

Smart Motorways Stocktake Action Review

Office of Rail and Road

15 July 2021



FINAL REPORT



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1. INTRODUCTION AND STUDY BACKGROUND

CEPA and EAM were jointly commissioned by ORR to undertake a review of a subset of five actions committed to by Highways England as part of the Smart Motorway Stocktake and Action Plan. This document reports on our review of Highways England's progress against the following actions (up to the end of February 2021), as well as an extension task to review Highways England's operational resourcing of smart motorways (carried out during May 2021):

- **Action 2: Faster roll out of stopped vehicle detection (SVD)**
 - 2a: installation of SVD technology on every existing all lane running by end of March 2023.
 - 2b: Large-scale trial of CCTV analytics for SVD.
- **Action 6a: Considering a national programme to install more emergency areas on existing smart motorways.**
 - Action 6b: Acting urgently to investigate and act on accident clusters.
- **Action 7a: Investigate M6 Bromford Viaduct and sections of the M1.**
 - Action 7b: Monitor existing smart motorways and new ones after they become operational.
- **Action 10: More communication with drivers, and**
- **Action 11: Displaying 'report of obstruction' messages.**

The objective of this review is to provide ORR with recommendations for an appropriate and proportionate approach to monitoring Highways England's delivery of these actions. Our review focuses on three objectives:

- a. Review the processes Highways England is using to monitor the delivery and recognise the benefits of each action, including data requirements, analysis, and benefits realisation.
- b. Review existing metrics, any Highways England has in development and consideration of further metrics if appropriate.
- c. Produce findings and recommendations to enable ORR to understand whether each action being delivered as actioned is likely to be successful and/or identify areas where confidence is low(er).

This report documents the progress that Highways England is making in response to the actions within scope. The review ran concurrently with the development of Highways England's first year progress report (published in April 2021¹) and is based on information provided to the review up to the end of February 2021. It also considers risks to progress and provides a view on whether benefits will be realised. Based on the work that we have undertaken to date we also identify a shortlist of possible monitoring options for ORR to consider further and identify next steps in the development of these options.

The Smart Motorway stocktake was published by the Department of Transport in 2020 and details a series of actions that Highways England has committed to complete by 2025, i.e. by the end of RIS2. There is currently² some discussion about acceleration of aspects of the Action Plan. This report does not consider scope for acceleration. The following guidelines have also been agreed between ORR, Highways England and CEPA/EAM:

- The project scope is confined to five actions (2, 6, 7, 10 and 11) and does not include a review of other actions Highways England could take to improve smart motorway safety.
- The project should not consider the background to the Action Plan or question the Actions.

¹ Highways England (April 2021) "Smart motorways stocktake: First year progress report 2021" available [online](#).

² As at February 2021.

- If there are gaps in the expected level of confidence of delivering Stocktake actions the project will provide findings and recommendations to address these.
- The project should include a review of existing Highways England metrics to measure each action and where appropriate suggest further metrics to ORR if appropriate e.g. 'near misses'.

1.1. STRUCTURE OF THIS DOCUMENT

Section 2 of this document provides a summary of the five Stocktake actions that form this review, our analysis of progress, assessment of likelihood of success and initial thoughts on monitoring options.

Section 3 provides a summary of the monitoring options identified for each action and considers how these might be applied by ORR in its monitoring.

Section 4 provides a review of Highways England's approach to resourcing smart motorways.

Appendix A provides further details on the initial consideration of the longlisted monitoring options outlined in Section 3.1.

Appendix B provides a more detailed assessment of the sifted monitoring options against the criteria described in Section 3.2.

Appendix C provides the scope document provided for this review.

2. STOCKTAKE ACTIONS: DRAFT FINDINGS

This section discusses Highways England’s progress against the Action Plan for the five action areas (eight actions in total, including sub-actions) reviewed in this project, the processes Highways England is using to monitor the delivery and benefits of each action, and considers risks to progress and a view on whether benefits will be realised as per the Action Plan.

Key information and dependencies for each Action are summarised in Table 2.1 below.

Table 2.1: Summary of key information related to each Action.

Action	Heading	Owning directorate	Start and End date ³		Dependencies
2a	SVD rollout	Major Projects	Started	End March 2023	All new schemes will be opened with SVD in place.
2b	CCTV trial	ITD	Started	Dec 2020 Trial results given to DfT	None
6a	Consider retrofitting Emergency Areas	Major Projects / SES	December 2021	March 2022	Action 5 (December 2021)
6b	Accident clusters	SES	Started	Ongoing	STATS19 data releases and data improvements. Supported by Action 7b monitoring data.
7a	M6 / M1 investigation	SES	Started	November 2020	None
7b	SM monitoring	SES	Started	March 2025	STATS19 data releases.
10	Communication	Comms.	Started	November 2021	Impact of Covid-19 on campaign start date. Campaign second wave 6-12 months after wave one.
11	Report of obstruction messages	Operations	Started	March 2023	Action 2a. Delivery of CHARM.

2.1. ACTION 2A: FASTER ROLL OUT OF STOPPED VEHICLE DETECTION (SVD)

2.1.1. Action 2a: Installation of SVD technology on every existing all lane running by end of March 2023.

The Safety Evidence Stocktake and Action Plan⁴ found that the high-level statistics suggest that fatal casualty rates on the All Lane Running (ALR) motorway network as it stands are lower, while injury rates are slightly higher. The risk modelling suggests that when converting conventional motorways to ALR, many risks decrease, while some increase. For example, the risks of a vehicle being driven too fast, and of a vehicle drifting off the carriageway, reduce whilst the risks of unsafe lane changing and of a vehicle stopping in a live lane increase.

³ Dates sourced from the implementation plan provided at the time of our review.

⁴ DfT (March 2020) “Smart Motorway Safety: Evidence Stocktake and Action Plan” available [online](#)

Although many of the risks are lower, when smart motorways are compared to conventional motorways, the stocktake report states that “*the risk of a collision between a moving vehicle and a stationary vehicle is higher on non-hard-shoulder motorways*”. This is why the SoS has required Highways England to accelerate the roll out of stopped vehicle detection (SVD). Highways England has now trialled and implemented a radar-based SVD system on two smart motorway sections of the M25 and has also installed it on a smart motorway section of the M3. The advantage of the SVD system is it is specifically designed to detect a stationary vehicle, typically in 20 seconds, set a message automatically on electronic signs⁵, and alert a control room operator who can see the incident on camera, close lanes and dispatch an on-road Highways England traffic officer to attend to the stopped vehicle.

Smart motorway schemes completed in 2020 are the first to have the SVD technology implemented as standard but other smart motorways are without it. While Highways England is committed to rolling out SVD to every existing all lane running smart motorway, prior to the stocktake there was no public timetable for this work. The stocktake requires Highways England to install the technology on all lane running smart motorways within the next 36 months, setting a clear public timetable for the first time.

Highways England has shared a programme that it has stated⁶ is on target to deliver the remaining 21 retrofit SVD schemes, ahead of the March 2023 deadline. We would anticipate that ORR will wish to receive a report on the progress against the updated programme⁷ as part of its monitoring process (e.g. as part of the monthly and quarterly reports produced by Highways England, as appropriate).

The benefits case for SVD is set out in Highways England’s Benefits Realisation & Evaluation Plan (BREP). The BREP summarises the main benefits and dis-benefits to be monitored as follows:

Benefit / Disbenefit	Measurement
Delay during construction and improved journey time / journey time reliability in operations	Journey time and journey time reliability statistics from HE’s Performance Analysis Unit (RIF database) and Regional Intelligence Units
Reduction in severity and numbers of incidents	DfT Killed and Seriously Injured statistics (STATS 19)
Reduced incidents response time	SVD alarm logs HALOGEN ⁸ logs and Control Works logs
Reassurance to users	Highview regular customer insight surveys – safety perception
Impacts during construction	Additional delay measured by Regional Intelligence Units

The contribution of these actions will be seen in a reduction in duration of broken down vehicles and improved operational response time; key things to be monitored. The introduction of SVD is also expected to increase customer perception of safety on the network. The benefits and disbenefits of introducing SVD also contribute to Highways England’s corporate KPIs in the Performance Specification. These include:

- fewer people killed or seriously injured on the Strategic Road Network (SRN) to support a decrease of at least 50% by the end of 2025, against the 2005-09 average baseline, and
- the performance, in terms of average delay, to be no worse at the end of the second road period than it is at the end of the first road period.

⁵ The facility to set signs (“Report of Obstruction”) automatically will be interrupted during the implementation of CHARM, the signs having to be set manually by Control Room staff for up to six months – see section 2.2

⁶ ORR Deep Dive meeting with HE 21st January 2021

⁷ Subsequent to the date of our review, Highways England agreed with DfT to complete the installation of radar SVD technology on existing ALR motorways by the end of September 2022, six months earlier than previously committed. Refer to Highways England (20 April 2021) “Smart motorways stocktake: First year progress report”, p6, available [online](#).

⁸ With the rollout of CHARM some systems will be replaced, such as HALOGEN.

The Benefits Realisation Management section of the BREP states that SVD is to be retrofitted on 21 schemes. Of the 21 schemes, 11 will have SVD introduced as part of the main scheme or shortly after. The BREP provided for this review covers the 10 schemes that require individual evaluation of the addition of SVD i.e. those being retrofitted.

Some of the data that the BREP anticipates using for monitoring, are only formally made available by DfT a year or more after the action to implement SVD is complete. Although these data will be useful, we anticipate that both ORR and Highways England will want to monitor impacts sooner.

Highways England plans to monitor activities of each scheme individually following their opening (at intervals consisting of week one, month three and month six). The key items being monitored, are:

- Time to detect baseline established (to be used in subsequent monitoring reports)
- Detection rate
- False positive rate
- Monitoring the frequency of alerts from places of relative safety (PRS) within an ALR section against live lane alerts
- Operator response times
- Resilience / availability
- Maximum end-to-end time to alert a ROC operator of a Stopped Vehicle Event (30 seconds)

The 6-months post opening monitoring will assess a sample of 50 stopped vehicle events at random over the period from SVD system alert logs, CCTV footage and feedback from ROC and TOS operators. For the M3 Junctions 2 to 4a the month 6 monitoring will be completed before the handover to operations, i.e. up to June 2021.

A single 1 year after Post Opening Project Evaluation (POPE) report will be created using the above mentioned monitoring reports and other internal data sources. These will need to be utilised to provide an appropriate context on areas such as live lane stops and incident clearance times across the network. The timing of this report will align with the last stand-alone scheme (M6 J16-19 Nov 2022).

Benefits management needs to be sustained beyond the project delivery timeframe, to review whether a project is on track to realise its benefits. To support this, the BREP sets out plans for handover of benefits and sustained benefits management as part of the transition of the project into business as usual.

Highways England has an effective process to fit SVD technology into the wider safety system and the BREP provided for this review states that a key benefit of SVD will be reduced incident response times, and that this will be obtained from SVD alarm logs HALOGEN logs and Control Works logs. SVD benefits for each scheme will be monitored for up to 6 months post-implementation. The BREP does not state if Highways England is intending to compare the benefits of SVD against the 'Before' situation i.e. where a combination of existing control systems and manual operator interventions are used to respond to a stopped vehicle until the arrival of Traffic Officers.

2.1.2. Action 2b: Large-scale trial of CCTV analytics for SVD

To complement the installation of SVD, Highways England has been investigating the potential for other existing technologies to play a role in detecting stopped vehicles. Highways England has run a first phase trial of a video analytics service platform (VASP) system that analyses CCTV images. This was completed on programme and presented to DfT in November 2020.

The project demonstrated the following key outcomes:

- The viability of connecting digital video analytics to the analogue Highways England CCTV cameras using the Highways England Traffic Cameras (HETC) Service

- Alerts for incidents of interest were delivered to operators' desks, allowing quicker response and the potential benefits of video analytics on day to day operations to be explored.
- VASP was shown to be able to detect 3 types of incident identified by Highways England's Regional Control Centre staff and stakeholders of which 2 were designated as being high priority and one being complementary:
 - Stationary Vehicles (high priority)
 - Congestion (high priority)
 - Camera Moved (complementary)
- Standards driven approaches have been developed to facilitate evaluation of diverse analytics capabilities from a diverse range of innovative suppliers.

For the two high priority capabilities tested, the trial reported results which indicated a high level of precision.

[✕]

Highways England will now launch a second phase to test the results in winter weather and light at the same location. The aim of this second phase is to gain a better understanding of the potential for this technology that may enable greater use of the extensive CCTV coverage on smart motorways, providing another option alongside SVD based radar technology.

CCTV is already used for a wide range of activities on smart motorways and the analytics system has the limitation of the CCTV cameras not having complete automatic coverage of the network – they are set to point one-way and have to be reoriented manually. For these reasons, CCTV-based analytics is always likely to be secondary to SVD. Although external to the VASP system, the trial did observe external factors that could limit the use of CCTV to detect stopping vehicles, the main one being the reliability of camera feeds.

Going forward, post the second phase of the trial, ORR may wish to understand the benefits that CCTV analytics could have and monitor how Highways England plans to utilise that capability.

2.2. ACTION 11: DISPLAYING 'REPORT OF OBSTRUCTION' MESSAGES

This review ran concurrently with the development of Highways England's first year progress report⁹ (published in April 2021) and is based on information provided to the review up to the end of February 2021.

The Stocktake Action Plan includes a commitment to roll out the automatic display of "report of obstruction" messages on overhead signs, to warn oncoming drivers of a stopped vehicle in the road ahead.¹⁰ Automation of these messages is already operational on the M25 (Junctions 23 to 27 and 5 to 7) and is now active on the M3 (Junctions 2 to 4a).

As we note throughout this report, the display of "report of obstruction" messages is dependent on the delivery of Action 2 ("Faster rollout of Stopped Vehicle Detection") since the automatic message is triggered by the SVD alert. Under Action 2, SVD is expected to be installed on all existing ALR smart motorways by March 2023 at the latest and automated display of "report of obstruction" messages will be delivered concurrently.

However, the rollout of the automated obstruction messages is complicated by the replacement of Highways England's Traffic Management System (HATMS). HATMS, and the Control Office Base System (COBS) which is the main component of HATMS, is the software system which HE's regional control room operators use to set message signs, speed signals and monitor traffic flows. HATMS is being replaced over the next year by the CHARM

⁹ Highways England (April 2021) "Smart motorways stocktake: First year progress report 2021" available [online](#).

¹⁰ DfT (March 2020) "Smart motorway safety: evidence stocktake and action plan" para 1.21, available [online](#)

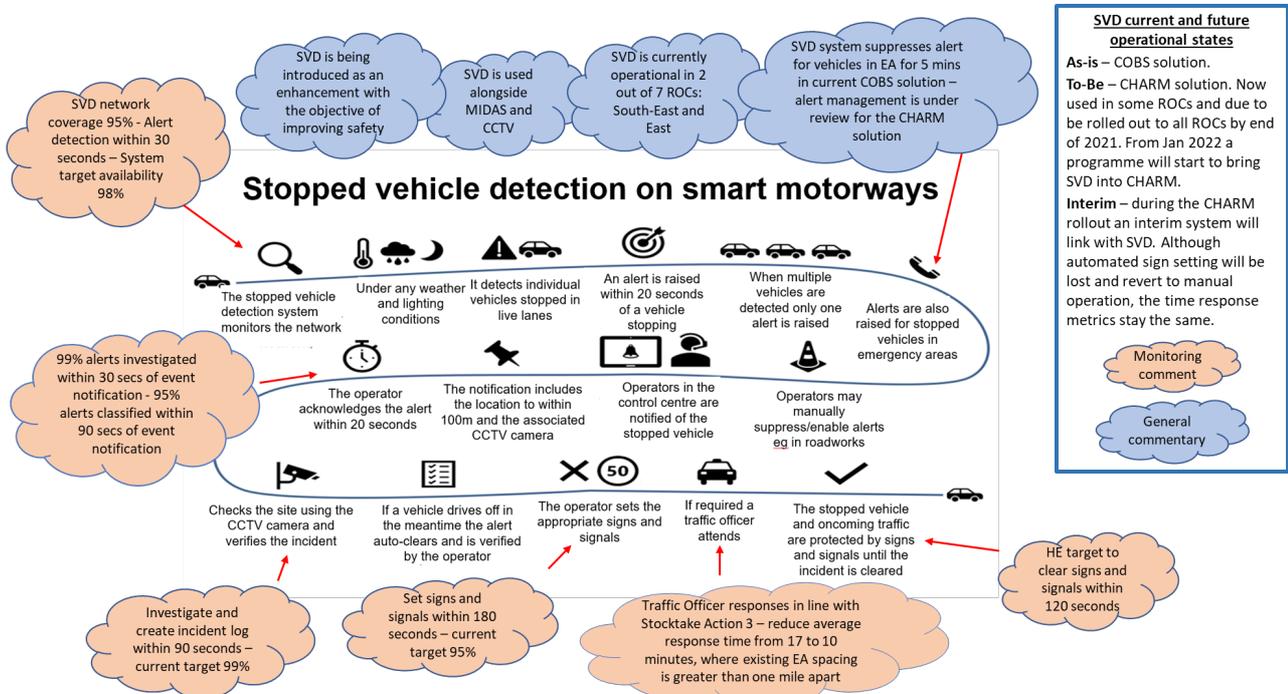
programme¹¹, which provides more advanced traffic management services. The programmed rollout of CHARM is due to complete in December 2021, and there is a programme to bring SVD capability into CHARM from January 2022.

Although automated display of obstruction messages is now installed on the M25 and the M3 (between the Junctions noted above), the current COBS-based system will be switched off over the coming months and the *automated* capability to display “report of obstruction” messages will be unavailable to the relevant Regional Operations Centres (ROCs)¹² until such time as the SVD alerting function is incorporated within CHARM. We understand from Highways England that it currently expects automated message-setting capability to be restored across all regions within 6 months of the completion of the national CHARM roll-out, based on the rollout programme provided at the time of our review.¹³ Therefore, we highlight the interaction between CHARM, SVD and the automated “report of obstruction” messages as a key risk which ORR should monitor and require the company to report on an ongoing basis. We highlight however that this is one part of the overall process to manage stopped vehicles and that ORR should consider the whole of that process rather than limit its focus to those parts which are covered in this review of selected Stocktake actions.

During the transitional period (between switching off the current COBS-based system and incorporation of the SVD alerting function within CHARM, which may last between 6-12 months), Highways England told us that it will be using the “SVD Alerting Tool” which is a standalone system. The SVD Alerting Tool will send an alarm to the ROC Operators when it detects a stationary vehicle in a live lane, and we understand that a “report of obstruction” message will then be manually set by the Operator for the nearest two upstream VMS installations, before the operator actively investigates the nature of the alert.

To demonstrate the process described above, Figure 2.1 below summarises the SVD process from stopped vehicle to incident clearance, noting the transitional states of which we are aware. This includes some general commentary and SVD system monitoring areas and targets.

Figure 2.1: Stopped vehicle detection on smart motorways.



Source: EAM analysis of information provided by Highways England

¹¹ Highways England informed us that it has already been replaced in two Areas.

¹² East of England ROC from 22 May and the South East ROC from 17 July.

¹³ Email from Highways England to Elliott Asset Management, dated 12 February 2021.

The “report of obstruction” message is designed by Highways England as a ‘holding message’ to warn drivers of a possible but unconfirmed hazard ahead, whilst Highways England ROC Operators investigate further. In other words, it should only be displayed until the nature of the obstruction has been established and a more appropriate message has been set, or the alert cleared. Additionally, it is not an instruction which drivers must adhere to – i.e. it is a warning to proceed with caution, but not an instruction to change lane or otherwise.

The “report of obstruction” message is one of several *inputs* which contribute to an overall *targeted outcome* of reducing the likelihood of live lane collisions. As an individual action, it does not have a direct benefit that can be measured separately from other actions which are targeting this outcome. But, in the context of recognising the contribution of ‘report of obstruction’ messages, ORR should note that Highways England told us that the “report of” language has been tested with the Company’s Customer Panel and performed well in terms of user preference and understanding.¹⁴

There are established control room processes and targets for responding to alerts within 30 seconds. SVD events are logged (currently within the HALOGEN system) and a random sample of log entries from each region are reviewed by a central team to ensure that operating procedures were followed, and appropriate messages set within the allotted timescales. Although we have not been provided with copies of entry logs or of their review, we understand that performance against these standards and targets is good, and that the review process creates a feedback loop to ensure that stopped vehicle events are responded to effectively.

2.3. ACTION 6: CONSIDERING A NATIONAL PROGRAMME TO INSTALL MORE EMERGENCY AREAS (EAs) ON EXISTING SMART MOTORWAYS

2.3.1. Action 6a: Consider Retrofitting Emergency Areas

Design standards have been amended for future schemes when they enter the design stage, to reduce the distance between safe places to stop in an emergency to 0.75 miles where feasible and a maximum of 1 mile where it is not. This applies to new schemes and means motorists will reach a safe place to stop at least every minute when travelling at 60mph. During 2020, Highways England completed the design of the first smart motorways to this latest specification. In practice, across the first four schemes using this 1-mile maximum spacing standard, the *average* distance between places to stop in an emergency is 0.75 miles, which means drivers will *on average* reach one every 45 seconds at 60mph.

Highways England achieved the delivery of 10 new EAs on the M25 by December 2020. Consideration is being given to a national programme of retrofitting additional emergency areas (EAs) on existing smart motorways where places to stop in an emergency are more than one mile apart, drawing on evidence from the programme to deliver additional EAs on the M25. There will be a thorough evaluation of the M25 programme, collecting data on live lane stops before and after the extra EAs are installed. The ‘after’ data will be collected over the 12-month period January to December 2021, looking at the number of live lane stoppages per month and comparing with the M25 smart motorway stretches before the additional 10 EAs were installed. It is hoped that the analysis of the 12 months of ‘after’ data will help Highways England develop a framework to assess the potential benefits of additional EAs and, if appropriate, decide where to build more EAs. It may be useful going forward for ORR to understand how HE plans to use data from M25 and other smart motorways and when it expects to decide whether/how to retrofit across the existing network.

2.3.2. Action 6b: Acting urgently on accident clusters.

In addition to considering a national programme to install more EAs on smart motorways, where there have been clusters of incidents, Highways England is instructed by the Action Plan to not wait for this work to conclude but to act urgently to investigate and act where necessary.

¹⁴ Email from Highways England to Elliott Asset Management dated 26 February 2021.

Highways England reported that work into the definition of a cluster is ongoing and that there will be some reporting of this work in the 2020 annual safety assessment, which was due to be published in February 2021 but is now delayed.

Highways England is taking care over the terminology ‘collisions’ when considering whether incidents are linked to the performance of EAs, for example ‘limping vehicles’ can also be included within an incident cluster: a collision is an incident that occurs at a well-defined location, whereas a ‘limping vehicle’ is an incident that occurs on a stretch of motorway, making the defining of ‘clusters’ problematic. Highways England’s process for a cluster review includes consideration of the geographical locations with the highest number of incidents. The analytical stage looks at repeating patterns, causation and collision factors that influence incidents, control room data e.g. live lane stoppages (non-injury, not STATS19 data, being aware of double counting, reports from the Traffic Officers). Highways England will then consider opportunities to intervene to reduce frequency and severity, all to inform new EA locations.

To conclude whether incidents are linked to the performance of EAs, Highways England should complete the updating of its definition of what constitutes a ‘cluster’ and ORR should monitor whether the Company is making urgent progress on this issue. This is so that the incidence of future clusters can be monitored against the current performance of smart motorways. Analysis of clusters should include ‘limping’ vehicles, as collisions are unlikely to be relatable to EA locations, unless they involve a vehicle entering or leaving an EA. If Highways England is unable to include ‘limping vehicles’ within ‘clusters’, due to the need to define an exact location for each incident, ORR may wish to monitor how ‘limping vehicles’ are being separately considered to help determine the performance of EA locations.

2.4. ACTION 7

2.4.1. Action 7a: Investigate M6 Bromford Viaduct and Sections of the M1

DfT and Highways England have heard the concerns about clusters of incidents on specific sections of the M6 and M1 smart motorway. This includes the M6 Bromford viaduct between Junctions 5 and 6, where places to stop in an emergency are furthest apart, although Highways England traffic officers are stationed at each end of the viaduct. Concerns have also been raised about sections of the M1 where multiple collisions have occurred. These include M1 Junctions 10 to 13 (Luton) and Junctions 30 to 35 (Sheffield). Evidence of multiple incidents on the M1 Junctions 39 to 42 (Wakefield) has also been seen.

There is a strong commitment to investigate urgently what more could be done on the M6 Bromford viaduct and on these sections of the M1. Four independent safety reviews have been carried out, one on each of these stretches of smart motorway, and findings have been communicated to DfT. We have been provided with summary slides presented to DfT which show that the safety reviews were not based solely on a cluster analysis but focussed on a macro level analysis that is carried out within POPE studies¹⁵ i.e. based on increases in Fatal Weighted Injuries (FWIs). These safety reviews are currently being finalised (early 2021) and we would expect actions to be monitored. Within the locally defined clusters, Highways England has been able to identify some causes, but these are not necessarily related to live lane breakdowns. The cluster analysis will identify additional EA locations and other interventions to reduce collisions risk, but this only applies to the four locations relevant to Action 7a¹⁶. Where an intervention is considered likely to make a difference, changes to the motorway at these locations are being considered.

Highways England has, however, been unable to define the term ‘cluster’ for use on all the different types of roads within its remit, and is reviewing its definition to ensure its appropriateness for smart motorways going forward. Although it is likely to involve a specific number of collisions over a defined time period and directional length of

¹⁵ OYA POPEs for three or the four SM stretches in question were published in March 2020: the M1J30-35 POPE is still ongoing.

¹⁶ Stated at the ORR Deep Dive meeting with HE 20th January 2021.

smart motorway, we are unaware of whether it includes other factors, such as ‘limping vehicles’, ‘near misses’ reported by Traffic Officers and other HE supply chain contractors, and ‘call outs’ to repair damaged street furniture such as road restraint barriers.

2.4.2. Action 7b: Monitor existing smart motorways and new ones after they become operational.

There is also a commitment to monitor existing smart motorways and new ones after they become operational to review safety data and evaluate whether they are meeting the safety objective of being as safe as, or safer than, the conventional motorways they replace.

The latest Annual SRN Collision Monitoring Review (all road types), originally due in October 2020, which utilises the delayed 2019 STATS19 data, should have been published by mid-February 2021, but is still delayed. It should include a subset of the annual SRN review, focussing on smart motorways. Likely delays with 2020 STATS19 data could impact Highways England’s ability to deliver a timely second annual Stocktake report. Highways England state that they will consider other potential monitoring methods, beyond the statistical methods used of comparing data in the stocktake, and better consider the utilisation of operational data to enable increased frequency of monitoring points. However, evidence of these methods and approaches was not provided during the study.

Highways England told us that all POPE assessments are discussed with Exec-level sponsors to recommend whether lessons can be learned for schemes in development or future schemes. ORR may wish to follow up with Highways England to ensure that lessons learnt from the M1 and M6 studies (7a) are used to inform interventions on other sections of Smart Motorway, or on the wider SRN.

2.5. ACTION 10: MORE COMMUNICATION WITH DRIVERS

The stocktake contained a commitment to spend an additional £5 million on national and targeted public information campaigns to increase awareness and understanding of smart motorways, how they work and how to use them confidently. This section describes the campaign that Highways England has commissioned to satisfy this commitment (the “Go Left” campaign).¹⁷

The “Go Left” campaign provides advice on what to do in the event of a breakdown on the motorway.¹⁸ It is being promoted on radio, digital audio, TV and catch-up TV, paid-for social media and at motorway service areas. It will also be promoted by “key stakeholders” to broaden the reach of the campaign, and Highways England’s supply chain. The target audience is all users of the SRN, with a slight media skew towards a female and younger audience: internal analysis of Highways England’s Highview survey finds that female users are (on average) less confident with the idea of breaking down across all types of roads, and younger users are more likely to report breaking down.

The campaign is anchored through a 30 second TV advert and a longer 60 second version.¹⁹ From March 2021, it will air for six weeks in two waves with a break of approx. 4-5 months in between. The adverts will be available on YouTube²⁰ from launch, supported by four 20 second videos covering key associated messages:

- What to do if you breakdown on a motorway without a hard shoulder;
- What to do if you breakdown and you cannot get out of live traffic;

¹⁷ Highways England 10 March 2021 “Go left! Highways England launches biggest ever motorway safety campaign” available [online](#)

¹⁸Highways England (accessed 6 July 2021) “If you get into trouble on a motorway – go left” available [online](#).

¹⁹ A British Sign Language version will be made available for deaf road users.

²⁰ <https://www.youtube.com/channel/UC68PZJdKAzOWv0yDHqXrmZw>

- Preventing a breakdown; and
- Emergency areas.

Other products will also be available including a best practice guide for industry and an overseas drivers guide. We also note that there is an ongoing consultation on updating the Highway Code to provide more guidance for new motorists on smart motorway driving under a separate action in the Stocktake.²¹

The stocktake states that the aim is to ensure drivers receive advice to help them keep safe on smart motorways including advice on what to do in a breakdown.²² Research by Brake has previously shown that there are relatively low levels of smart motorway awareness amongst the general public: while 75% of drivers surveyed knew what a smart motorway is, only 48% knew the rules for driving on one.²³ But our engagement with Highways England finds that the campaign focus has been broadened to how to stay safe during a breakdown on motorways generally (i.e. it is not focused on smart motorways specifically). In agreement with DfT, the phrase “smart motorways” is not used because Highways England considers that a vehicle breakdown can occur on any road and that the Company’s safety messaging should be as applicable and relevant as possible to all high speed roads. Instead the campaign refers to motorways “without a hard shoulder”. We think that this introduces a risk of message dilution (i.e. users remain unclear about, or are unaware of, the guidance in the event of a live lane breakdown on a motorway without a hard shoulder), and we conclude that the campaign does not completely fulfil the objective of the Action Plan (but note that the Company has previously developed campaign material on: How to drive on smart motorways; Red “X” lanes; Emergency Refuge Areas).²⁴

At the time of our interview with Highways England (January 2021), we were told that the communications campaign was ready to air, but that DfT and Highways England had jointly agreed to postpone the launch following the Prime Minister’s announcement of a national lockdown on 4 January and instructing people to “stay at home”. Highways England stated it was important that the ‘Go Left’ campaign did not appear to contradict the Government’s Covid-19 advice. The campaign was launched on 10 March²⁵, with the second wave planned for late summer 2021.

Nonetheless, Highways England has developed a draft evaluation plan to measure the success of the campaign and strengthen future campaigns. The evaluation plan is underpinned by a logic model (or “theory of change”) which identifies the outcomes that Highways England is seeking to achieve and the longer-term impacts that these outcomes might translate into. This is shown in the figure below.

²¹ DfT (March 2020) “Smart Motorway Safety: Evidence Stocktake and Action Plan” para 1.26, available [online](#).

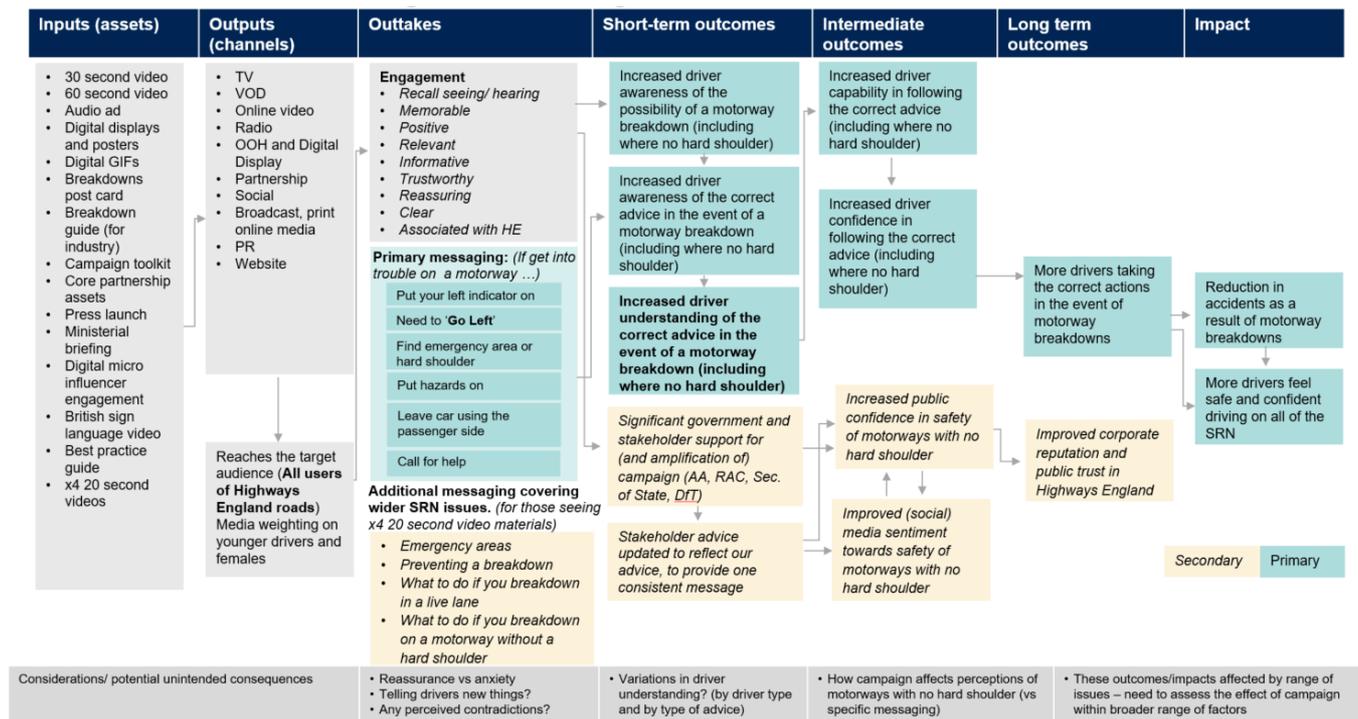
²² DfT (March 2020) “Smart Motorway Safety: Evidence Stocktake and Action Plan” para 1.20, available [online](#).

²³ Brake (October 2020) “Smart motorway danger revealed as less than half of drivers are aware of the rules” available [online](#)

²⁴ <https://www.youtube.com/playlist?list=PL97acKxwGOTOGX2myQ4cK1k4uT-ql18vA>

²⁵ Highways England 10 March 2021 “Go left! Highways England launches biggest ever motorway safety campaign” available [online](#)

Figure 2.2: Breakdown campaign logic model



Source: Highways England

The overall aim of the campaign is to improve user confidence, but the evaluation plan notes that confidence is a “complicated belief system” which is difficult to measure through a survey due to its reliance on self-reporting. To overcome this, Highways England will ask new questions in its Highview survey which will collect driver responses across four components which influence confidence:

- I know (awareness) [what to do in the event of a breakdown]
- I feel capable (self-efficacy) [of following the guidance]
- I think others know (social) [what to do in the event of a breakdown]
- I understand (awareness) [why I should follow the guidance].

The new Highview questions were launched in December 2020 and will run until at least June 2021.

Separately, Highways England has commissioned research to measure short term outcomes through a series of pre-, mid- and post-campaign surveys. The main aim is to understand recognition levels, public response and message take-out. Highways England considers that the work will address issues of perceived independence but will also offer better representation of the target audience than Highways England’s current internal tools.

Finally, Highways England’s social media team will also track how the various online posts are performing. This will feed into the first week activity report and the overall final evaluation report. Highways England will also receive a post campaign analysis report from the media buying agency, which will cover key metrics to show how the different campaign assets performed, e.g. in terms of reach and opportunities to view.

3. OPTIONS FOR MONITORING

In reviewing Highways England’s plans for and progress against the five Stocktake actions in scope of this report, we established how Highways England plans to monitor its own progress and considered what data might be available to develop a longlist of potential indicators which ORR might use in its monitoring of Highways England’s progress. In some cases we considered whether there are existing measures which ORR might utilise for monitoring, but we were not constrained by this and we identified a range of other measures which we consider could be developed using data that Highways England holds, or could collect with some targeted further development of its internal processes. The longlist is set out in Section 3.1 below with the shortlisting in Section 3.2 and the assessment of potential indicators in Section 3.3.

3.1. LONGLIST IDENTIFICATION

The longlist has been developed to cover the following four areas:

- Measures which provide **oversight of progress against delivery plans**, i.e. where success is contingent on meeting a deadline and/or the completion of another programme ORR may wish to monitor whether the actions are being implemented as anticipated in the Action Plan.
- Measures which cover the **effectiveness of communications** in ensuring that users of the SRN know how smart motorways work and what to do if they breakdown or think that they might.
- Measures which monitor progress towards **key Action Plan outcomes**, i.e. a measurable reduction in safety risk.
- ‘Other’ existing operating indicators

The measures we identified are as follows:

Indicator	Description
<i>Oversight of progress against delivery plans</i>	
SVD rollout	ORR needs to monitor progress on the delivery of Action 2a. Possible measures might include the actual number of SVD schemes completed against the baseline; or completed value of work against planned value.
CCTV trial	ORR should monitor progress on the delivery of Action 2b, which would require sufficient and timely data from Highways England on the progress of the second phase trial.
CHARM rollout status	ORR needs to monitor the progress of CHARM and observe the interface between the CHARM programme, the rollout of SVD, and the automatic report of obstruction messages. This will require timely reporting of progress by Highways England and an explanation of the risks to Actions 2a and 11.
Cluster definition	ORR needs to monitor progress on the delivery of Actions 6a and 6b. An important first step would be for Highways England to update ORR on a common ‘cluster’ definition which it is using to identify sections where more urgent action is required. In the short term, ORR could gather ‘cluster’ definitions from individual regional collision monitoring reports to check consistency of definition.
<i>Effectiveness of communications</i>	
‘Go Left’ – audience reach	Number of views / opportunities to see the ‘Go Left’ campaign across all media channels, as reported by Highways England’s media agents.
‘Go Left’ – audience awareness	ORR might monitor the effectiveness of the campaign in generating road user awareness. One option would be for Highways England to use Highview to

measure the percentage of users responding that they have seen, or are aware of, the 'Go Left' campaign.

'Go Left' – audience understanding	ORR might monitor the effectiveness of Highways England's communications campaigns in generating road user understanding of the correct breakdown advice. One option would be for Highways England to use Highview to measure the percentage of users responding correctly when asked to identify correct guidance when breaking down on a motorway without a hard shoulder.
User confidence in smart motorways	ORR might monitor the effectiveness of Highways England's communications activities in improving user confidence in smart motorways. One option would be for Highways England to use Highview to measure the difference between the percentage of users responding that they feel confident when using a motorway without a hard shoulder, compared to a standard motorway.

Achievement of key Action Plan outcomes

Stopped vehicle events in live lanes	Highways England will be recording stopped vehicle events via SVD. It could report the number of stopped vehicle events in live lanes to ORR on a regular basis, plus the rate per distance travelled (e.g. per million vehicle miles).
Collisions on SM sections	All reported collisions on smart motorway sections will be collected in STATS19 – trends in this measure might indicate an underlying need for action.
Reported near misses	Number of health, safety and wellbeing incidents and reported near misses on smart motorways, as recorded in AIRSWEB. Highways England could provide this data to ORR as additional information and/or to support trend analysis.
Time taken to attend a stopped vehicle	Highways England is targeting a reduction in the average time taken to attend a stopped vehicle from 17 to 10 minutes, where the existing spacing between safe places to stop in an emergency is more than one mile. It is exploring how it might record this data. Once established, Highways England could report average and absolute attendance time for all stopped vehicle events to ORR (i.e. including those which are not first attended by a traffic officer). ²⁶
Traffic officer attendance time	As above but limited to events where a Highways England traffic officer attends the vehicle.

'Other' operating indicators

SVD – detection rate	Highways England has undertaken trials to assess the percentage of stopped vehicle events accurately detected by the SVD system. Any updates on this analysis could be provided to ORR to demonstrate the effectiveness of SVD.
Time to set signs and signals	Highways England already records time taken to set the signs and signals associated with stopped vehicle events. Signs will be set within 3 minutes of receiving the alert – potentially focused on Red "X" signs.

We carried out an initial assessment of these indicators to identify the data required to construct them and to their respective strengths and weaknesses. Our initial assessment is set out in further detail in Annex A. Based on this initial assessment we separated the longlisted options into short- and long-term monitoring options and decided to take all but two indicators forward to a further assessment from which to identify a short list of potential options.

²⁶ For example, other emergency response services may be first on the scene.

Table 2: Summary of sifting assessment of longlisted monitoring options for further consideration

Indicator	Short / Longer term	Further assessment	Explanation
Oversight of progress against delivery plans			
SVD rollout	Short term	Y	Key enabler of an overall improvement in safety; Highways England holds programme data which allows for monitoring of delivery of Action 2a.
CCTV trial	Short term	Y	Would allow ORR to monitor the delivery of Action 2b and engage with Highways England on its objectives e.g. is CCTV likely to be a temporary tool that can be used whilst the SVD roll out continues, a complementary tool or back up tool in the longer term.
CHARM progress	Short term	Y	Allows for monitoring of delivery of Action 11.
Cluster definition	Both	Y	<p>Would allow for monitoring of delivery of Action 6.</p> <p>In the longer-term ORR needs to monitor whether the investigation of clusters is leading to similar (and effective) mitigation measures, and that they are being applied across the SRN, not just smart motorways.</p> <p>Action 7a: ORR should check whether clusters are defined consistently within the four studies, and that the resulting mitigation measures are likely to be as effective for one study as in another.</p>
Effectiveness of communications			
'Go Left' – audience reach	Short term	Y	Will be reported to Highways England as part of the campaign evaluation.
'Go Left' – audience awareness	Short term	Y	Initial measure of the awareness of the campaign message among road users.
'Go Left' – audience understanding	Longer term	Y	Good indicator of user comprehension of safety guidance.
User confidence in smart motorways	Longer term	Y	Overall indicator of user perception of safety.
Achievement of key Action Plan outcomes			
Stopped vehicle events in live lanes	Both	Y	Main outcome indicator of interest – particularly for ORR in relation to Action 6a.
Collisions on SM sections	Both	Y	Different indicator of risk, less relevant for Action 6a, but more relevant for Action 7b.
Reported near misses	Both	Y	Forward looking indicator of safety risk and might complement other outcome indicators.
Time taken to attend stopped vehicle	Both	Y	Good indicator of Highways England's response to stopped vehicle events.
Traffic officer attendance time	Both	Y	As above but limited to events attended by a traffic officer.
'Other' operating indicators			

SVD – detection rate	Short-term	N	Less directly connected to Highways England’s delivery of the Action Plan. ORR might consider this option again if it needs to consider the effectiveness of SVD in greater detail.
Time to set signs and signals	Both	N	Less directly connected to safety outcomes

We present this longlist to show that a variety of options have been considered, but we recognise that it would not be proportionate for ORR to regularly monitor all the available options. Ultimately our aim will be to identify a small number of measures that ORR can focus on which give a broad sense of progress in the round. In the next section we narrow this longlist down to a shortlist using standard criteria for good practice performance indicators.²⁷

3.2. SHORTLISTING OF MEASURES

This work assesses the longlisted indicators against a set of criteria commonly used for evaluating performance measures, and describes how they might relate to one another ‘in the round’. Our approach is based on our professional judgement and experience of applying a similar assessment to Highways England’s other RIS2 performance measures and in designing incentives for other clients.

We use the following criteria to help us assess the longlisted options and identify those indicators that would be most appropriate for ORR’s use in monitoring the delivery of the Action Plan:

- **Aligns with user priorities.** Good indicators should measure performance in a way that is meaningful to the road user and/or other stakeholders, in that it relates to an outcome they value.
- **Measurable.** The indicator can be easily measured, calculated and can be supported by a timely, reliable and robust data source. Natural or month-to-month variation (“noise”) in the underlying data can be mitigated or “looked through”, particularly where it relates to external factors.
- **Understandable and insightful.** The indicator is helpful for monitoring performance and is easily understood by stakeholders. It should provide ORR with a robust overview of performance without needing disproportionate amounts of supporting information, unless and until the indicator moves materially.
- **Controllable.** The indicator measures something which Highways England can control or influence through its activities and behaviours. Few indicators are completely within the control of the Company and are often subject to external influences. But it would be a poor metric if Highways England was unable to improve measured performance by changing its actions and behaviours.
- **Targetable.** It is possible to attach a target, ‘ambition’ or trajectory to the indicator to incentivise performance and measure progress.
- **Forward-looking.** Most indicators provide a snapshot of performance over a recent period. But the best indicators can provide early warning of performance issues ahead and stimulate action before poor performance materialises.
- **Unintended consequences.** It is important to consider whether the incentives introduced by the metric might have a perverse effect, for example by encouraging the Company to focus on measured performance rather than improving the outcomes that users and stakeholders actually value.

The results of our assessment are simplified in the scorecard below. The scorecard illustrates how the potential indicators score relative to each other. The absolute scores were not definitive in our overall assessment (i.e. in

²⁷ Criteria that we have used in the past include being simple to understand; ownable and controllable by Highways England; targeted on the outcomes of interest and meaningful to users; availability of timely supporting data; forward looking; minimise perverse ‘gaming’ incentives; minimal “noise” and uncontrollable variation.

isolation, the overall score did not determine which measures were shortlisted), rather they helped us to identify which of the potential indicators are likely to be the most suitable measures of progress and/or safety outcomes.

A more detailed assessment of each option against the seven criteria is set out in Appendix B.

Table 3: Summary assessment of potential indicators against the seven criteria

	Aligns w/ user priorities	Measurable	Understandable and insightful	Controllable	Targetable	Forward-looking	Unintended consequences	Score
SVD progress	✓✓	✓✓	✓✓	✓✓	✓✓	✓	✓	12
CCTV trial	✓	?	?	✓✓	✓✓	✓	✓	7
CHARM progress	✓	?	?	✓✓	✓✓	✓	✓	7
Cluster definition	✓	✓	✓	✓✓	✓✓	✓✓	✓	10
'Go Left' campaign – audience reach	✗	✗	✗	✓	✗	✓	✓✓	4
'Go Left' campaign – user awareness	✓	✓	✓	✓	✗	✗	✓✓	6
User understanding of breakdown advice	✓✓	✓	✓✓	✓✓	✓✓	?	✓	10
User confidence in smart motorways	✓✓	✓	✓	✓	✓✓	✓	✓	9
Stopped vehicle events in live lanes	✓✓	✓✓	✓✓	✓	✓✓	✓✓	✓✓	13
Collisions on smart motorway sections	✓✓	✓	✓	✓	✓✓	✗	✓	8
Reported near misses	✓	✓	✓	✓	✗	✓✓	✓	7
Time taken to attend stopped vehicle	✓✓	✓	✓✓	✓✓	✓✓	✓✓	✓✓	13
Traffic officer attendance time	✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	13

✓✓ = performs well against criteria ✓ = meets criteria with only minor issues ✗ = performs poorly against criteria ? = uncertain

Under the 'oversight of progress against delivery plans' group of measures, we consider that ORR requires sufficient and timely data to monitor Highways England's progress against the Action Plan. We found that the 'SVD progress' measure performed best against our seven criteria: delivery of the SVD programme is an enabler of the safety improvements that the Action Plan seeks to introduce, and so it is important that ORR receives regular status updates on the programme to enable it to monitor Highways England's progress against the baseline programme which supports the Action Plan.

ORR could potentially develop 'schedule performance indicator' (SPI) type measures for the most important Action Plan deliverables that it could monitor internally; we believe that the data exists.

The ‘CHARM progression’ measure is less central to tracking the delivery of safety outcomes and ORR will need to further understand what reporting data Highways England can produce which might satisfy its monitoring needs; it would seem to us to be an important programme for ORR to monitor in the context of its impact on automated messaging. Whilst CHARM is being rolled out and ‘report of obstruction’ / Red X signs are set manually, ORR might wish to use Highways England’s internal reports to monitor the time taken to acknowledge SVD alerts and set the appropriate signs and signals.

The ‘CCTV trial’ and ‘Cluster definition’ performed less well against our principles for indicators. We would suggest that ORR requires Highways England to provide progress updates as part of the regular monthly monitoring.

Under the ‘**effectiveness of communications**’ group of measures, we found that a short- and long-term horizon is relevant to the choice of indicator. The ‘audience reach’ and ‘campaign awareness’ measures are both short-term indicators that ORR may wish to monitor over the next 12 months. Although it may wish to place more emphasis on campaign awareness which we consider to be more relevant to safety outcomes, less prone to measurement error and more insightful from ORR’s perspective. ‘User understanding’ and ‘user confidence’ might both be viewed as medium-to-long term indicators to replace awareness in due course. They both performed similarly well against our principles, although it must be acknowledged that user confidence would be more prone to external influences, e.g. via the media.

Finally, under the ‘**achievement of key Action Plan outcomes**’ group of measures, we found that ‘time taken to attend stopped vehicle from live lane’ and ‘traffic officer attendance time’ performed best against our principles. Both measure similar, controllable outcomes – they are similar to the existing *Incident Clearance Time KPI* in the formal Performance Specification between DfT and Highways England. We therefore suggest that ORR only monitors one of the two (but not both). The only significant difference between the two would be the breadth of coverage of stopped vehicle events – there may be instances where traffic officers are not the first responders to attend, although we would expect such cases to be relatively small in number.

The other three potential indicators in this group performed less well against our principles and so ORR should be mindful of their respective shortcomings if it chooses to utilise them. As the Action Plan creates a commitment to reduce the average attendance time when a vehicle is stopped, it would also make sense for Highways England to report the ‘number of stopped vehicle events’ which would, in any event, form part of an attendance metric (it is not additional). Both ‘reported near misses’ and ‘smart motorway collisions’ would provide additional explanatory or contextual data should ORR wish to widen its monitoring analysis and could therefore be part of an extended monitoring toolkit. We agree with ORR’s view that monitoring these might provide early indication of emerging issues; although the data may be incomplete or skewed it has the advantage of providing a leading (as opposed) to lagging view of performance.

3.3. ASSESSMENT OF POTENTIAL INDICATORS IN THE ROUND

Whilst each of the assessed options has its own strengths and weaknesses, it would be disproportionate for ORR to monitor all of them. Having assessed each of them against our ‘bottom-up’ criteria, we then considered the options ‘in the round’ to ensure that we shortlisted a combination of indicators that:

- **Focuses** ORR’s monitoring efforts on the outcomes which matter most to the safety of road users;
- Ensures an appropriate **balance** across the three types of indicators that we longlisted (progress indicators; communications indicators; outcome indicators); and
- Ensures good **coverage** of the Action Plan actions that were within scope of our review, and
- Ensures that the shortlisted indicators **complement** each other without disproportionate overlap.

In the round, we consider that ORR would be well served by monitoring delivery of all the Action Plan commitments to the timetable, but there is no single indicator that we found which would enable it to do this. We expect that ORR

will want to put in place arrangements that allow it to monitor progress of all actions on a routine and ongoing basis e.g. as part of monthly reporting, if this is not already the case.

Elsewhere we found that there is potentially a hierarchical relationship between indicators. Some would be of higher priority for ORR to focus on because, for example, they relate more directly to the outcome of interest, or because Highways England is more in control of the outcome. These might be ‘primary indicators’ which are considered most important to ORR’s monitoring, but they might helpfully be supported by ‘secondary indicators’ which complement them and provide good cover across the Action Plan and its intended safety outcomes. For example, one of the attendance measures described above might be a good primary measure but secondary indicators on collisions and near misses would provide additionality.

Under the ‘**oversight of progress against delivery plans**’ group of measures, we found that all of the potential indicators would provide ORR with useful insight into Highways England’s delivery of the Action Plan. Because the SVD programme is a key enabler of the safety improvements that will be delivered under Actions 2 and 11 (and under other Actions which are not in scope of this review), we recommend that ‘SVD progress’ be considered a ‘primary indicator’. This should be supported by a ‘CHARM progress indicator’, but ORR will need to explore further with Highways England what reporting data it could produce to satisfy ORR’s monitoring requirements. Some of the secondary indicators we considered would be better replaced by a request for additional routine information to ensure that ORR has sight of progress across the Action Plan. This is shown in Table 4 below.

Table 4: Proposed hierarchy of indicators for monitoring progress against the delivery plan

Status	Title	Commentary / rationale	Monitoring timetable
Progress against the delivery plan			
Leading indicator	SVD progress	Leading indicator on progress towards a key Action that should improve safety outcomes for users who stop in a live lane.	2-years
Supporting indicator	CHARM progress	Complex programme which is on the critical path for delivery of Action 11, and with implications for Action 2.	12-months
Additional information	CCTV update	Ensures that ORR is sighted on progress against Action 2b.	12-months
Additional information	Cluster definition	Ensures that ORR can satisfy itself that Highways England is making meaningful progress on Action 6, potentially in time for ORR’s annual review due in July 2021.	6-months
Additional information	National EA Programme Study	Ensures that ORR is sighted on progress against Action 6a.	End of RIS2

Under the ‘**effectiveness of communications**’ group of measures, we discounted the ‘Go Left – audience reach’ measure because we considered that it would likely be prone to measurement error and would be of limited use to ORR in terms of insight into the effectiveness of the campaign. Of the remaining three measures, we considered that ORR would ideally measure progress towards users having greater confidence in smart motorways (perhaps eventually being as confident using smart motorways as conventional motorways). Over the next 12 months, this might involve monitoring user awareness of the ‘Go Left’ breakdown advice as the primary indicator, but from March 2022 onwards this indicator could transition into ‘user understanding of the correct breakdown advice’ for the remainder of RIS2 (operating as a supporting indicator in the meantime).

By the end of RIS2, we suggest that ORR implements ‘user confidence in smart motorways’ (relative to conventional motorways) as its primary indicator, because this is the ultimate outcome that Highways England’s communications activities seek to improve. ORR should work with Highways England on how best to obtain the

required information and use it for monitoring. We would suggest use of Highview for data collection, since this is a large-scale survey vehicle that Highways England controls. Further work would also need to be undertaken on the form of the data reported to ORR e.g. monthly actuals, rolling average etc. This is shown in Table 5 below.

Table 5: Proposed hierarchy of indicators for effectiveness of communications campaigns

Status	Title	Commentary / rationale	Monitoring timetable
Effectiveness of communications			
Short-term primary indicator (next 12 months)	User awareness of breakdown advice	Measures the immediate user response to the 'Go Left' campaign and can build on existing Highview questions.	12-months
Medium term primary indicator	User understanding of breakdown advice	More direct indicator of whether Highways England's communications campaigns are effective, but user understanding will take some time to build.	2-years
Long term primary indicator	User confidence in smart motorways	Ultimately, one of the key outcomes that the Action Plan seeks to improve, but probably a longer-term goal whilst new safety improvements are yet to be fully rolled-out (e.g. SVD).	End of RIS2

Finally, under the 'achievement of key Action Plan outcomes' group of measures, we considered that 'time taken to clear a stopped vehicle' was the most appropriate leading indicator for this area because it offers a broader coverage of stopped vehicles events. But 'traffic officer attendance time' might also satisfy ORR's requirements, if the number of stopped vehicle events where a traffic officer was not required to attend is low (e.g. where the emergency services were the first responders, or where the road user used its own vehicle recovery service). Both measures would be within the Company's control. As a subset of that indicator (and therefore using the same data) we suggest that ORR should also monitor the number of stopped vehicle events (both absolute number and expressed as a rate per distance travelled) as this is a more forward looking indicator of casualty risk. This is shown in Table 6 below.

Table 6: Proposed hierarchy of indicators for key Action Plan outcomes

Status	Title	Commentary / rationale	Monitoring timetable
Key Action Plan outcomes			
Leading indicator	Time taken to attend a stopped vehicle	Highways England's response to a stopped vehicle event and therefore largely within the Company's control.	End of RIS2
Supporting indicator	Stopped vehicle events in live lanes	Reducing this outcome is a high priority for user safety – but must be recognised as less controllable than TO attendance.	End of RIS2
Additional measure	Reported near misses	Potential forward-looking indicator of underlying risk. Events which could have become an accident under different circumstances.	End of RIS2
Additional measure	Smart motorway collisions	Additional safety data which ORR may need to analyse should it identify an issue or concern with the leading indicators.	End of RIS2

3.4. CONCLUSIONS AND NEXT STEPS

ORR should ensure that it receives sufficient and timely data from Highways England to monitor its progress against the Action Plan. Within the actions that we have considered we recommend that its focus should be on the SVD programme and the implementation of CHARM, but monitoring Highways England's progress and plans in relation to the second phase of the CCTV trial, and the progress of the national Emergency Areas review might also be useful. ORR could potentially develop SPI type measures using Highways England data for internal monitoring against the key Action Plan commitments.

At the current time, the indicators that we propose in subsection 3.3 are defined in outline only. In most cases we believe that Highways England holds the necessary information (or data) to operationalise measures quickly, and to begin reporting them to ORR in time for the second half of the 2021/22 reporting year. But there are immediate next steps which ORR should explore with Highways England, before confirming its approach:

- **CHARM progress.** ORR should engage with Highways England to better understand how the CHARM programme interfaces with Actions 2 and 11, and identify what regularly reported programme information Highways England could provide to demonstrate to ORR that they are on track (or otherwise) to integrate the SVD / automatic report of obstruction messages into CHARM.
- **Use of Highview as a vehicle for monitoring user understanding of smart motorways.** ORR should ensure that it receives sufficient information to assess the effectiveness of Highways England's communications activities. One option would be for Highways England to use Highview – its internal user experience online survey – to monitor progress towards improved user confidence in smart motorways, and report progress to ORR on a regular but proportionate basis (e.g. quarterly).
- **Time taken to attend stopped vehicle events.** We think there is a clearer case for a formalised measure in this area given the commitments contained in the Action Plan. There are some issues for ORR to consider and work through in terms of designing the measure, and there are potentially some trade-offs between a measure which is perfect and getting it in place quickly. For example:
 - Would ORR require the measure to include stopped vehicle events in Emergency Areas?
 - Would ORR require the measure to include stopped vehicle events where a Traffic Officer was not deployed?

4. REVIEW OF OPERATIONAL RESOURCING OF SMART MOTORWAYS

4.1. INTRODUCTION

In this section we review Highways England's approach to resourcing smart motorways. This task is an extension to the original study carried out at ORR's request. This extended review is based on information received from Highways England during May 2021 and provides an assessment of the capacity of Highways England's regional operational resources, including Traffic Officers, On-Road and Control Centre staff, to manage and operate smart motorways.

The scope of this extended task was to review Highways England's operational standards for smart motorways to provide ORR with a view on:

- Whether the current staffing levels for the management of smart motorways (by region) meet Highways England's current policy and standard operating instructions for traffic officer control rooms and on-road staff;
- Whether the supporting technology is in place to meet the required current specification;
- What resilience measures are in place to compensate when staffing levels and/or technology are below the required level; and
- How the resilience measures have been determined as adequate and how derogations from the current policy and standard operating instructions are authorised.

Two exclusions were specified in the extension scope:

- Achievement of faster attendance times by traffic officers on sections of all lane running (ALR) where Emergency Refuge Areas (ERAs) are greater than one mile apart (Stocktake Action 3); and
- The impacts of SVD.

The exclusions have been applied save to the extent that the review would be materially incomplete or misleading were these issues to be ignored.

Consistent with the earlier tasks in this review, we have relied on Highways England for the information that underpins our analysis and findings. We have assumed that the information it has provided is accurate and have not sought to independently verify the detail of what has been given to us. Where this information was provided in writing or in a relevant document, we have cited the source, but our understanding is also based on an interview conducted with experienced Highways England staff, including Heads of Service Delivery, Business Transformation and HR Business Partners.

The timeframe for the review has been short. In some cases, Highways England did not provide information that we requested, either because it was not able to within the expedited timeframe for this review, or because it considered such information was not relevant. For example, whilst Highways England arranged interviews with two regional Heads of Service Delivery to answer our resourcing questions, we also requested that Highways England arrange an interview with frontline operational managers to better understand day to day resourcing and how smart motorway instructions impact on the day-to-day capacity of the ROC-based and On-Road teams. Highways England told us that this request could not be fulfilled within the timeframe for this review.

Aspects of our analysis of resourcing draw comparisons between selected roles of interest at Highways England and vacancy, absence and staff retention rates seen in the UK workforce overall, in other professions, or within the public sector and other large employers. These comparisons provide context for Highways England's resourcing issues but they are imperfect (because granular data by role in comparator organisation is not publicly available).

Further work should be undertaken to refine these comparisons if ORR wishes to draw firmer conclusions on the resourcing issues that we identify.

4.2. CONTEXT

Highways England's six regions operate with a combined complement of around 1,500 on-road and network operations staff.²⁸ The regions all employ a similar operational staff structure. Throughout the review we refer to on-road teams consisting of Traffic Officers and On-Road Supervisors who attend to incidents on the network but are based at various outstations around their home region, and teams based in the Regional Operations Centres (ROCs) who monitor the network remotely and respond to reports of incidents, including by despatching on-road teams to assist.

The regions differ in terms of the size of their ROC-based and On-Road teams depending on a combination of 'demand factors', which we understand to relate to the size of the network, but also the historical level of incidents and related activity in each region. Highways England explained to us that its staffing plan for each region had evolved over time based on data-led experience, and that regional headcount was not planned based on any productivity-related metrics (e.g. number of vehicles or length of road). Highways England also explained that each region can flex its operational resource requirements depending on its needs, although all the regions employ a 'six days on – three days off' rotational shift policy.

Highways England told us that in setting resource plans for the ROC-based and On-Road teams, it took the overall operational needs of the SRN into account, meaning that smart motorways are not considered in isolation, rather the network is considered holistically. There are no dedicated smart motorway resources within these teams and each region is sized, and skilled, to operate and respond to incidents across all routes and road-types. So, whilst our scope is focused on the operation of smart motorways, in practice this cannot be completely separated from Highways England's overall approach to resourcing the network.

Given that Highways England's resourcing plans for the ROC-based and On-Road teams are based on historic levels of activity, ORR asked us to consider whether any additional policies and operating instructions relating to smart motorways impacted on Highways England's capacity to operate them.

4.3. SETTING THE RIS BASELINE LEVEL OF RESOURCE

Highways England told us that RIS2 regional staffing levels were set through the Strategic Business Plan (SBP) budgeting process. The budget was based on resourcing levels at the end of RIS1, with some change driven by the extension of the *Incident Clearance Time KPI* to become a 24-hour metric from the start of RIS2, which required additional night shift resources. We understand that the budget in RIS2 does not vary from year-to-year but it does include some contingency to deal with risks around unexpected staff absences, or changes to the completion of its smart motorway programme. Highways England told us that it regularly reviews staffing levels for planned and unplanned events, such as short-term staff rostering and absence management, but it did not systematically consider the impact of smart motorways on the level of ROC-based and On-Road resource it would require in RIS2.

Since the SBP budgeting process, the Covid-19 pandemic has significantly impacted Highways England's operating environment, with implications for its resourcing plans and recruitment. Rules and guidance relating to social distancing, for example, mean that Highways England has tried to minimise situations where two or more Traffic Officers are required to work in the same vehicle. It has adopted much greater use of "single crewed" patrols: this is not a new mode of operation and was being trialled before the start of the RIS but has been used much more extensively during the pandemic. Because Highways England receives a single line item in the RIS2 budget for combined regional operational expenditure, it has a degree of flexibility over how to spend this across the regions,

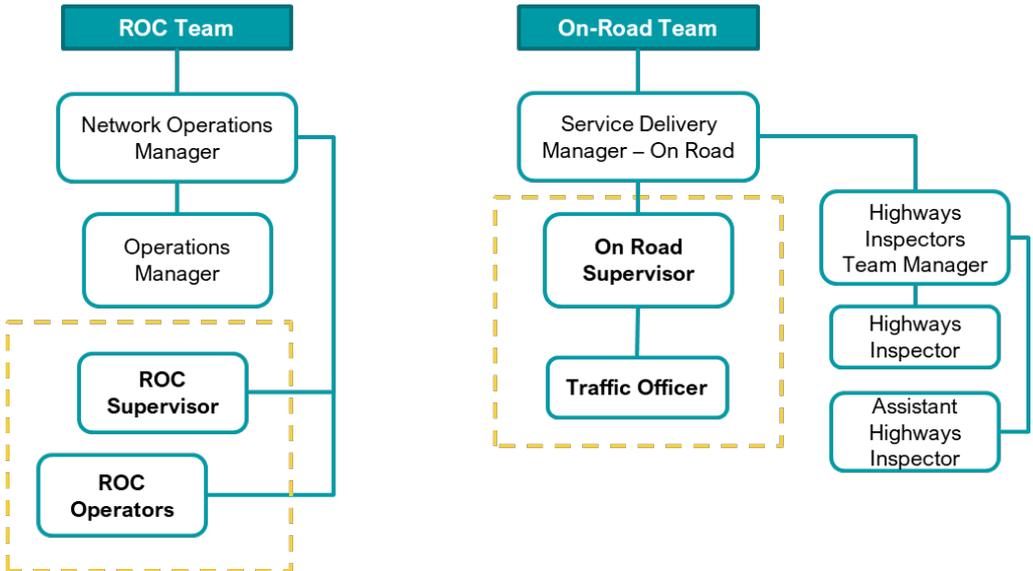
²⁸ Full-Time Equivalent (FTEs)

including on adjustments to the new operating environment, e.g. PPE, and additional vehicles required for single crewing.

4.4. CURRENT OPERATIONAL RESOURCING

We have considered Highways England’s current staffing levels and associated resourcing indicators across four key roles in the ROC-based and On-Road teams: Traffic Officers (TOs), Network (or “ROC”) Operators, and their respective supervisors.

Figure 4.1: ROC and On-Road Team Structures



4.4.1. Vacancies and resourcing structure

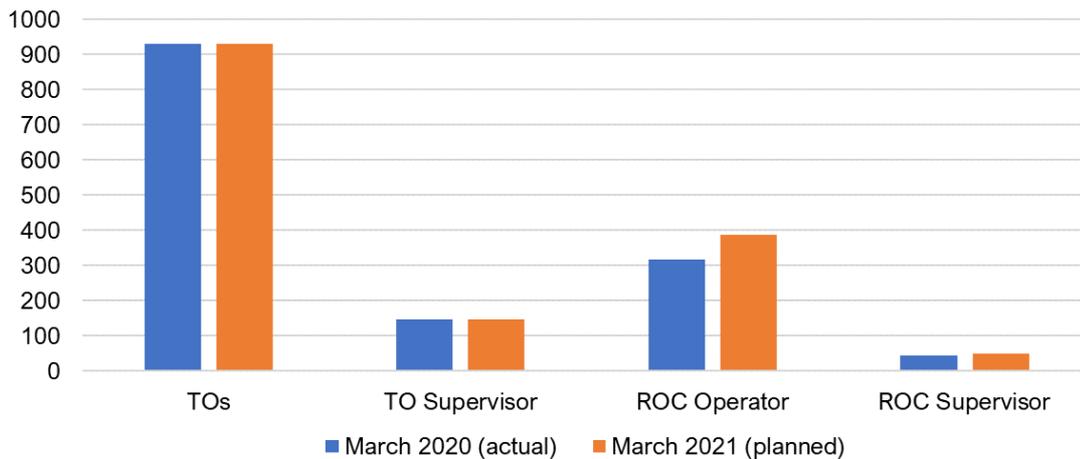
To explore whether Highways England has adequate ROC-based and On-Road resources to operate smart motorways, we requested data on planned and actual staffing levels by role, nationally and by region, at the beginning of RIS2 (April 2020), and as of 31 March 2021.

Planned changes in staffing levels

To provide context for any changes in resourcing levels, we first looked at Highways England’s planned staffing levels to provide a point of comparison for its actual (or ‘outturn’) staffing levels. Figure 4.2 shows how Highways England planned to grow staffing levels between 2020 and 2021: this is shown as difference between the actual full-time equivalent (FTE) position in March 2020 and the planned FTE numbers for March 2021.

Figure 4.2 shows that across the four roles, Highways England was planning an FTE increase of 5% (74 FTEs). This increase is made up predominantly of ROC Operators (70 FTEs), alongside a marginal increase in Supervisors and a small TO decrease.

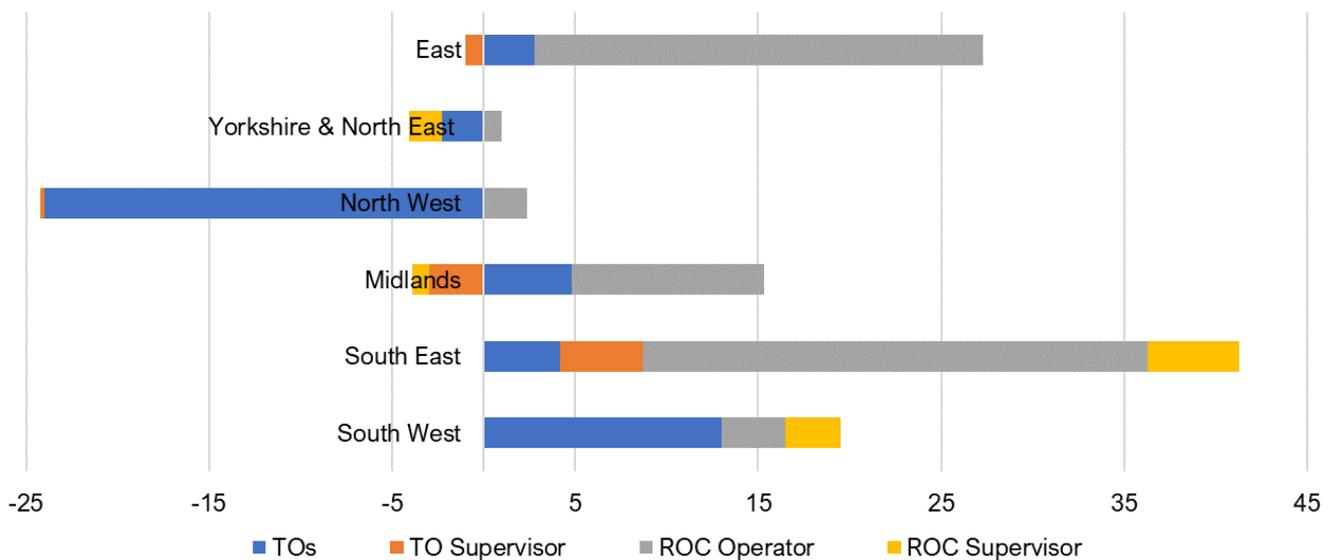
Figure 4.2: Planned growth in FTEs between March 2020 and March 2021



Source: CEPA Analysis of Highways England data²⁹

Figure 4.3 below shows that the planned increase in ROC Operator FTEs was largely focussed on the East and South East regions. The overall minor decrease planned for TOs at a national level was based on a notable decrease in FTE numbers in the North West, offset by increases in the South West, South East, Midlands and East. In some cases, the planned changes to FTE levels for the TO and ROC Operator roles are relatively large compared to the size of the existing cohort. Planned changes in Supervisor roles were more marginal by comparison.

Figure 4.3: Difference between actual FTEs (March 2020) and planned FTEs (March 2021) by region



Source: CEPA Analysis of Highways England data

Actual changes in staffing levels

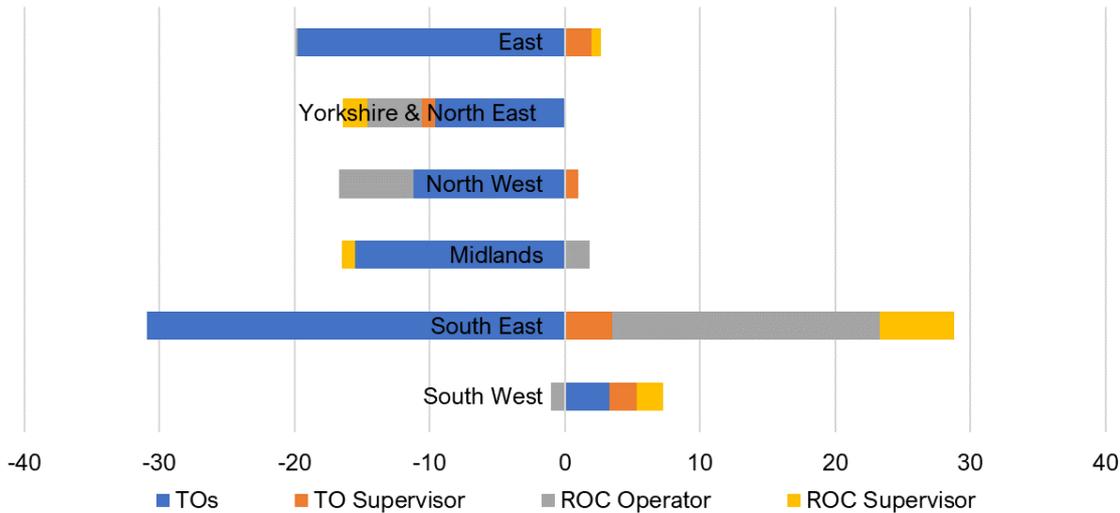
In practice Highways England has not been able to realise its planned growth in staffing levels. Between March 2020 and March 2021, Highways England lost 60 FTEs across the four roles, resulting in a 133 FTE (9%) shortfall against planned RIS2 levels.

²⁹ 'Smart Motorway Extension Response 30 April 21' and 'TM1 and TM2 ORR'

Figure 4.4 below shows that there was a decrease of 84 TOs, offset slightly by marginal increases in FTEs for the other roles. The loss of TOs was greatest in the South East, with notable losses also in the East. The South East had the largest staffing composition changes between 2020 and 2021, with the region also gaining 10 new supervisors and 20 ROC Operators.

Highways England’s plans show that it intended to grow the number of ROC Operators across all regions, as shown in Figure 4.3 above. Figure 4.4 below shows that these plans were achieved in the South East and Midland regions, with the remaining regions experiencing a decline in ROC Operator FTEs.

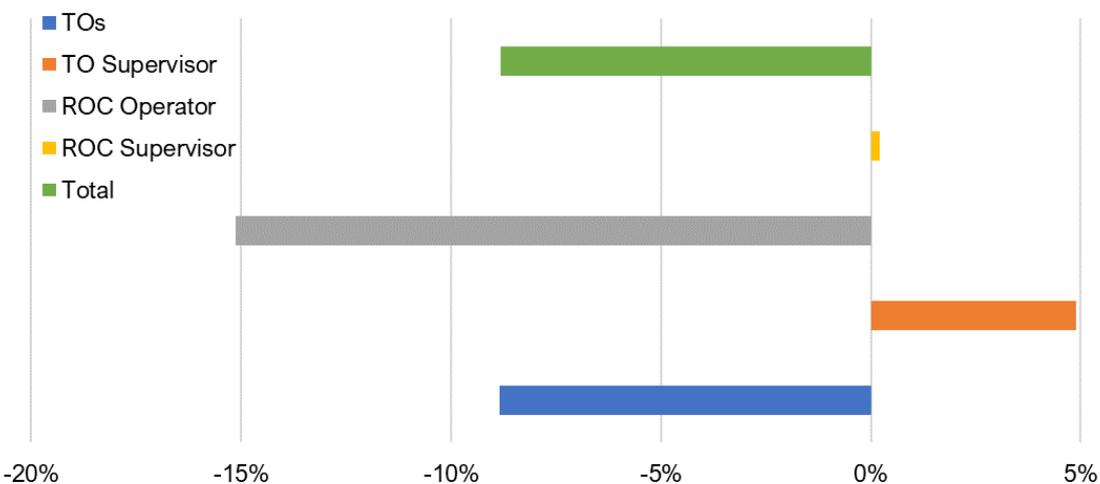
Figure 4.4: Difference between March 2020 and March 2021 actual FTEs by region



Source: CEPA Analysis of Highways England data

Figure 4.5 below presents the national picture in terms of the current vacancy rate.³⁰ It shows that there is an overall national shortfall of around 9% at present (133 FTEs). Staff vacancies are greatest for ROC Operators, where 15% (59 FTEs) of planned roles are vacant, i.e. in the role that Highways England had planned the largest increase in between 2020 and 2021. By comparison, Highways England currently has more supervisory FTEs than planned, with both TO and ROC Operator Supervisors being in surplus.

Figure 4.5: Planned vs. Actual FTEs (as of March 2021) on a national level

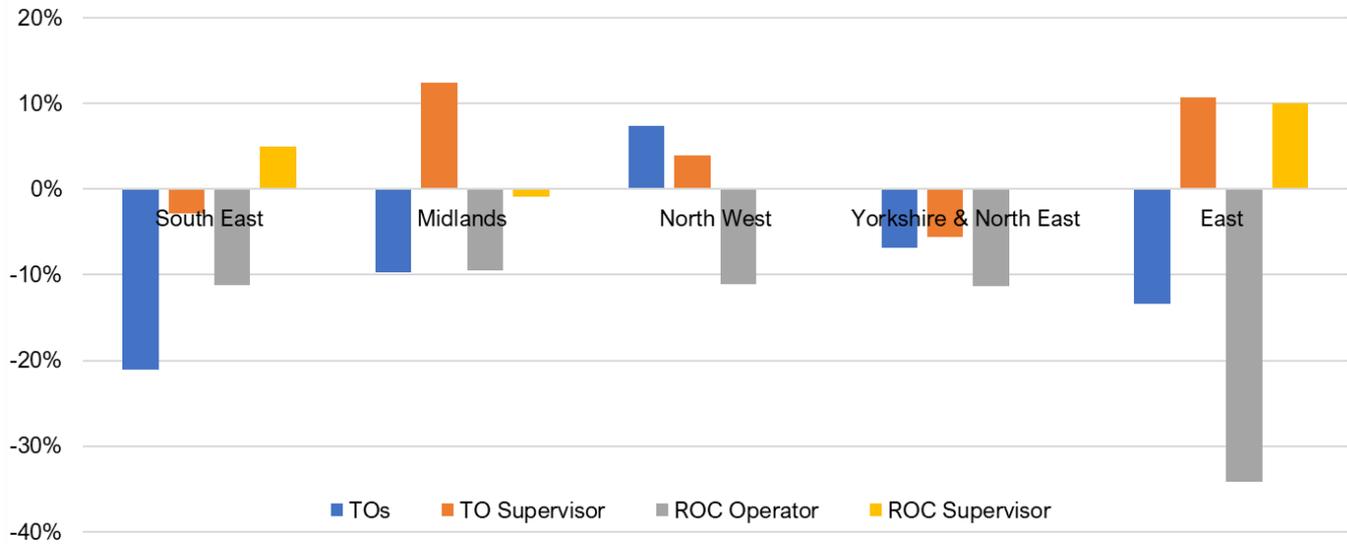


Source: CEPA Analysis of Highways England data

³⁰ Actual FTEs in 2021 against planned FTEs

Figure 4.6 below shows that the vacancies are not evenly distributed across the regions.

Figure 4.6: Planned vs. Actual FTEs by region (as of March 2021)



Source: CEPA Analysis of Highways England figures

Note: Positive value represents a surplus in FTEs against planned levels, and negative value represents a shortfall.

The vacancy rate for ROC Operators in the East (34%) is substantially higher than the national level, shown in Figure 4.5; other regions have a shortfall closer to the national level of 15%. The South East has a significant shortfall of TOs (21%) which Highway’s England advises is related to competition for staff in the area and the relative attractiveness of the package that it offers. The East has a shortfall of 13%. The East region also has the largest overall surplus of supervisory roles, whilst the remaining surplus of supervisory roles are more evenly spread across the other regions.³¹ The reason for this surplus in supervisors is unclear. Highways England indicated that sizing issues across roles may be addressed in future as part of the Operational Excellence programme.

Highways England recognises that there are significant vacancies in some of the regions. It told us that:

- Recruiting into these roles is more challenging in the South East and East because there is more competition for talent in these regions at Highways England’s salary points.
- There was a Company-wide pause on recruitment in the early months of the Covid-19 pandemic for all but essential roles. It is now recruiting again but has had to deal with a recruitment backlog.
- The South East region recently received approval to recruit an additional 24 TOs to address the shortage against the Company’s planned resource levels for that region.

Vacancy rates

We compare Highways England’s vacancy rates for the On-Road and ROC-based roles to job vacancy rates in other UK service-sector industries over the last 10 years.³² Figure 4.7 shows that the level of vacancies in the service sector has fluctuated but remains consistently below 4%. Across 2020, the economy had an average vacancy rate of around 2%, compared to the overall vacancy rate of 9%³³ for the ROC-based and On-Road roles in

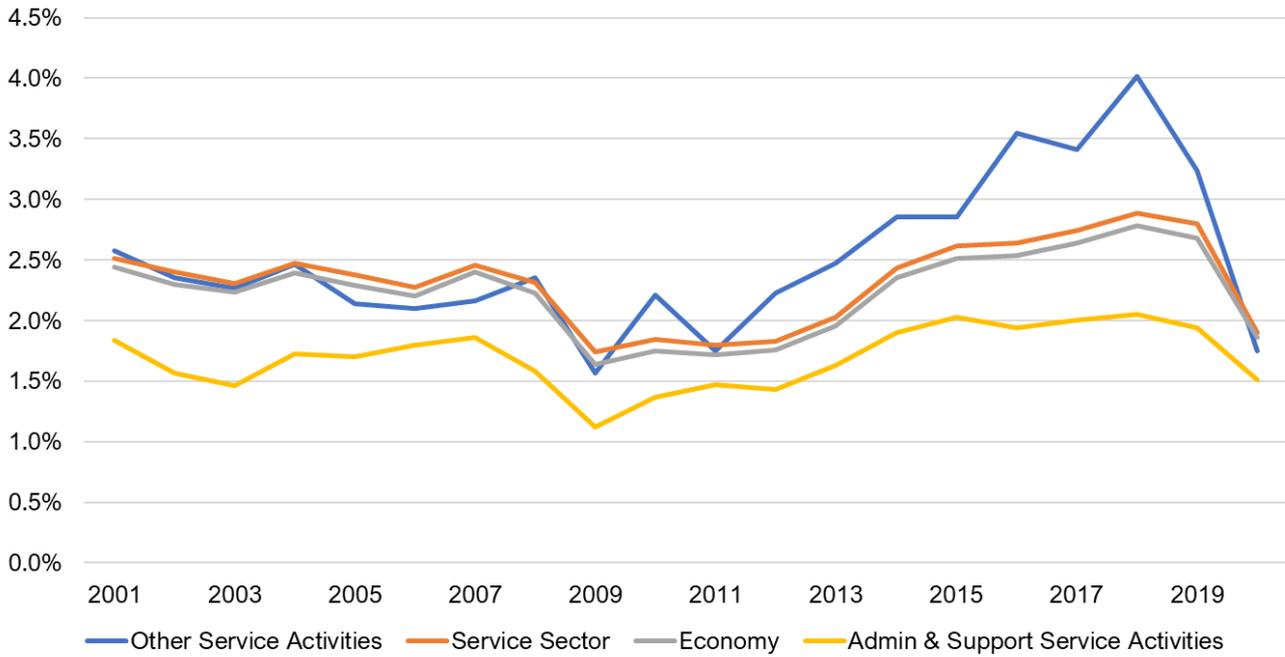
³¹ We note that Operation Brock has a significant impact on On-Road resources in the South East, and that this may have an indirect impact on resources in other regions (e.g. East) to the extent that other regions contribute to the resourcing of Operation Brock, or provide ‘mutual aid’ to the South East.

³² We use other service industries as an approximate comparator given the nature of the ROC-based and On-Road roles, but the ONS data is not granular enough to generate a benchmark of industries that might be close comparators for these activities.

³³ As at March 2021.

2021. This comparison suggests that Highways England has a high vacancy rate for these roles. This may partly reflect the specialist nature of these roles where staff have to demonstrate good decision-making abilities under pressure and in an environment where safety is an imperative.

Figure 4.7: UK Job Vacancies (per 100 employed jobs)



Source: CEPA Analysis of [Labour Market Statistics](#), ONS, 2021.

Summary

Across the roles of interest to this study, Highways England planned to achieve growth of 74 FTEs (~5%) between 2020 and 2021 to support its operation of the SRN. The figures provided by Highways England show that it was unable to achieve this planned growth because the Company experienced a reduction in FTEs overall. Consequently, Highways England holds a substantial number of vacancies in key operational roles. These vacancies are not evenly spread by region, and in some regions the shortfall is 20%–30%.³⁴ Highways England acknowledges both the overall shortfall and the inconsistencies in staff numbers at various grades across the regions. Highways England told us that it has plans to address these issues in due course. As we note in the sub-sections below on attrition, recruitment and training, it will take in practice at least 12 months before Highways England is able to close these vacancies.

4.4.2. Attrition

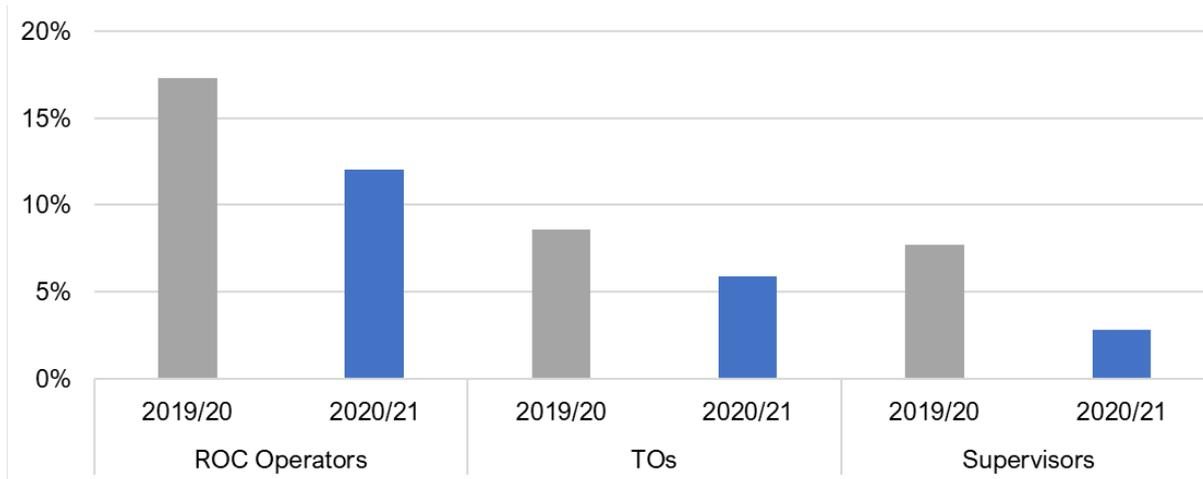
Highways England provided data on staff joiners and leavers for 2019/20 and 2020/21 for each of the four roles at a national level, allowing us to calculate rates of staff churn ('attrition'). The data shows that across the two-year period, more staff left Highways England (254) than joined (178) for the roles in question. This is most notable for TOs, where there is a net loss of 68 staff (headcount) across the two-year period.³⁵

³⁴ A discussion of Highways England's arrangements for cross-regional support can be found in Section 4.5.

³⁵ We asked for attrition data in FTE format to allow for comparison with the planned and actual staff data, but Highways England was not able to provide within the timeframes of this review.

Figure 4.8 below shows that the attrition rate³⁶ reduced between 2019/20 and 2020/21 for all roles. The ROC Operators had the largest attrition rate in 2019/20 but this fell by 5 percentage points in 2020/21.

Figure 4.8: Attrition rate for 2019/20 and 2020/21



Source: Highways England, 2021

However, the data covers two years which were fully or partly affected by the Covid-19 pandemic. There is wider evidence which suggests that a reduction in attrition rates may be partly attributable to wider labour market concerns and hiring conditions, because staff are less likely to leave an organisation if there are fewer vacancies in the wider economy.³⁷ As such, any continuation in the recent fall in the attrition rate for these roles should not be assumed as given.

It is more difficult to benchmark Highways England’s attrition rates than its vacancy rate, as staff churn depends on the nature of the role and the organisation, and there is no clear comparator time-series dataset available publicly. Attrition rates in the UK economy are generally around 15% on average but attrition is lower in the public sector than the private sector on average. Previous research by the ONS shows that attrition rates for public service roles delivered in high pressure environments can be low – e.g. Police (6%), Nurses and midwives (8%) and Doctors (11%).³⁸ In previous work for ORR, Highways England provided data which suggests that organisation wide its overall attrition rate is just under 12% and therefore the 2020/21 attrition rates for ROC Operators and TOs seem broadly in-line with the rest of the organisation.³⁹

Although Highways England has recently seen some reduction in rates of attrition in these roles, it continues to lose more staff than it than it recruits across the roles being examined. Combined with a high vacancy rate this means that operational shortages are likely to worsen over time, which poses a sustainability risk to Highways England’s capacity to operate smart motorways both now and in future, particularly as traffic volumes recover from Covid-19 related impacts. Highways England told us that it is conscious of the risk posed by staff churn and to mitigate its effects it permits the regions to recruit up to 105% of planned headcount.

³⁶ Rate at which employees leave the workforce over a given time. Calculated as: Number of employees that left/ Average number of employees.

³⁷ See Job Openings and Labour Turnover data in the Society for Human Resource Management (July 2020) “As Jobs Disappear, Employees Hang On to What They Have“ available [online](#); and US survey data from the Society for Human Resource Management (March 2021) “Turnover ‘Tsunami’ Expected Once Pandemic Ends” available [online](#).

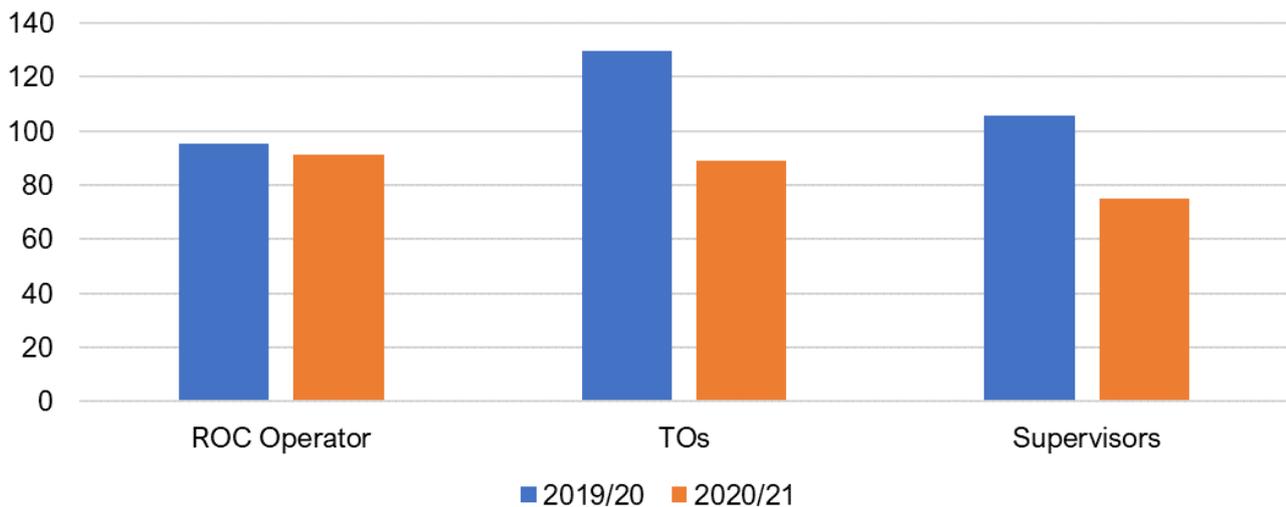
³⁸ ONS (17 June 2019) “Is staff retention an issue in the public sector?” available [online](#).

³⁹ CEPA (24 March 2020) “Review of Highways England’s supply chain management framework in readiness for RIS2” available [online](#).

4.4.3. Recruitment

Highways England provided data on the average time to recruit (days) across each role for 2019/20 and 2020/21. The data is based on the time taken from a requisition being raised to the candidate starting the role. Figure 4.9 shows that the time taken to recruit has improved (i.e. decreased) across the two-year period for each role, taking an average of 110 days in 2019/20 down to 85 days in 2020/21. The data suggests it is currently taking Highways England around 3 months to recruit into any role. In our experience this is not unusual.

Figure 4.9: Time to recruit (days)



Source: Highways England data from its Taleo recruitment system, 2021

4.4.4. Training

In terms of training, TOs undergo a four week assessed foundation programme, which is followed by a period of ‘on-the-job’ coaching on the network. This allows new staff to observe the standards and safety practices required. Refresher training is also provided for this role in manual handling, first aid and trauma, for around 3 days every 2-3 years, and every quarter TO’s are observed to ensure the role is being carried out in compliance with the required instructions and standards. Highways England then identifies any further staff development needs and cover these through trained coaches or formal training. Any changes to staff responsibilities are assessed and any subsequent training needs are met as required.

For ROC Operators, the initial three week induction programme includes ‘on-the-job’ modules across three levels (basic, intermediate and advanced) to ensure new staff develop an understanding of the activities and processes required in the role. This foundation training is followed by an operational coaching programme alongside competence reviews. There is also refresher training provided for around 0.5 days every 2-3 years for this role⁴⁰, the adequacy of which is being monitored. Linked to the roll-out of CHARM, some ROC Operators in the North East and South West will also undertake a one-off, four day CHARM training, with no refresher training required.

All new ROC Operators and TOs receive smart motorway training during their foundation training, and Highways England also delivers additional training to the existing workforce on a needs basis, such as for TOs who normally work in an ALR environment, but are being asked to also work on ‘dynamic hard shoulder’ sections of the network.

In addition to the role specific training, all Highways England staff are required to undertake health, safety and wellbeing e-learning, which is around 0.5 days.

⁴⁰ Smart Motorways Extension Response 30 April 21, Highways England.

Overall, TOs require 9 weeks of training, and ROC Operators 10 weeks, from their induction to become accredited and able to perform their duties unsupervised. Once the formalised induction and training process is complete, refresher training is undertaken every 2-3 years (dependent on training course) for both roles. Both TOs and ROC Operators may still be subject to training post-induction, as well as requiring a competence assessment upon assuming unsupervised duties.

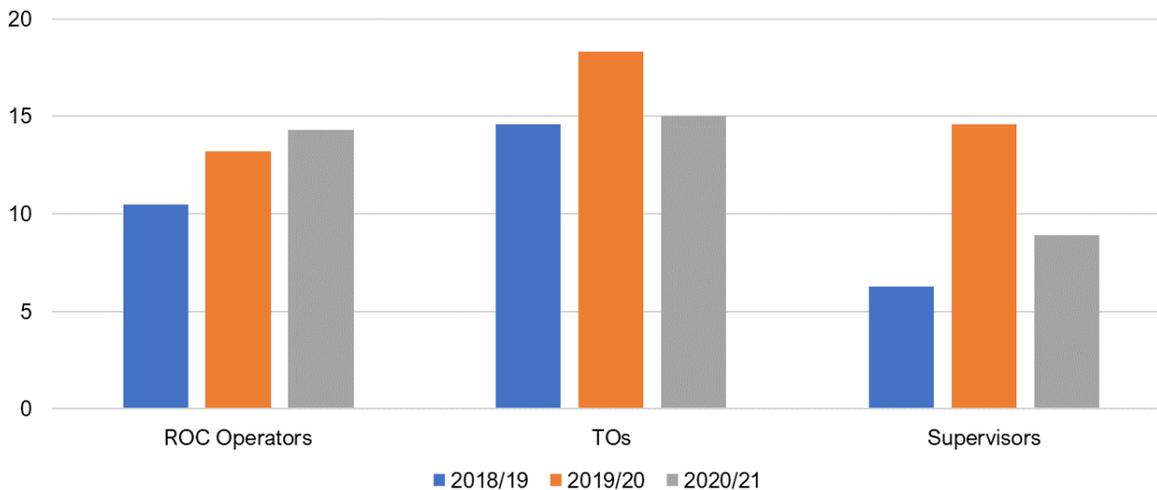
Given combined recruitment and training time, it takes around 6 months before a Highways England vacancy (within the roles of interest to this study) are filled by staff who can operate unsupervised.

4.4.5. Sickness and Absence

Highways England provided data on absences (calendar days per employee) by both role and region for 2018/19, 2019/20 and 2020/21. Data was provided at a total level, as well as broken down by short and long-term absence.

Figure 4.10 below shows that in 2020/21 ROC Operators had an average of 14 days total (short and long term) absence per employee, whilst TOs were on a similar level at 15 days. Supervisors had a lower rate of 9 days per employee. The data suggests that the Covid-19 pandemic has not had a notable adverse impact on absence rates, with both TOs and Supervisors experiencing a decrease in absence days per employee during this period.

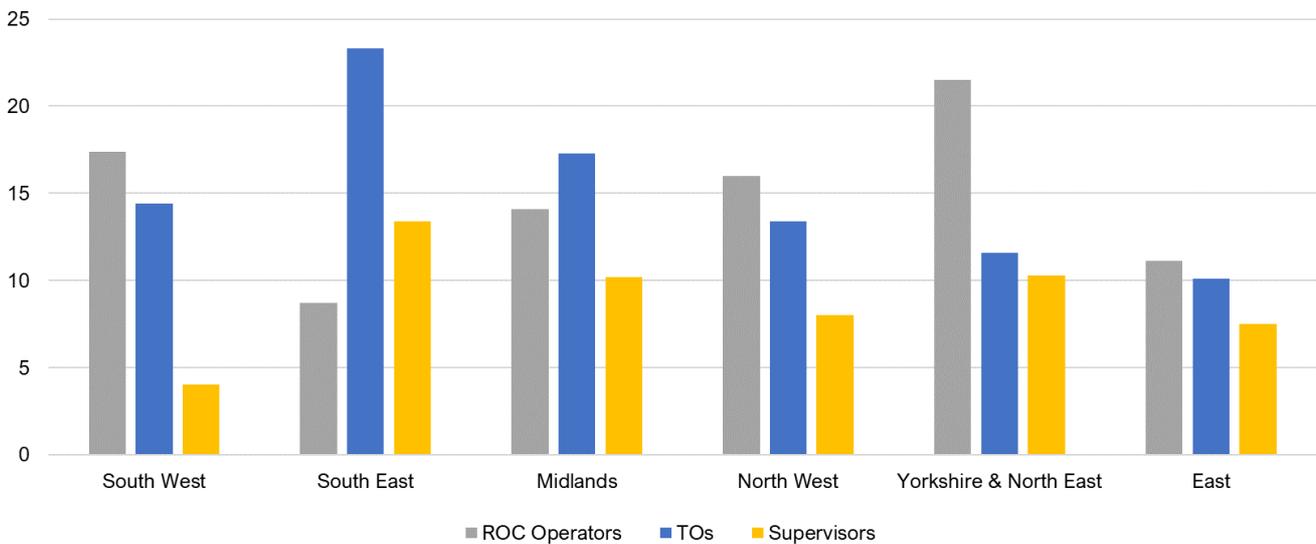
Figure 4.10: Total (short and long term) absence (calendar days per employee)



Source: Highways England, 2021

Figure 4.11 below shows staff absence days by region. The data shows that Yorkshire & North East has the highest absence rate for ROC Operators (22 days), and the South East is the region with the highest absence rate for TOs (23 days). The absence rates for these roles vary notably between regions, whilst the supervisor absence rate is more consistent across the different areas.

Figure 4.11: Total (short and long term) absence (calendar days per employee) in 2020/21 by region

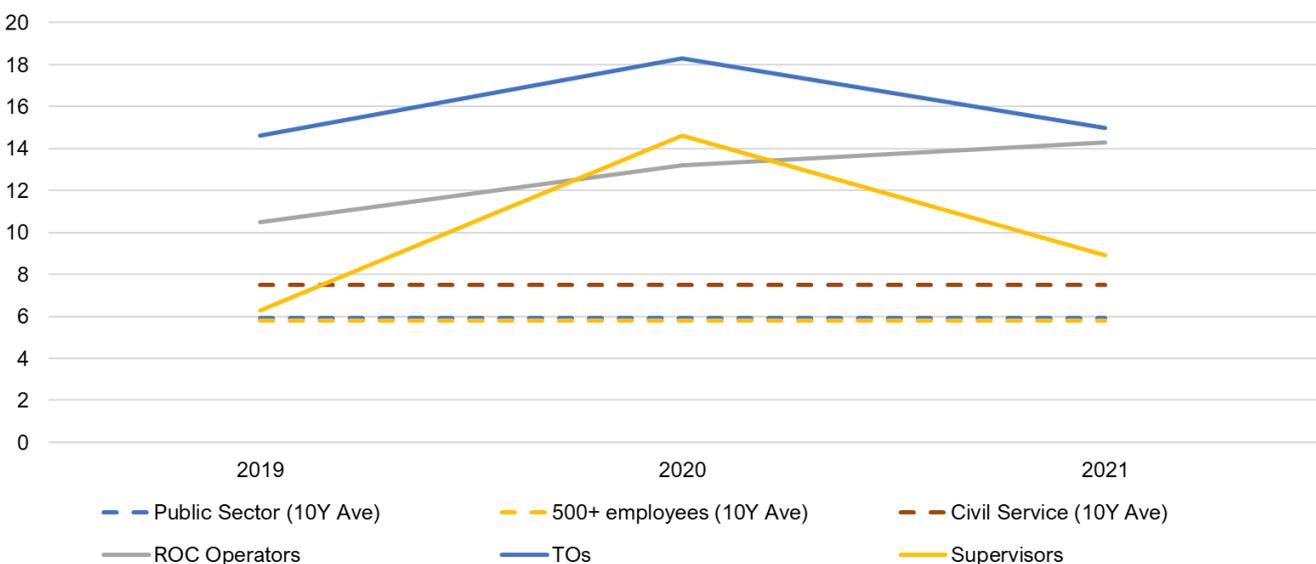


Source: Highways England, 2021

Absence rates are challenging to benchmark because absences may be related to the nature of the role, and there are no obvious comparator datasets available in the public domain. But to provide context for the figures provided by Highways England, Figure 4.12 below shows the number of working days per employee lost through absence in the public sector and in other organisations with over 500 employees.

Absences in both the public sector, and organisations with over 500 employees, are currently around 6 days per annum. For both of these comparators, the average number of working days lost through absence per worker has remained at a similar level since 2010, with the long-term average number of days for the 2010 to 2020 period being around 6. As shown below, Highways England’s ROC Operators and TOs are currently sitting substantially above this at a national level. The same is true within most roles (including supervisors) and regions.

Figure 4.12: Number of working days lost through absence per worker



Source: CEPA Analysis of Highways England, ONS and Cabinet Office data

Highways England recognises that the absence rate for TOs and ROC Operators is relatively high. To manage staff absences, occupational health and wellbeing services are provided to staff via a third-party provider. These are aimed at reducing absence through early support. Highways England told us that it does not currently have any absence-related targets set for staff.

Overall, we find that Highways England has levels of absence (within the roles of interest) which are substantially above the averages of other large organisations (as shown in Figure 4.12), and the most acute absence issues appear to be in the South East, where there is also a large number of vacancies.

Highways England confirmed that holiday entitlements range from 26 to 31 days, depending on combination of contractual arrangements and the length of the employees' service⁴¹, and that cover for holiday is factored into rostering.

Summary

- Highways England planned to grow its On-Road and ROC-based teams in the early years of the RIS. This has not been achieved.
- Highways England is holding a substantial number of vacancies in key operational roles which are not evenly spread by region. Some regions (notably the South East and East) have a shortfall in the region of 20%–30%.
- The ROC-based and On-Road teams are 'top-heavy' in that Highways England has more supervisors than planned. Highways England plans to review the sizing of its operational teams in due course through the Operational Excellence 2025 programme.
- Highways England is losing more staff than it is recruiting, although staff churn has slowed over the last year.
- As with any organisation, Highways England's data suggests that getting people into post is time consuming – roughly three months to recruit and another three months before new staff can operate independently. These timeframes are not unusual but do not help given Highways England's current resourcing shortfall.
- Average absences amongst TOs and ROC Operators appear high relative to other large organisations, noting that absence rates can be related to the specific workplace environment and that the specific roles considered in this review might have characteristics which contribute to this higher than average rate. Absence is not evenly spread across the regions some regions have a more significant issue than national averages would suggest.

The combination of vacancy levels, recruitment, training periods and absence leads us to the view that Highways England is facing significant resourcing risks at present, and that the issue is particularly acute in some regions.

4.5. RESILIENCE AND SUPPORTING TECHNOLOGY

Resilience measures

Highways England's strategy is to make optimum use of all available resources to meet demand. It has mapped its TOs patrol routes and 'park up' locations based on local need, historic incident data and to provide network coverage. The patrol strategy is built around the whole regional network, meaning current and planned smart motorways as well as other motorways and those APTRs which are patrolled.

We have also seen evidence of the strategy and review process Highways England uses to manage its regional resources and meet its Required Service Level (RSL) for each shift on a weekly basis.⁴² Although each region operates a tailored patrol strategy, all regions deploy ROC-based and On-Road staff to a standard roster rotation of 6-days on and 3-days off. The fixed rostering pattern has been negotiated with trade unions on behalf of its staff members and is managed by a central rostering team. There is some flexibility within the roster, and the central rostering team will seek to ensure that there are sufficient resources to cover the minimum resource levels (RSLs) for all regions and shifts. The RSL is the number of crews that are required to meet a holistic view demand comprising: traffic volumes (prime driver), incident numbers and locations, and the *Incident Clearance Time KPI*.

⁴¹ Holiday entitlements do not vary by grade as a matter of HR policy but do vary by length of service.

⁴² 2015 Customer_Operations_National_Roster_Parameters_Version_2.0

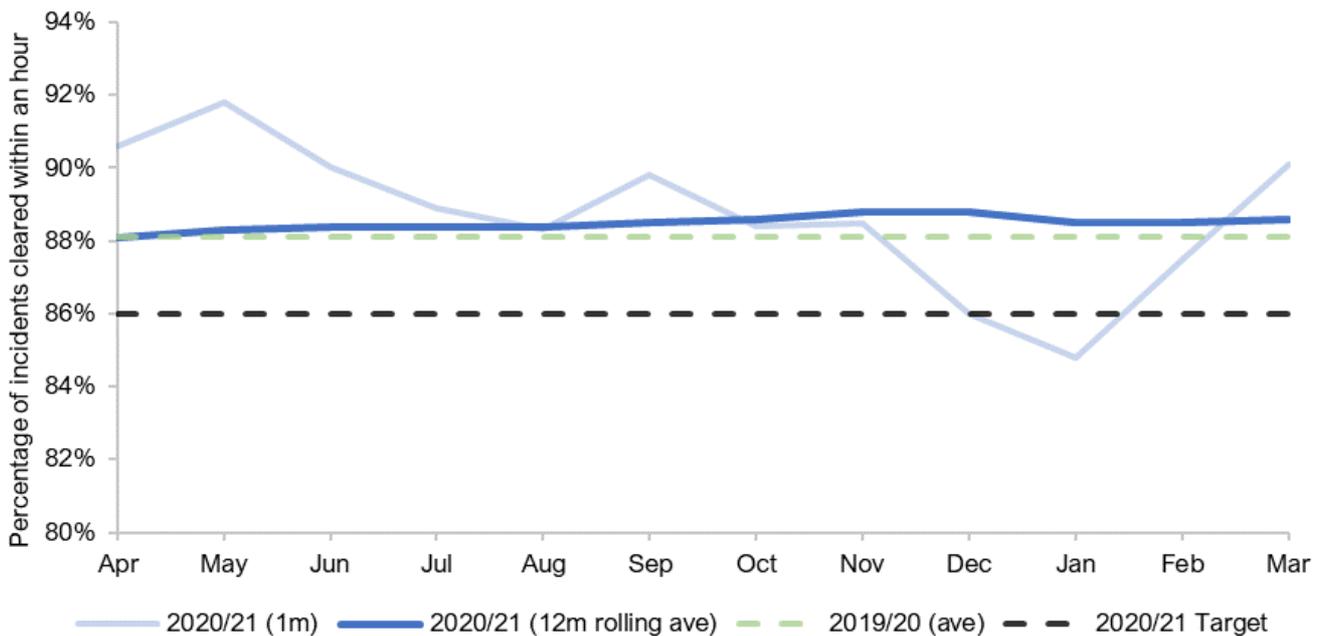
Highways England also provided evidence to show that it regularly reviews its patrol strategies and future rostering in weekly meetings, and it told us that patrol strategies are refined over time based on data and intelligence.

Although there are a significant number of vacancies in its ROC-based and On-Road teams, Highways England points to its ability to meet its service performance levels and KPIs as evidence of the adequacy of this approach. Figure 4.13 below shows Highways England’s performance against the *Incident Clearance Time KPI* for 2020-21. It represents the proportion of incidents cleared within 1 hour for which Highway England has a RIS2 target of 86%. For our purpose performance against this KPI is imperfect because:

- Other work we have completed for ORR shows that Covid-19 related impacts on traffic volumes have made this target less stretching (as with other demand-led indicators).
- It is not smart motorway specific.
- The target time of 1 hour to clear an incident is not a proxy for the 10 minute Action Plan target to attend that Highways England will face in future.

However, it is the service expectation currently in place (pending Highways England delivering the Smart Motorway Action Plan target⁴³). Highways England’s performance against the in-month measure fluctuated around a 12 month rolling average of ~88% as traffic volumes grew over the course of 2020/21, but it has met the KPI target despite the staffing shortfall.

Figure 4.13: Motorway incidents cleared within an hour (%), April 2020 to March 2021



Source: ORR monitoring data

Notwithstanding Highways England’s performance against the incident clearance KPIs and RSLs, given the scale of the resourcing issues that we identify in Section 4.4 above, we consider that some regions would be stretched during periods of high demand on the network.

To help manage resourcing constraints, Highways England explained that it has a range of measures in place to ensure that service demands can be met, and incidents are managed and dealt with effectively. These resilience measures were developed to provide operational flexibility not to specifically address resourcing shortfall. But if a

⁴³ DfT (March 2020) “Smart Motorway Safety: Evidence Stocktake and Action Plan” available [online](#), p63 §1.9.

shortage of resources occurs, such as when staffing levels are reduced or when network demand is exceptionally high, there are various options available to maximise available capacity, including:

- Overtime arrangements, where this is agreed with staff who are off-rotation;
- ‘Mutual aid’ arrangements, which allow one region to draw on support from adjacent regions. Cross-boundary working is considered ‘business as usual’ and is part of providing a more ‘dynamic’ service; and
- Single crewing – which allows Highways England to put more patrol vehicles on the network.

Highways England’s ‘ROC Protocol for Cross Boundary Deployment Strategy 2021’ sets out the basis of these ‘mutual aid’ arrangements. It defines the common types of events that might require cross-boundary working and describes the principles that the Company will apply in managing cross-boundary working, for the benefit of the whole network. Cross-boundary working arrangements may include TOs from one region working in another on a short-term basis (i.e. for a small number of shifts) or alternate control centre management, in the event of a shortage of ROC Operators in the home region. Mutual aid and joint TO working is described as business as usual and may be required where incidents occur at regional boundaries.⁴⁴

In terms of initiating and authorising requests for cross-boundary working, the ROC protocol notes that:

- Daily minor unplanned events are dealt with through a simple operational procedure between ROC’s;
- Duty Traffic Managers can authorise cross border deployments for major incidents; and
- Duty ROC Team managers can authorise cross border deployment for minor incidents.

The adoption of these principles aims to reduce and avoid the potential for conflict and confusion. The document does not provide insight into situations where multiple regions may be simultaneously stretched for resources, how these conflicts might be escalated, and whether such tensions occur frequently.

Figure 4.14: Illustrative example of Highways England incident categorisation

Scale \ Type	Unplanned	Planned
Major plus	Pandemic	Operation Brock
Major	Plane crash on motorway	NEC Motor Show
Minor	Debris on the road (Probably HE lead)	Short term resources issue impacting on one ROC

Source: ROC Protocol for Cross Boundary Deployment Strategy 2021, Highways England.

Mutual aid agreements undergo weekly planned testing when no cross-boundary activity has been recently undertaken. If a protocol is used, a Business Continuity Incident form is sent to the Business Continuity team for the monthly report that is issued.⁴⁵ Cross-border activity also occurs during serious network incidents, where regional borders are impacted. Authorisation for mutual aid deployment is by operational order authorised by the respective Operations Managers.

In terms of longer-term known resourcing issues (e.g. positive Covid-19 cases), regions can liaise with each other for support to be provided, which is then reassessed daily. This can be coordinated through the National Network Managers daily call, attended by all regions. Highways England also have a business continuity guide, which dictates the measures available to be taken.

⁴⁴ ROC Protocol for Cross Boundary Deployment Strategy 2021.docx

⁴⁵ BCR Report people 07.04.21.docx

We asked Highways England how often its resilience measures are in operation because it seems likely that it is reliant on these at present in some (if not all) regions, given current staff shortages. Highways England does not operate a metric that would provide this information and was not able to pull together information in the timeframe for this piece of work.

Due to social distancing requirements during the Covid-19 pandemic, Highways England has also trialled single crewing of TO vehicles as the standard operating mode, which has enabled it to deploy more TO patrols on the network. Single crewing is currently based on an interim safety case which has a 21 June 2021 end date. The safety case business benefits are currently being reviewed to see if this could be extended to business as usual.⁴⁶ Highways England's own assessment of single crewing to date appears to suggest that it could enable a level of performance that is at least as good as the standard patrolling arrangements, because it should enable more active patrols and therefore a vehicle closer to the site of a potential incident.⁴⁷

Because there is a greater risk of incidents and/or stopped vehicle events in live lanes on smart motorways, we asked Highways England how frequently incidents on smart motorways required more than one TO to attend, as this would potentially introduce an inefficiency if the first TO on scene has to wait for a second vehicle. Highways England explained that the number of TOs required would depend on the nature of the incident, and a decision to send more than one TO to an incident can only be made by the control centre operator if they receive good intelligence: it often requires attendance by an initial TO, who will conduct a dynamic assessment when they arrive on site. Highways England was unable to provide data on TO attendance because single crewing is still in a trial phase. Once the review of single crewing is complete, ORR may wish to follow up on its effectiveness in the context of smart motorways, given the likely importance of this measure in meeting future attendance time commitments.

Technology

The ability to respond to incidents on smart motorways requires the adequate functioning of roadside technology systems, alongside management of the technology by ROC operators. Where this technology does not function as planned and/or fails, it can cause knock-on effects on resources.

The programmed introduction of CHARM⁴⁸ and rollout of SVD⁴⁹ will provide an increase in available technology to assist control centre operators. Highways England told us that where CHARM has been rolled out it has worked well (with some teething troubles)⁵⁰ but the Company recognises that it is still understanding the benefits and what the new technology can offer in terms of optimising resources. We note that the technology is being introduced, in part, to aid performance rather than reduce the number of control room operators. Highways England told us that it is cognisant of the role of technology in supporting ROC operators to make good decisions, and that there may be limits on the amount of technology and associated tools that an operator can realistically monitor. The size, shape and roles of the control room operators are being reviewed as part of Highways England's Operational Excellence 2025 programme, to ensure that the Company delivers improved operational performance. Highways England also told us that any decision to adjust its regional resources based on the introduction of new technology will be data driven and planned, not carried out arbitrarily.

Where technology fails or if the RSLs cannot be met due to staff shortages, Highways England will use business continuity procedures to manage operations. For example, if CHARM technology in one region fails (the primary region) then Highways England can transfer control over traffic operations to a 'buddy' region (secondary or reserve region). The secondary Regional Operations Centre can set the signs and signals in the primary region. To demonstrate that this is tested through business continuity planning, Highways England provided a Control Room

⁴⁶ Business Case for Single Crewing Implementation v1.1.docx

⁴⁷ Single Crewing End of Trials report v.1.0.docx

⁴⁸ Currently active in the South West and Yorkshire & North East but being rolled out across the regions more gradually.

⁴⁹ Currently installed on the M25 (Junctions 23 to 27 and 5 to 7) and M3 motorways (Junctions 2 to 4a).

⁵⁰ Email from Highways England to Elliott Asset Management dated 19 May 2021

Exercise Feedback Form detailing a test evacuation and handover of communications between the West Midlands and North West control centres.⁵¹

In addition, whilst support sought from adjacent regions is primarily for call handlers, or radio support, with signs and signal management typically retained within the region, the 'Tiberius' system allows regions to take control of one another's signals when required.

Summary

Highways England has a range of resilience measures that can be utilised when levels of staffing and/or technology availability are lower than expected and at present they appear to be supporting Incident Clearance KPI performance. Though as we note earlier in the report, this is not a good proxy for the expectations on Highways England under the Smart Motorway Action Plan.

Whilst we find that Highways England is not optimally resourced at present, the resilience measures and single crewing are likely to be helping the On-Road teams manage ongoing pressures. It seems likely, given the scale of staff shortfalls and absences, that Highways England relies on these resilience measures relatively frequently, at least on the resourcing side. ORR may wish to monitor use of resilience measures going forward. It may also wish to review Highways England's assessment of single crewing in due course.

Given the current combination of staffing shortages and recovering traffic volumes there is a risk around Highways England's future capacity to meet the de facto target to reduce the average time for a traffic officer to attend a stopped vehicle from 17 minutes to 10 minutes, where the existing spacing between safe places to stop in an emergency is more than one mile. ORR may wish to monitor Highways England's staffing and absence management plans and formally assess, in due course, Highways England's ability to achieve a 10 minute attendance target.

4.6. APPLICATION TO SMART MOTORWAYS

This section expands on the issues raised above and applies them to the overarching question: does Highways England have the right levels of control centre staff and traffic officers to operate Smart Motorways safely?

Do the current staffing levels for the management of smart motorways (by region) meet Highways England's current policy and standard operating instructions for traffic officers, control rooms and on-road staff?

Picking up from the themes identified above, we note that Highways England organises and resources its control centre and on-road teams to operate the network as a whole. Staff are expected to be ready to cover and respond to events on all road types in their region. Specifically, it has not sought to provide dedicated control centre or on-road resource for smart motorways.

We recognise that the environment in which Highways England operates has been unusual over the past 15 months (due to Covid-19) and that this has implications for resourcing and recruitment activities. At the same time, the Company has been developing its response to the Smart Motorway Stocktake and Action Plan.

While at present Highway's England may not be adequately resourced to meet the Action Plan commitment, it has started to consider its implications. Highways England emphasised to us that is continually reviewing and adjusting its organisation of control centre and on-road resources to improve performance. This now includes how best to achieve the new commitment to reduce the average time it takes for a traffic officer to attend a stopped vehicle, where the existing spacing between safe places to stop in an emergency is more than one mile. For example, Highways England provided an Interim Patrol Strategy for the East Midlands region, which was developed with this new commitment in mind. The strategy dictates where regional patrols are conducted based on how many crews the East Midlands has available against its shift needs. In this case, the need varies between a minimum requirement (RSL) of 6 crews for the night shift to a maximum of 12 crews for the Early and Late shifts from Monday to Friday and 9 crews for the same shifts at the weekends.⁵² If additional staff and Traffic Officer vehicles

⁵¹ Control Room Live Exercise Feedback Form 2020.docx

⁵² East Midlands Review of our Traffic Operations Patrol Strategy.docx and TOS review 3.xlsx

are available over the minimum requirements the region will deploy these to increase the service provision to meet demand, improve incident clearance times and ALR response times.

Highways England told us that similar strategies have been, or will be, produced by all other regions with operational smart motorways, and that these strategies will be subject to regular review and refinement.

Is the supporting technology in place to meet the required current standard?

For smart motorways, the technology (i.e. SVD and supported by CHARM) is currently being rolled out.⁵³ Highways England has told us that, “*the final completion date [of CHARM] is likely to be extended by a couple of months due to the acceleration of the SVD programme and the associated training and technical implications. A replanning exercise is underway to meet the Smart Motorway stocktake commitments to SVD implementation with the minimum of disruption to the CHARM delivery plan*”.⁵⁴ We have commented on the risks related to roll out of new IT systems in Sections 2 and 3 above.

In the meantime, staff in the regions where the technology is available (or soon will be) are being trained to use it. In terms of staff capacity and the impact on resourcing pressures, the training does not appear to be onerous (0.5 days), and Highways England is confident that the technology will be accessible.

Overall, we find that it is not possible to assess whether the supporting technology will enable Highways England to meet the required standards on smart motorways at this time, given the current stage of roll out. ORR should consider whether it wishes to revisit this question later, once the new technologies are better embedded.

What resilience measures are in place to compensate when staffing levels and/or technology are below the required standard?

We noted in Section 4.5 above how Highways England has some flexibility in rostering which it routinely uses to manage planned events and short-term constraints due to e.g. staff illness and training. Highways England can also utilise overtime to ensure that minimum resource levels are maintained across all shifts, and we noted how the regions are also accustomed to working cross-boundary through mutual aid agreements. These are applied in the context of Highways England’s operation of the network as a whole, meaning Highways England does not employ smart motorways-specific staffing resilience measures.

An aspect of resilience that ORR may wish to consider further is how reliant Highways England is on deploying these resilience measures to maintain performance. Given the significant shortfall of actual staff against its resourcing plan it seems likely that they are routinely used and relied upon. This seems particularly true of single crewing which has enabled On-Road teams to deploy more patrol vehicles on the network, providing greater network coverage. Whilst single crewing has been an available working arrangement for a minority of trained staff, its wider use is still being trialled and is currently a voluntary working arrangement. An ongoing review will decide whether this can be extended to around 80% of operational activities in future. At this time Highways England cannot provide data on the impact of single crewing on smart motorway response time but it points out that it is meeting its KPI target.

If the supporting technology fails, Highways England has formalised business continuity plans which it routinely tests and practices. For example, it has spare workstations in the ROCs if there are workstation-specific faults; it can use CCTV to monitor the network if there is a fault with the roadside signs and signals; and ROC Operators in other regions can provide remote support if a ROC has a shortage of Operators, usually agreed before the start of each shift. In extreme, if the entire ROC lost access to the supporting technology, responsibility for operating the technology would transfer to another ROC until the technology is restored. In addition, all TOs in the region would be instructed to actively patrol the network, monitoring for incidents.

⁵³ Highways England committed to retrofitting existing ALR motorways with SVD by September 2022 as part of the Smart Motorways Stocktake – first year progress report, available [online](#).

⁵⁴ Email from Highways England to Elliott Asset Management dated 19 May 2021

How are these resilience measures determined as adequate?

We understand that the adequacy of these reliance measures is not formally ‘measured’, rather adequacy is considered by Highways England in the context of overall performance and demand factors. For example, Highways England ensures that a monthly cross Traffic Operations Regional Performance Group (RPG) meets to discuss patrol strategies and operational performance.⁵⁵ Whilst the RPG considers a range of performance issues, it would include adequacy of resilience measures if there were concerns that these measures had not been able to adequately sustain expected performance.

Highways England explained that through the RPG, weekly incident review meetings and other deep dives into areas of operational performance, the Company’s resilience measures are effectively under continual review. Highways England emphasised that decisions on these measures are data driven and supported by operational expertise from the On-Road and ROC-based teams. Taking this context as a starting point, ORR may wish to assure itself that Highways England is monitoring a range of useful forward-looking indicators and risks around the new 10 minute smart motorway attendance time commitment, where the existing spacing between safe places to stop in an emergency is more than one mile .

4.7. CONCLUSIONS AND RECOMMENDATIONS

Based on the evidence provided within the timeframe of this project and our analysis of it, our main conclusion is that Highways England is currently materially under-resourced against its own plan. We also conclude that Highways England likely has scope to improve its management of staff absence. The combination of vacancy levels, recruitment, training periods and absences leads us to the view that Highways England is facing a significant resourcing shortfall at present, and that the issue is particularly acute in some regions.

During COVID, when traffic levels have been reduced, Highways England has had to adjust its operations including single crewing to meet its Incident Clearance KPI. The lower traffic levels have also reduced the number of incidents but these tailwinds are expected to subside over time making current and future targets more challenging to meet. Given the issues raised in this review, it seems likely to us that Highways England will need to undertake further work to understand how and by when it will meet the Action Plan commitment of reducing the average attendance time to the 10 minute target.

We make the following recommendations to ORR on its future monitoring activities:

No.	Issue	Recommendation
1	Increased monitoring	ORR should now require Highways England to provide analysis to explain demonstrate how it plans to address the current resourcing shortfall, and how in time it will demonstrate that the resourcing shortfall has been closed. ORR should also require Highways England to set out by when it expects to meet the Action Plan commitment of reducing the average attendance time to the 10 minute target, where the existing spacing between safe places to stop in an emergency is more than one mile.
2	Staffing levels	ORR should monitor the implications of Highways England’s vacancy levels in the ROC-based and On-Road teams going forward (actual staff levels vs planned) and staff turnover (including number of leavers and joiners) by region, as leading indicators of issues which may affect operational performance.
3	Absence rates	ORR should monitor whether Highways England has an effective plan for managing absence.
4	Single crewing	Once the current trial of single crewing is complete, ORR should review the conclusions made by Highways England on single crewing and whether it is the

⁵⁵ Email from Highways England to Elliott Asset Management dated 17 May 2021

	most appropriate measure for meeting Highways England's 10 minute average attendance target.
5 Use of resilience measures	ORR should review how frequently the regions rely on the resilience measures to mitigate the impact of staffing shortages and technology availability; and monitor the impact on operational performance as traffic volumes return to pre-Covid levels.
6 Oversight of operating risks and resilience	ORR should review whether Highways England's Traffic Operations Regional Performance Group is monitoring a range of useful forward-looking indicators and risks to ensure that the Company is employing a range of effective resilience measures, and/or highlight the need for further action to ensure resilience of smart motorway operations.
7 Outcome monitoring	Reinforcing our work on monitoring measures in Section 3, ORR should consider monitoring metrics which provide a more direct measure of how long it takes Highways England to attend stopped vehicles on smart motorways.
8 Preparing for RIS3	As Highways England develops its Strategic Business Plan for RIS3, ORR should assess to what degree it is able to establish robust links between planned resources and Highways England's ability to deliver improved performance against the smart motorway KPIs to be deployed in RP3.

Appendix A INITIAL LONGLISTING ASSESSMENT

Appendix A sets out in further detail what we considered during our initial qualitative assessment of the longlisted monitoring options, to decide which options were worthy of a more detailed assessment against our criteria for good monitoring measures. In that context, this initial assessment is effectively superseded by the assessments set out in Appendix B.

Oversight of progress against delivery plans

SVD rollout	Relevant actions:	2a, 11
<p>Description: Progress against Highways England’s baseline plan. Could be measured as ratio of SVD schemes completed, or value of work completed as a share of planned value.</p>	<p>Data required: Actual reported value (or number of SVD schemes completed) versus forecast baseline (i.e. baseline as at March 2020)</p>	
<p>Strengths / weaknesses:</p>		
<ul style="list-style-type: none"> • Meaningful impact on SM safety – completion of SVD is an important enabler to reducing safety risk and supporting other Actions. • Largely within the control of Highways England. • Not a detailed indicator of future risks (i.e. not yet realised) but could provide early warning of risk to March 2023 deadline if progress falls behind schedule. 		
<p>Initial conclusion: Provides useful indicator of progress to date on SVD programme and whether Highways England is ahead or behind expected schedule. Would be a more insightful measure of progress if it could be value of work rather than number of schemes completed, as the measure would be less ‘lumpy’ (i.e. changes to performance is binary: i.e. scheme completed / not completed).</p>		
CHARM rollout – implementation status	Relevant actions:	11
<p>Description: An indicator of the progress of CHARM through various milestones, up to the point at which SVD and automated report of obstruction messages can be fully incorporated into the system.</p>	<p>Data required: TBC</p>	
<p>Strengths / weaknesses:</p>		
<ul style="list-style-type: none"> • Depends on the availability of useful and easily extractable information from Highways England – depends on the extent of current management information collected by the Company. • Important influence on SM safety processes – SVD will eventually be incorporated into CHARM, and also key enabler to the automation of “report of obstruction” messages. • But less easily understood – progress on CHARM may not translate directly towards progress on Action 11 on a one-to-one basis. • Might become resource intensive for ORR to monitor regularly and in detail 		
<p>Initial conclusion: Design of metric would need to be worked through with Highways England, and underlying data considered before we can conclude if this is a useful metric or not.</p>		
CCTV trial – implementation status	Relevant actions:	2b
<p>Description: An indicator of the progress of the CCTV trial programme and robustness of the outcome</p>	<p>Data required: Programme from current status to ‘investment decision’ and regular progress updates</p>	
<p>Strengths / weaknesses:</p>		
<ul style="list-style-type: none"> • ORR would use this indicator to determine whether any further CCTV trial is likely to deliver a robust set of results on which Highways England can make an ‘investment decision’ on the use of CCTV as part of the stopped vehicle detection environment. 		

- A positive decision to invest would not be an indicator of success. This indicator would focus on whether Highways England is achieving a reasonable balance between a timely and robust process for trialing CCTV, and whether it is likely to reach a conclusion on the ‘investment case’ for CCTV monitoring in a timely fashion.
- Indicator would be based on evidence submitted by Highways England, but assessment of progress against the trial’s objectives would inevitably involve the use of judgement by ORR.

Initial conclusion: At this point we would advise ORR to monitor the second phase trial and engage with Highways England on its objectives e.g. is CCTV likely to be a temporary tool that can be used whilst the SVD roll out continues, a complementary tool or back up tool in the longer term.

Effectiveness of communications

Audience reach of ‘Go Left’ Campaign

Relevant actions: 10

Description: Number of views / opportunities to see the ‘Go Left’ campaign.

Data required: Post-campaign evaluation of various media sources and audience reach

Strengths / weaknesses:

- Input based measure rather than effectiveness – i.e. measures how much media has been purchased.
- Short-term measure which will likely decay after the campaign has finished.
- Awareness of the campaign may not translate into understanding of the guidance.
- Difficult to benchmark against other Highways England campaigns due to greater size.

Initial conclusion: Likely to be a lag before campaign feeds through into desired outcomes, so this will provide a short-term metric of how well the campaign has performed in terms of coverage. Worth shortlisting but likely to be of greater internal use to Highways England than ORR for monitoring purposes.

User awareness of ‘Go Left’ Campaign

Relevant actions: 10

Description: % of users responding that they have seen, or are aware of, the ‘Go Left’ campaign

Data required: During- and post-campaign surveys

Strengths / weaknesses:

- Will show how widely the campaign has been seen amongst users, and if there are particular user groups who may have been less exposed to the campaign, to better inform future campaigns.
- Short-term measure which will likely decay after the campaign has finished.
- Awareness of the campaign may not translate into understanding of the guidance.
- Difficult to benchmark against other Highways England campaigns due to greater size.

Initial conclusion: Likely to be a lag before campaign feeds through into desired outcomes, so this will provide a short-term metric of how well the campaign has performed in terms of coverage. Worth shortlisting but likely to be of greater internal use to Highways England than ORR for monitoring purposes.

User understanding of ‘breakdown advice

Relevant actions: 10

Description: % of users responding correctly when asked to identify correct guidance when breaking down on a motorway without a hard shoulder

Data required: Monthly Highview survey – potentially a new (permanent) question – asking users to identify what steps to take in a breakdown scenario.

Strengths / weaknesses:

- Longer-term measure which will show user understanding of breakdown guidance after the campaign has finished.
- More direct link to outcome than post-survey evaluations – and clearer link to aspects of smart motorway experience that many users worry about.
- Pre-campaign survey should provide a ‘baseline’ in terms of general user understanding.
- Understanding of guidance may not translate into users taking the correct course of action in every case – e.g. correct recall of guidance less likely in high pressure situation.

Initial conclusion: Longer-term indicator that will help to assess whether communications campaigns have a measurable impact on user understanding. Should be shortlisted by ORR.

User confidence in smart motorways	Relevant actions: 2a, 6a, 10 and 11
<p>Description: Difference between % of users responding that they feel confident when using a motorway without a hard shoulder, compared to a standard motorway</p>	<p>Data required: Monthly Highview survey – potentially a new (permanent) question – asking about perception of confidence.</p>
<p>Strengths / weaknesses:</p> <ul style="list-style-type: none"> • More holistic measure which will capture user perceptions relating to a wider range of factors in the smart motorway environment, e.g. SVD / Red X signs, and might be linked to possible actions to improve safety. • Perception-based and therefore less directly related to actual risk. Possible influence by external factors, e.g. media coverage. • There may be a lag between Highways England action and movement in the measure. 	
<p>Initial conclusion: Not a standalone measure. Could be shortlisted but would need to be considered as one of many sources of evidence about Highways England’s progress.</p>	

Achievement of key Action Plan outcomes

Stopped vehicle events in a live lane	Relevant actions: 2a, 6a, 6b, 7b, 10 and 11
<p>Description: Number of stopped vehicle events in live lanes (also rate – e.g. per million vehicle miles)</p>	<p>Data required: Stopped vehicle events (from ControlWorks logs)</p>
<p>Strengths / weaknesses:</p> <ul style="list-style-type: none"> • Meaningful outcome – stopped vehicle event in a live lane is a high risk event. Could provide indicator of developing “clusters”. • But not every event will involve an injury or collision, and some may result in multiple casualties so aligning events and casualties may be challenging. • Backwards-looking – i.e. requires stopped vehicle events (and risk of collisions) to materialise. • Frequency may vary significantly from month-to-month. Tolerance of noise will depend on urgency to investigate cause of events, e.g. bad weather, and actions Highways England can take in response. • Potential for rising trajectory due to expanding SM network and traffic level recovery from Covid-19. Rate may be more comparable over time than absolute number. • Likely correlation with casualties. 	
<p>Initial conclusion: Potential outcome metric. Helpful to Highways England when investigating causes of stopped vehicle events and would enable ORR to monitor risk that is wider than collisions or casualties.</p>	

Collisions	Relevant actions: 2a, 6a, 6b, 7b, 10 and 11
<p>Description: All collisions on SM sections</p>	<p>Data required: Casualties data from STATS19</p>
<p>Strengths / weaknesses:</p> <ul style="list-style-type: none"> • Familiar data source, but validated data only available with significant lag. More timely data may be available from the Police but unvalidated. Highways England may have own internal data. • There is no obligation for all personal injury collisions to be reported to the police (e.g. the driver only injured in a single vehicle collision), so data may not represent the full range of accidents on smart motorways. • Frequency may vary significantly from month-to-month. Causes may be unrelated to stopped vehicle events, and applicable to motorways more generally. • Correlation with casualties may be weaker than other outcome measures. 	
<p>Initial conclusion: Potential use as part of a suite of outcome metrics, but of limited use on a standalone basis. Probably not the main outcome measure that ORR would rely on for any Action other than 7b.</p>	

Reported near misses	Relevant actions:	2a, 6a, 6b, 7b, 10 and 11
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Description: Number of health, safety and wellbeing incidents and reported near misses on SM sections.

Data required: AIRSWEB report

Strengths / weaknesses:

- Forward-looking indicator which would not rely on risks materialising.
- All Service Providers and Contractors working for Highways England are required to use Airsweb to report and record accident and near miss investigations. Should encourage good reporting where incident is *seen* but not all near misses are seen and reported (e.g. by users).
- Even if each near miss event had the potential to become an accident or cause a vehicle to become stationary in a live lane, several recorded events may not be smart motorway-specific.

Initial conclusion: Not a standalone measure. Would need to be considered as one of many sources of evidence about Highways England's progress. But would help ORR to adopt a more forward looking stance and trend data could be included in the Annual Safety Statement to provide something of leading indicator.

Time taken to attend stopped vehicle in live lane	Relevant actions:	All actions
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Description: Average time taken to attend a stopped vehicle in a live lane, and cumulative distribution of stopped vehicle events to monitor cases where it takes >10 minutes to reach vehicle

Data required: TBC

Strengths / weaknesses:

- This is the outcome that is most meaningful to users and correlated to undesired events. Where stranded in a live lane, users will worry about how long before they can be rescued. The longer it takes, the greater the risk.
- Simple to understand and calculate, assuming data can be collected, logged and reported.
- Actionable – Highways England can move resources to influence the indicator.
- Timely – should be able to update automatically each time an SVD event is created and logged.
- Perverse incentives – can be addressed if both *average* and *absolute* indicators are captured.
- Measurement – may need to consider whether there is a need to capture cases where a Traffic Officer is not dispatched.

Initial conclusion: Users need confidence that they will be recovered from a high-risk situation as quickly as possible, so ORR should monitor both the *average* time taken to attend users broken down in a live lane, and the *absolute* time taken in cases which last longer than average, to provide an incentive on even the hardest/longest/busiest sections of network and sections where EAs are more than a mile apart.

Other operating indicators

SVD – detection rate	Relevant actions:	2a
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Description: Detection accuracy for Stopped Vehicle Events (detected stopped vehicle events as a percentage of all stopped vehicle events).

Data required: ROC Control Works logs, SVD alert data, and CCTV footage to validate findings (see Plan for Monitoring Operations – SVD schemes)

Strengths / weaknesses:

- Direct measure of the reliability of the SVD system
- Important to retain road user credibility in signs and signals.
- Less easily understood in terms of ultimate safety outcomes

Initial conclusion: Useful for monitoring performance of equipment but less so for interpreting Highways England progress. ORR may wish to request that this data forms part of Highway's England's routine performance updates.

Time to set signs and signals	Relevant actions:	2a
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Description: Signs and signals will be set within 3 minutes of receiving the alert – potentially focused on Red “X” signs

Data required: ROC Control Works logs, SVD alert data, and CCTV footage to validate findings (see Plan for Monitoring Operations – SVD schemes)

Strengths / weaknesses:

- Existing metric already measured by Operations directorate.
 - Important to retain road user credibility in signs and signals, but not a direct indicator of the effectiveness of SVD system on overall smart motorway risks.
 - Less easily understood in terms of ultimate safety outcomes
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Initial conclusion: Useful for monitoring performance of ROC processes and responses but less so for interpreting Highways England progress on Action Plan

Appendix B ASSESSMENT OF LONGLISTED MONITORING INDICATORS AGAINST SELECTION CRITERIA

B.1. OVERSIGHT OF PROGRESS AGAINST DELIVERY PLANS

B.1.1. SVD rollout – Schedule Performance Indicator

Principle	Commentary
Aligns with user priorities	Performs well against criteria. The SVD infrastructure is a key enabler for Highways England to be able to identify stopped vehicles in high risk situations and close live lanes accordingly. Therefore, the timely roll-out of this action as per Highways England’s implementation plan is important to improving overall safety outcomes.
Measurable	Performs well against criteria. Highways England should be able to report progress against its baseline implementation plan. It would be best if this were a quantitative measure – likely meaning that Highways England should report the ratio of value (or number) of actual SVD schemes completed as a share of planned value (or number) of schemes completed. We expect this information to exist but Highways England would need to confirm.
Understandable and insightful	Performs well against criteria. Would provide useful insight into Highways England’s progress against implementation plan but would need to be combined with (i) clear and transparent process for reopening the baseline plan (e.g. if deadlines are brought forward), and (ii) regular status updates on residual risks to the programme.
Controllable	Performs well against criteria. Fully within Highways England’s control.
Targetable	Performs well against criteria. Baseline implementation plan would act as the target.
Forward-looking	Meets criteria with some minor issues. Backwards looking progress indicator but nonetheless relevant. Slow progress would indicate that the ultimate deadline may be missed unless Highways England can make up time ahead. Value could be improved by combining with a regular status update on residual risks to the programme.
Unintended consequences	Meets criteria with some minor issues. A common issue with SPI indicators is the incentive to reopen the baseline schedule against which progress is measured.
Overall assessment and other factors	Leading indicator for ORR to monitor progress against the Action Plan.

B.1.2. CCTV trial

Principle	Commentary
Aligns with user priorities	Performs well against criteria. As with the introduction of SVD, the use of CCTV analytics could be a key enabler for Highways England to be able to identify stopped vehicles in high risk situations and close live lanes accordingly. At this stage, ORR should be monitoring the second phase trial of CCTV analytics and engaging with Highways England over its possible use, either in the short term while SVD is being implemented, or as a complimentary or backup tool to SVD.
Measurable	Uncertain. The second phase trial might be monitored in terms of the length of trial period needed (uncertain but presumably less than 6 months if the aim is to test efficacy in winter conditions) and the success of spotting stopped vehicles. While the completion of the trial is clearly a requirement of the Action Plan, how the ‘success’ of the trial will be assessed is currently not set out.
Understandable and insightful	Uncertain. In due course ORR will want to understand whether the CCTV analytics approach generates positive response rates that are at least as high as the standard set for radar-based SVD (85%), which in turn relies on accurate measurement of true positive and false positive

sightings. But in terms of ‘ticking-off’ the action plan commitment, meeting a deadline for completion of the trial is more understandable but less insightful.

Controllable	Performs well against criteria. Highways England has the ability to control the second phase of the trial, and decide on the usefulness of CCTV analytics compared to radar-based SVD.
Targetable	Performs well against criteria. The indicator to complete the extended trial on time is in principle targetable if ORR can agree a target date with Highways England.
Forward-looking	Performs poorly against criteria. Completion of the trial would be a backwards looking progress indicator, although it would nonetheless be relevant.
Unintended consequences	Meets criteria with some minor issues. Following the second phase trial, ORR may wish to assure itself that there is no conflict between use of CCTV cameras for SVD analytics and wider use of CCTV cameras by ROC operators in their other day-to-day activities.
Overall assessment and other factors	Necessary to monitor progress against Action 2b, but likely to be considered an ‘additional measure’ rather than a leading indicator.

B.1.3. CHARM rollout status

Principle	Commentary
Aligns with user priorities	Meets criteria with some minor issues. Not the highest priority indicator on this list, but nonetheless we consider it important that ORR receives regular updates on CHARM progress, from the perspective of automated report of obstruction warnings.
Measurable	Uncertain. Highways England would need to confirm what data it routinely reports on the progress of CHARM.
Understandable and insightful	Uncertain. CHARM is a large, complex programme probably with many interdependencies and risks. Unclear whether ORR would gain much insight from a relatively simplistic indicator (if one can be constructed) or whether it would require a more comprehensive update on the CHARM programme.
Controllable	Performs well against criteria. Fully within Highways England’s control
Targetable	Performs well against criteria. Baseline implementation plan would act as the target.
Forward-looking	Meets criteria with some minor issues. Backwards looking progress indicator but nonetheless relevant. Slow progress would indicate that the ultimate deadline may be missed unless Highways England can make up time ahead. Value could be improved by combining with a regular status update on residual risks to the programme.
Unintended consequences	Meets criteria with some minor issues. A common issue with schedule progress indicators is the incentive to reopen the baseline schedule against which progress is measured.
Overall assessment and other factors	Potentially a secondary indicator if the uncertainty can be resolved around what data is routinely reported on the progress of CHARM. Closely related to SVD rollout.

B.1.4. Cluster definition

Principle	Commentary
Aligns with user priorities	Meets criteria with some minor issues. The definition of what constitutes a ‘cluster’ of incidents is not of direct interest to road users, but will focus road safety practitioners on using all the available data when determining appropriate mitigation measures to reduce the risk of further incidents. Some Highways England Areas may be using just injury collision data, and some may also be using Near Miss data, incidents involving ‘limping vehicles’, and reports from public such as ‘animals on the carriageway’, or combinations of these.
Measurable	Meets criteria with some data comparability issues. These different data sets will come from different sources e.g. STATS19 from the police, reports of limping vehicles and animals

on the motorway from Control Room logs and members of the public. The final ‘cluster’ definition will need to be a combination of the number of collisions/reports/control logs, over a set distance, and perhaps taking into consideration exposure to risk i.e. traffic levels.

Understandable and insightful	Meets criteria with some minor issues. As an indicator, it is unlikely to provide ORR with much insight into ‘progress’ but could be used as part of a conversation about potential areas where Highways England should focus its resources and attention. But an agreed definition will be useful for stakeholders (incident investigators, senior management) and to ensure its consistent use for internal monitoring purposes over the whole network.
Controllable	Performs well against criteria. Highways England will have full control over the definition. It may need to be different on SMs and conventional motorways, due to the differences in types of risk. APTRs will also need their own definition to the higher levels of collisions risk on other types of SRN roads such as single carriageway rural, urban and inter-urban carriageways.
Targetable	Performs well against criteria. It is not targetable in the traditional sense of a performance metric, but nonetheless it is a necessary step in completing Actions 6a and 6b. A timeframe will need to be established for this. Thereafter, the monitoring of ‘clusters’ becomes an ongoing action.
Forward-looking	Performs well against criteria. If used appropriately, may help to identify areas of apparent higher risk and encourage Highways England to mitigate risks in those locations.
Unintended consequences	Meets criteria with some minor issues. Definition of ‘cluster’ will need to be gradually calibrated. Too low a number of incidents may result in an unnecessarily high workload for investigators, in terms of data collection, analysis and reporting, and may be disproportionate relative the benefits that can be realised (via the investigation of potential options for intervention).
Overall assessment and other factors	Within the remit of the Action Plan, potentially useful as an ‘additional measure’ rather than a leading indicator.

B.2. EFFECTIVENESS OF COMMUNICATIONS

B.2.1. Audience reach of ‘Go Left’ campaign

Principle	Commentary
Aligns with user priorities	Performs poorly against criteria. The reach of the ‘Go Left’ campaign is not directly measuring road user understanding of Highways England’s advice on what to do in the event of a breakdown, or what to do in the event of a breakdown on a smart motorway specifically. It may be correlated in the short term whilst the campaign is live, but this will depend on the campaign’s success.
Measurable	Performs poorly against criteria. Audience reach is a common metric for media campaigns, but it is usually an estimated figure. For online media, Highways England’s media agents will likely calculate and report a total number of <i>impressions</i> and divide this by the <i>average number of times</i> each person is likely to see the campaign advert. Additionally, Highways England is using a multi-channel approach, so the calculation of reach will differ depending on the channel.
Understandable and insightful	Performs poorly against criteria. Measure is likely to be of little value to ORR as campaign reach may depend on external factors that are beyond the Company’s control and are not being measured, e.g. TV audience may vary month-by-month depending on show popularity.
Controllable	Meets criteria with only minor issues. Controllable to the extent that Highways England picks the media and the size of media purchase, but there are some external factors.
Targetable	Performs poorly against criteria. Difficult to target without good benchmark information. This is Highways England’s largest campaign so there may not be other internal campaigns that offer a good comparison.

Forward-looking **Meets criteria with only minor issues.** Low audience reach would be an early indicator of low user understanding in times ahead, but good audience reach would not necessarily translate into good user understanding e.g. one year later. Only a short-term indicator.

Unintended consequences **Performs well against criteria.** None identified.

Overall assessment and other factors We consider that this measure would offer ORR only limited insight into the effectiveness of the Highways England's communications and would only be of short-term relevance.

B.2.2. User awareness of 'Go Left' campaign

Principle	Commentary
Aligns with user priorities	Meets criteria with only minor issues. Road users have to be aware of the campaign before they can understand it, so this would align with user priorities. But it is important to note that, longer term, awareness would not equate to an understanding of the advice, which is the one of the main intended outcomes of the communications campaign.
Measurable	Meets criteria with only minor issues. We anticipate that Highways England would have to establish a question within the Highview survey to measure and track awareness of the 'Go Left' campaign. ORR should note that Highview is not designed to be a statistically representative of the SRN user population like SRUS, however it might be a pragmatic, short term solution. There may be some issues around how representative the sample is during the recovery from Covid-19 given impact on traffic levels, although Highview is an online survey so it has continued during lockdowns.
Understandable and insightful	Meets criteria but with longer term comparability issues. Awareness of the campaign is straightforward to understand, and it may offer ORR some short-term insight on the effectiveness of the campaign, but this will fade over time once the campaign has finished.
Controllable	Meets criteria with only minor issues. Controllable to the extent that HE picks the media and the size of the overall budget. Once the campaign is live, Highways England has limited ability to affect change that could improve its effectiveness beyond buying additional media at short notice.
Targetable	Performs poorly against criteria. Difficult to target without good benchmark information. Awareness of other breakdown campaigns are tracked via Highview – but this is HE's largest campaign so there may not be a good benchmark or comparison.
Forward-looking	Performs poorly against criteria. Low user awareness of the campaign would be an early indicator of low user understanding of breakdown advice generally. But note that the measure will become less relevant once the campaign has finished.
Unintended consequences	Performs well against criteria. No concerns identified.
Overall assessment and other factors	Potentially of use to ORR as a short-term indicator – as awareness of the campaign builds this may translate into a more general understanding.

B.2.3. User understanding of breakdown advice

Principle	Commentary
Aligns with user priorities	Performs well against criteria. Good alignment with target outcome of the communications campaign, i.e. clear guidance on what to do in the event of a breakdown or emergency need to stop.
Measurable	Meets criteria with only minor issues. We anticipate that Highways England would have to establish a permanent question within the Highview survey to measure and track user understanding of the correct breakdown advice. ORR should note that Highview is not

designed to be a statistically representative of the SRN user population like SRUS. Alternative options might be explored but a pragmatic solution will be required.

Understandable and insightful	Performs well against criteria. Straightforward to understand and good link to the effectiveness of HE's communications campaigns, although potentially with some lag after the initial campaign starts.
Controllable	Performs well against criteria. Fully within Highways England's control, because the Company picks the media, the size of the overall communications budget and is in control of the communications contents. Fewer external factors as this is a longer-term indicator.
Targetable	Performs well against criteria. A trajectory of improvement could be set over time once a baseline level was established and assuming Highways England is able to continue funding communications activity beyond this campaign.
Forward-looking	Uncertain – potentially but with some issues. Low user understanding would undoubtedly be a concern from a risk perspective, but it may not be reflected / correlate with the materialisation of risk via accidents and collisions. In other words, it may not directly translate as a warning of future issues but would indicate the need for a larger (or different) communications approach.
Unintended consequences	Meets criteria with only minor issues. If this were to become a permanent question in Highview, then ORR would need to better understand the governance of question design and sample gathering would need to be considered to assure itself of consistency of approach over time.
Overall assessment and other factors	Potential to be a leading indicator for this area, to be combined with a secondary 'confidence' indicator.

B.2.4. User confidence in smart motorways

Principle	Commentary
Aligns with user priorities	Performs well against criteria. The Stocktake stated that in most ways, smart motorways are "as safe as, or safer than" conventional motorways. Additionally, Highways England wants to keep its breakdown advice consistent across all types of high speed roads. So, longer term (potentially by the end of RIS2), the ultimate outcome which the communications plan is driving towards is for road users to be confident in the safety of smart motorways.
Measurable	Meets criteria with only minor issues. Could be incorporated into Highview survey or potentially within SRUS. Further consideration would need to be given to monthly sample sizes (e.g. how many respondents to either survey actually used a smart motorway in the past month). Either way, there will need to be a pragmatic trade-off between having a scientifically robust measure and cost of obtaining extra respondents.
Understandable and insightful	Meets criteria with only minor issues. We think that the indicator would be easily understandable, but there may need to be an associated 'open text' response option to allow Highways England to gather supporting information to better understand what drives road user perceptions and how it can improve confidence.
Controllable	Meets criteria with only minor issues. Although confidence may be affected by external factors, e.g. media attention, this indicator would be largely within Highways England's control as this is one of the objectives of the Stocktake and Action Plan.
Targetable	Performs well against criteria. A trajectory of improvement could be set over time once a baseline level was established.
Forward-looking	Meets criteria with only minor issues. Once established, road user confidence may be a useful forward-looking indicator. But we also recognise that it may be affected by backwards-looking factors, e.g. media attention on casualties could cause the measure to deteriorate etc. Whilst we would expect it to broadly reflect the underlying level of risk over the long-term, it may deviate from the underlying level of risk in the short-term.

Unintended consequences	Meets criteria with only minor issues. If this were to become a permanent question in Highview, then ORR would need to better understand the governance of question design and sample gathering would need to be considered to assure itself of consistency of approach over time.
Overall assessment and other factors	Potential to become a leading indicator over the longer term, once user awareness and understanding has been established (i.e. towards the end of RIS2). Probably only a supporting indicator in the short term.

B.3. ACHIEVEMENT OF KEY ACTION PLAN OUTCOMES

B.3.1. Number of stopped vehicle events in live lanes

Principle	Commentary
Aligns with user priorities	Performs well against criteria. This is a high-risk event and therefore any indicator which tracks and monitors these events would be considered well aligned with users' priorities.
Measurable	Performs well against criteria. SVD will detect stopped vehicle events, so the data should be available from Highways England's COBS system. Data is likely to be overall robust, but we know that SVD captures in the region of 85% stopped vehicle events ⁵⁶ so it is likely to be an underestimate.
Understandable and insightful	Performs well against criteria. Would probably need to be reported as a rate per distance travelled, to allow for comparability over time as vehicle miles recover post-Covid, and as length of smart motorway network grows. This would also allow for easier comparisons between stretches of smart motorway in order to identify outliers. But ORR should still have access to absolute numbers for additional context.
Controllable	Meets criteria with some minor issues. Accidents and breakdowns cannot be eliminated entirely, but Highways England would be able to exercise some influence on this indicator through its placement of (additional) Emergency Areas, and its communications campaigns telling drivers to try and get to a place of relative safety.
Targetable	Performs well against criteria. A target could be set once a stable baseline is known. One might hope to see a declining trend over time as a result of improvements introduced in the Action Plan.
Forward-looking	Performs well against criteria. Number of stopped vehicle events might indicate a changing profile of underlying risk, and therefore a growing risk of potential casualties.
Unintended consequences	Performs well against criteria. No concerns identified.
Overall assessment and other factors	Possibly a secondary indicator to support an indicator where Highways England has greater control over the outcome. Further exploration of the data would be needed to determine whether the percentage share of 'missed events' is stable over time.

B.3.2. Collisions on smart motorway sections

Principle	Commentary
Aligns with user priorities	Performs well against criteria. This is an outcome that users want to avoid.
Measurable	Meets criteria with minor issues. Reported in STATS19 but minor collisions are less likely to be reported to the police than more serious collisions and casualties, so this measure is likely to be an underestimate (the size of this effect is unknown). STATS19 data is published by DfT often with a significant lag (~9 months for 2019) so Highways England would need to explore

⁵⁶ Highways Magazine (16 March 2021) "Errors in report cast doubt on smart motorway safety system" available [online](#).or

the possibility of reporting unvalidated data so that performance could be reported on a timelier basis, with revisions made later if required.

Understandable and insightful	Meets criteria with minor issues. Some consideration needed to ensure that the impact of recovering traffic volumes and the growth of the smart motorway network do not obscure the underlying trends (e.g. initially reporting it as a rate per distance travelled). Care would also need to be required not to confuse collision and casualty numbers i.e. one collision involving several fatalities can skew casualty rates.
Controllable	Meets criteria with minor issues. Accidents cannot be eliminated entirely, and the root cause of some collisions could be down to e.g. driver error. But there is no significant difference versus other indicators which are already part of the Performance Specification.
Targetable	Performs well against criteria. A target could be set once a stable baseline is known.
Forward-looking	Performs poorly against criteria. Would be a backwards-looking indicator.
Unintended consequences	Meets criteria but potentially undervalues certain interventions. Some interventions that Highways England might deliver could reduce risk, due to improved driver awareness and slower impact speeds, and may result in a reduction in collision severity without a reduction in overall collision numbers.
Overall assessment and other factors	Could be an additional measure to support further analysis by ORR if leading indicators suggest there is an issue, but is limited by its backwards-looking nature. May need further investigation of the frequency and causes of collisions which tend to go unreported. This indicator is closely related to other indicators such as the number of stopped vehicle incidents.

B.3.3. Reported near misses

Principle	Commentary
Aligns with user priorities	Meets criteria but with some minor issues. A near miss is an incident that would have resulted in an injury or property damage, under only slightly different circumstances. Although in many cases near misses might correlate well with the underlying level of risk – and users would want potential risk to be reported and monitored – it is not obvious that this metric would be comprehensive enough, as a significant number of ‘near misses’ may go unreported if there are no workers around to witness them.
Measurable	Meets criteria but with some minor issues. Reported in AIRSWEB along with breakdown by type of event. As above, the absolute number of reported near misses would likely be lower than the actual number of near misses (size of effect not known).
Understandable and insightful	Meets criteria if given specific role. Absolute numbers are likely to be relatively small and ‘performance’ may vary considerably month-to-month. But useful to Highways England as an indication of potential underlying risk and to explore the underlying root causes. And although absolute numbers may vary month-to-month, it could be used by ORR to monitor and further investigate trends.
Controllable	Meets criteria but with some minor issues. Highways England and its supply chain train and manage the workforce to respect safety guidance and employ safe working practices. Indicator will be affected by some external factors, e.g. Highways England cannot control driver behaviour beyond its communication campaigns.
Targetable	Performs poorly against criteria. Probably not targetable in this context (i.e. it is usually a supply chain measure to benchmark suppliers and drive safer working practices) but trend analysis could be insightful.
Forward-looking	Performs well against criteria. Its main value is as a forward-looking indicator under the ‘safety pyramid’ approach which emphasises the relationship between near misses and accidents.
Unintended consequences	Meets criteria but with some minor issues. Targeting this metric might incentivise undesirable behaviours (e.g. a culture of underreporting near misses) although it is already a requirement to report so this effect should not be overstated. There is sometimes a tendency

to focus on the human behaviour aspect of near misses, but this should not obscure a focus on the root causes.

Overall assessment and other factors	Possible role as a supporting indicator used for trend analysis and for monitoring locations of higher risk, e.g. works sites. Highways England would also need to explore what sort of near misses are going unreported, and potentially consider ways to increase near miss reporting.
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B.3.4. Time taken to attend stopped vehicle in live lane

Principle	Commentary
Aligns with user priorities	Performs well against criteria. The highest priority for a road user if they breakdown on the SRN is to find a place of relative safety (e.g. an emergency area), but this is not always possible. Analysis presented in the Stocktake showed that one of the key risks that increase on ALR is a collision involving vehicles in a live lane, so clearing stationary vehicles from a live lane is a key outcome that is in users' interests.
Measurable	Meets criteria with only minor issues. Highways England describes this as a new requirement which it is investigating further. But with SVD, Highways England will be able to record and report all stopped vehicle events. They will also need to record the point at which the vehicle is cleared from the live lane. This should be straightforward where a traffic officer attends the scene but may be more challenging where it is reliant on the ROC operator to record when the lane was cleared because a traffic officer was not required.
Understandable and insightful	Performs well against criteria. Should provide ORR with good oversight of performance. If indicator were to deteriorate, more detailed analysis might be required to understand clearance time by type of incident and, if the overall number of incidents is relatively small each period, additional supporting information may be required to interpret performance (e.g. Highways England will also need to record and report type of event).
Controllable	Performs well against criteria. Highways England can influence performance by changing the number of traffic officers, patrol routes and park up locations. In future, it may be able to enhance its use of real time data analytics and vehicle-to-infrastructure communications to predict stopped vehicle events and/or respond faster. But we note that Highways England will never be able to eliminate stopped vehicle events entirely.
Targetable	Performs well against criteria. The indicator would be similar in effect to the incident clearance metric, which is targeted. Performance might be “noisy” depending on the number of stopped vehicle events each month. Noise can be smoothed by using a rolling average over the last 12 months but would need further investigation of the data when available.
Forward-looking	Performs well against criteria. This indicator would be a relatively forwards-looking indicator, in that it does not rely on a casualty event to occur before performance indicates a potential increasing / decreasing safety risk.
Unintended consequences	Performs well against criteria. It would be important to design the measure such that there is a meaningful reduction in risk before a stopped vehicle event can be categorised as ‘cleared’. For example, if the ROC operator turns on the Red ‘X’ and closes the lane, that does not necessarily mean that the event has been ‘cleared’ in a meaningful sense (because vehicles travelling behind the stopped vehicle may not respond to the closed lane signals).
Overall assessment and other factors	Stronger case for a formalised, leading indicator for this area. But closely related to the ‘traffic officer attendance time’ indicator (see below) and so ORR should monitor one of the two (but not both). Whilst this measure might have a broader coverage, this potentially comes at the expense of more onerous data collection and interpretation requirements.

B.3.5. Traffic officer attendance time – reaching a stopped vehicle on a smart motorway

Principle	Commentary
Aligns with user priorities	Meets criteria with only minor issues. Related to the indicator above (or perhaps a sub-indicator thereof) this measure would align well with Highways England’s commitment to “reduce the attendance time from an average of 17 minutes to 10 minutes”. But coverage of

stopped vehicle events would be less wide, as traffic officers are not required to attend all events.

Measurable	Performs well against criteria. Highways England describes this as a new requirement which it is investigating further. But with SVD, Highways England will be able to record and report all stopped vehicle events. They will also need to record the point at which the traffic officer reaches the stopped vehicle.
Understandable and insightful	Performs well against criteria. Measure will be relatively easy to understand and should provide a good, insightful indicator of Highways England's overall performance.
Controllable	Performs well against criteria. Highways England has control over traffic officer attendance time as it can change (or introduce additional) traffic officer patrols and change park-up locations.
Targetable	Performs well against criteria. The indicator would be similar in effect to the incident clearance metric, which is targeted. Might need to be a 12-month rolling measure to even out any noise in monthly performance.
Forward-looking	Performs well against criteria. This would be a forward-looking measure because the longer a stranded motorist has to wait for assistance, the greater the risk of harm.
Unintended consequences	Performs well against criteria. Attendance targets would need to be designed such that Highways England has incentives that include all types of stopped vehicle events including the hardest/longest to reach stopped vehicle events as well).
Overall assessment and other factors	Similar to 'time taken to clear stopped vehicle from live lane' but probably more straightforward to gather and record data as this related to an existing commitment in the Action Plan.

Appendix C **ORR PROJECT SCOPE AND CEPA/EAM RESPONSE**

1.1 Objective

The overarching objective of this project is to provide ORR an appropriate and proportionate approach to monitoring HE's delivery of the Smart Motorways Action Plan (SMAP).

This will be focussed on specific parts of the action plan that the ORR requires support to effectively carry out our duties. These are listed in the project scope below.

1.2 Project Scope

The project should provide advice to the ORR on the approach it should adopt to monitoring Highways England's delivery of the Smart Motorway Action Plan. This should focus on the processes and procedures the company has in place for the efficient delivery of the action plan activities for which it is responsible.

The project will;

- Review and assess Highways England's processes and procedures for delivery of the action plan, focusing on;
 - planning of the work outlined in their implementation plan;
 - data collection and analysis being undertaken; and
 - measuring outputs.
- Review Highways England's operational processes and propose an approach for how ORR can best monitor the efficient delivery of the plans outlined in their implementation plan to deliver relevant actions from the action plan (see Annex A);
- Establish how Highways England is monitoring its own progress, the data that is available, and any performance metrics that it has/is developing in this area.
- Establish whether Highways England has effective feedback loops built into its processes to learn lessons and support continuous improvement; and
- Make recommendations to ORR on potential areas of improvements both ORR and HE could make to secure improved performance and monitoring of the action plan, and Smart motorways in general.

The scope of work is specifically not to form an opinion on whether the activities agreed by the SofS in the action plan should be changed or to provide advice on the efficacy of the actions being undertaken.

The project is not expected to duplicate any work that Highways England is undertaking with DfT, in relation to the smart motorway stock take and action plan. Where areas of mutual interest exist, we would expect the project leads to liaise with DfT.

When setting out any recommendations on the approach to monitoring, it should be recognised that this should aid Highways England to improve performance. It is important to note that Highways England's funding levels for RIS2 have already been set. Any recommendations should be within Highways England's control to act upon. Any recommendation for action by Highways England in RP2, that is beyond the agreed RIS2 scope (either due to funding, or remit), should acknowledge this.

Annex A - Specific actions from the smart motorway action plan within the scope of this project

The project is not to consider all 18 actions in the plan, but will focus on the subset below:

Action 2: faster roll out of stopped vehicle detection.

- Does Highways England have effective processes in place to assess whether stopped vehicle detection technology is being delivered to the proposed plan and is delivering the expected safety benefits on the SRN?
- Does Highways England have an effective process to develop appropriate information/metrics that should be collected/reported to support benefits realisation of this system?

- Does Highways England have an effective process to determine how effectively the technology fits into the wider safety system – from detection of a stopped vehicle to the dispatching of traffic officers?
- Does Highways England have an effective process for assessing the benefits of the trial of CCTV on the effectiveness of its response to stopped vehicles?

Action 6: Considering a national programme to install more emergency areas on existing smart motorways installing more emergency refuge areas on existing smart motorways.

- Is Highways England using an effective process for it to consider a national programme of more emergency areas and potential locations what inputs it uses in considering potential locations?
- What process is Highways England considering using to prioritise any future potential programmes for more ERAs on the smart motorway network? Is the process effective and/or following best practice? What lessons are being learnt by Highways England from the approach of identifying incident clusters more widely across the SRN?

Action 7: Investigate M6 Bromford viaduct and sections of the M1.

- What processes does Highways England have in place to ensure that lessons learnt from the investigations on the M6 and M1 inform interventions on other sections of smart motorway? Are these processes effective?
- How is Highways England assessing whether there are lessons that can be learnt for the benefit of the wider SRN?

Action 10: More communication with drivers.

- How is Highways England assessing the impact/benefit of the communications activities it is undertaking?
- How has Highways England satisfied itself that the benefits are likely to be realised. What process does HE have in place / developing to assess the success of these activities?
- What processes does the company have in place to learn the lessons from these activities and improve the effectiveness of future campaigns?
- What is the most appropriate way for ORR to monitor and report on the efficient delivery of these activities?

Action 11: Displaying ‘report of obstruction’ messages.

- Linking up with action 2 – how is Highways England proposing to assess the efficiency and effectiveness of the processes it will adopt, from identifying an obstruction, to notifying drivers and dispatching traffic officers and/or contractors to clear an obstruction?

1.3 CEPA/EAM Approach

The objective of this project is to provide advice to ORR on an appropriate and proportionate approach it might adopt to monitor aspects of Highways England’s delivery of the Smart Motorway Action Plan. Our approach will focus on Highways England’s processes and procedures to deliver five specific plan actions (2, 6, 7, 10, 11). The project will include:

- A review of processes HE is using to monitor the benefits of each action, including data requirements, analysis and benefits realisation.
- A review of existing metrics, any HE has in development and consideration of further metrics if appropriate.
- The production of findings and recommendations to enable ORR to understand whether each action is likely to be successful and/or identify areas where confidence is low(er).

To achieve this, we propose a project in two parts:

- Review of SM actions:** An initial high level review of HE’s plans and progress against five actions (2,6,7,10,11) to provide context for the project and update ORR on progress being made, timelines for roll out etc. The objective of this initial element of work is to understand **what** HE is doing. We will then provide a review of the likely effectiveness of the approach and deliverability of the timelines being proposed, this will provide insight into **how** HE is undertaking its selected actions, its approach to prioritisation and the expected trajectory of reduction in safety risk. An important component of the context phase will be to establish how HE is monitoring its own progress, the data that is available and any performance metrics that it has/is developing in this area.

Part 1 Report: Based on this analysis we will produce a report which brings the initial review together and covers activities, programme, prioritisation and stakeholder interfaces etc to identify whether Highways England is doing the things required, to minimise SM risk (related to the actions within scope). The report will also suggest an initial long list of potential monitoring/metric options for RP2 and RP3.

- b) **Options for Monitoring:** The actions that ORR has identified within scope can be broadly categorised as ‘infrastructure changes’ being SVD and additional ERA’s and improving communication with drivers/ their compliance. Our initial view, which will be informed by the Part 1 Report, is that ORR might seek to monitor the reduction of risk to drivers stopped in running lanes and effectiveness of communication i.e. compliance with SM messaging, via two performance indicators.

Understanding whether these metrics are appropriate requires a deeper dive into HE’s operational processes and an exploration of the use of operational data to manage safety on the SM network. We will analyse the processes that HE follows when an incident occurs to identify potential scope for monitoring and consider how HE uses the data from those processes to manage its own performance. This will include the implications for road users and road worker safety and identify what other data, such as the use of near misses, could improve these processes. This second part of the project will draw upon the M1 and M6 case studies mentioned in Action 7, assuming that data is readily available.

Note: At this point we are aiming for a monitoring approach/metrics that uses outputs; in this case the reduction in safety risk that results from the actions that HE takes. This is generally preferable to using inputs such as speed/extent of SVD roll out, number of ERAs etc. but requires reliable links to be made between input and outputs which in turn is reliant on data.

Part 2 Report: Based on the deep dive analysis that we have undertaken in Phase 2 we will develop range of options for monitoring/ metrics that is set out in the Part 1 report into a short list of viable options that identify data sources, counterfactual etc. and the pros and cons of each option considering what HE is already doing and the complexity/impact/cost of each option for HE.

We intend to liaise with DfT during the project at key stages to ensure there is synergy of views and no duplication of work effort.

1.4 Notes to accompany Lines of Enquiry

The project will collect evidence from a combination of published documents, requested information and engagement with Highways England. It is proposed to have one engagement period for Part 1 and a follow up engagement period for Part 2. We also propose to have a ‘challenge workshop’ to allow ORR/HE/DfT to discuss our monitoring proposals. Our supplementary notes to accompany the above Lines of Enquiry include:

Action 2: faster roll out of stopped vehicle detection.

- How are safety benefits defined and how are these measured?
- Consider what constitutes ‘faster’ roll out against a baseline.
- The use of CCTV in conjunction with SVD.
- The implications for Traffic Officer response times

Action 6: Considering a national programme to install more emergency areas on existing smart motorways installing more emergency refuge areas on existing smart motorways.

- What is the process and rationale?
- What is the supporting evidence, including the link between collisions and ERAs, to make decisions?
- Note: GD 301 Smart motorways provides guidance on siting and spacing of ERA spacing.

Action 7: Investigate M6 Bromford viaduct and sections of the M1.

- What are HE’s continuous improvement processes that relate to collision investigations?
- What are the impacts for motorways and APTR?

Action 10: More communication with drivers.

- What communications activities does HE currently have underway and planned?
- Does HE hold evidence/insight on the social norms / behaviours which create risk?

- Does HE have a theory of change for each communication activity?
- How do the separate activities interact? For example do they support one another and/or intervene at multiple levels.
- How are the communications activities tailored and targeted at users/groups of users?
- How does HE test and refine the clarity of communication? Does it provide users with an alternative perspective / choice?
- How is HE joining up with other highways authorities to (i) support their communications activity, and (ii) learn from others.
- How is HE working with other emergency services / suppliers to improve delivery of / adherence to key messages?
- How does (or could) HE quantitatively monitor user understanding of these messages?
- How does (or could) HE quantitatively monitor user compliance with these messages?
- How is HE evaluating new communications activities to inform future campaigns?

Action 11: Displaying ‘report of obstruction’ messages.

- Consider the process of stopped vehicle identification – how it is detected – how it is messaged – how the risk is mitigated. What is the baseline for reopening an affected section and how will HE report against this now and into the future? Specifically:
 - Can HE describe and explain the protocols and management / recording systems that it uses from obstruction identification to removal?
 - How does HE then assess the underlying causes of the obstruction?
 - What are the key milestones on the M25 and M3 trials?
 - How does HE identify the original time at which the obstruction event occurred?
 - How does HE test, monitor and refine the speed / accuracy of the automatic stopped vehicle detection system?
 - How does HE plan to monitor driver compliance with the “report of obstruction” message?
 - What is the quantitative impact on near misses, collisions and casualties since the trials were introduced?

1.5 Assumptions

The project will recognise:

- The SM Stocktake is a sensitive area for all parties and it is likely that there will be a regular Stocktake in the future.
- The project scope is confined to five actions (2,6,7,10,11) and does not include a review of other actions HE could take to improve SM safety.
- The project should not consider the background to the Action Plan or question the Actions.
- If there are gaps in the expected level of confidence of delivering Stocktake actions the project will provide findings and recommendations to address these
- The project should include a review of existing HE metrics to measure each action and where appropriate suggest further metrics to ORR if appropriate e.g. ‘near misses.

Recognising that this is a sensitive subject area, CEPA/EAM will keep ORR updated on progress and notify ORR of any constraints, such as the sharing of data in a timely fashion or lack of evidence, that could impact the quality of deliverables or do not allow CEPA/EAM to reach valuable conclusions on a monitoring approach.

CEPA/EAM should confirm what HE is working on with DfT in each of the five actions (to avoid duplication) at the Inception meeting.

On an ongoing basis CEPA/EAM should agree any project observations from its engagement with HE during the project, to aid the fast-track of review deliverables.

CEPA/EAM should make an initial list of information requirements and submit these in advance of the Inception meeting to be able to start the review as soon as appropriate.



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