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Mobile phone use and seat belt compliance survey 2021

Final report

Document control

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Contents

Executive summary

The main objective of the survey work outlined in this report was to establish the level of compliance with current legislation on mobile phone use by drivers and seat belt use of all vehicle occupants. This is to support the Department for Transport's (DfT) actions to maintain high standards of safety on the road network.

This report presents the methodology used to conduct the 2021 mobile phone use and seat belt surveys. Previous surveys (including in 2017 and 2014) were performed by manual survey techniques by roadside observers. This left a margin for potential human error as there was only one chance to observe the behaviour of vehicle occupants. For the 2021 survey, a new approach was taken by capturing videos at the survey sites (without personnel present during the survey), and later reviewing the videos for non-compliant activities.

This work is necessary because:

- It is illegal to use a **hand-held mobile phone** or similar device in a vehicle, even when stopped at traffic. Driver distraction was identified as a contributory factor in 110 KSIs in 2018 and mobile phone use is a key category in driver distraction.
- There were over 200 people killed and nearly 1,000 serious injuries where vehicle occupants were **not wearing a seat belt** on Great Britain's roads in 2018.

This work extends the surveys conducted on behalf of the DfT since 1988 and therefore provides evidence of non-compliance behaviours when using the national road network.

The survey was carried out across 88 sites throughout England, Wales, and Scotland, on both weekdays and at the weekend. The survey was carried out between September and October 2021 and the data analysis, verification, and validation was completed by June 2022.

1. Introduction

1.1 Project background

The Department for Transport (DfT) performs regular surveys for hand-held mobile phone use and seat belt compliance by drivers and vehicle occupants. This is to capture evidence and understanding of the level of compliance amongst vehicle occupants – for both drivers and passengers.

These surveys started in 1988, with a survey of seat belt usage by vehicle occupants on the national road network. Since 2002, the surveys have included observations of mobile phone use. Prior to the survey presented in this report (2021), the survey was last carried out in 2017 (‘Seat belt and mobile phone use surveys: Great Britain, 2017’, Department for Transport, 7 February 2019).

These regular surveys have previously been conducted using manual recording techniques, in which observers at the roadside record their observations by hand. However, the lessons learnt from the 2017 report highlighted some of the difficulties and limitations of this technique, particularly around consistency, accuracy, and assurance. Therefore a new approach, using high-definition video cameras, was adopted for the 2021 survey.

1.2 Project aim and objectives

The aim of the survey was to provide evidence of driver compliance with hand-held mobile phone legislation by drivers and evidence of seat belt wearing rates of drivers and passengers.

To achieve this, the following objectives were set:

- Perform survey fieldwork at 90 sites across England, Wales, and Scotland before the clocks changed at the end of October 2021.
- Analyse and appropriately weight the survey fieldwork data.
- Independently verify and validate the survey data to provide assurance regarding its completeness, logic, and accuracy.

This work contributes to the DfT's efforts to continue the downwards trend in the numbers of people killed or seriously injured (KSI), which had started to slow in 2017 (see https://www.gov.uk/government/collections/road-accidents-and-safety-statistics for more information).

1.3 Mobile phone use whilst driving

Driver distraction was identified as a contributory factor in 110 KSIs in 2018 (Department for Transport, 2019).

Hand-held mobile phone use is a key category in driver distraction, but drivers can also be distracted in many other ways, such as interacting with other devices, eating, reading, dealing with other passengers (such as children or animals), and applying make-up or shaving.

This section describes the problem related to mobile phone use while driving, and the law that is applied to identify the offence.

1.3.1 Mobile phone use whilst driving: The problem

Research into the use of a hand-held mobile phones while driving has found:

- It increases the risk of being involved in a road crash up to nine times[1].
- Reaction time to hazardous events increases by up to 50% when talking on a hand-held or hands-free mobile[2].
- When sending and retrieving text messages, time spent with the eyes off the road increases by 400%[2].
- Drivers make 140% more incorrect lane changes when texting[2].
- After interacting with an information system such as a phone or other device, it can take nearly half a minute to regain full attention[2].
- Phoning while driving can impair ability to pay attention to the road to an extent comparable to a blood alcohol level of 0.5g/litre (50mg per 100ml), which is close to the drink drive limit (80 mg per 100ml) in the UK[3].
- Dialling and conversing on a hand-held mobile increases the risk of crashes and near crashes to more than 3%[4].
- Mobile phone use by other drivers contributes to driver frustration in customer satisfaction surveys[5].
- 3% of all drivers admit to using a hand-held phone while driving during every journey[6].

[1] https://www.cambsdriveiq.co.uk/mobile_phone_report.pdf

[2] https://trafikverket.ineko.se/Files/sv-SE/10969/RelatedFiles/2007_35_analysis_of_the_literature_the_use_of_mobile_phones_while_driving.pdf

[3] https://www.sciencedirect.com/science/article/pii/S0022437514000310#bb0140

[4] ttps://www.tandfonline.com/doi/full/10.1080/00140131003672023?casa_token=wuc4TUq5OEMAAAAA%3AhWhDJXh4FXLYMblXp19T5osVIo9Ro5CjW_QVpDk1oshDhLw3YH5pxSYoAqGj-QqPL8HG6ozCSgk

[5] https://www.autoexpress.co.uk/car-news/consumer-news/92588/mobile-phone-use-tops-list-of-uk-drivers-biggest-pet-hates

[6] https://www.brake.org.uk/files/downloads/Reports/Direct-Line-Safe-Driving/In-vehicle-distraction-Direct-Line-Safe-Driving-Report-2019.pdf

1.3.2 Mobile phone use whilst driving: The law

At the time of the 2021 survey, the offence of using a hand-held mobile phone was specified as using a hand-held device for ‘interactive communication’. This mainly concerned phone calls, sending text messages, or accessing the internet. The offence carried a minimum penalty of £200 and six penalty points.

The law changed in March 2022 (after the 2021 survey) – it is now illegal to use a mobile phone while driving under almost all circumstances. The new law can be found by visiting https://www.gov.uk/using-mobile-phones-when-driving-the-law. Discussion of these changes were in the public domain during the 2021 survey.

Notably, the law introduced in 2022 was tightened up to reduce ambiguity. It states the law also applies to drivers or riders who are:

- Stopped at traffic lights
- Queuing in traffic
- Supervising a learner driver
- Driving a car that turns off the engine when you stop moving
- Holding and using a device that is offline or in flight mode

The 2017 survey was performed just after a new law had come in to force that doubled the fine (£100 to £200) and doubled the penalty points (3 to 6) for hand-held mobile phone use.

1.4 Seat belt use

Great Britain has some of the highest seat belt compliance figures in the world[1].

It is also one of the countries where the wearing of seat belts, and enforcement of seatbelt laws, has the highest public support. However, there remains a minority of drivers and vehicle occupants who continue to not wear a seat belt.

This section describes the problem related to vehicle occupants not wearing a seat belt, and the law that is applied to identify the offence.

[1] https://apps.who.int/gho/data/view.main.51416

1.4.1 Seat belt use: The problem

In 2017, 98.6% of drivers, 93.1% of front seat passengers, and 90.7% of rear seat passengers were observed using a seat belt.

Yet a determined few who do not use seat belts contribute disproportionately to recorded KSIs:

- The Department for Transport found that 23% of car occupants who were killed in 2019 were not wearing a seat belt[1]. This indicates that car occupants who do not wear a seatbelt are disproportionately likely to be killed in road collisions.
- The level of seat belt compliance as a contributory factor to road fatalities has remained over 20% for the last 6 years[2].
- A study by the Parliamentary Advisory Council for the Transport Safety (PACTS) in 2018, based on data collected by the Police Forensic Collison Investigator (PFCI), concluded that almost a third (31%) of people who died in vehicles in Great Britain were not wearing a seat belt[3].

[1] https://www.gov.uk/government/collections/road-accidents-and-safety-statistics

[2] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/928205/reported-road-casualties-gb-annual-report-2019.pdf

[3] https://www.pacts.org.uk/wp-content/uploads/Report-4.pdf

1.4.2 Seat belt use: The Law

The law in the United Kingdom states you must wear a seat belt if one is fitted in the seat you are using. Full details can be found at https://www.gov.uk/seat-belts-law.

There are very few exemptions from this rule. You do not need to wear a seat belt if you are:

- A driver who is reversing, or supervising a learner driver who is reversing.
- In a vehicle being used for police, fire and rescue services.
- A passenger in a trade vehicle and you are investigating a fault.
- Driving a goods vehicle on deliveries that is travelling no more than 50 metres between stops.
- A licensed taxi driver who is *plying for hire* or carrying passengers.
- Hold a medical exemption. Your doctor may say you don't have to wear a seat belt for a medical reason. They will give you a *Certificate of Exemption from Compulsory Seat Belt Wearing*.

Additionally, the law clarifies that:

- You must wear a seat belt if you are pregnant, unless your doctor says you do not have to for medical reasons.
- You must wear a seat belt if you are a disabled driver or passenger, unless you do not have to for medical reasons. You may need to adapt your vehicle.

A fine of up to £500 can be issued if the vehicle occupant is not wearing a seat belt when they are supposed to. Additionally, the driver can be fined up to £500 if a child under 14 is not in the correct car seat or wearing a seat belt.

1.5 The 2017 survey

The previous survey of mobile phone use and seat belt compliance for the Department for Transport was carried out in 2017 by TRL Limited. The results of the 2017 survey and the methodology used can be found at https://www.gov.uk/government/statistics/seatbelt-and-mobile-phone-use-surveys-2017.

The 2017 survey was conducted using a manual survey approach consistent with the previous survey approaches, with the aim to allow any long term trends to be analysed. The main characteristics of the work were:

- 135 surveys were conducted at 90 different survey locations across England, Wales, and Scotland between 7th October 2017 and 19th June 2018.
- Additions to the approach over previous approaches included observations of driver and rider distraction such as eating or re-configuring satnav systems, and extending the observations to capture data on the mobile phone use of cyclists and motorcyclists.
- The 2017 approach included spot checks, supervisor checks, and post-survey checks. It applied weighting to the survey data to be representative of local and national traffic flows.
- Observations of mobile phones were made at sites with both stationary and moving vehicles.
- Observations for seat belt use were carried out at sites with only stationary vehicles (e.g. waiting at traffic lights).

1.6 The 2021 survey approach

Previous surveys (such as in 2017) used a site-based manual data collection method. This typically involved three individuals recording observations at the roadside (a mobile phone observer, seat belt observer, and a traffic enumerator). Depending on the survey requirements, the observers would either stand still and allow the vehicles to pass them (moving sites) or walk alongside stationary vehicles whilst they waited at traffic lights (stationary sites).

The method in the 2021 survey was designed to match that of the 2017 survey, but with one significant difference: Using video cameras to record the scene and performing the observations back in the office.

This section provides a short overview of the video-based approach, explains why it was used, and gives a comparison with the manual approach.

1.6.1 The 2021 survey approach: Overview

The 2021 survey approach involved a number of changes to the data collection and analysis process:

- Video cameras were used to capture footage at the sites. This use of modern technologies was designed to capture evidence that was consistent, auditable, and repeatable.
- Removing survey personnel from site during the survey periods.
- Performing desk-based video analysis, allowing the analyst to pause and rewind the footage as required.
- Quality assurance was performed by independently analysing the video.
- Using video and video snapshots to demonstrate examples of non-compliance.

Removing the roadside observer and relying on the video footage provided a number of benefits:

- It allowed the recording of mobile phone use and seat belt survey data simultaneously.
- It provided a opportunity to capture vehicle occupants without the risk that the presence of physical observers would change their behaviours.
- It allowed pause and replay the video, enabling the analyst to be more certain of their observations.
- It enabled other analysts or supervisors to watch the same video, to help ensure consistent and accurate information was being logged.

1.6.2 The 2021 survey approach: Comparison to the 2017 approach

The 2021 survey used a video survey method. This created the challenge of ensuring that the process provided comparable data to that captured in the 2017 survey, which used a manual roadside survey method.

The 2021 survey approach was also a test of the feasibility of a video-based survey for future surveys.

A pilot survey involving the use of the 2017 and 2021 survey methodologies side-by-side was planned to provide a comprehensive comparison. However, the first attempt to perform this pilot was unsuccessful: the video system provided poor quality images due to very heavy rainfall and unsuitable camera setup. Further opportunities to carry out the comparison were not carried out by the sub-contractor despite the Department for Transport's request.

An evaluation of the two methods shows that generally the video survey method compares well to the manual survey method and provides data that allows comparison. The video survey method is an improvement over the manual survey method regarding total cost, flexibility, and most crucially, auditability. The manual survey method continues to hold the advantage in industry maturity.

1.6.3 The 2021 survey approach: Implications for the change

By adopting the video survey method for the 2021 survey it was apparent there are some implication for a change in survey method. The primary examples are:

- The survey technique at the stationary sites differed between 2017 and 2021. The cameras were in a fixed location at the survey sites in 2021. During the stationary site surveys in 2017, the surveyors walked along the queuing traffic to make observations. For the 2021 survey the video analysts waited for the vehicles to pass the camera (the same technique was used for both moving and stationary site surveys in 2021).
- It was easy to provide assurance regarding survey quality during the 2021 survey, and no sites required re-visits. However, the video quality during some surveys was not considered good enough and alternative samples were sought from similar site types.
- The visibility of rear seat passengers is severely compromised using the video survey method. The 2017 survey methodology noted this was a small issue for the manual survey method (for instance, due to window tints) and it may become more difficult in the future. The position of the video cameras for the 2021 survey resulted in a small sample of rear seat passenger observations.

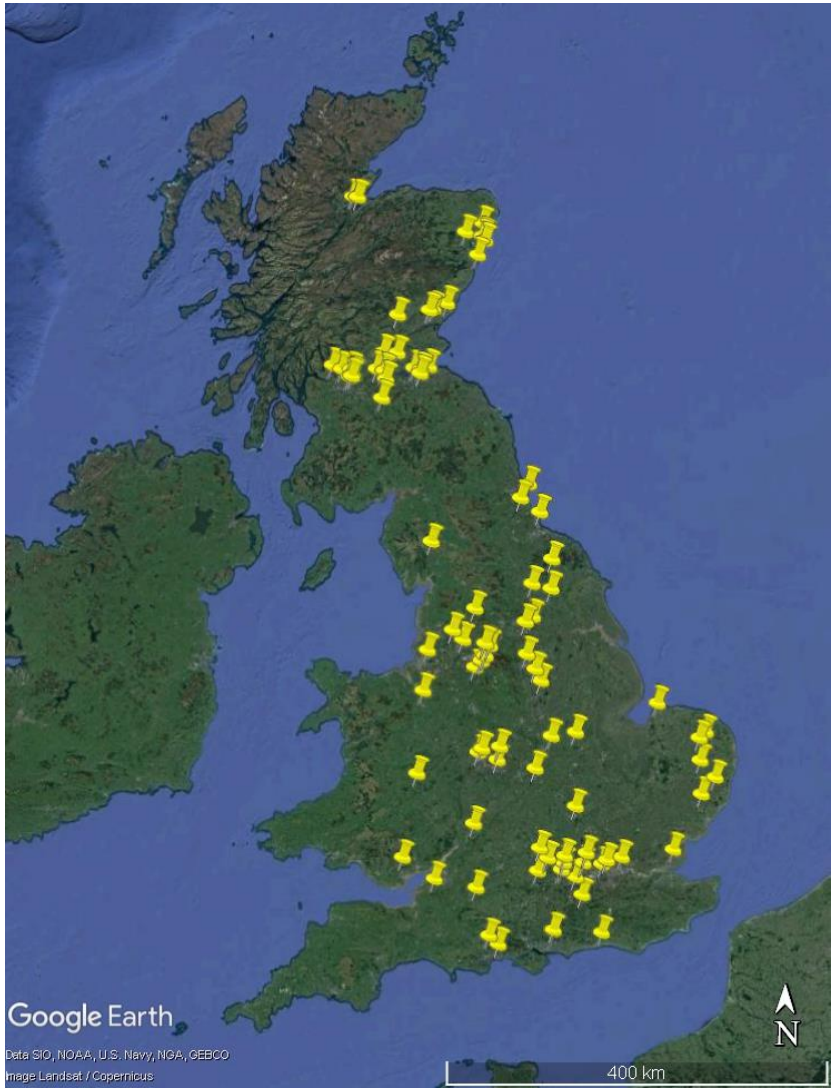
2. Survey methodology

2.1 Survey methodology introduction

This section describes the process of how the survey work was performed. Specifically it details:

- **Survey site selection**. How, why, and which sites were selected.
- **Survey data requirements**. The types and categories of data required.
- **Survey fieldwork**. The methods used and activities performed to collect the data.
- **Surveyor and analyst training**. Training given to all personnel.
- **Survey video analysis**. The methods and processes followed to perform the desk-based analysis.
- **Survey validation**. The activities performed to validate the survey data and analysis.

The structure of the methodology was driven by the need to provide a comparison to the surveys carried out in 2017, whilst also demonstrating the feasibility of using a video-based approach for future surveys.



2.2 Survey site selection

The Department for Transport provided a list of sites requiring survey, matching those used for the 2017 survey. Ninety sites were given, providing a geographical spread of road types of Great Britain: Urban and rural, major and minor.

The standard requirements for all survey sites were:

- Safe pedestrian access.
- Safe standing at the survey location (at least one metre away from moving traffic) for manual surveys OR the availability of street furniture to safely attach video systems.
- Clear visibility (lighting, weather conditions, pollution).
- Adequate traffic flow.

Motorway sites were excluded for four reasons:

- It is physically difficult to access.
- The positioning of surveyors or video cameras is critical to provide clear views of vehicles at higher speeds.
- There are no stationary vehicles.
- There is a high risk to surveyors.

For the 2021 approach, the site surveyors were required to be able to safely access each site and set up the video recording equipment. Road side furniture had to be present to provide a platform for the video systems, located at least 1 metre away from moving traffic.

2.2.1 Survey site selection: Stationary and moving sites

As per the 2017 survey, a combination of stationary and moving sites were used.

- ***Moving sites*** require surveys of moving vehicles. They are in locations where the traffic typically flows and there are no stationary or queuing vehicles. The surveyor remains still as the vehicles drive past them.
- ***Stationary sites*** require surveys of stationary vehicles, such as those waiting at traffic lights. The surveyor waits for the vehicles to stop and then walks alongside the queuing traffic to make observations.

Due to the 2017 survey approach, there were twice as many stationary sites as moving sites, as the number of vehicles typically counted during the manual approach is higher at moving sites.

The video-based approach used for the 2021 survey effectively meant that all vehicles could be observed whilst stationary (by pausing the video) and the video was fixed in a single location (like the surveyor for moving sites).

However, the same sites and requirements were required to allow a comparison to behaviour in 2017 to be made.

2.2.2 Survey site selection: Survey site categories

The 2021 survey involved 135 surveys at 90 sites (as 45 sites required a survey both on a weekday and at the weekend). There were eight different site categories, differentiated by:

- ***Location***
  (England and Wales, or Scotland).
- ***Time***
  (Weekday or weekend).
- ***Site type***
  (Vehicles are stationary, i.e. at traffic lights, or moving).
  - ***Stationary*** record hand-held mobile phone use, seat belt compliance, and traffic count.
  - ***Moving*** record hand-held mobile phone use and traffic count.

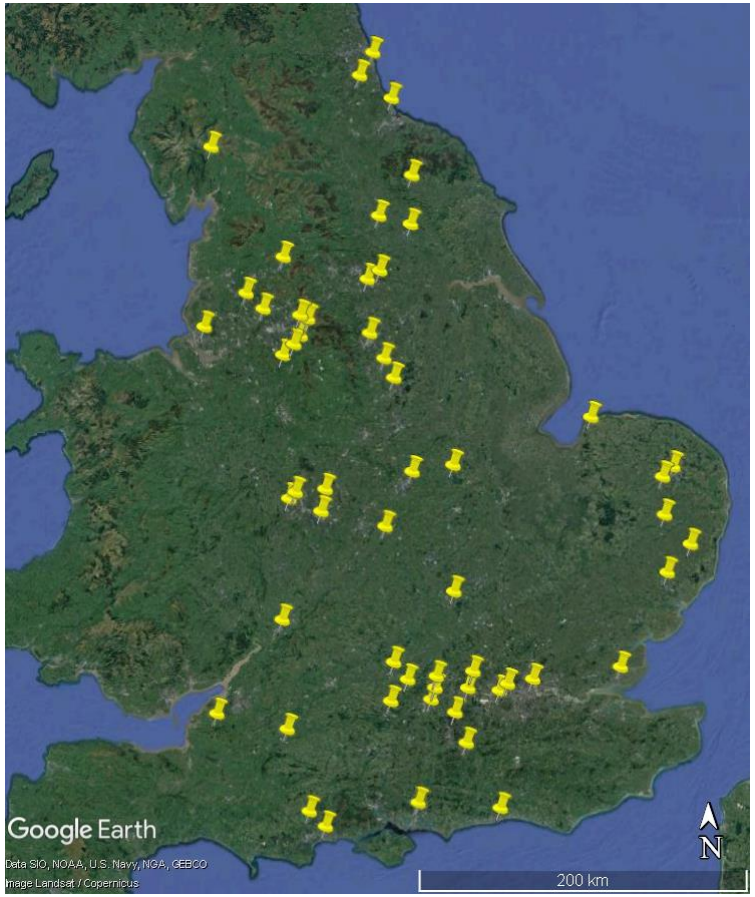
The table to the right summaries the site categories and lists the number of surveys required for each.

Site category	Location	Time	Site type	Survey type & no.			Total site visits
				Mobile phone	Seat belt	Traffic count	
SV1	England and Wales	Weekday	Stationary	☑ 40	☑ 40	☑ 40	40
SV2			Moving	☑ 20	☐	☑ 20	20
SV3		Weekend	Stationary	☑ 20	☑ 20	☑ 20	20
SV4			Moving	☑ 10	☐	☑ 10	10
SV5	Scotland	Weekday	Stationary	☑ 20	☑ 20	☑ 20	20
SV6			Moving	☑ 10	☐	☑ 10	10
SV7		Weekend	Stationary	☑ 10	☑ 10	☑ 10	10
SV8			Moving	☑ 5	☐	☑ 5	5
						Total	135

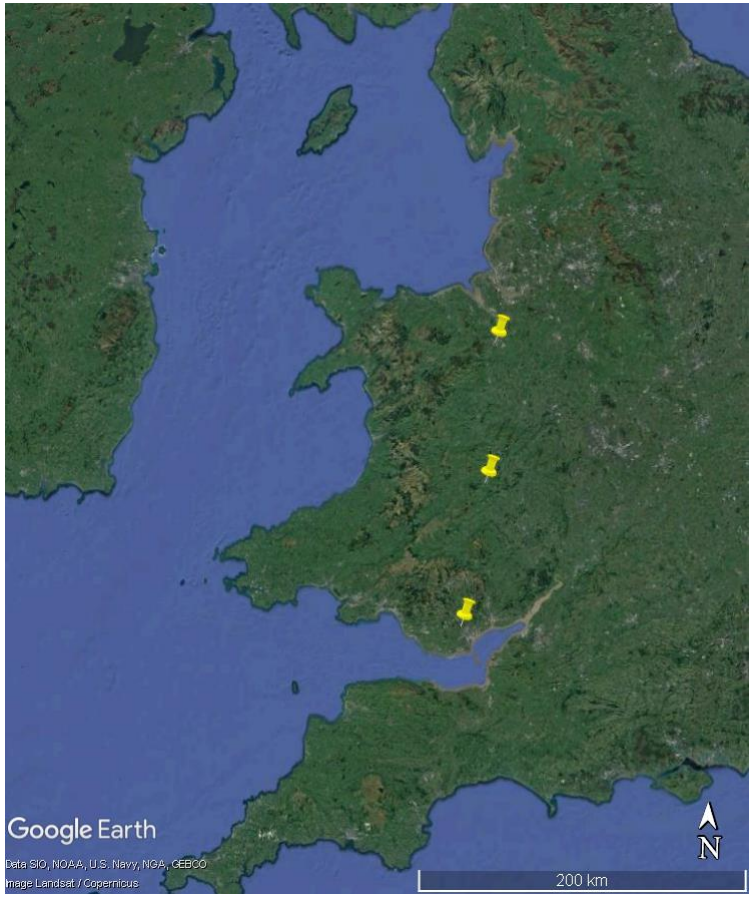
2.2.3 Survey site selection: Survey site locations

The survey site locations were spread throughout Great Britain. The images below show the locations of the sites in England, Wales, and Scotland. A detailed list of the sites can be found in Appendix B.

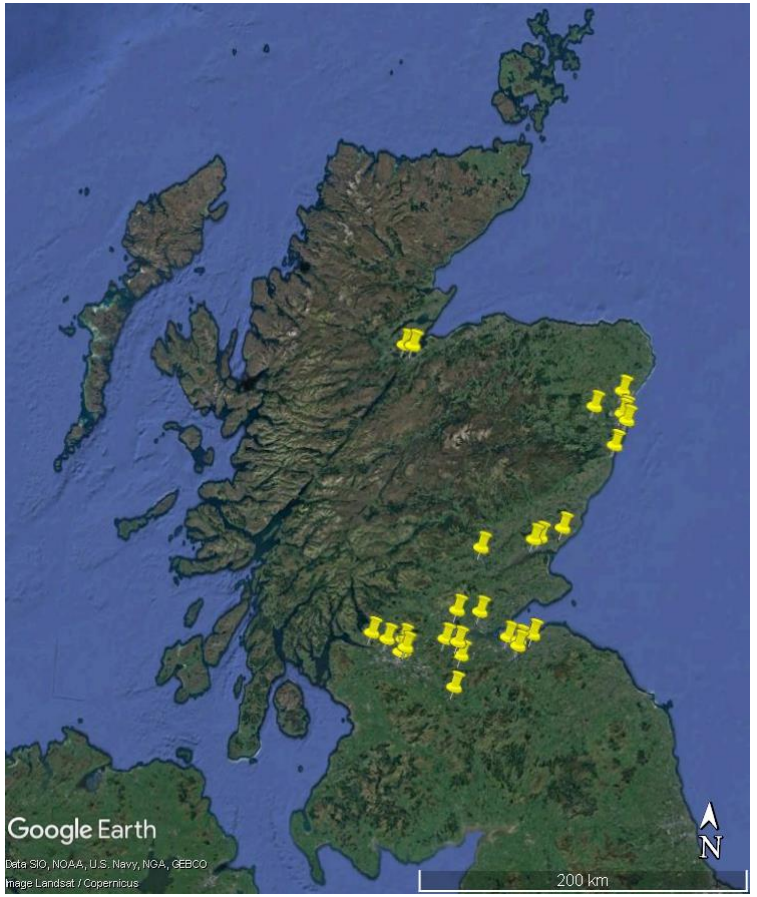
Survey sites in England



Survey sites in Wales



Survey sites in Scotland



2.3 Survey data requirements

The survey data requirements replicate those captured during the previous survey in 2017, with the addition of the presence of passengers during all mobile phone use surveys (moving and stationary sites). Recording vehicle speed compliance during the surveys was found to be difficult and unreliable, and is not included in the results.

The table opposite provides a summary of the data required for the mobile phone use and seat belt compliance surveys. The categories for each data requirement are provided in Appendix A. (Note: The categories for some data types differ for each survey type).

Alongside each of these surveys, a traffic count survey was also required.

Ref	Data		Mobile phone survey		Seat belt survey
			Stationary	Moving	Stationary
Start of each survey day					
T1	Date		☑	☑	☑
Start of each survey session					
S1	Site number		☑	☑	☑
S2	Session number		☑	☑	☑
S3	30 minute period (e.g. 0900-0930)		☑	☑	☑
S4	Video installer		☑	☑	☑
S5	Analyst (reviewing the video)		☑	☑	☑
S6	Observation conditions		☑	☑	☑
Vehicle details					
V1	Vehicle	Type	☑	☑	☑
V2		Colour	☑	☐	☑
Occupant information					
D1	Driver only	Hand-held mobile phone use	☑	☑	☐
D2		Sex	☑	☑	☑
D3		Age group	☑	☐	☑
D4		Seat belt use	☐	☐	☑
D5		Passengers present	☑	☑	☐
P1	Passengers	Seating position (inc. on lap)	☐	☐	☑
P2		Sex	☑	☑	☑
P3		Age group	☑	☐	☑
P4		Seat belt use	☐	☐	☑
P5		Other notable observations	☑	☑	☑

2.4 Survey fieldwork

This section presents the fieldwork data collection methods used and an overview of the equipment.

The survey fieldwork needed to be completed before the 30th October 2021 (when the clocks changed from BST to GMT) to be consistent with previous surveys. In the event, all fieldwork was completed by 25th October 2021.

The fieldwork was required to cover a range of sites across different geography, road type, time of day, and time of week, as described in Sections 2.2 and 2.3.

This section describes:

- Site pre-screening
- Fieldwork planning
- Survey equipment
- Pre-survey fieldwork
- Post-survey fieldwork and data retrieval

2.4.1 Survey fieldwork: Site pre-screening

The sites were pre-screened to identify those that may not have been feasible for the 2021 survey. For example, where there were roadworks or safety risks that could not be mitigated effectively. This was done using:

- Google Earth and Google Street View.
- Traffic management and roadworks planning databases.
- Contact with local authorities and local knowledge.

A pre-survey site inspection was not performed in advance of the survey site visit. This was deemed inefficient and unnecessary as 2021 approach was not to use observers positioned at the roadside. Instead, the survey site team were instructed to attend the site, perform a site inspection and risk assessment, and install the video systems if the site was deemed suitable. This was possible as the survey personnel are experienced technicians regarding the installation of video systems for traffic surveys. The video system can be programmed to record video for a specific period, allowing sites to be visited several days in advance of the survey date.

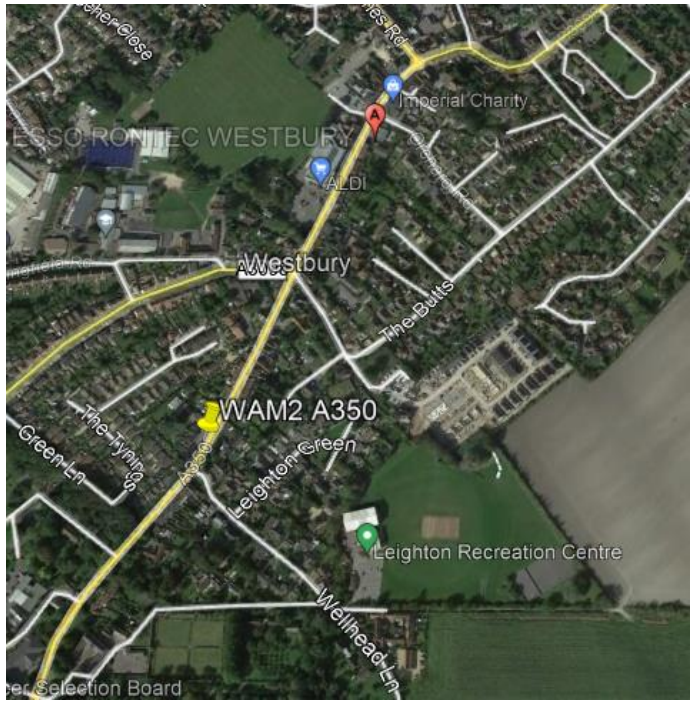
Any issues identified when arriving at the site for the first time could be reported to the survey coordinator and a repeat visit performed if necessary.

In the event, no sites were deemed unsuitable and video systems were installed at the same time as the site inspection.

2.4.2 Survey fieldwork: Fieldwork planning

The sub-contractor developed a risk assessment based on existing practice (installing video systems for traffic surveys). This considered all survey operatives, road users, and pedestrians prior to installation, during the recording of data, and during decommissioning.

The sub-contractor contacted all local authorities in advance of the survey to inform them of their intention to perform the survey work on behalf of the Department for Transport and to obtain the necessary permissions for placing video equipment at the roadside (if applicable). Where there was no response from the authorities, the sub-contractor continued with the survey work as would be normal for traffic surveys and managed any subsequent engagement (such as retrospectively purchasing permits).



The following activities were performed prior to any survey work:

- Providing notice to relevant local authorities, police forces, and key local residents of the intension to carry out the survey work.
- Confirming the type of equipment required and available street furniture in the area (using remote site inspection, primarily Google StreetView).

2.4.3 Survey fieldwork: Equipment

The following camera equipment was used by the sub-contractor:

- Dome camera providing a wide-angle view (Sony 2.1MP 1080p Starvis back-illuminated CMOS sensor).
- Regular lens mini-HD camera with built-in DVR providing a zoomed-in view of the vehicle interior.

The cameras were attached to street furniture identified during the pre-survey planning (an example is shown to the right). Depending on the site characteristics, they were set at different heights and angles to maximise the view of vehicle occupancy and ppositioned to ensure all lanes in the direction of the survey could be observed.

The cameras were programmed to record video for pre-determined periods.

Other equipment used by the sub-contractor included:

- Smartphone for communication and site situation capture.
- Padlocks and Tamtorque fixings.
- Ladder.
- Vehicles for transport to/from site.
- Temporary traffic management equipment.
- Back up equipment (cameras, batteries and chargers, fixings).

2.4.4 Survey fieldwork: Pre-survey fieldwork

The sub-contractor travelled to the site to perform a site inspection and install the video equipment. Multiple video systems were available allowing surveys to be carried out simultaneously at different locations. The site installation was commonly up to 24 hours in advance of the survey time.

The following actions were completed prior to departure to sites:

- The Survey Coordinator briefed all personnel to ensure familiarity with the plan and routes to the sites.
- They also performed a review of local site conditions the day before survey work was carried out (such as weather, traffic and roadworks, road closures, and local news). The survey team were instructed to install the camera systems at locations that would capture a suitable flow of traffic. Some of the challenges faced are described in Section 2.4.7.

On arrival at the site, the survey personnel:

- Reviewed the site assessment and checked the information was still valid.
- Notified the Survey Coordinator as to whether the assessment was still valid, and the site was suitable for survey and provided any detail regarding re-assessment.
- If the assessment or re-assessment allowed, they continued to set up the survey equipment.
- Tested all equipment before installation. Spare equipment and batteries were carried. Where equipment was to be left unattended, it was secured with padlocks and Tamtorque fixings.
- Left the video systems in-situ to record video for programmed survey periods. For instance, this included capture on weekdays and weekends. The equipment included contact notices should anyone need to raise issues about the survey whilst the surveyors were absent. No such communications were received.

2.4.5 Survey fieldwork: Video system set up

The exact position of the observation staff in 2017 was unknown, but for most sites this was intuitive due to the position of a layby or traffic lights. The exact location for the 2021 survey was determined by the availability of lighting columns or other street furniture to attach video systems, as well as the direction and volume of traffic flow. The examples shown here give a view of the survey location taken from Google StreetView (left, showing the available street furniture to attach the video system) and a screenshot from the video captured during the 2021 survey (right).

Moving site, Lake District

Stationary site, south Norfolk

2.4.6 Survey fieldwork: Post-survey fieldwork and data retrieval

At the end of the data collection period, the sub-contractor returned to the site, performed a spot-check to make sure images had been recorded, removed the video equipment, and restored the site.

In the event of any issues (for example, theft or damage to equipment), the survey would have been repeated, but no such issues arose.

The following tasks were then carried out:

- Video was returned to the office, downloaded from the SD cards and uploaded to a secure server.
- All video files were sorted by project number, site location, survey date, and survey session.
- The video was checked for data validity, completeness, clarity, and screened for use in video analysis.
- The sub-contractor informed the consultant of completion of data collection.
- The video data was shared with the consultant for purposes of survey validation (this was completed before the start of any analysis).

Some of the external challenges faced during the survey fieldwork are described in Section 2.4.7 and specific issues related to the video survey method are described in Section 2.4.8.

2.4.7 Survey fieldwork: Survey fieldwork external challenges

The 2021 survey fieldwork was carried out in September and October 2021. The following unusual events occurred that required additional planning and consideration:

- The fuel supply crisis in September (an issue due to a shortage for surveyor vehicles as well as potential queuing at fuel stations close to survey sites). This required the survey fieldwork teams to set off early to the sites to allow additional time to find fuel stations with supply.
- The COP26 United Nations Climate Change Conference in Glasgow, from the 31st October. The survey teams amended the survey plan to complete any affected surveys in the locality well in advance.
- Heavy and persistent rain causing flooding in October 2021 in Scotland and northern England. This occurred between the 26th and 29th October. The survey teams ensured all survey work was completed by the 25th October, although poor weather in the week before did affect the video quality at some sites.

2.4.8 Survey fieldwork: Video-based approach challenges

The video survey approach provided a number of benefits, but also introduced new challenges. Three examples are provided below. This meant that some surveys could not be reviewed fully or had more unknown observations.

Heavy **rainfall** brought reduced light and reduced windscreen transparency. The images below show screenshots from the same survey.

The video systems were not configured to adjust adequately to **changing light conditions**. The images below show screenshots from the same survey.

The video angle could pick up **glare on windscreens**. The images below are from different surveys.

2.4.9 Survey fieldwork: Summary of fieldwork

The survey fieldwork teams visited 90 sites and set up 135 surveys (as some sites required surveys on weekdays and weekends). During the post-survey video assessment, videos from two sites were found not to be useable: LS11 (poor video quality and heavy rain) and SM6 (corrupted data card). This resulted in 88 valid sites and 131 separate surveys for the 2021 survey.

The survey fieldwork was required to be completed before the end of October 2021 and the change in time from BST to GMT. The final survey was recorded on the 25th October 2021.

The video quality varied across the survey sites (and often during the survey period), as demonstrated in Section 2.4.7. A useful indicator for this was the ability of the video analyst to be able to determine the sex of the driver. If this could not be done, the sex was recorded as code 99 (unknown). The table below shows the number of surveys where this indicator was high. Eleven surveys were found to have a percentage of code 99s for driver sex over 30%, including three surveys where it was over 50%.

% of code 99s for driver sex	Number of surveys	Notable sites
> 50%	3	SM4, SM5, SM10
40% to 50%	1	WS11
30% to 40%	7	
20% to 30%	12	
10% to 20%	26	
< 10%	82	

2.5 Survey video analysis

Observation of the survey videos was started in November 2021, after all the fieldwork was completed.

The sub-contractor performed the first pass of the analysis, capturing the observations in a spreadsheet and capturing screenshots of non-compliance.

The consultant's role was to provide quality assurance and validate the survey data. This originally involved independently analysing a smaller sample of the video from each site, although following a review it was amended to include a complete check of all records.

This section provides a high-level overview of the video analysis process, the criteria for selecting a sample of video, the typical setup, the quality assurance process, and the steps involved in the survey data validation.

SITE INFORMATION											VEHICLE DETAILS		DRIVER						FRONT SEAT PASSENGER (A)		
No.	WEEKDAY	STATIONARY / MOVING	DATE	Time	SITE NUMBER	SESSION	START TIME	STAFF ON SITE	STAFF ANALYSIS	CONDITIONS	VEHICLE TYPE	VEHICLE COLOUR	DRIVER MOBILE PHONE	COLUMN NOT IN USE	DRIVER SEX	DRIVER AGE	DRIVER RESTRAINT	PASSENGERS?	FSP(A) SEX	FSP(A) AGE	FSP(A) RESTRAINT
239	7	S	09/10/21			2	1400-1430	N/A	N/A	5	1	Silver	2		2	6	1	0			
240	7	S	09/10/21			2	1400-1430	N/A	N/A	5	1	White	0		2	6	1	0			
241	7	S	09/10/21	14:03:34		2	1400-1430	N/A	N/A	5	1	Black	6		1	6	1	0			
242	7	S	09/10/21			2	1400-1430	N/A	N/A	5	1	Grey	0		2	5	1	1	2	5	1
243	7	S	09/10/21	14:04:13		2	1400-1430	N/A	N/A	5	1	Black	0		2	6	2	1	1	6	1
244	7	S	09/10/21			2	1400-1430	N/A	N/A	5	1	Black	0		1	6	1	1	2	6	1
245	7	S	09/10/21			2	1400-1430	N/A	N/A	5	1	Black	0		1	6	1	0			
246	7	S	09/10/21			2	1400-1430	N/A	N/A	5	1	Black	0		1	6	1	1	2	7	1
247	7	S	09/10/21			2	1400-1430	N/A	N/A	5	1	Blue	0		2	6	1	0			
248	7	S	09/10/21			2	1400-1430	N/A	N/A	5	1	Black	0		1	5	1	0			
249	7	S	09/10/21	14:05:45		2	1400-1430	N/A	N/A	5	1	Grey	0		2	6	1	1	1	5	1
250	7	S	09/10/21			2	1400-1430	N/A	N/A	5	1	Silver	0		2	6	1	0			
378	7	S	09/10/21	14:31:14		3	1430-1500	N/A	N/A	5	6	Silver	0		1	6	99	1	2	6	1
379	7	S	09/10/21			3	1430-1500	N/A	N/A	5	1	White	0		1	6	1	0			
380	7	S	09/10/21			3	1430-1500	N/A	N/A	5	1	Blue	0		2	6	1	0			
381	7	S	09/10/21			3	1430-1500	N/A	N/A	5	1	Silver	0		1	6	1	0			
382	7	S	09/10/21			3	1430-1500	N/A	N/A	5	1	Black	0		1	99	1	1	1	5	1
383	7	S	09/10/21			3	1430-1500	N/A	N/A	5	1	Red	0		2	5	1	0			
384	7	S	09/10/21			3	1430-1500	N/A	N/A	5	1	Green	0		1	6	1	1	1	5	1
385	7	S	09/10/21			3	1430-1500	N/A	N/A	5	1	Red	0		1	7	1	0			
386	7	S	09/10/21			3	1430-1500	N/A	N/A	5	1	Grey	0		1	6	1	1	2	6	1
387	7	S	09/10/21			3	1430-1500	N/A	N/A	5	1	Black	0		1	6	1	0			
388	7	S	09/10/21			3	1430-1500	N/A	N/A	5	1	Blue	0		1	6	1	0			
389	7	S	09/10/21			3	1430-1500	N/A	N/A	5	1	Silver	0		1	6	1	0			
390	7	S	09/10/21			3	1430-1500	N/A	N/A	5	1	Black	0		1	6	1	0			
391	7	S	09/10/21			3	1430-1500	N/A	N/A	5	4	Black	0		1	5	1	0			
392	7	S	09/10/21			3	1430-1500	N/A	N/A	5	1	Silver	0		1	6	1	1	1	6	1
393	7	S	09/10/21			3	1430-1500	N/A	N/A	5	1	Black	0		2	5	1	0			
394	7	S	09/10/21			3	1430-1500	N/A	N/A	5	1	White	0		2	6	1	1	1	4	5
395	7	S	09/10/21			3	1430-1500	N/A	N/A	5	1	Blue	0		2	6	1	0			
396	7	S	09/10/21			3	1430-1500	N/A	N/A	5	7	Black	0		1	6	1	0			
397	7	S	09/10/21			3	1430-1500	N/A	N/A	5	1	White	99		99	99	99	0			
398	7	S	09/10/21			3	1430-1500	N/A	N/A	5	1	Blue	0		1	6	1	1	2	6	1
399	7	S	09/10/21			3	1430-1500	N/A	N/A	5	1	Red	0		1	5	1	0			
400	7	S	09/10/21			3	1430-1500	N/A	N/A	5	1	Grey	0		2	6	1	1	2	5	1
401	7	S	09/10/21			3	1430-1500	N/A	N/A	5	1	Grey	0		2	5	1	0			
402	7	S	09/10/21			3	1430-1500	N/A	N/A	5	1	Blue	0		1	6	99	0			
403	7	S	09/10/21			3	1430-1500	N/A	N/A	5	1	Blue	0		1	6	1	1	2	7	1
404	7	S	09/10/21			3	1430-1500	N/A	N/A	5	1	Red	0		2	6	1	0			
405	7	S	09/10/21			3	1430-1500	N/A	N/A	5	4	Black	0		1	6	1	1	2	6	1
406	7	S	09/10/21	14:34:32		3	1430-1500	N/A	N/A	5	1	White	0		2	6	1	0			
598	7	S	09/10/21			4	1500-1530	N/A	N/A	4	1	White	0		1	5	1	1	2	5	1

2.5.1 Survey video analysis: High-level process

Once the video was downloaded and prepared for analysis, the video analysts completed the following steps:

- Videos were extracted and analysed to check they would meet the survey requirements.
- A traffic count of the whole survey period in all lanes of the survey direction was performed.
  - During this count, the video analyst would highlight any issues such as traffic congestion or other issues which may make the analysis of mobile phone and seat belt use difficult.
- An appropriate sample size for the mobile phone and seat belt use surveys was determined. The sample was made from observations taken for a calculated length of time from the start of each 30min period of the survey, to at least match the sample size of the 2017 survey for each site. An example is shown in Section 2.5.2.
- The video was then re-watched to capture the mobile phone and seat belt data.
  - The data was recorded in an Excel spreadsheet following the same format as the 2017 survey.
  - Where non-compliance was observed (regarding mobile phone use or seat belt wearing) a video screenshot was captured.
- Data was self-checked by the video analyst for completeness.
- Any issues identified in the video analysis were immediately raised with the Survey Manager.

2.5.2 Survey video analysis: Sample size

The survey fieldwork provided almost 600 hours of video, during which 206,021 vehicles passed through the sites. Comparison with previous surveys needed around 65,000 vehicles to be observed and information captured about mobile phone use and seat belt compliance. However, the 2021 sample also needed to match the sample captured from 2017 regarding weekday/weekend, country, major or minor road, and urban or rural location.

As a starting point, the total number of observations made at each site in 2017 was used as a target for the 2021 survey (plus 10% to account for the expected unknown observations). The traffic count was divided by the 2017 survey total for each site to determine the proportion of vehicles requiring observation for the 2021 survey. This proportion was observed from the start of each half hour of the 2021 survey period to ensure a spread of observations throughout the entire period (and not just sampled from the start).

Once the first pass of the video analysis was completed, it was clear that changes in traffic flow and challenges with video quality at the survey sites resulted in some over-sampling and some under-sampling of certain site types. This was reviewed and additional observations were made from some sites to ensure the sample size for each type was sufficient.

There are some notable differences in the samples collected between 2017 and 2021. The 2017 survey has a bias for morning sessions and the 2021 survey has a bias for afternoon sessions (the ratio is approximately 2:1 in each case). There was no requirement made for an even split in the survey requirements, hence the survey fieldwork teams programmed video capture for convenience in deployment and video analysts selected video sessions based on best available video quality. Further details on the sample can be found in the data validation in Section 3.2 and a full list of the site information can be found in Appendix B.

2.5.3 Survey video analysis: Setup

The images below show the typical setup used by the video analyst. The video was played on one display screen and the spreadsheet was edited on a separate screen.

2.5.4 Survey video analysis: Quality assurance

The following activities were planned to provide validation of the survey fieldwork and analysis:

Site visits

The consultant would perform spot checks during survey fieldwork to assess whether the process was being followed safely, accurately, and as designed.

Sub-contractor independent checking

Regular independent checking to ensure consistency and accuracy. A secondary analyst to repeat periods of analysis in isolation from the primary video analyst. Survey Manager to compare the results and addressed any issues.

Consultant parallel video analysis

The consultant to perform parallel video analysis of 10% of all planned surveys, independent from the sub-contractor analysis. (Note: due to uncertainties regarding the 2021 survey results, eventually all survey data was reviewed).

Consultant review

All survey data subject to a desk-based check. Including data completeness, accuracy, data logic, and survey procedure. Video snapshots of all instances of non-compliance to be reviewed.

During the video analysis process the following amendments were made:

Site visits

The consultant attended one site where a video-based survey was being performed and assessed whether the process was being followed safely, accurately, and as designed.

Sub-contractor independent checking

The Survey Manager provided regular checks for consistency and logic. Repeat analysis of the entire dataset was required following feedback from the consultant.

Consultant parallel video analysis

The consultant performed the independent analysis of 10% of planned surveys. However, due to uncertainties regarding the 2021 survey results, eventually all survey data was re-analysed by the consultant.

Consultant review

All survey data was subject to a desk-based check.
All instances of non-compliance, including the video snapshots, were reviewed during the complete re-analysis by the consultant.

2.5.5 Survey video analysis: Validation

The survey data was checked by the consultant for data completeness, logic, and accuracy. A checklist was developed as shown below, and used to assess the data from each of the 131 surveys. The results of this analysis can be found in Section 3.2.

Validation area	Checklist item	
Data completeness	Does the data match the survey session?	☑
	Is the survey metadata complete (conditions, time, site name, etc)?	☑
	Is the site sample size adequate?	☑
	Is the data in the correct format (e.g. date, time)?	☑
	Is there missing data?	☑
Data logic	Are comments relevant to session?	☑
	Are there data conflicts (e.g. adults in child seats)?	☑
	Is the dataset unique?	☑
	Is the traffic count greater or equal to the count in previous surveys?	☑
	Are there any obvious outliers?	☑
Data accuracy	Are overall site data values valid (e.g. within sensible thresholds)?	
	Mobile phone use	☑
	Driver seat belt compliance	☑
	Driver age	☑
	Driver sex	☑
	Front seat passenger seat belt compliance	☑
	Is the comparison with the QA data satisfactory?	☑
	Is data correct for random checks of vehicles (compliant and non-compliant)?	☑
	Is the false positive rate acceptable? (% miss-identified)	☑
	Is the false negative rate acceptable? (% missed)	☑

2.6 Training

The approach used for the 2021 survey was based on established use of video cameras to capture imagery during traffic surveys. This process is well established, and the sub-contractor had existing procedures and personnel familiar with the requirements of completing such survey fieldwork.

The process of reviewing the video images for identifying non-compliance behaviour inside the vehicle was relatively new. Training and guidance was developed to ensure all video analysts were capturing the correct data, accurately and consistently.

This section describes the training provided to the fieldwork surveyors and the video analysts.

2.6.1 Training: Fieldwork surveyor training

A core team of fieldwork surveyors led by the Survey Coordinator undertook the survey work. As the 2021 survey used a video-based approach, the number of fieldwork surveyors (those required to visit survey sites) was comparatively small compared to the 2017 survey. The 2021 surveyors were also permanent employees of the sub-contractor, whose day-to-day job involved setting out video systems for similar surveys, such as traffic surveys. This ensured consistency in the fieldwork process, as the personnel were fully trained in their respected roles and knowledgeable about the survey purpose. The Survey Coordinator provided a briefing to the surveyors including:

- An induction to the project.
- Confirmation that surveyors were fit to complete the training and survey fieldwork.
- A discussion to brief participants about the survey, its purpose, an outline of the survey methodology, the equipment to be used, and the proposed survey scheduling.
- Details of survey performance requirements (including data quality and data quantity).
- An understanding of the common risks and how to mitigate them.
- Communication and escalation processes.

The survey fieldwork personnel were expected to follow the sub-contractor’s Health and Safety Manual.

2.6.2 Training: Video analyst

A key advantage of using a video-based approach is that video can be paused, slowed down, or replayed easily. It can also be viewed by many different people if required. These aspects were used to build consistency in the video analysis.

It is possible for different people to observe the same video and determine the categories differently (for example, a 30 year old male could appear to one observer as aged just under 30, and to another observer as just over 30). The sub-contractor produced guidance documents containing video snapshot examples across the various categories.

The sub-contractor and the consultant also performed various practice sessions and arranged for different analysts to slightly overlap analysis to allow consistency to be measured. Analysts were also encouraged to share knowledge around edge cases (such as drivers whose sex may be difficult to determine).

The following pages demonstrate the collective guidance created throughout the video analysis process. The guidance is focused on the data types of vehicles, sex, age, mobile phone use, and restraints.

2.6.3 Training: Video analysis category guidance (vehicles)

Category	Vehicle type	Example	
1	Car		Light vehicles including campervan, MPVs (less than 8 passengers), limousines, and light vehicles towing trailers.
2	Taxi		Hackney carriages or taxis that can be hailed or flagged down (typically have the word Taxi prominently displayed).
3	Private hire		Vehicles available for private booking only. Vehicles marked with private hire plates or text advertising private hire services.
4	Light goods vehicle		Goods vehicles with design gross vehicle weight not exceeding 3500Kg. Inc. pickup and car-based vans with rear windows panelled out.
5	Medium and heavy goods vehicle		Goods vehicles with design gross vehicle weight exceeding 3500Kg and having 2 or 3 axles (MGV) or 4 or more axles (HGV).
6	Buses / coaches		Any number of axles, with a capacity to carry 8 or more passengers
7	Motorcycle		A two- or three- wheeled motor vehicle. Including street, off-road, and dual purpose bikes, as well as scooters and mopeds.
8	Pedal cycle		Pedal cycles (including electrically assisted), with two wheels.

2.6.4 Training: Video analysis category guidance (sex)

Category	Sex	Example	Typical characteristics
1	Male	   	Seating position is lower and further from steering wheel; hand resting on top of steering wheel; beard or stubble; sports clothing; colour shirt; prominent Adam's apple.
2	Female	   	Head lower in vehicle; Low cut tops or vests; long hair and pony tails; wearing scarf; seat belt positioned between breasts and closer to neck; wearing blouse.
99	Unable to see	  	Windscreen is opaque; face is not visible and no other features offer clues.

2.6.5 Training: Video analysis category guidance (age)

Category	Age	Body shape	Skin and hair	Clothing	Accessories & other clues
1	Baby (<1)	Average height up to: 2ft 5in (75cm)		Likely to be wearing body grows or sleep suits. May have dribble bib or pacifier (dummy).	Most likely in a rear facing child seat.
2	Toddler (1-4)	Average height between: 2ft 5in (75cm) and 3ft 7in (108cm)		Common for clothing to have cartoon characters or bold colours.	Most likely in a forward facing child seat with heavy bolsters and slightly reclined.
3	Young child (5-9)	Average height between: 3ft 7in (108cm) and 4ft 6in (138cm)		May be wearing primary school uniform.	Most likely in a forward facing child seat with light bolsters and using vehicle seat belt.
4	Older child (10-13)	Average height between: 4ft 6in (138cm) and 5ft 3in (160cm)		School uniform may include jacket or tie.	Most likely using a booster seat or no child seat.
5	Younger (14-29)	As age increases: - Body gets bigger, but arms do not (loss of muscle mass). - Stomach begins to bulge more. - Body stiffness increases. - Nose and ears become larger.	As age increases: - Skin gets less firm, sags around the face, gets more lines (wrinkles), less plumpness (bones and veins become more pronounced), and more sun damaged (darker and patchy). - Hair line recedes, more grey hairs, hair styles become more conservative, and hair becomes more dry.	- Young people more likely to be wearing sports clothing. - Working age people may be wearing work clothes (high vis jackets, uniform, etc). - Older people more likely to wear a jacket. - Younger people tend to wear more fashionable clothing.	As age increases: - More likely to wear glasses. - More likely to wear rings and jewellery. Certain vehicle types are more common.
6	Middle (30-59)				
7	Older (60+)				
99	Unable to see	There is a person present, but no distinguishing features can be seen. For instance, the vehicle interior is too dark or the view is obscured.			

Research into estimating age has found: Young people tend to be judged as older, and old people tend to be judged as younger; the order in which estimates are made is important (after viewing an older person, the observer is more likely to overestimate the age of the next person) – this is more pronounced when the image is low quality; guesses are incorrect by an average of 8 years; older people are generally better at estimating age; and estimates are most accurate when the observer is judging someone close to their own age.

2.6.6 Training: Video analysis category guidance (mobile phone use)

Category	Phone use	Example	
0	No phone use	n/a	There is no phone use and the analyst can confirm this.
1	Ear	 	The phone is held close to the head in a manner suggesting it is being used for a conversation. Traditionally this was to position the phone against the ear, but increasingly the user may hold the phone in front of their mouth using speaker mode (or speakerphone).
2	Hand	  	The phone is in the user's hand. They may or may not be clearly interacting with it. This does not include touching a phone whilst it is in a cradle.
3	Headphones (motor / pedal cyclists only)	 	A rider is wearing headphones.
4	Object in hand (not a phone)	  	This code is used to capture when a driver is holding another object that is very unlikely to be a phone. Common objects include drinks or food, papers, wallets, sunglasses cases, cigarettes and e-cigarettes, and make-up.
99	Unable to see	n/a	If the analyst is not able to determine due to poor visibility of obscuration, then this is coded 99.

2.6.7 Training: Video analysis category guidance (restraints)

Category	Restraint use	Example images	
1	Seat belt	n/a	Seat belt is being used as intended. Chest strap is most likely to be visible either across the chest or over shoulder. Also includes lap belts in older vehicles and harnesses.
2	Unrestrained	n/a	Includes improper use of the seat belt, such as behind back or under arm.
3	Rear facing baby seat	 	May be in the front or rear seats. Passenger seat belt may not be used as some are attached to a base using the Isofix points. Typically designer for use from birth to 15 months old.
4	Child seat	 	Front facing. May use a built-in harness (for younger smaller children) or the vehicle's passenger seat belt. Includes heavy bolsters around the body and head. Child seats for smaller children may be more reclined (left image).
5	Booster seat	 	Seat base only. No back seat. Uses the vehicle's passenger seat belt. Unlikely to be visible to outside observers, but a child will appear in a raised seating position.
6	On lap	n/a	The passenger (typically a child) is sitting on the lap of another passenger. They may be sharing the restraint.
99	Unable to see	n/a	The seat belt is not visible, but it is also not possible to determine no seat belt in use. For instance, the vehicle interior is too dark or the view is obscured.

2.7 Survey data weighting

In order to provide a representative survey of Great Britain, each observation needs to be appropriately weighted in two ways:

- Sampling weights are used ensure the survey results are not biased by sites with a high or low number of survey observations. The sampling weights adjust for low or high survey counts for site categories (combinations of country, weekday/weekend, and moving/stationary, see Section 2.2.2). For instance, sites where the survey count (for the site category) is relatively low are weighted higher, and sites where the survey count is relatively high are weighted lower.
- Traffic weights are used to ensure the survey results are representative of expected traffic flow for the site categories. For instance, if the percentage of traffic flow for a particular site category is known to be 20% (according to TRA0306 2019) and the percentage of all survey data for this site category is found to be 15%, then a higher weight is required.

The weights are calculated separately for:

- Moving and stationary sites.
- Great Britain overall, and separately for England and Wales, and Scotland.

Observations where driver phone use or seat belt compliance is unknown were excluded from the weighting calculations.

2.7.1 Survey data weighting: Sampling weights

The sampling weight is determined by comparing the proportion of vehicles surveyed in each survey with that of the proportion of the total vehicles surveyed for that site category. There are eight site categories (combinations of England and Wales or Scotland, weekday or weekend, and moving or stationary) as described in Section 2.2.2).

Steps to calculate the sampling weights:

1. Calculate the proportion of vehicles that were surveyed for each site category (eight values). Divide the total survey count by the total traffic count per site category.
2. For each survey (there were 132 mobile phone surveys and 89 seat belt surveys in 2021), calculate the proportion of vehicles that were surveyed (surveyed divided by counted). This excludes cycles and code 99s for mobile phone use or seat belt use.
3. For each survey, calculate the sampling weight by dividing the appropriate value for the site category (1) by (2).

This calculation is repeated to calculate weights applicable to Great Britain as a whole. This is done by reducing the number of site categories to four (combinations of weekday or weekend and moving or stationary).

2.7.2 Survey data weighting: Traffic weights

The traffic weight is determined by reviewing the *observed traffic count* for each road type in each country, and comparing them to *expected traffic volumes* derived from national traffic figures. Traffic weights consider the traffic *counted* and not the number of vehicles *surveyed* (full traffic counts were made for each 4.5 hour survey session, but not all vehicles were surveyed for mobile phone and seat belt use).

For instance, if we expect the percentage of traffic using a major, rural, England & Wales road on a weekday to be 35%, and the comparable percentage in the 2021 survey is 25%, then a traffic weight of 1.4 is applied to any survey with this combination of country, road type, and day of the week.

A set of traffic weights were calculated separately for each combination of country and day of week. There are six sets of traffic weights: England and Wales weekday, England and Wales weekend, Scotland weekday, Scotland weekend, Great Britain weekday, and Great Britain weekend. Each set of traffic weights sums to 1. Within each set of traffic weights there are four road types: Major rural, major urban, minor rural, and minor urban.

The expected traffic volumes were calculated using the 2019 national traffic figures (TRA0103 Average traffic by day of week) and the related estimate that 76.7% of traffic happens on a weekday. The table to the right shows the volume of traffic recorded on each road type in each country in 2019, in billion vehicle miles.

Country	Major		Minor	
	Rural	Urban	Rural	Urban
England and Wales	90.8	44.8	48.1	77.5
Scotland	10.2	4.4	4.5	5.6
Great Britain	101	49.2	52.6	83.2

2.7.3 Survey data weighting: Traffic weights calculation steps

Steps to calculate the traffic weights:

1. Calculate the expected traffic volume percentage for each road type in each traffic weight set (see Section 2.7.2) using national traffic figures.
2. Calculate the observed traffic count percentage for each road type in each traffic weight set (see Section 2.7.2) using the traffic count data from the 2021 surveys.
3. For each survey (there were 132 mobile phone surveys and 89 seat belt surveys in 2021), assign the correct expected traffic volume percentage (1) and observed traffic count percentage (2) relevant to the site's country, day of week, and road type.
4. For each survey, divide the expected traffic volume percentage (1) by the observed traffic count percentage (2) to find the traffic weight.

3. Survey results and validation

3.1 High-level summary of survey data

The results of the 2021 survey on mobile phone use and seat belt use can be found on the gov.uk website and are not presented in this report. The raw survey data is weighted before statistics can be calculated. The following high-level numbers summarise the 2021 survey data:

- The survey fieldwork took place between the 17th of September and the 25th of October 2021.
- 90 sites were visited and video data was collected for 135 surveys (45 sites included both weekday and weekend surveys). Of these, the video data was suitable for 88 sites and 131 surveys.
- Each of these 131 surveys lasted for 4.5 hours (a total of 589.5 hours of video).
- The total traffic count across all surveys was 207,223 vehicles (excluding cycles).
- The total number of vehicles observed for mobile phone use was 65,356.
- The total number observed for seat belt use was 22,641.
- The total number of vehicles observed on a weekday was 47,020 and on a weekend was 18,943.
- 683 drivers were observed using a mobile phone (either to ear or in hand).
- 705 drivers of cars, vans, or goods vehicles were observed not using a seat belt.

3.2 Survey data validation

The table below summarises the actions performed to validated the survey data. More detailed results of this validation are presented over the following pages.

Validation category	Validation step	Description
Data completeness	Data matches session?	All survey data matches the listed session information.
	Survey meta data complete?	All complete except the sub-contractor analyst initials were not included.
	Adequate sample size?	The site-by-site comparison to 2017 differs, but the site mix matches (e.g. 44k vs 45k for weekdays, 13k vs 18k for weekends).
	Data in correct format?	Some revisions were required for consistency (e.g. colons in time stamps removed).
	Missing data?	No data was missing.
Data logic	Comments relevant to session?	Some comments were used to amend the data (e.g. references to certain phone uses).
	Data conflicts?	Reviewed and corrections made following re-analysis of video (e.g. adults recorded in child seats).
	Unique dataset?	No duplication of data. In addition, a full review of 68k records was completed by the consultant with no repetition detected.
	Traffic count compared to 2017?	There are no traffic flow outliers.
	Obvious outliers?	Some outliers were investigated and corrected following additional video review.
Data accuracy	Full analysis compares well with quality assurance sample?	General rates of phone use are within expected ranges. General rates of seat belt use are within expected ranges. There is a smaller than expected sample of category 7 (60+). There is a slightly higher sample of category 1 (male) as compared to the 2017 survey and other similar traffic surveys. General rates of seat belt use are within expected ranges.
	Reasonable comparison of QA?	The comparison was favourable for driver age and sex, but less favourable for mobile phone compliance (although all non-compliance observations in the quality assurance sample were also identified in the full analysis).
	Random check of vehicles	All records checked by both the sub-contractor and the consultant, plus the additional QA checks.
	False positive rate? (% wrong)	All records were re-analysed.
	False negative rate (% missed)	All records were re-analysed.

3.2.1 Survey data validation: Data completeness

Validation step	Completed?	Comments
Data matches session?	☑	The consultant independently performed a spot-check of survey data alongside video and video snapshots of each survey.
Survey meta data complete?	☑	All survey metadata present, except initials of individuals performing fieldwork.
Adequate sample size?	☑	There are differences in the samples used between 2017 and 2021 when comparing site-by-site (as shown in the table below), however there is a close correlation between the sample sizes for site categories (e.g. weekend and weekday, urban and rural, major and minor). A full list of the sites and the survey count for both 2017 and 2021 surveys is provided in Appendix B.
Data in correct format?	☑	The survey data was reviewed by the consultant to check for consistent formatting. For instance, numbers stored as text, the use of colons in some time stamps and not others, and typos such as letters where only numbers should appear. Where incorrect formatting was identified, it was either directly revised by the consultant (if the required revision was obvious) or a query was made to the sub-contractor.
Missing data?	☑	88 of the original 90 sites were successfully surveyed in 2021. This accounts for 131 of the 135 surveys. There were two sites that were excluded from the 2021 survey compared to the 2017 survey. The data storage card used to collect the video at site SM6 became corrupted and the video data was lost. Site LS11 was the first site to be surveyed, but the weather and position of the video systems made analysis very difficult, and although this understanding helped during the installation of video systems at other sites, time pressures did not allow the survey teams to return to site LS11.

The table to the right compares the sample sizes used for the surveys completed in 2017 and 2021. This demonstrates how the approach is designed to create a like-for-like comparison, as close as feasible.

Site type		Sample size for moving sites		Sample size for stationary sites	
		2017	2021	2017	2021
Country	England and Wales	24,225	27,625	19,143	19,369
	Scotland	13,610	11,552	9,169	10,664
Road type	Major	25,874	22,584	16,582	15,102
	Minor	11,961	16,593	11,730	14,931
Area	Urban	22,226	25,095	21,081	20,454
	Rural	15,609	14,082	7,231	9,579

3.2.2 Survey data validation: Data logic

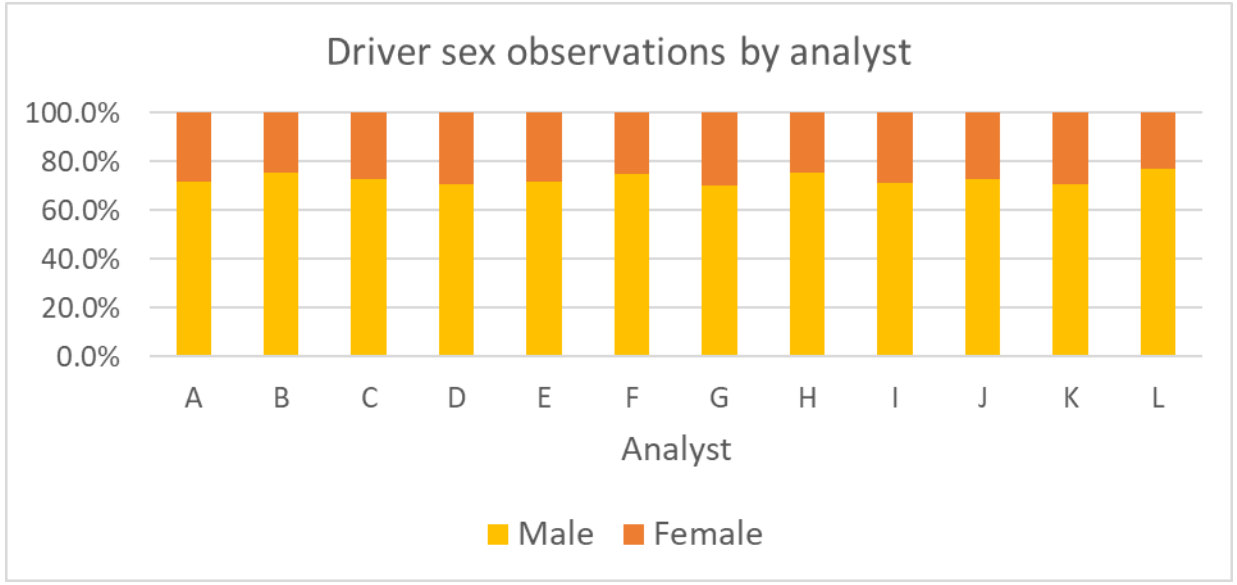
Validation step	Completed?	Comments
Comments relevant to session?	☑	The notes were found to be relevant to the session.
Data conflicts?	☑	There were a few limited conflicts such as children in the drivers seat and adults in child seats. These were corrected following re-analysis of the video.
Unique dataset?	☑	All data provided by the sub-contractor was subsequently re-analysed by the consultant. No duplicate data.
Traffic count compared to 2017?	☑	Despite the changed environment since 2017, the spread of traffic was similar in 2021. More vehicles were counted in the 2021 survey. The table shown below compares the traffic counts by site type.
Obvious outliers?	☑	A few outliers were detected but they were found to be data inaccuracies and were corrected following re-analysis of the video. Sections 3.2.6 and 3.2.7 show the rates of mobile phone use and seat belt non-compliance by site for example.

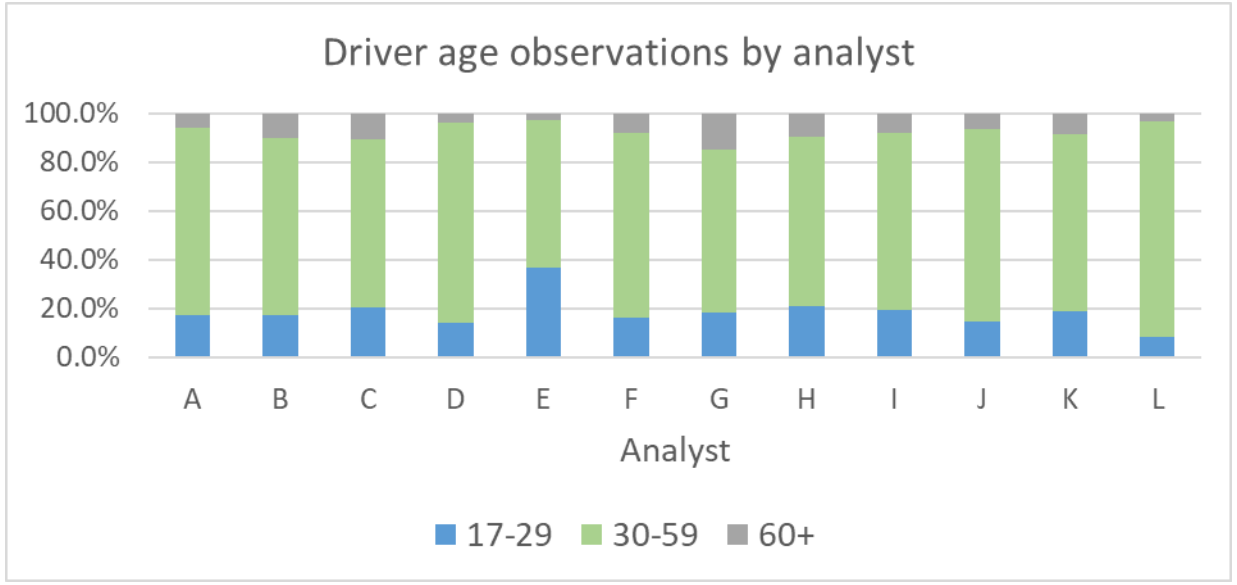
The table to the right compares the traffic count from the surveys performed in 2017 and 2021. The traffic count is much greater in 2021 as all vehicles were counted in each 4.5 hour session, whereas in 2017 the method counted alternate 30 minute periods.

Site type		Traffic count	
		2017	2021
Country	England and Wales	93901	150636
	Scotland	35055	55385
Road type	Major	87637	128439
	Minor	41319	77582
Area	Urban	36427	69209
	Rural	92529	136812

3.2.3 Survey data validation: Data accuracy

Validation step	Completed?	Comments
Full analysis compares well with quality assurance sample?	☑	Driver phone/seat belt/age/sex within threshold FSP seat belt within threshold Comparison of urban/rural, major/minor, within threshold. Direct comparison of offences (mobile phone use and seat belt non-compliance) showed only a few edge cases created differences. Comparison between analysts was favourable. The charts below show there was variance between analysts, but this was withing acceptable thresholds in relation to the sites they observed.
Data correct during random check of vehicles?	☑	All data reviewed by sub-contractor and consultant.
False positive rates reasonable?	☑	All survey data was re-analysed.
False negative rates reasonable?	☑	All survey data was re-analysed.





3.2.4 Survey data validation: Count per site – 2017 compared to 2021

To facilitate a comparison between 2017 and 2021, the ideal approach would be to sample the same number of vehicles each site. However, some sites in the 2021 survey suffered from poor video quality, resulting in a smaller sample size, offset by larger samples taken from sites with good video quality and the same characteristics. The tables below show the survey counts for 2017 and 2021 by site. The 2021 figures are colour coded to represent how close the 2021 count was to the 2017 count.

Green
Greater than 2017 or within 10%
Yellow
Within 25%
Orange
Within 50%
Red
Less than 50%

Site ID	Survey count 2017	Survey count 2021
BM1	1954	1743
BM2	1371	164
BS1	652	888
BS2	1260	1133
BS3	1872	796
LM1	1354	2181
LM2	154	250
LM3	1050	1463
LM4	2832	3496
LM5	1257	1351
LM6	418	641
LS1	1480	465
LS10	1214	258
LS12	814	893
LS13	1030	670
LS14	502	936
LS15	951	921
LS16	998	3158
LS17	740	428
LS2	658	803
LS3	1079	1484
LS4	1017	1977

Site ID	Survey count 2017	Survey count 2021
LS6	665	1492
LS7	806	170
LS8	401	180
LS9	269	512
MS10	1511	304
MS13	512	124
MS3	972	647
SM1	1104	1454
SM10	1265	1850
SM2	565	818
SM3	1691	868
SM4	2105	2098
SM5	103	43
SM7	645	847
SM8	3988	1700
SM9	460	1102
SS1	1384	650
SS10	886	292
SS11	1167	834
SS12	822	617
SS13	1220	809
SS14	946	879

Site ID	Survey count 2017	Survey count 2021
SS15	976	2767
SS16	1038	1309
SS17	891	1000
SS18	773	544
SS19	714	936
SS2	629	480
SS20	297	476
SS3	1022	669
SS4	221	214
SS5	705	439
SS6	1687	2343
SS7	370	174
SS8	610	205
SS9	922	1153
WAM1	72	121
WAM2	1110	2380
WAM3	1469	3224
WAS1	937	1286
WAS2	421	1114
WAS3	1853	804
WAS4	580	1046
WM1	497	1544

Site ID	Survey count 2017	Survey count 2021
WM2	1358	980
WM3	2985	2390
WM4	514	343
WM5	823	432
WM6	673	223
WM7	2482	446
WM8	893	987
WM9	959	1955
WS1	829	379
WS10	917	390
WS11	342	548
WS12	1352	278
WS13	820	1356
WS15	822	809
WS17	902	2481
WS2	189	212
WS3	494	778
WS4	945	267
WS6	330	763
WS7	859	282
WS8	727	376
WS9	675	351

3.2.5 Survey data validation: Quality assurance sample comparison

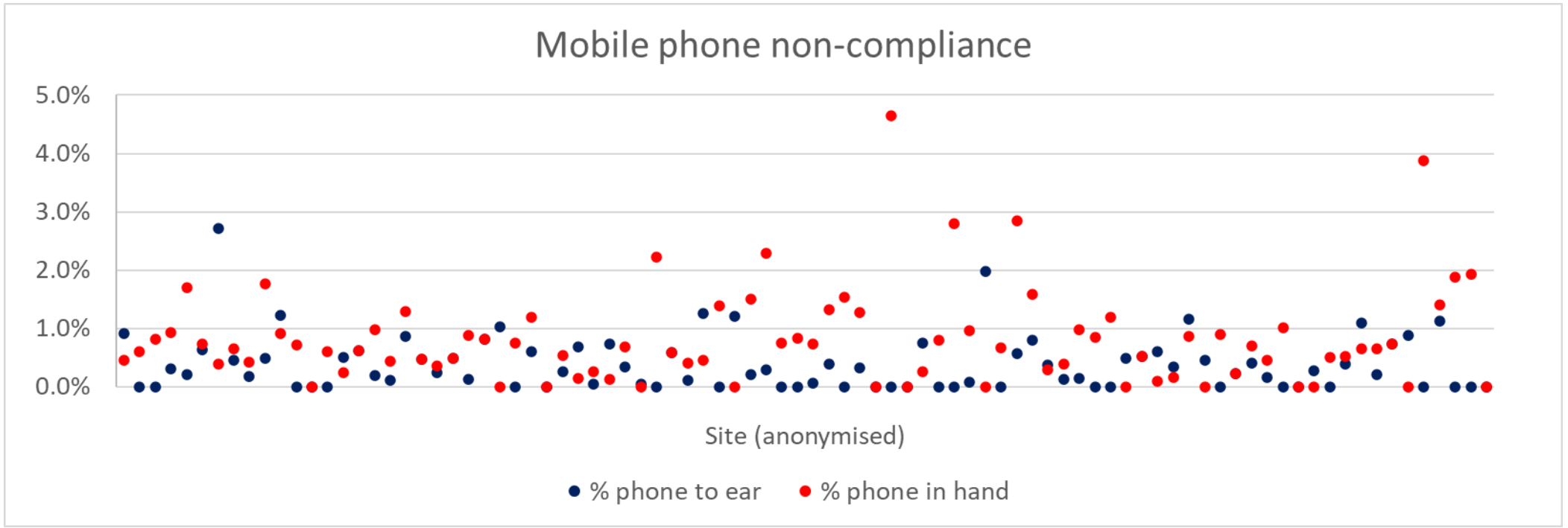
This table compares the results of the full survey analysis with the independent quality assurance (QA) sample.

Generally the two datasets compare favourably for driver sex and age. There are more notable differences in driver mobile phone use and seat belt wearing. This is partly due to relatively small numbers of non-compliance in the QA sample. All non-compliance observations in the QA sample were also present in the full analysis.

Category	Subcategory	Method	Driver Information									
			Sex		Age			Mobile use			Restraint	
			Male	Female	17-29	30-59	60+	Ear	Hand	Non	Yes	Non
Country	Scotland	QA sample	65.90%	34.10%	27.46%	65.91%	6.63%	0.30%	0.72%	98.98%	96.13%	3.87%
		Full analysis	73.38%	26.62%	19.51%	72.87%	7.62%	0.31%	0.81%	98.88%	95.39%	4.61%
		Difference	7.47%		-7.95%	6.96%	0.99%	0.02%	0.08%	-0.10%	-0.74%	
	England and Wales	QA sample	69.32%	30.68%	18.12%	73.25%	8.64%	0.00%	0.00%	98.88%	96.62%	3.38%
		Full analysis	72.36%	27.64%	17.66%	73.54%	8.80%	0.61%	0.98%	98.41%	92.93%	7.07%
		Difference	3.04%		-0.46%	0.29%	0.17%	0.02%	0.08%	-0.10%	-3.69%	
Relevance	Major	QA sample	72.13%	27.87%	15.76%	75.95%	8.29%	0.25%	0.29%	99.47%	95.66%	4.34%
		Full analysis	73.81%	26.19%	18.11%	74.95%	6.94%	0.37%	0.75%	98.88%	94.76%	5.24%
		Difference	1.68%		2.35%	-1.00%	-1.35%	0.12%	0.47%	-0.59%	-0.90%	
	Minor	QA sample	63.98%	36.02%	23.53%	68.04%	8.43%	0.52%	0.61%	98.87%	96.70%	3.30%
		Full analysis	71.32%	28.68%	18.17%	71.98%	9.86%	0.69%	1.13%	98.18%	92.67%	7.33%
		Difference	7.34%		-5.36%	3.93%	1.43%	0.16%	0.52%	-0.68%	-4.03%	
Area	Rural	QA sample	73.65%	26.35%	13.16%	75.97%	10.87%	0.44%	0.39%	99.17%	97.76%	2.24%
		Full analysis	73.53%	26.47%	18.34%	73.65%	8.01%	0.81%	0.83%	98.37%	95.79%	4.21%
		Difference	-0.12%		5.18%	-2.31%	-2.86%	0.37%	0.44%	-0.81%	-1.97%	
	Urban	QA sample	66.92%	33.08%	20.88%	71.34%	7.77%	0.35%	0.44%	99.21%	96.26%	3.74%
		Full analysis	72.24%	27.76%	18.04%	73.24%	8.72%	0.37%	0.98%	98.66%	92.70%	7.30%
		Difference	5.32%		-2.84%	1.89%	0.95%	0.01%	0.54%	-0.55%	-3.56%	

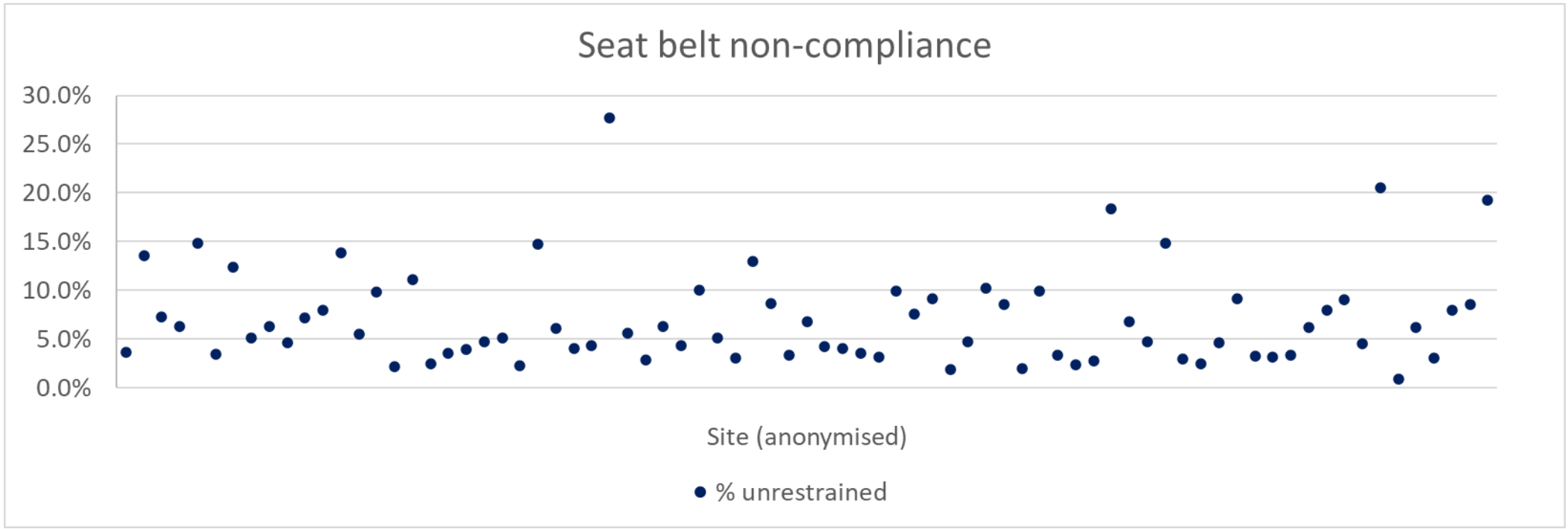
3.2.6 Survey data validation: Mobile phone use non-compliance by site

The chart below shows the percentage of drivers using a mobile phone whilst driving at each site. This chart was used to determine whether any sites were significant outliers. Some sites initially presented abnormally high rates of non-compliance, and following investigation, corrections were made.



3.2.7 Survey data validation: Seat belt non-compliance by site

The chart below shows the percentage of drivers not wearing a seat belt whilst driving at each site. This chart was used to determine whether any sites were significant outliers. There appear to be some sites with abnormally high non-compliance, however following investigation it was found these sites had atypically high numbers of bus and taxi/private hire vehicles, which are much more likely to have drivers not using a seat belt.



3.2.8 Survey data validation: The challenge of determining mobile phone use

In recognition that determination of driver mobile phone use is challenging, additional steps and attention was carried out during the analysis.

All observations of mobile phone use (code 1 and 2) were subjected to additional review. Of the 854 observations of mobile phone use observed by the sub-contractor, 31 (3.6%) were eventually amended to no phone use.

An additional code (code 4) was adopted for observations of mobile phone use in the 2021 survey. This captured observations where the driver appeared to be holding an object or their arm was in an unusual position, but mobile phone use was not suspected. This additional code served two purposes: To highlight the challenge of determining mobile phone use amongst other activities; and highlighting specific instances for additional review.

During the secondary review of code 4 observations, three observations were amended to mobile phone use (one phone to ear, two phone in hand). In the final dataset, there are 766 code 4 observations.

4. Survey evaluation

4.1 Outcomes against objectives

The objectives of this survey and the outcomes are presented in the table below.

Objective	Outcome
Perform survey fieldwork at 90 sites across England, Wales, and Scotland before the clocks changed at the end of October 2021.	The 2021 survey fieldwork was completed a week before the October deadline. However, the video data for two sites was subsequently found to be inadequate. Due to the nature of the video survey method, it was possible to substitute the data from the missing sites with additional survey data from similar site types.
Analyse the survey fieldwork data.	The video survey data was analysed completely. However, assessment of the first draft of the survey analysis found large discrepancies regarding the survey data types of driver mobile phone use, and the age and sex of all vehicle occupants. Re-training and re-analysis was required of all survey data.
Independently verify and validate the survey data to provide assurance regarding its completeness, logic, and accuracy.	The video survey method provided an excellent system to allow assurance to be performed. The consultant carried out independent analysis of 10% of the required survey sample, which allowed evaluation of the full survey analysis. Where inconsistencies or doubt was identified it was possible to review the exact video footage used to create the observations.

4.2 Evaluation of video-based approach

A report by PACTS in 2020 concluded the Department for Transport survey from 2017 (which showed a drop in use) is perhaps not aligned to other evidence. Furthermore, it suggested the decrease in mobile phone use enforcement over the last decade may have led to an increase in serious injuries. This strengthens the requirements for studies such as this, in order to gain a greater understanding of the levels of mobile phone use. For seat belt use, it was argued the methodology for the 2017 survey was different to 2014 (more so from 2009), which has led to difficulties assessing trends. It concludes such surveys are too infrequent and focus on lower risk situations – whereas wearing rates have been increasing, and fatalities have also been increasing recently. The report also links the increase in fatalities to a reduction in seat belt wearing enforcement.

- The PACTS report supports the desire for a more auditable and repeatable approach.

The 2017 data collection method involved 3 individuals: a mobile phone observer, seat belt observer and enumerator. Once the traffic started to form they would walk down the line of traffic recording observational detail of the passengers until the end of traffic line. Each survey was done independently to avoid crowding around vehicles potentially causing distress to occupants.

Taking away the observer and relying on the video footage provided a number of benefits. It allowed the recording of all sets of data simultaneously, and provided a opportunity to capture vehicle occupants without risking changing their behaviours with physical observers around. Re-watching of the recorded video provided the opportunity for analysis on multiple occasions. This compares favourably to the 2017 survey, where inconsistencies could not be checked and corrected easily.

4.3 Lessons learnt

The Department for Transport (DfT) performs regular surveys for hand-held mobile phone use and seat belt compliance by drivers and vehicle occupants. This is to capture evidence and understanding of the level of compliance amongst vehicle occupants – for both drivers and passengers.

These surveys started in 1988, with a survey of seat belt usage by vehicle occupants on the national road network. Since 2002, the surveys have included observations of mobile phone use. Prior to the survey discussed in this report (2021), the survey was last carried out in 2017 ('Seat belt and mobile phone use surveys: Great Britain, 2017', Department for Transport, 7 February 2019).

These regular surveys have previously been conducted using manual recording techniques, in which observers at the roadside record their observations by hand. However, the lessons learnt from the 2017 report highlighted some of the difficulties and limitations of this technique, particularly around consistency, accuracy, and assurance. Therefore a new approach, using high-definition video cameras, was adopted for the 2021 survey.

Following the 2021 survey, the project team assessed the new approach and reflected on what went well and what could be done differently. This section summarises the lessons learnt separated into the following themes:

- Survey planning
- Survey fieldwork
- Survey analysis

4.3.1 Lessons learnt: Survey planning

What went well?	What could be done differently?
Survey fieldwork was planned and delivered within a tight timeframe. Some details from the 2017 survey were not available (such as direction of traffic), yet the survey team were able to make suitable judgements. The survey planning activities ensured no sites were visited that could not be surveyed (e.g. due to road closures). Regular meetings between the consultant and DfT were established. The consultant was proactive at solving issues and there was open dialogue with the DfT regarding the challenges of the new approach, resulting in no surprises. Covid did not significantly impact the project delivery (although some team members did require time off). The DfT was active and engaged at meetings and quick to respond to queries via email.	More time is required between procurement and the start of the fieldwork. The 2021 survey used a novel approach and there was a slight delay to procurement. This resulted in pressure on the sub-contractor to prepare the survey fieldwork, with some lower priority actions not fully completed (such as sharing of training plans) in favour of achieving the primary objective of completing the fieldwork. Additional time allocated to piloting the technique (including comparison to the manual approach) and ironing out process issues would have improved overall survey efficiency and precision. For instance, revision of the camera systems and calibrations that were used. Completion of the survey pilot should be a condition of the contract with the sub-contractor. Greater oversight from the consultant of the training provided by the sub-contractor would improve consistency and ensure the data accuracy requirements were being met and process improvements could be addressed earlier. Develop a rigid programme of data sharing between the sub-contractor and consultant to allow earlier survey validation to mitigate potential re-work. The final dataset from the sub-contractor remained deficient in a few areas (such as accuracy of age and sex observations), requiring full re-analysis by the consultant. To avoid this, there should be more rigorous training and assessment of those performing the analysis, and more detailed guides provided. Time should be allocated for this during planning. The 2017 survey noted the sites were clustered geographically in some areas – the same sites were used for the 2021 survey. Additional research could establish whether this creates any bias.

4.3.2 Lessons learnt: Survey fieldwork

What went well?	What could be done differently?
The survey fieldwork was delivered whilst avoiding critical operational challenges such as the fuel shortage crisis. Video systems can be installed well in advance of the survey and programmed to capture more data than is required for very little additional cost, providing good redundancy. Safety of site personnel is much improved as they are not required to stay at site for long periods or to be exposed to members of the public. Due to extensive experience in the area of non-compliance activities, the consultant was familiar with the identification of mobile phones and seat belts.	A high number of cars have tinted rear windows (85% in some samples, and a trend that was noted in the 2017 survey report). The use of different camera types or survey methods should be explored. Near-side camera locations makes observing off-side passengers difficult. Additional cameras configured to view off-side passengers may help (such as positioning a dedicated camera on the opposite carriageway). Windscreen glare from sunlight can significantly reduce visibility of vehicle interiors. The consultant is familiar with how to reduce these issues from work performed in related projects. The review of the video data following the survey was completed after the deadline to complete the survey fieldwork. As data from two sites was later found to be unsuitable, this resulted in no opportunity to perform any repeat surveys. A review of the video data should run parallel to the survey data capture to facilitate a proactive response.

4.3.3 Lessons learnt: Survey analysis

What went well?	What could be done differently?
The final analysis provided data that was suitable for publication.	The sub-contractor should provide more frequent interim datasets to the consultant to allow parallel assurance to be performed. There was resistance to this in favour of completing the full task. This resulted in the sub-contractor performing re-analysis of the entire dataset twice – firstly to improve the capture rate of mobile phone offences and secondly to correct age and sex observations.
Data from two of the ninety sites was found to be unsuitable for analysis. Data from other similar sites was identified to fill the gap.	There remained ambiguity in some data categories, such as the exact position and interaction with a mobile phone (to ear, in hand, on lap, touching in cradle), which can lead to inconsistencies. More categories should be added where required.
Entering data directly into a spreadsheet as the vehicles were observed removed a significant point of failure found in previous surveys (human error during transcription).	Many drivers hold items that could appear to be phones (such as e-cigarettes, sunglasses, etc). A measure of confidence in the observation could be included if the analyst has any doubt.
The weighting of the survey sample was aligned with previous surveys, and a tool was established that would allow this process to be more efficient in the future.	Some drivers wear seat belts in unusual ways (such as under their arm or around their back). Additional categories may be included to capture this behaviour.
The survey verification and validation processes highlighted the need to re-analysis. Although this delayed the completion of the project, it ultimately delivered results with much greater confidence.	Identifying occupant age is difficult for all types of survey. The categories are also very wide (e.g. 30-59). More categories (such as 20-29, 30-39, etc) would provide greater granularity and reduce category bias.
Much improved auditing and assurance capability due to availability of the exact imagery used to perform the analysis. No opportunity to falsify data. The video data could be re-reviewed, paused and evaluated ensuring quality assurance from a desk-based location.	A data type should be considered for other notable behaviours such as driver-passenger engagement, eating, reading, dealing with children, make up application, and shaving.
The consultant was able to provide additional resources for the re-analysis, and ultimately led to data that was suitable to publish.	The stationary site type is no longer required as the video can be paused to allow the observer to record observations.
	Bias could be introduced by the motivation to validate the survey by comparing the results with previous surveys. There is wide variability of road user behaviours due to many factors (such as time of day). With a few revisions (e.g. sampling at a site over a longer period), this would increase the robustness of the 2021 survey approach.

5. Conclusion

5.1 Summary

The 2021 survey for driver mobile phone use and driver and passenger seat belt compliance collected observations from 88 sites across England, Wales, and Scotland. A new video-based approach was used that has various benefits related to consistency, auditability, and operator safety, although the methodology was designed in such a way to provide a reliable comparison of road user behaviour in previous surveys.

The survey fieldwork was completed on time (before the clocks changed at the end of October), despite challenges such as the fuel crises, the impact of covid, and periods of heavy rainfall. However, video from two sites was subsequently found to be unusable, requiring additional video samples to be analysed from other sites of the same type.

There were challenges in survey analysis (particularly consistent identification of mobile phone use and driver age and sex) and some re-work was required where quality assurance found the data quality to be poor. But this highlights one of the major benefits of the video-based approach – the video evidence is available for review or validation by supervisors. It was also possible to re-sample video from sites where the representative sample was low for certain site types (for instance, minor roads in England). Other key challenges of the survey included identification of rear seat passengers and child restraints (often obscured by tinted windows or difficult video angles).

The survey validation process proved to be extremely valuable in providing confidence of the survey results. All images used to capture observations could be reviewed by supervisors or reviewers, which is in contrast to the fieldwork spot check approaches used in previous surveys.

Overall, the survey provided results that allowed the Department for Transport to study the change in road user behaviour from previous surveys as well as demonstrated the feasibility of the novel video-based survey approach.

Appendix

A. Categories, data types, and codes

The tables below show the categories, data types, and codes used to record the observations.

Vehicle

V1: Vehicle > Type	Code
Car	1
Taxi	2
Private hire vehicle	3
Van	4
Heavy goods vehicle	5
Bus, coach, minibus	6
Motorcycle	7
Pedal cycle	8
Blank	99

V2: Vehicle > Colour	Code
Black	1
White	2
Grey	3
Silver	4
Blue	5
Green	6
Red	7
Yellow	8
Maroon	9
Orange	10
Beige	11
Gold	12
Other	99

Driver

D1: Purpose of mobile phone use	Code
No phone	0
Ear	1
Hand	2
Headphones (motor / pedal cyclists only)	3
Object in hand / unclear	4

D2: Sex	Code
Male	1
Female	2
Unknown	99

D4: Seat belt use	Code
Seat belt	1
Unrestrained	2
Unknown	99

D3: Age	Code
17-29	5
30-59	6
60+	7
Unknown	99

D5: Passengers present	Code
No	0
Yes	1

Passenger

P1: Seating position	Code
Front seat passenger	A
Left-hand rear seat passenger	B
Central rear seat passenger	C
Right-hand rear seat passenger	D
Front middle passenger	E
Third row left-hand rear seat passenger	F
Third row central rear seat passenger	G
Third row right-hand rear seat passenger	H

P2: Sex	Code
Male	1
Female	2
Unknown	99

P3: Age group	Code
Baby (<1)	1
Toddler (1-4)	2
Young child (5-9)	3
Older child (10-13)	4
Younger (14-29)	5
Middle (30-59)	6
Older (60+)	7
Unknown	99

P4: Seat belt use	Code
Seat belt	1
Unrestrained	2
Rear facing baby seat	3
Child seat	4
Booster seat	5
On lap	6
Unknown	99

P5: other observations
Text notes

Traffic survey

Data		Required
Observer		☑
Date		☑
Site number		☑
Location		☑
Session number		☑
Traffic count	Car	☑
	Taxi	☑
	Private hire vehicle	☑
	Van	☑
	Heavy goods vehicle	☑
	Bus, coach, minibus	☑
	Motorcycle	☑
	Pedal cycle	☑

B. 2021 survey information by site

Site information										Weekday				Weekend			
Site ID	Moving or stationary	Road	Local authority	Country	Major or minor	Urban or rural	Latitude	Longitude	Speed limit	Survey date	AM/PM	Traffic count	Survey count	Survey date	AM/PM	Traffic count	Survey count
BM1	M	A4071	Rugby	England	Major	Rural	52.3467	-1.3319	50	07/10/2021	AM	3181	1090	09/10/2021	PM	3795	653
BM2	M	A459	Dudley	England	Major	Urban	52.5300	-2.1180	30	08/10/2021	PM	2654	164	n/a	n/a	n/a	n/a
BS1	S	A4101	Dudley	England	Major	Urban	52.4962	-2.1745	30	11/10/2021	AM	1030	492	n/a	n/a	n/a	n/a
BS2	S	A452	Birmingham	England	Major	Urban	52.5465	-1.8560	30	11/10/2021	PM	2229	380	09/10/2021	PM	2171	250
BS3	S	Howard Road	Birmingham	England	Minor	Urban	52.4280	-1.8923	30	11/10/2021	PM	1694	268	09/10/2021	PM	1580	159
LM1	M	B1172	South Norfolk	England	Minor	Urban	52.5738	1.1245	40	24/09/2021	PM	2204	523	25/09/2021	PM	1686	1653
LM2	M	B1116	Suffolk Coastal	England	Minor	Rural	52.2041	1.3486	50	24/09/2021	PM	1079	250	n/a	n/a	n/a	n/a
LM3	M	B2177	Portsmouth	England	Minor	Urban	50.8507	-1.0679	30	17/09/2021	AM	986	878	18/09/2021	AM	626	585
LM4	M	A5109	Barnet	England	Major	Urban	51.6086	-0.2695	30	17/09/2021	PM	3335	1973	18/09/2021	AM	2601	1523
LM5	M	C	Richmond upon Thames	England	Minor	Urban	51.4531	-0.3591	30	17/09/2021	PM	1406	297	18/09/2021	PM	1099	1054
LM6	M	C	West Berkshire	England	Minor	Urban	51.4061	-1.2955	30	24/09/2021	AM	656	641	n/a	n/a	n/a	n/a
LS1	S	A4130	South Oxfordshire	England	Major	Urban	51.5376	-0.9007	30	24/09/2021	AM	1126	125	25/09/2021	PM	1106	113
LS10	S	A259	Worthing	England	Major	Urban	50.8119	-0.3670	30	17/09/2021	PM	1202	1171	18/09/2021	PM	1159	130
LS11	S	A1202	Tower Hamlets	England	Major	Urban	51.5107	-0.0685	30	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
LS12	S	A127	Southend-on-Sea	England	Major	Urban	51.5587	0.6955	40	27/09/2021	PM	2829	491	n/a	n/a	n/a	n/a
LS13	S	A205	Hounslow	England	Major	Urban	51.4890	-0.2874	30	24/09/2021	PM	1616	191	25/09/2021	PM	1463	160
LS14	S	C	Ipswich	England	Minor	Urban	52.0577	1.1330	30	27/09/2021	PM	691	473	n/a	n/a	n/a	n/a
LS15	S	Knoll Road, Camberley	Surrey Heath	England	Minor	Urban	51.3401	-0.7443	30	17/09/2021	AM	1279	358	18/09/2021	PM	1200	133
LS16	S	B3022	Windsor and Maidenhead	England	Minor	Urban	51.4708	-0.6300	30	24/09/2021	AM	2740	463	25/09/2021	AM	2391	1292
LS17	S	B1108 Watton Rd	South Norfolk	England	Minor	Urban	52.6253	1.2208	30	24/09/2021	PM	1565	108	25/09/2021	PM	1191	140
LS2	S	A283 (old A3)	Waverley	England	Major	Rural	51.1732	-0.6503	30	17/09/2021	AM	1641	428	n/a	n/a	n/a	n/a
LS3	S	A4130	Vale of White Horse	England	Major	Rural	51.6171	-1.2675	40	24/09/2021	PM	3138	551	25/09/2021	PM	2795	262
LS4	S	A1066	South Norfolk	England	Major	Urban	52.3685	1.1280	30	24/09/2021	PM	2371	268	25/09/2021	AM	1279	746
LS6	S	B4009	West Berkshire	England	Minor	Rural	51.5226	-1.1484	30	23/09/2021	PM	1210	767	n/a	n/a	n/a	n/a
LS7	S	B478	Wokingham	England	Minor	Urban	51.4755	-0.9136	20	23/09/2021	PM	2240	128	n/a	n/a	n/a	n/a
LS8	S	B416 Windsor Road	South Bucks	England	Minor	Rural	51.5609	-0.5839	40	23/09/2021	PM	1843	217	n/a	n/a	n/a	n/a
LS9	S	Cutbush Lane	Wokingham	England	Minor	Urban	51.4125	-0.9495	30	24/09/2021	PM	269	266	n/a	n/a	n/a	n/a
MS10	S	B6174	Tameside	England	Minor	Urban	53.4575	-2.0118		15/10/2021	PM	1005	82	16/10/2021	PM	906	105
MS13	S	B6170	Tameside	England	Minor	Urban	53.4765	-2.0804	30	15/10/2021	PM	1553	101	n/a	n/a	n/a	n/a
MS3	S	A34/ A537	Cheshire East	England	Major	Rural	53.2639	-2.2329	40	15/10/2021	PM	2764	258	16/10/2021	PM	1432	111
SM1	M	A85	Perth & Kinross	Scotland	Major	Rural	56.4082	-3.5019	40	22/10/2021	PM	1756	1454	n/a	n/a	n/a	n/a
SM10	M	PERTH RD	Dundee City	Scotland	Minor	Urban	56.4559	-2.9916	30	22/10/2021	AM	1030	1002	23/10/2021	PM	867	848
SM2	M	A930	Angus	Scotland	Major	Rural	56.5194	-2.7121	60	25/10/2021	PM	862	606	n/a	n/a	n/a	n/a
SM3	M	A862	Highland	Scotland	Major	Rural	57.4792	-4.3079	40	25/10/2021	PM	1147	787	23/10/2021	PM	1076	81
SM4	M	A944	Aberdeenshire	Scotland	Major	Rural	57.1720	-2.4111	30	25/10/2021	PM	1209	1203	23/10/2021	PM	902	895
SM5	M	B825	Falkirk	Scotland	Minor	Rural	55.9136	-3.8224	30	25/10/2021	AM	87	43	n/a	n/a	n/a	n/a
SM6	M	B999	Aberdeenshire	Scotland	Minor	Rural	57.2551	-2.1301	50	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
SM7	M	A728	Glasgow City	Scotland	Major	Urban	55.8447	-4.2139	40	25/10/2021	PM	870	847	n/a	n/a	n/a	n/a
SM8	M	A82 Longman Rd	Highland	Scotland	Major	Urban	57.4827	-4.2244	30	25/10/2021	AM	2601	1550	23/10/2021	PM	2830	150
SM9	M	Cove Road	Aberdeen City	Scotland	Minor	Urban	57.0972	-2.0889	30	25/10/2021	PM	1116	1102	n/a	n/a	n/a	n/a
SS1	S	A89	West Lothian	Scotland	Major	Urban	55.8987	-3.6997	30	25/10/2021	AM	1120	128	23/10/2021	PM	987	231
SS10	S	The Wisp	Midlothian	Scotland	Minor	Rural	55.9133	-3.1176	30	25/10/2021	PM	1570	208	n/a	n/a	n/a	n/a
SS11	S	B8084	West Lothian	Scotland	Minor	Urban	55.8987	-3.6997	30	22/10/2021	PM	963	278	23/10/2021	PM	842	177
SS12	S	A8	Glasgow City	Scotland	Major	Urban	55.8623	-4.1991	40	22/10/2021	PM	703	169	23/10/2021	PM	760	179
SS13	S	A930	Dundee City	Scotland	Major	Urban	56.4685	-2.9312	40	25/10/2021	AM	2372	170	23/10/2021	PM	3360	359

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Site information										Weekday				Weekend			
Site ID	Moving or stationary	Road	Local authority	Country	Major or minor	Urban or rural	Latitude	Longitude	Speed limit	Survey date	AM/PM	Traffic count	Survey count	Survey date	AM/PM	Traffic count	Survey count
SS14	S	A90(T)	Aberdeen City	Scotland	Major	Urban	57.1330	-2.1332	40	25/10/2021	PM	1946	469	n/a	n/a	n/a	n/a
SS15	S	A82 (T)	Glasgow City	Scotland	Major	Urban	55.9033	-4.3788	40	25/10/2021	AM	1019	974	23/10/2021	PM	1683	665
SS16	S	Colinton Rd	Edinburgh, City of	Scotland	Minor	Urban	55.9299	-3.2240	30	22/10/2021	PM	1674	475	23/10/2021	PM	1557	264
SS17	S	B763	Glasgow City	Scotland	Minor	Urban	55.8358	-4.2490	30	25/10/2021	PM	1784	519	n/a	n/a	n/a	n/a
SS18	S	C / unclass	East Dunbartonshire	Scotland	Minor	Urban	55.9046	-4.2247	30	25/10/2021	PM	806	177	23/10/2021	PM	623	135
SS19	S	B9119	Aberdeen City	Scotland	Minor	Urban	57.1464	-2.1130	30	25/10/2021	AM	1360	599	n/a	n/a	n/a	n/a
SS2	S	A73	South Lanarkshire	Scotland	Major	Rural	55.6542	-3.7253	40	25/10/2021	PM	898	262	n/a	n/a	n/a	n/a
SS20	S	B861	Highland	Scotland	Minor	Urban	57.4770	-4.2267	20	25/10/2021	PM	1002	183	n/a	n/a	n/a	n/a
SS3	S	A957	Aberdeenshire	Scotland	Major	Urban	56.9638	-2.2083	30	22/10/2021	PM	831	179	23/10/2021	AM	437	215
SS4	S	A71	West Lothian	Scotland	Major	Rural	55.8267	-3.6689	60	25/10/2021	AM	607	126	n/a	n/a	n/a	n/a
SS5	S	A199	East Lothian	Scotland	Major	Rural	55.9447	-2.9874	40	25/10/2021	AM	1309	234	n/a	n/a	n/a	n/a
SS6	S	A814	West Dunbartonshire	Scotland	Major	Rural	55.9352	-4.5273	40	25/10/2021	AM	2685	1003	23/10/2021	PM	3164	339
SS7	S	A977	Fife	Scotland	Major	Rural	56.0692	-3.7174	30	25/10/2021	AM	612	90	n/a	n/a	n/a	n/a
SS8	S	Lasswade Road	Midlothian	Scotland	Minor	Urban	55.8831	-3.1248	30	25/10/2021	AM	1178	115	n/a	n/a	n/a	n/a
SS9	S	Waggon Road	Fife	Scotland	Minor	Rural	56.0636	-3.4977	30	22/10/2021	PM	636	429	23/10/2021	PM	544	268
WAM1	M	B4355	Powys	Wales	Minor	Rural	52.2996	-3.0703	30	11/10/2021	PM	127	121	n/a	n/a	n/a	n/a
WAM2	M	A350	Wiltshire	England	Major	Urban	51.2547	-2.1870	30	11/10/2021	PM	2836	2380	n/a	n/a	n/a	n/a
WAM3	M	B3064	Bournemouth	England	Minor	Urban	50.7223	-1.8616	30	17/09/2021	AM	2439	2352	18/09/2021	AM	1933	871
WAS1	S	A38	North Somerset	England	Major	Rural	51.3345	-2.7938	40	11/10/2021	PM	1992	353	09/10/2021	AM	1437	344
WAS2	S	B3082	East Dorset	England	Minor	Rural	50.8057	-1.9993	30	17/09/2021	AM	614	581	n/a	n/a	n/a	n/a
WAS3	S	A38	Gloucester	England	Major	Urban	51.8463	-2.2310	40	11/10/2021	PM	4011	464	n/a	n/a	n/a	n/a
WAS4	S	B4262	Cardiff	Wales	Minor	Rural	51.5289	-3.2595	30	11/10/2021	AM	2064	278	09/10/2021	AM	1562	330
WM1	M	A181	County Durham	England	Major	Rural	54.7746	-1.5345	60	15/10/2021	PM	1552	1544	n/a	n/a	n/a	n/a
WM2	M	A591	South Lakeland	England	Major	Rural	54.3830	-2.9105	30	21/10/2021	PM	3515	969	n/a	n/a	n/a	n/a
WM3	M	A59	Harrogate	England	Major	Rural	54.0095	-1.3658	60	15/10/2021	PM	3264	876	16/10/2021	PM	2629	1514
WM4	M	A6192	Chesterfield	England	Major	Rural	53.2434	-1.3290	40	15/10/2021	PM	1071	343	n/a	n/a	n/a	n/a
WM5	M	B1257	Ryedale	England	Minor	Rural	54.2269	-1.0601	60	15/10/2021	PM	890	220	16/10/2021	PM	725	212
WM6	M	A541	Wrexham	Wales	Major	Urban	53.0489	-2.9996	30	18/10/2021	PM	1722	223	n/a	n/a	n/a	n/a
WM7	M	A6030	Leicester	England	Major	Urban	52.6379	-1.0907	30	07/10/2021	PM	2289	222	09/10/2021	PM	2387	224
WM8	M	B4034	Milton Keynes	England	Minor	Urban	51.9929	-0.7397	30	08/10/2021	AM	1648	987	n/a	n/a	n/a	n/a
WM9	M	B5232	Salford	England	Minor	Urban	53.5104	-2.4132	30	18/10/2021	AM	2236	1850	16/10/2021	PM	1772	104
WS1	S	A617	Ashfield	England	Major	Urban	53.1394	-1.2438	40	15/10/2021	PM	1686	195	n/a	n/a	n/a	n/a
WS10	S	A671	Burnley	England	Major	Urban	53.7890	-2.2348	30	15/10/2021	PM	2238	266	n/a	n/a	n/a	n/a
WS11	S	A1036	York	England	Major	Urban	53.9630	-1.0781	30	15/10/2021	PM	1269	134	16/10/2021	AM	1276	198
WS12	S	A639	Wakefield	England	Major	Urban	53.7147	-1.3625	30	15/10/2021	AM	1473	198	16/10/2021	PM	1496	0
WS13	S	C	Sunderland	England	Minor	Urban	54.9008	-1.4097	30	15/10/2021	AM	1086	755	n/a	n/a	n/a	n/a
WS15	S	B6071	Sheffield	England	Minor	Urban	53.3792	-1.4554	30	15/10/2021	AM	1833	285	16/10/2021	PM	1830	170
WS17	S	B640	Rutland	England	Minor	Urban	52.6697	-0.7296	30	11/10/2021	PM	1263	1009	09/10/2021	PM	1416	321
WS2	S	A638	Wakefield	England	Major	Urban	53.6689	-1.4728	30	15/10/2021	PM	1023	121	n/a	n/a	n/a	n/a
WS3	S	A149, Heacham Road	King's Lynn and West Norfolk	England	Major	Rural	52.9076	0.5032	40	24/09/2021	PM	2652	446	n/a	n/a	n/a	n/a
WS4	S	A6	Bolton	England	Major	Rural	53.5943	-2.5693	50	18/10/2021	PM	1504	154	n/a	n/a	n/a	n/a
WS6	S	High Street	Hartlepool	England	Minor	Rural	54.6476	-1.2396	30	15/10/2021	PM	418	405	n/a	n/a	n/a	n/a
WS7	S	Mill Lane	Cheshire East	England	Minor	Rural	53.3209	-2.1354	60	15/10/2021	PM	789	145	16/10/2021	PM	462	88
WS8	S	Windlehurst road	Stockport	England	Minor	Urban	53.3661	-2.0781	30	15/10/2021	PM	997	113	16/10/2021	PM	740	85
WS9	S	A57	Liverpool	England	Major	Urban	53.4120	-2.9433	30	18/10/2021	AM	1656	248	n/a	n/a	n/a	n/a


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