reviews) on M6 and M1:

- M6 and M1 Incident and infrastructure investigations – summary (see here)
- Incident and infrastructure investigation: M6 Junctions 5 to 6 - independent review (see here)
- Incident and infrastructure investigation: M6 Junctions 5 to 6 - Highways England (now National Highways) response (see here)
- Incident and infrastructure investigation: M1 Junctions 10 to 13 - independent review (see here)
- Incident and infrastructure investigation: M1 Junctions 10 to 13 - Highways England (now National Highways) response (see here)
- Incident and infrastructure investigation: M1 Junctions 30 to 35 - independent review (see here)
- Incident and infrastructure investigation: M1 Junctions 30 to 35 - Highways England (now National Highways) response (see here)
- Incident and infrastructure investigation: M1 Junctions 39 to 42 - independent review (see here)
- Incident and infrastructure investigation: M1 Junctions 39 to 42 - Highways England (now National Highways) response (see here)

Annex N – Detailed collision data

To provide greater transparency, alongside this report we have published the detailed collision data spreadsheet here.

This document and accompanying data have been prepared by National Highways with assistance from its consultants (where employed). The document and its accompanying data remain the property of National Highways.

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

This dataset will be refreshed when updated information becomes available. We will be interested to hear your thoughts on how to improve this data. If you want to contact us, please click here.

Annex O – Glossary of terms

Term	Explanation
All lane running (ALR) motorways	All lane running (ALR) motorways apply the controlled motorway technology, permanently converts the hard shoulder as a running lane, and feature emergency areas. Emergency areas are places to stop in an emergency. They are approximately 100 metres long (the average length of a football pitch) by 4.6 metres wide and set back from the left-hand edge of the motorway. An emergency telephone from which to alert National Highways of an issue and call for help is provided in each emergency area and all of them have orange surfacing to make them more visible. Emergency areas are for when a driver has no alternative but to stop and it has not been possible to leave the motorway or reach a motorway service area. Other places to stop in an emergency include sections of remaining hard shoulder, such as on slip roads at junctions.
bCall	bCall is a system that allows the driver to call for breakdown assistance direct from their vehicle.
Casualty rate	The casualty rate takes the number of casualties and controls for the volume of traffic on the road, more specifically it is defined as the number of casualties per hundred million vehicle miles travelled.
CCTV	Closed-circuit television. The primary users of the traffic cameras are our Regional and National Traffic Operations Centre operators. The operators are able to move and zoom the cameras to monitor and manage congestion and incidents, when notified. The cameras give a bird's eye view of what is happening which helps the operator to decide on the support needed.
Controlled motorways (CM)	Controlled motorways apply technology to a conventional motorway to control the speed of traffic retaining a permanent hard shoulder. Controlled motorways add variable and mandatory speed limits to a conventional motorway to control the speed of traffic, while retaining a permanent hard shoulder. Overhead electronic signs display messages to drivers, such as warning of an incident ahead.
DfT	Department for Transport
Dynamic hard shoulder running (DHS) motorways)	Dynamic hard shoulder running (DHS) motorways apply the controlled motorway technology and temporarily increase capacity by utilising the hard shoulder, and feature emergency areas. The hard shoulder is some of the time, but not always, used as a live running lane, with electronic signs and signals to guide drivers when it is safe to use for live running. Emergency areas are installed as on ALR motorways.
DVLA	Driver and Vehicle Licensing Agency is an executive agency, sponsored by DfT
eCall	eCall is a system that phones the emergency services automatically if the vehicle it's fitted to is involved in an incident.

Fatal and Weighted Injuries (FWI) measure	This gives a fatality 10 times the weight of a serious casualty, and a serious casualty 10 times the weight of a slight casualty. Specifically, it is calculated as: Fatal and Weighted Injuries = Fatal casualties + Serious Casualties * 0.1 + Slight Casualties * 0.01
Fatal and Weighted Injuries (FWI) rate	The FWI rate takes the FWI measure and controls for the volume of traffic on the road, more specifically it is defined as the number of FWI casualties per hundred million vehicle miles travelled.
Fatal casualties	A person who has died from their injuries up to 30 days after the incident.
Killed and Serious Injuries (KSI)	The number of people killed or seriously injured in a road traffic collision.
Live lane breakdown (LLB)	Vehicles that are subject to a breakdown incident on a live lane due to a number of reasons – for example loss of power, engine or tyre issue.
Live lane stop	Vehicles that are stationary or parked on a live lane due to a number of reasons – for example breakdown, collisions or medical episodes.
Monitoring	**Regional control room incident management and monitoring** Once we are notified of an incident, we can use CCTV and other technology to verify details and determine appropriate actions during the course of the incident. Notification can arise from various sources including the police, public, SVD technology where in place, recovery industry and our traffic officers. Actions in response may include setting signs and signals and deploying resources, such as traffic officers. When resources allow, we carry out virtual patrolling. This is the proactive use of technology to provide an overview of smart motorway sections, including emergency areas. Virtual patrolling is not a routine activity conducted in our regional control rooms. **Roadworks monitoring** For major scheme upgrades where we have roadworks in place, we typically implement a reduced speed limit and CCTV monitoring within the roadworks. An on-site, 24/7 team use the CCTV to proactively monitor the roadworks section and can arrange to deploy free recovery service to vehicles which stop in the roadworks. **Further monitoring** We also use equipment to monitor areas such as data, air quality and wind speed. The information is gathered periodically.

Motorway Incident Detection and Automatic Signalling (MIDAS)	MIDAS is a system set up to identify queuing traffic or congestion by monitoring traffic speed and flow. Once queuing traffic or congestion is detected, the system automatically sets appropriate messages on variable message signs to warn drivers of conditions of the road ahead. It also automatically sets speed limits displayed on the signs and signals at the roadside and overhead on gantries. MIDAS can also reduce the risk of secondary incidents in queuing traffic, i.e. the risk of vehicles colliding with the rear of a queue of traffic. It does this by identifying a queue and then automatically reducing speeds and setting accompanying warning messages. In addition, on smart motorway sections only, it also includes a congestion management function designed to smooth traffic flow and throughput by reducing traffic speed, allowing reduced headway between vehicles, to try and stop traffic queues forming. This is done by setting signals and message signs upstream of where congestion is detected.
ORR	Office of Rail and Road.
Personal Injury Collisions (PICs)	The number of collisions which have resulted in a person sustaining an injury. PICs do not reflect the number of people injured in each collision (casualties).
Places to stop in an emergency	Places to stop in an emergency include motorway services, emergency areas and remaining sections of hard shoulder, such as on slip roads.
POPE	National Highways produces Post Opening Project Evaluation (POPE) reports 'one year after' and 'five years after' following the opening of a road scheme for all scheme impacts, including but not limited to safety.
Serious casualties	People sustaining injuries requiring hospitalisation, or any of the following injuries whether or not the individual went to hospital: fractures, concussion, internal injuries, crushings, burns (excluding friction burns), severe cuts, severe general shock requiring medical treatment and injuries causing death 30 or more days after the incident.
Slight casualties	People sustaining a minor injury such as a sprain (including neck whiplash), bruise or cut which is not judged to be severe, or slight shock requiring roadside attention. This definition includes injuries not requiring medical treatment.

Smart motorway	A smart motorway is a section of motorway that uses traffic management methods to increase capacity and reduce congestion in particularly busy areas. These methods include using the hard shoulder as a running lane and using variable speed limits to control the flow of traffic.
STATS19	STATS19 database is a collection of all road traffic accidents (collisions) that resulted in a personal injury (casualty) and were reported to the police within 30 days of the accident. More information can be found here. One collision may give rise to several casualties, which are categorised according to their severity (slight, serious or fatal). In this report we predominantly use the terms 'collisions' and 'casualties'. The term 'injuries' is used particularly in line with widely adopted definitions, metrics or in order to reduce the technical language of the report.
Stopped vehicle detection (SVD)	Stopped Vehicle Detection technology identifies stopped vehicles, typically within 20 seconds and provides an alert to our control rooms. Our operators can then close lanes with a Red X signal, display speed limits and deploy traffic officers.
Strategic road network (SRN)	In England, the SRN is made up of motorways and trunk roads (the most significant A roads). They are administered by National Highways, a Government-owned company.
Transport Select Committee	Nominated by the House of Commons to scrutinise the Department for Transport. Its formal remit is to hold Ministers and Departments to account, and to investigate matters of public concern where there is a need for accountability to the public through Parliament. It is chaired by Huw Merriman MP.
Vehicle Miles	Traffic statistics are presented in units of vehicle miles (billion or hundred million vehicle miles – bvm or hmvm respectively), which combines the number of vehicles on the road and how far they drive. This is a standard way of presenting traffic volumes.
VRO	Vehicle Recovery Operator.

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