THE ROAD SAFETY TRUST

Making Roads Safer

Combining the carrot and the stick: can ANPR Speed Indicator Devices reduce speed in rural areas?

Provided to Suffolk County Council through funding from the Road Safety Trust

RESEARCH SERVICES

agilysis

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This report has been prepared for Suffolk County Council as an independent evaluation of ANPR SIDs by Agilysis. The team would like to thank Jon Shaw and Mike Motteram for commissioning the study and managing the trial, and the Road Safety Trust for funding the research.

ABBREVIATIONS

ACPO	Association of Chief Police Officers
ANPR	Automatic Number Plate Recognition
ANPR SID	Automatic Number Plate Recognition Speed Indicator Device
ATC	Automatic Traffic Counter
CSW	Community Speed Watch
LHA	Local highway authority
PCC	Police and Crime Commissioner
SCC	Suffolk County Council
SID	Speed Indicator Device
SLA	Service Level Agreement
TVAS	Temporary Vehicle Activated Sign
VAS	Vehicle Activated Sign

EXECUTIVE SUMMARY

This report presents the findings of a research study carried out to review the effectiveness of automatic number plate recognition (ANPR) speed indicator devices (SIDs) in reducing speeds in rural areas, specifically in Suffolk.

The focus of this research study is an evaluation of an intervention which combines the functionalities and behavioural approaches from ANPR cameras, SIDs and targeted warning letters. Warning letters are most usually sent out through community speed watch (CSW) initiatives through the manual recording of the number plates of the offending drivers' vehicles by community volunteers. The piloting of ANPR SIDs as an intervention is therefore novel; with the outputs of this study potentially having significant road safety policy implications for localised speed management efforts, not just in rural Suffolk.

This research study has been commissioned by Suffolk County Council (SCC) – with £30,000 funding granted by the Road Safety Trust – to evaluate how effective ANPR speed indicator devices are at reducing speeds. The study contributes to the evidence base for this intervention type, itself a relatively recent development in the context of speed management efforts at the local level.

At the outset, this pilot study had a number of objectives:

- To determine if average speeds in rural villages can be reduced through the use of ANPR SIDs
- To determine if the proportion of speeding vehicles can be reduced through the use of ANPR SIDs
- To determine if publicising the use of ANPR SIDs leads to further reductions in average speeds in rural villages
- To determine if ANPR SIDs are more effective than vehicle activated signs (VAS) at reducing average speeds in rural villages
- To determine if public awareness and knowledge of warning letters influences the effectiveness of VAS in reducing average speeds in rural villages
- To determine if local residents think ANPR SIDs and/or VAS are effective at reducing average speeds in rural villages

This study brings together a mix of data sources and analytical approaches to address the central research questions:

- *How effective are ANPR SIDs at reducing the proportion of speeding vehicles in villages?*
- *Does public awareness of the use of warning letters influence effectiveness?*

Combining 'carrot and stick' elements from different speed management tools means that two behaviour change approaches are deployed simultaneously in one intervention: ANPR SIDs. Elements of SID/VAS feedback prompts are combined with the targeted enforcement-based intervention of warning letters (facilitated by ANPR monitoring capabilities). The first of these behavioural nudges is therefore *informing drivers of their vehicle speed*; the second is the *threat of punitive action*. The study has been designed to collect quantitative and qualitative data to understand the impacts of informing drivers of their vehicle speed, (through immediate feedback from the sign), and through warning letters (both those directly sent to registered keepers and through publicising that letters will be sent).

ANPR SIDs are a new tool, without an evidence base. VAS have been evaluated, although the UK research is not recent. It is difficult to identify research into the effectiveness of CSW on driven speeds, although a literature review exploring the implications of roadside feedback devices (VAS and SIDs),

in addition to initiatives such as community speed watch, has been undertaken for this study. The review found that SIDs were slightly more effective at reducing speeds than VAS, with one study finding immediate reductions in average speed of up to 7mph at SID sites.

This study is a pre-and-post design, with comparison group. There were several sources of data collection:

- Speed monitoring – collecting average and 85th percentile speeds, traffic flow, proportions of vehicles in each 'speed bin',and the percentages of vehicles exceeding the posted speed limit.
- Interviews with parish council representatives – prior to the start of the trial, to gauge perceptions on the issues of speeding in their villages.
- Surveys with parish council representatives – after the trial to gather perceptions on changes in speed, feedback from parishioners, and thoughts on the process of installing the devices.
- Surveys with residents who live close to the devices – after the trial to gather perceptions on changes in speed.
- Interview with Suffolk County Council representative – to gather insight into the processes involved in managing the ANPR SID programme.

Sites were selected from Suffolk County Council's database of sites. There are already approximately 70 TVAS sites in Suffolk and parishes were invited to submit suggestions for sites to be considered for ANPR SID. As of 24th November 2022, there were around 200 requested sites on the list. Ten temporary VAS and 10 ANPR SID sites were randomly selected for inclusion in the study. The TVAS study sites were all selected from the west of the county and the ANPR SID study was in the east (to avoid any 'halo' effect where the devices influence speeding behaviour at other study sites). The sites in each group were not situated far from one another, due to the practicalities of speed monitoring and device installation. Sites were located in 30mph limits and had to meet set criteria for installation (visibility, parking access, space to carriageway, etc.). The eligible sites in each area were allocated a number and were selected using a random number generator.

ANPR SIDS

Speed indicator devices detect and display vehicle speed to drivers (in an associated colour to indicate whether a vehicle's speed is above or below the posted limit). This differs from vehicle activated signs (VAS), which only display a colour symbol upon activation (such as a green 'smiley' face to indicate approval or a red 'sad' face to indicate disapproval).[1] SIDs and other VAS devices can help drivers to comply with speed limits, but on their own present no threat of sanction to those who intentionally exceed the limits. The deployment of signs like SIDs and VAS require no direct engagement with drivers so can be used by local authorities and communities, who do not need to access a database of registered keepers of vehicles. Community Speed Watch activities do require the involvement of the police as community volunteers record the vehicle registration numbers of speeding vehicles and share them with the police, who in turn issue warning letters. Drivers detected speeding by Community Speed Watch volunteers cannot be prosecuted because the offences are not detected by police. This is why warning letters are issues instead. Warning letters can be framed to include a variety of behavioural nudges, in addition to their function as an explicitly punitive measure. In this trial, two of these speed management tools are combined into one device: the ANPR SID. Rather than either displaying the speed of each passing vehicle or sending a warning letter from the police, ANPR SIDs display the speed at the time each driver passes the device but also takes a photo of each vehicle, with

[1] Whilst SIDs can be considered a type of vehicle activated sign (one of many variations), the distinction between them made here is to make clear they have been implemented and monitored separately in the current pilot as part of two interventions, experimental ANPR SIDs and VAS devices.

its recorded speed, for later download by Suffolk County Council. A representative from SCC selects vehicles which have exceeded the speed limit and sends their details to Suffolk Constabulary to process and issue warning letters. The combination of ANPR and SID functionalities with warning letters could prove to be more effective than deploying the constituent interventions separately, effectively overcoming the limitations of when only one behaviour change approach is used in isolation.

There are some lessons learnt from the trial. Firstly, in terms of advice to other authorities considering utilising ANPR SIDs, there are some considerations regarding operations. As warning letters are a fundamental component of the devices, a partner authority is required that can provide registered keeper details via a data sharing agreement. It was not possible to engage with the DVLA in order to set up such an agreement, so it is essential to get the local police on side to perform that function.

Also operationally, the ANPR Officer spoke about how authorities need to think about the capacity for letter sending and how to prioritise which detections to send letters out for. For Suffolk County Council, it was decided to send out 40 letters from each site visit, with 50% of these selected randomly from detections between 35mph and 40mph, with the rest from those over 40mph, working from the fastest speeds downwards. The intention is to send out letters to all drivers over the ACPO threshold with future deployments.

FINDINGS

The main conclusion of the study is there was no detectable impact of ANPR SIDs in reducing neither speed nor the proportion of speeding vehicles at selected sites.

Paired t-tests were carried out to compare sites against themselves in different time periods to observe changes and whether these could have occurred by chance or be due to the intervention. The study found that there were no significant changes in average or 85th percentile speed (the speed at which 85% of traffic is travelling at or below), or the percentages over the enforcement threshold of 35mph, during the trial period for either ANPR SID or TVAS devices. This is across five points in time and two one-week deployments of the devices, with publicity of the ANPR SID devices in the middle of the trial. Other studies of SIDs have detected reductions in speed, albeit for a limited period of time during single deployments. However, for the sites in this trial, selection was based on nomination by villages and then random selection for inclusion in the study. This means that baseline speeds and evidence of an existing speeding problem were not predefined criteria. With pre-existing high levels of compliance with the speed limit, it is difficult to change behaviour to achieve an observable effect which could not have occurred by chance.

Despite the lack of observed changes in driven speeds, there was positive feedback from the villages, both from residents and from parish representatives. This aligns with evidence on Community Speed Watch, which mobilises residents to proactively engage with their community concerns. Whilst perceived speeds are important to residents for encouraging active travel and for improving quality of life, it should be noted that the risk of collisions is that the same as before, given that actual speeds did not change. Perceived risk doesn't alter actual collision risk and whilst speeds are low, there is a chance that people could feel safer and therefore behave less cautiously.

The results of this trial have revealed that site selection and integrity are critical in optimising the chances of the selected intervention producing the desired effects; and that a behavioural diagnosis or 'mapping' of the road safety issues at play can help to ensure that the intervention designed or selected is relevant to effectively target the problem behaviours identified. The ANPR SIDs have a high level of support amongst the parish authorities surveyed, and the perceived road safety benefits of

them are clear amongst residents when compared to other existing speed indicator devices. Despite these insights regarding ANPR SIDs, parishes and residents still view existing TVAS as a relevant intervention by prompting drivers about their speed. Levels of agreement in the utility of TVAS devices across many of the fields were very strong, indicating that they remain an optimal choice of intervention from the perspective of communities and proactively dealing with concerns around speeding and connected driver behaviour.

RECOMMENDATIONS

Recommendations for future deployment to improve effectiveness:

- Site selection is an important factor to consider. Choosing sites that have evidenced speeding issues would potentially have the most impact. Across all the sites selected in this trial, average speeds were already low and so the effect of the intervention was not statistically significant. With general compliance good before the intervention, it is difficult to determine the impact these devices might have on a larger proportion of offending drivers.
- Budget limitations and affordability meant the sample size of sites was small and constrained. If sites were selected with higher levels of non-compliance, the sample size would not have been such an issue. However, these were devices deployed for a few weeks and without targeting sites with high levels of recorded speeding, meaning the results need to be placed in perspective. For future research to result in more conclusive findings, larger sample sizes and relating budgets could be potentially significant.
- There were several site integrity issues, which is why a certain number of sites had to be excluded from the analysis to not skew the rest of the findings. This reduced the sample sizes.

INTRODUCTION

This report presents the findings of a research study carried out to review the effectiveness of automatic number plate recognition (ANPR) speed indicator devices (SIDs) in reducing speeds in rural areas, specifically in Suffolk.

Traditionally, ANPR and SIDs have been deployed as separate road safety and crime management tools. ANPR camera systems record the number plate detail of vehicles, data which is processed by police forces. They are typically used for vehicle tax and crime detection purposes. Speed indicator devices, on the other hand, detect and display the vehicle speed to the driver (in an associated colour to indicate whether a vehicle's speed is above or below the posted limit). This differs from vehicle activated signs (VAS), which only display a colour symbol upon activation (such as a green 'smiley' face to indicate approval or a red 'sad' face to indicate disapproval).[2] SIDs and other VAS devices can help drivers to comply with speed limits, but on their own present no threat of sanction to those who intentionally exceed the limits. The deployment of signs like SIDs and VAS require no direct engagement with drivers so can be used by local authorities and communities, who do not need to access a database of registered keepers of vehicles. Community Speed Watch activities do require the involvement of the police as community volunteer record the vehicle registration numbers of speeding vehicles and share them with the police, who in turn issue warning letters. Drivers detected speeding by Community Speed Watch volunteers cannot be prosecuted because the offences are not detected by police. This is why warning letters are issues instead. Warning letters can be framed to include a variety of behavioural nudges, in addition to their function as an explicitly punitive measure. In this trial, two of these speed management tools are combined into one device: the ANPR SID. Rather than either displaying the speed of each passing vehicle or sending a warning letter from the police, ANPR SIDs display the speed at the time each driver passes the device but also takes a photo of each vehicle, with its recorded speed, for later download by Suffolk County Council. A representative from SCC selects vehicles which have exceeded the speed limit and sends their details to Suffolk Constabulary to process and issue warning letters. The combination of ANPR and SID functionalities with warning letters could prove to be more effective than deploying the constituent interventions separately, effectively overcoming the limitations of when only one behaviour change approach is used in isolation.

The focus of this research study is an evaluation of an intervention which combines the functionalities and behavioural approaches from ANPR cameras, SIDs and targeted warning letters. Warning letters are most usually sent out through community speed watch (CSW) initiatives through the manual recording of the number plates of the offending drivers' vehicles by community volunteers. The piloting of ANPR SIDs as an intervention is therefore novel; with the outputs of this study potentially having significant road safety policy implications for localised speed management efforts, not just in rural Suffolk.

Rural areas often present a disproportionate level of road safety risk compared to urban areas. Between 2016 and 2020, 63% of casualties who were fatally injured on Great Britain's roads were on rural roads at the time of their collision. Overall, 35% of casualties injured on rural roads were in 20mph, 30mph or 40mph speed limits, showing that risk is not limited to the higher speed rural roads (with one-fifth of fatal casualties injured in built-up rural areas). Introducing mechanisms to reduce vehicles speeds has the potential to reduce the frequency and severity of collisions, with Nilsson's

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'Power Model' showing that a 5% increase in average speeds leads to approximately a 10% increase in injury collisions and a 20% increase in fatal collisions. Subsequent modelling continues to demonstrate the strong link between mean speed of traffic and road safety, particularly the number of fatalities and the number of injury collisions. (Elvik, Vadeby, Hels, & van Shagen, 2019) .

The purpose of this research study is to provide an evaluation of ANPR SIDs, addressing the overarching issue of whether or not they can effectively reduce speeds in rural villages, and therefore if there is future potential for local authorities to use them as a speed management tool. The report has been designed to include the logical components of what would be needed if this type of intervention was to be implemented elsewhere, providing supportive explanation.

PROJECT SUMMARY

This research study has been commissioned by Suffolk County Council (SCC) to evaluate how effective ANPR speed indicator devices are at reducing speeds. The study contributes to the evidence base for this intervention type, itself a relatively recent development in the context of speed management efforts at the local level.

PROJECT OBJECTIVES

The study has a number of objectives, which are to:

- Determine if average speeds in rural villages can be reduced through the use of ANPR SIDs.
- Determine if the proportion of speeding vehicles can be reduced through the use of ANPR SIDs.
- Determine if publicising the use of ANPR SIDs leads to further reductions in average speeds in rural villages.
- Determine if ANPR SIDs are more effective than VAS at reducing average speeds in rural villages.
- Determine if public awareness and knowledge of warning letters influences the effectiveness of VAS in reducing average speeds in rural villages.
- Determine if local residents think ANPR SIDs and/or VAS are effective at reducing average speeds in rural villages.

PROJECT OUTPUTS

This report is the main output of this research study, commissioned as a pilot evaluation for road safety policy development purposes. The report is intended to support those local road safety practitioners seeking to deploy this type of intervention and vehicle activated signs, and so the evaluation is presented in a manner which allow others to easily identify and incorporate relevant information into similar schemes which involve either this intervention or similar configurations of its constituent components. This includes the study design process, through which data was gathered and all the necessary project components were completed.

CONTEXT, INVOLVEMENT AND FUNDING

This research study has benefited from the involvement of a range of road safety stakeholders. The procurement of the devices has been secured through investment by Suffolk County Council, with Parishes having been able to request that sites in their areas be included in the trial (with approval from their County Councillor).

Road Safety Trust

The project is partially funded by the Road Safety Trust, which is the largest independent funder of road safety research in the UK.

Suffolk County Council

The introduction and review of ANPR speed indicator devices in Suffolk provides the County Council with an opportunity to assess the effectiveness of what is a novel intervention in the context of speed management in rural areas of the county. The evaluation of ANPR SIDs gives road safety practitioners at the county level the opportunity to understand the effectiveness of different speed management approaches.

Suffolk Roadsafe Partnership

Suffolk County Council, in partnership with Suffolk's Police and Crime Commissioner and Suffolk Constabulary have recently begun trialling the use of ANPR cameras through the Council's 2020 fund. The Partnership was created in 2007 to bring together expertise and resource from the main agencies involved in road safety across the county. The three overarching areas of focus for the Partnership are drivers and riders; education; and speed prevention. Enforcement efforts to reduce speeding in rural Suffolk have included a mixture of fixed, mobile, and average speed cameras, alongside educational prompts for drivers through CSW and Temporary Vehicle Activated Signs (TVAS) devices.

This ANPR SID trial compliments the Partnership's current community-based strategy 'working together to reduce speed' (Suffolk Roadsafe Partnership, 2022) based on these four pillars of collaboration: police enforcement interventions; CSW volunteering; deployment of Parish Council purchased SIDs; and County Council deployed TVAS.

The Partnership has previously set out the desired impacts of ANPR cameras procured through the 2020 Fund, and which now form part of the ANPR SID intervention for this study:

- Fewer speeding offences achieved through reductions in speed
- Fewer collisions
- Reduced level of complaints from local communities
- Improvements in the quality of life for residents

Parish Councils

Whilst responsibility for highways falls with SCC, Parish councils maintain a remit for the management of specific road safety interventions and activities within their boundaries. Their input into this study provides seminal insights and evidence into ANPR SID effectiveness on the ground in rural villages of the county. Contributions from parish council representatives pertaining to the ANPR SID pilot have been captured through qualitative investigation, both before and after the trials. The outputs from these interviews and survey questionnaires have been analysed to identify core themes and insights into the perceived effectiveness of this intervention at the local level. These outputs will provide a substantial point of cross-reference for the empirical observations relating to changes in selected speed metrics.

METHODOLOGY

This study brings together a mix of data sources and analytical approaches to address the central research questions:

- *How effective are ANPR SIDs at reducing the proportion of speeding vehicles in villages?*
- *Does public awareness of the use of warning letters influence effectiveness?*

Combining 'carrot and stick' elements from different speed management tools means that two behaviour change approaches are deployed simultaneously in one intervention: ANPR SIDs. Elements of SID/VAS feedback prompts are combined with the targeted enforcement-based intervention of warning letters (facilitated by ANPR monitoring capabilities). The first of these behavioural nudges is therefore *informing drivers of their vehicle speed*; the second is the *threat of punitive action*. The study has been designed to collect quantitative and qualitative data to understand the impacts of informing drivers of their vehicle speed, (through immediate feedback from the sign), and through warning letters (both those directly sent to registered keepers and through publicising that letters will be sent).

ANPR SIDs are a new tool, without an evidence base. VAS have been evaluated, although the UK research is not recent. It is difficult to identify research into the effectiveness of CSW on driven speeds, although a literature review exploring the implications of roadside feedback devices (VAS and SIDs), in addition to initiatives such as community speed watch, has been undertaken for this study.

This pilot provides an opportunity to understand the effectiveness of the rationale behind two of these tools, helping local authorities prioritise their speed management toolkits.

STUDY DESIGN

This study is a pre-and-post design, with comparison group. There were several sources of data collection:

- Speed monitoring – collecting average and 85th percentile speeds, traffic flow, and the percentages of vehicles exceeding the posted speed limit.
- Interviews with parish council representatives – prior to the start of the trial, to gauge perceptions on the issues of speeding in their villages.
- Surveys with parish council representatives – after the trial to gather perceptions on changes in speed, feedback from parishioners, and thoughts on the process of installing the devices.
- Surveys with residents who live close to the devices – after the trial to gather perceptions on changes in speed.
- Interview with Suffolk County Council representative – to gather insight into the processes involved in managing the ANPR SID programme.

Site Selection

Sites were selected from Suffolk County Council's database of sites. There are already approximately 70 TVAS sites in Suffolk and parishes were invited to submit suggestions for sites to be considered for ANPR SID. As of 24th November 2022, there were around 200 requested sites on the list. Ten temporary VAS and 10 ANPR SID sites were randomly selected for inclusion in the study. The TVAS study sites were all selected from the west of the county and the ANPR SID study was in the east (to avoid any 'halo' effect where the devices influence speeding behaviour at other study sites). The sites in each group were not situated far from one another, due to the practicalities of speed monitoring and device installation. Sites were located in 30mph limits and had to meet set criteria for installation

(visibility, parking access, space to carriageway, etc.). The eligible sites in each area were allocated a number and were selected using a random number generator.

ANPR SID Installation and Monitoring

Sites were allocated to one of two groups, to manage deployment (either Group 1 or Group 2), with five ANPR SID and five TVAS in each. This was to spread out device installation and speed monitoring (as it was difficult to install and charge devices to have all ten out at once. TVAS and ANPR SID sites in Group 1 were monitored and installed at the same time (to ensure the data were collected in matched conditions), and the same is true for those sites in Group 2. The TVAS sites are comparison sites, with the same data collected at the same time as the ANPR SIDs. There are a number of external factors, such as weather, fuel shortages, Covid lockdowns etc which can affect speeds and traffic flows. If the use of warning letters alongside the display of vehicle speeds leads to a greater reduction in speed than just displaying vehicle speeds, then this should be observable in the data collected with greater reductions at ANPR SID sites than the comparison TVAS sites. A schedule was created which set out the monitoring and installation periods for sites in Groups 1 and 2.

Site Integrity

To have confidence in the results, the plan was that the selected sites (both ANPR SID and TVAS sites) should not have any other forms of speed management activity during the study period. This was communicated to the local parish council to manage expectations. Site integrity ensures a higher level of reliability in terms of the results generated and the comparability of them. This also ensures that as a novel study, policy makers will have confidence that the results can be used to accurately inform road safety and speed management policies related to the intervention being evaluated.

Whilst the intention was to maintain site integrity, other activities did go ahead. There were two sites which received enforcement activities and two villages which had community speed watch during the trial period. These sites were reviewed separately in the analysis to see if the additional activity influenced the results.

Site Limitations

There were two sites where there were issues during the trial.

Charsfield:

- Speed monitoring undertaken in the middle of the village (not near the proposed location)
- No appropriate post for ANPR SID (original assessment deemed it suitable for inclusion but on installation it was found not to be appropriate. As such, no device was installed at this site).

Barham:

- Existing SID still in place during baseline period (this has been noted in the analysis)

Speed Monitoring

Each Group of sites was monitored **five** times, resulting in 100 speed surveys being conducted. In total, 2,119,440 vehicles were measured over the entire period (with approximately 420,000 vehicles measured in each time period). Automatic traffic counters, in the form of rubber tubes, were used at all sites for every survey. Each survey was for one week. The five timepoints for surveys were:

- Baseline (one week before installation)
- Post (one week after installation)
- Four weeks' post (four weeks after installation)

- Baseline 2 (one week before second installation)
- Post 2 (one week after second installation)

Table 1 - Speed monitoring timeline

Week commencing	18/07/2022	25/07/2022	01/08/2022	08/08/2022	15/08/2022	22/08/2022	29/08/2022	05/09/2022	12/09/2022	19/09/2022	26/09/2022	03/10/2022	10/10/2022	17/10/2022
Baseline one	1	2												
Installation		1	2											
Post			1	2										
Four weeks' post						1	2							
Baseline two									1	2				
Publicity														
Installation two										1	2			
Post two													1	2

The key metrics from this study were collected at these five timepoints. To manage workloads, the two Groups of sites were monitored in consecutive weeks (meaning 10 sites were monitored at a time).

- Comparisons are made *within sites* (pre, post and four weeks post) and therefore the same type of monitoring equipment was used each time (in this case, pneumatic tubes).
- Average speed, 85th percentile speed and daily traffic flow were collected for each site at each point in time.

Publicity and Communications Engagement

As ANPR SIDs are novel devices, with most of the motoring public unaware of their functionality, the research design of this study allows the team to measure the effect of sending warning letters *when most people are unaware that they can do this* and also, *after publicity to inform them there is a risk of receiving a letter*. Gathering data before publicity AND afterwards provides insights for future deployment and investment. It was hypothesised that the same results could be achieved in both stages, meaning there is no need to accompany an ANPR SID scheme with a publicity campaign. Alternatively, it was thought that potentially better results might be achieved by informing motorists that there is a risk of receiving a letter. Lastly, it was possible that there could be a positive effect on temporary VAS sites after publicity, with motorists unsure of which types of site could result in a letter.

A key element of the study was the 'big reveal' of the use of ANPR SIDs in Suffolk. This was done after the first phase and data have been collected when the majority of motorists were unaware of warning letters being sent.

Publicity was arranged, involving the Police, Councillors and local representatives, aiming to engage the local media and maximise coverage. Given the importance of publicity within the study design, it was important that communications are managed so that:

- In the first phase, there should be NO public communications about the use of ANPR SIDs.
- In the first phase, if asked about the new devices, the response was that they are being trialled.

- Before the second deployment, publicity was planned (see the section on publicity on page 19)

RESEARCH METHODS

This study uses both quantitative and qualitative data sources to evaluate the effectiveness of ANPR speed indicator devices. Analysis of the quantitative data produces empirical evidence which shows how speeds may have changed where ANPR speed indicator devices have been implemented. Analysis of the qualitative data provides insights into both the perceived effectiveness of this type of intervention and the process of installation and usage of the devices. The latter can be used to improve the process and provide guidance to other authorities looking to replicate the intervention.

QUANTITATIVE DATA

This study uses speed data collected for specific weeks through tube surveys, collected at five points in time.

A closed-question survey was also distributed to households in villages where ANPR SID and VAS sites were installed as part the pilot. These were posted through the letter boxes of households in the vicinity of the device, and a pre-paid envelope was provided to return the completed form. The same questionnaire was disseminated to all village sites selected for either an ANPR SID or TVAS, allowing for comparative analysis of resident perceptions relating to vehicle speeds and speeding behaviour. A similar survey was issued to parish council representatives, with additional questions related to the practicalities of the devices.

QUALITATIVE DATA

This study also uses qualitative research methods data to generate insights into impressions on the effectiveness of the devices. Parish interviews have been conducted with representatives from as many of the parish councils of the selected 20 sites as possible. These interviews were conducted to acquire a picture of rural speeds and speeding behaviour concerns, and activity at the level of local speed management in the villages themselves. The interview transcripts were thematically analysed to identify common themes. An open-text section from the parish surveys further explored the selection, deployment, and process of installing ANPR SIDs and TVAS.

EVIDENCE BASE

EXISTING LITERATURE REVIEW

An open source and light touch literature review was carried out to gauge how effective SID and VAS devices are at reducing the proportion of speeding vehicles in rural villages, as well as selected interventions that are well-established within local speed management toolkits. The literature review also aimed to determine if public awareness of the use of warning letters influences effectiveness.

As the ANPR element of this specific trial is novel (using warning letters to encourage behaviour change amongst speeding drivers), the evidence base was scarce, especially surrounding the administering of warning letters to drivers who have been recorded as speeding. Community Speed Watch (CSW) is not entirely dissimilar to the behavioural objectives of ANPR SIDs and entails warning letters being sent out. It was therefore used as a comparator to assess effectiveness in the secondary literature. CSW schemes enable police-trained volunteers to work within their locality to carry out speed checks, using monitoring equipment to identify speeding motorists. Vehicle registration details can then be passed to the police, who issue warning letters to registered keepers of the speeding vehicles.

CSW is not intended to be an enforcement tool, but rather a way of raising awareness around speeding in communities, reminding and educating drivers. Warning letters in CSW schemes are sent by

manually collecting vehicle registration numbers, (unlike in this trial, where letters are sent after ANPR detection of vehicle registration details). Whilst there is limited research available which considers the speed impact dynamics of CSW, a qualitative study involving Chief Constables and Police and Crime Commissioners (PCCs) provides insight into the perceived utility of CSW as a roads policing tool (Wells & Millings, 2019)**.** Chief Constables noted that CSW provides a 'light-touch' opportunity to address genuine speeding concerns, but also to assuage concerns in situations where there is a disconnect between a community's *perceived* concern around the level of speeding, versus the *actual* proportion of offending drivers. In this sense, CSW as an *activity,* as opposed to its potential to achieve road safety outcomes, is what makes it valuable. PCCs more often noted the potential of CSW to counteract increasing levels of localised speeding offences and persistent community pressures aimed to increase action against speeding motorists, in a way that does not infringe on the operational remits of Chief Constables or other roads policing portfolios. For both interview groups in the study, the volunteer and public engagement elements of CSW provide police forces with the means to be seen as responsive to the issue of speeding in a way that increases their accountability and levels of public satisfaction through 'empowerment' – essentially acting as a multiplier of democratic accountability through co-production of action (as opposed to the co-production of reduced speed itself as the principal objective of self-ascribed community involvement). This perceived action of the community as a collective response to speeding is the core value of CSW schemes, as opposed to their actual speeding outcomes. This is reflected in the potential deterrent value of CSW warning letters, where the community action that generates the letters itself is seen as more valuable at the roads policing level. Alternative speed management tools involving automated speed camera technology may incur higher levels of public disapproval from drivers and community groups, owing in part to anxiety and enduring narratives surrounding mass surveillance.

There is relatively little research into the effectives of SIDs as an intervention to reduce speed in a way that is acceptable to the public, despite their long-established use by local authorities. A study carried out by the Thames Valley Road Safety Partnership (Poulter & McKenna, 2005) specifically considered the use of SIDs and their impact on driver behaviour on 30 mph limit roads (as an unenforced speed management intervention as opposed to enforced methods, such as fixed speed cameras). The SID experiments, using the same spatial and evaluation methodology as the speed camera experiments, found that SIDs had a consistent and significant impact on driver behaviour. Speed data analysis showed, on average, drivers reduced their speed by 5.9mph from the hours before to the hours after deployment, and by 7.0mph from the day prior to deployment. Whilst speeds returned to pre-deployment levels immediately after the SIDs, the results of a questionnaire issued as part of the study suggested that drivers found SIDs to be a more socially acceptable means of reducing speed than speed cameras (78% stated that the number of SIDs should increase, with only 33% stating that safety cameras should increase). Interestingly, drivers noted that they would reduce their speed for a SID to the same extent as when driving on a section of road subject to safety camera surveillance, despite the fact that there is no threat of enforcement with SIDs. All drivers reduced speeds regardless of whether they were driving above or within the speed limit. Over time, as drivers become accustomed to the speed limit, only drivers driving above the speed limit tended to reduce their speed.

A study of eleven sites where SIDs were installed on urban roads in London (Walter & Knowles, 2008) evaluated their effectiveness in reducing vehicle speeds, finding that there was an initial 'novelty effect' which lasted for approximately a week post-installation. The research objective included calculating how long the effect of a SID lasts whilst it is active. In all the sites where a SID was active for at least two weeks, their most effective period in reducing speeds was during the first week. There was a significant reduction in the effectiveness during the second week, and no observed change in

the mean speed measured between the second and third weeks, with the effect waning towards the end of the three-week period.

In speed observations post-SID installation, there were no continual speed reductions after the SID was removed (in line with previous studies) although there was a small but notable after effect at sites which had previously experienced the highest reductions whilst a SID was active. It is suggested that SIDs should remain at each site for at least two weeks and no longer than three weeks. As there are only minor effects after the SIDs are removed and that efficacy decreases in this time frame, it is recommended that they are reinstalled regularly. This case study included only urban roads in London, meaning that road layout, geography and environment all play a role when assessing SID effectiveness.

A road safety partnership study, carried out between 2006 and 2008, monitored four urban camera sites and one VAS site (replacement intervention for one camera site) where the equipment at each site was deactivated between two and eight months. At one of the camera sites, the deactivated camera, instead of being reactivated was replaced by a VAS device (Allsop, 2010). Camera signs were left in place during this period and but then later removed. At two of the 30mph sites with cameras, average speeds increased moderately after deactivation (1.5mph average increase) whilst the proportion of vehicles speeding above 35mph increased exponentially. At the third and fourth sites, both with much higher traffic flow, the average speed increased between 3.5 to 4mph upon deactivation. At the fourth site, there was virtually no change in average speeds following the 4mph increase from when the camera was deactivated to when it was replaced by a VAS device. The proportion of vehicles exceeding 35mph increased significantly when the cameras were out of action, but at the fourth site when the replacement VAS was operational, the proportion of vehicles exceeding this threshold notably decreased (only increasing again when the camera sign was removed). This suggests that when signage is present, VAS devices may reduce the proportion of vehicles exceeding the upper enforcement threshold of 35mph in 30mph limit areas, despite having minimal impact on average speeds.

Another study examined the comparative difference between VAS and SID in terms of their effectiveness in reducing the variable effects on the mean and standard speed deviation on a given road segment (Jomaa, Yella, & Dougherty, 2017). Preliminary results showed that both signs have a level of efficacy, however, SIDs were relatively more effective than VAS when deployed specifically on local roads. In contrast, the efficacy of the two interventions was only comparable when tested on highways. The study concluded that the use of SIDs is likely to be the better and 'most appropriate' intervention in 'local areas'.

PUBLICITY

The 'big reveal' of the trial took place on Wednesday 28th September 2022, with the Suffolk County Council and the Police and Crime Commissioner publicly announcing the use of ANPR SIDs in the county. A series of radio and newspaper interviews explained the trial, the purpose of the devices, and how they worked to send warning letters to speeding drivers. It explained that persistent offenders will be reported to Suffolk Constabulary and could be visited by a police officer to discuss their driving behaviour.

The story featured in the main local newspapers of the East Anglian Daily Times and the Ipswich Star as well as on local radio stations, BBC Radio Suffolk and Greatest Hits Radio Suffolk. The story featured on all of these organisations' news sites.

Social media was also used to spread the word, with Twitter and Facebook messages from Suffolk RoadSafe and individual Councillors. After two days, there were 50 comments and 40 shares of the Suffolk County Council Facebook post, with many supportive comments. For Twitter, after two days, there had been 2,688 impressions of the first tweet, with 1,210 impressions of the second.

FINDINGS

SPEED DATA ANALYSIS

Automatic traffic counters (ATCs) collected speed samples on both TVAS and ANPR intervention sites at five points in time:

1. Baseline 1 (pre-installation)
2. Post 1 (after installation)
3. Four-weeks post installation
4. Baseline 2 (pre-installation and post publicity)
5. Post 2 (post-installation)

Analysis was also undertaken to explore the proportion of vehicles in each speed 'bin' in each time period, comparing the ANPR sites with the TVAS sites. The data was supplied with the numbers of vehicles travelling between set miles per hour, called 'bins'. This means that it is not possible to determine the exact number of vehicles travelling at individual speeds but it is possible to explore changes in the proportion of vehicles in each speed bin. Ideally, the proportions of vehicles in the lower speed bins would increase after the intervention. Individual counts were not analysed, and some sites have much higher traffic flows than others.

Figure 1 - Proportions of vehicles in each speed bin in the Baseline 1 period, by site type

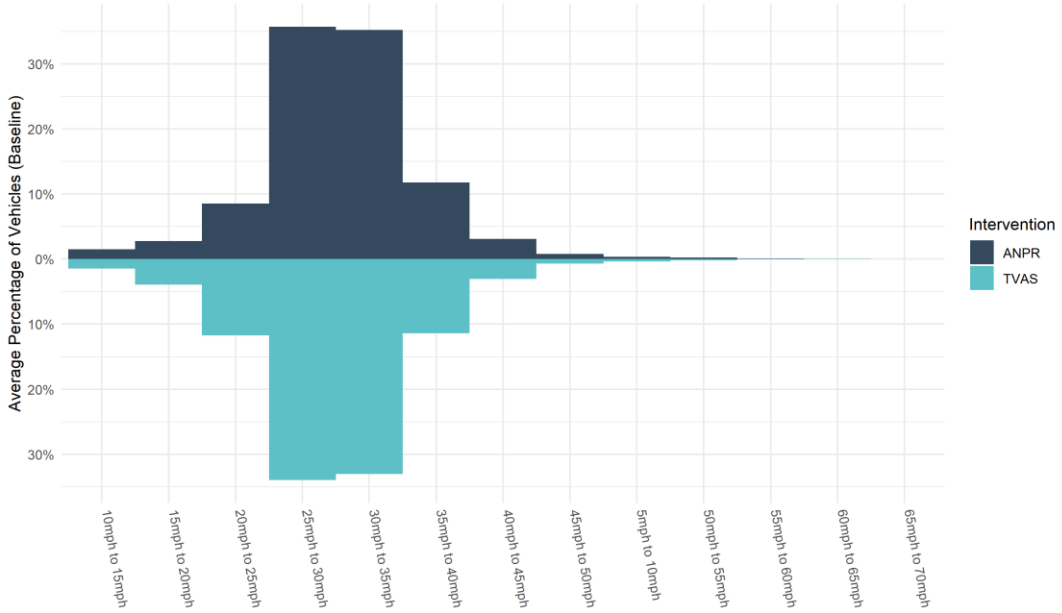


Figure 1 shows the first baseline period and the percentages of all vehicles in each speed bin. Before the first installation, there were some differences between the two site types. There were slightly higher proportions of vehicles in each speed bin from 25mph upwards for the ANPR sites compared with the TVAS sites. This is not surprising as the TVAS sites were well-established and had previously regularly received the signs, whereas the ANPR sites were new locations (although some may have previously received other speed management interventions, such as Police enforcement or Community Speed Watch). For example, for ANPR, 35.19% of vehicles were travelling between 30mph and 35mph, whilst it was 33.04% for TVAS sites. Conversely, 11.73% of vehicles at TVAS sites were travelling between 20mph and 25mph, compared to 8.54% for ANPR sites. T-tests were undertaken to compare the average distributions of ANPR SID sites with TVAS sites for all five time periods and TVAS had a statistically significant lower average speed on all occasions. These speed distributions

were inferred from the binned speed data, and Sheppard's corrections were applied to account for grouping errors.

Figure 2 shows the proportions of vehicles in each speed bin in the first 'post intervention' period, which was the week after installation of both types of device. The proportions are very similar to the first baseline period, with small percentage changes observed (the percentage of vehicles in the speed bins over 40mph was 0.20% lower for ANPR SID sites and 0.07% lower for TVAS sites. The increases in the proportions of vehicles in the speed bins below 30mph were very similar for the two site types: 0.99% for ANPR and 0.97% for TVAS). The main differences were in the speed bins either side of 35mph. For ANPR SID sites, there was a 0.29% reduction in the proportion of those driving between 35mph and 40mph (0.02% increase for TVAS), whilst there was a 0.90% reduction in the proportion of those driving between 30mph and 35mph for TVAS (and 0.50% reduction for ANPR). Below 30mph, there were 0.40% and 0.55% increases in the proportions of vehicles driving between 25mph and 30mph for ANPR and TVAS sites respectively.

Figure 2 - Proportions of vehicles in each speed bin in the Post Intervention 1 period, by site type

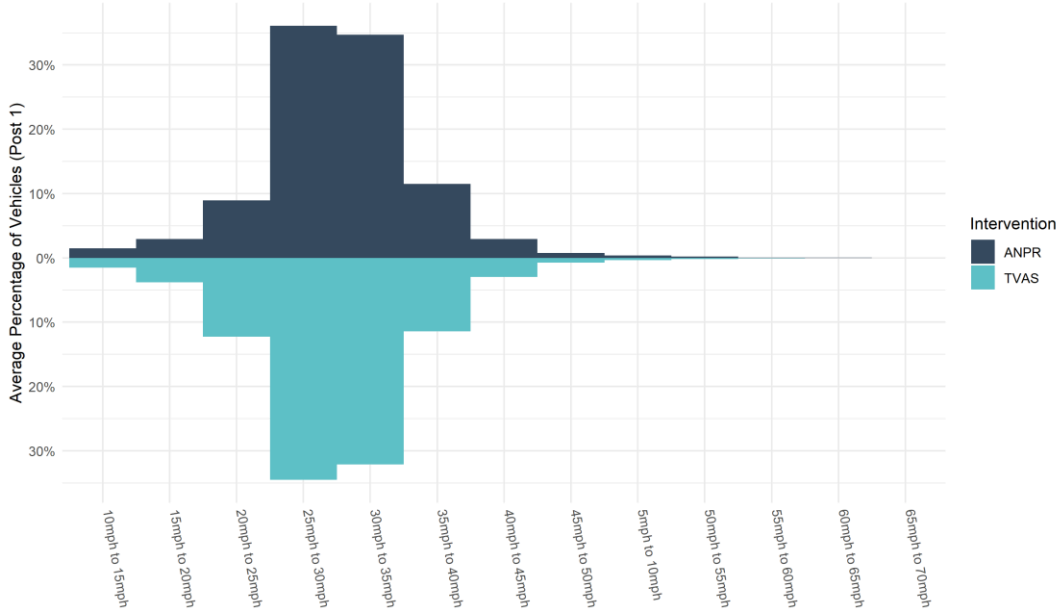


Figure 3 shows the speed bin distributions four weeks after the first installation for ANPR SID sites. There was very little change from the first post-installation period, with the only differences of note being a 1.14% increase in the proportion of vehicles travelling between 25mph and 30mph at TVAS sites; a 0.78% reduction in vehicles travelling between 35mph and 40mph at TVAS sites; and a 0.61% decrease in vehicles recorded between 25mph and 30mph at ANPR SID sites. Compared to the baseline period, again, there was very little change, with the only notable difference being reductions in those travelling between 30mph and 35mph (1.22%) and 35mph and 40mph (0.76%) for TVAS sites, which resulted in a 1.68% increase in those travelling between 25mph and 30mph. This did mean that there was a 2.42% increase in the number of vehicles travelling below 30mph at TVAS sites in the four weeks after installation than the baseline period.

Figure 3 - Proportions of vehicles in each speed bin in the Four Weeks Post Intervention period, by site type

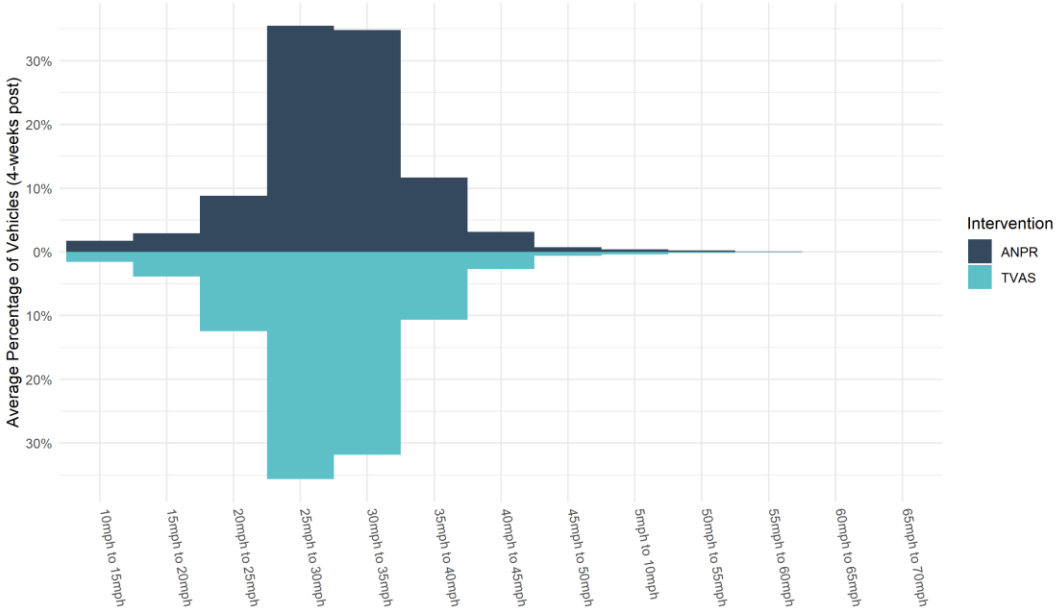
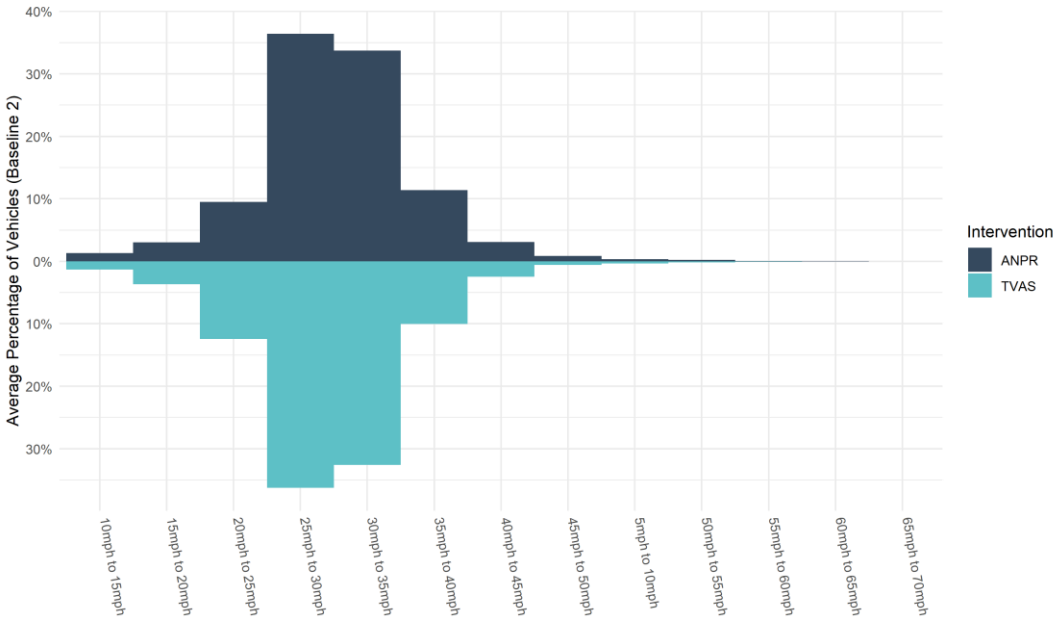


Figure 4 shows the same information for the second Baseline period, which occurred three weeks after the four-week monitoring period and in the week before publicity occurred. There were some differences in this period to the proceeding monitoring periods. Compared with the original baseline periods, both site types experienced increases in the proportion of vehicles travelling under 30mph; 1.78% for ANPR and 2.57% for TVAS sites. This specifically came from a 1.46% reduction in the number of vehicles travelling between 30mph and 35mph, and a 0.38% reduction between 35mph and 40mph, for ANPR SID sites. Similarly, there was a 1.39% reduction between 35mph and 40mph, and 0.47% between 30mph and 35mph, for TVAS sites.

These reductions were also observed when comparing Baseline 2 with the Post 1 and Four-Week Post periods, although the reductions were not as large.

Figure 4 - Proportions of vehicles in each speed bin in the Baseline 2 period, by site type



The final monitoring period was the one after the second installation and the publicity of the ANPR SID schemes, labelled 'Post 2'. There appears to be no impact on driver behaviour from the publicity work to announce that ANPR was being used to detect speeding motorists and that warning letters would be issued. There were very small increases in the proportions of vehicles travelling over 40mph for ANPR SID sites in all instances: 0.50% compared to Baseline 2; 0.19% compared to Baseline 1; 0.68% compared to Post 1; and 0.31% compared with Four Weeks Post. Conversely, there were reductions in the proportions travelling under 30mph at ANPR sites: 1.15% compared to Baseline 2; 0.09% compared to Baseline 1; 0.68% compared to Post 1; and 0.81% compared to Four Weeks Post. The results for TVAS were more mixed with a 1.30% increase in the proportion of vehicles travelling over 40mph at Post 2 compared with Baseline 2 but a 0.81% decrease and 0.76% decrease for Post 2 compared with Baseline 1 and Post 1. There was a 0.39% increase in vehicles over 40mph from Post 2 compared to Four Weeks Post. There were reductions in the proportions travelling under 30mph at TVAS sites at Baseline 2 compared with Post 2 (0.56%), Baseline 1 (0.28%), Post 1 (0.70%), and Four Weeks Post (1.02%).

Figure 5 - Proportions of vehicles in each speed bin in the Post Intervention 2 period, by site type

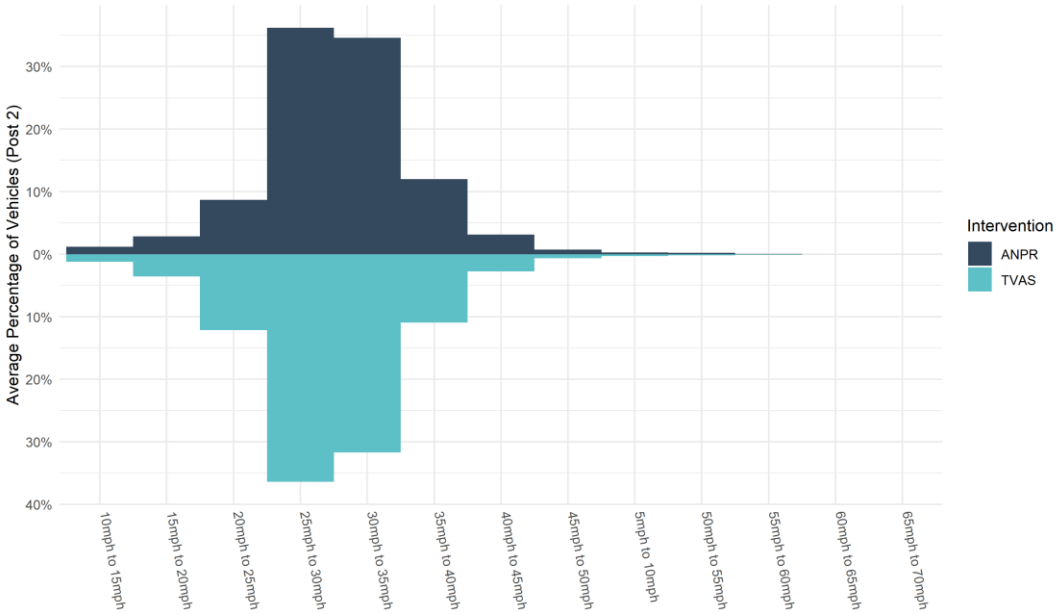


Table 2 and Table 3 show the proportions of vehicles in each speed bin for each time period, by the two site types, showing the small changes over time.

Table 2 - Proportions of vehicles in each speed bin for each time period at ANPR SID sites

Speed Bin	Baseline 1	Post 1	4 Weeks Post	Baseline 2	Post 2
5mph to 10mph	0.36%	0.35%	0.39%	0.32%	0.29%
10mph to 15mph	1.49%	1.49%	1.71%	1.31%	1.20%
15mph to 20mph	2.75%	2.96%	2.94%	3.04%	2.85%
20mph to 25mph	8.54%	8.92%	8.81%	9.51%	8.70%
25mph to 30mph	35.70%	36.10%	35.49%	36.42%	36.20%
30mph to 35mph	35.19%	34.69%	34.82%	33.73%	34.61%
35mph to 40mph	11.77%	11.48%	11.68%	11.39%	12.00%
40mph to 45mph	3.08%	2.95%	3.13%	3.09%	3.12%
45mph to 50mph	0.76%	0.75%	0.73%	0.83%	0.75%
50mph to 55mph	0.22%	0.19%	0.21%	0.23%	0.20%
55mph to 60mph	0.08%	0.07%	0.06%	0.07%	0.06%
60mph to 65mph	0.03%	0.02%	0.02%	0.03%	0.01%
65mph to 70mph	0.01%	0.01%	0.01%	0.01%	0.00%

Table 3 - Proportions of vehicles in each speed bin for each time period at TVAS sites

Speed Bin	Baseline 1	Post 1	4 Weeks Post	Baseline 2	Post 2
5mph to 10mph	0.35%	0.34%	0.39%	0.33%	0.29%
10mph to 15mph	1.48%	1.50%	1.55%	1.32%	1.24%
15mph to 20mph	3.93%	3.83%	3.86%	3.67%	3.55%
20mph to 25mph	11.73%	12.23%	12.42%	12.45%	12.13%
25mph to 30mph	33.98%	34.53%	35.67%	36.28%	36.41%
30mph to 35mph	33.04%	32.13%	31.81%	32.56%	31.71%
35mph to 40mph	11.42%	11.43%	10.65%	10.03%	10.96%
40mph to 45mph	3.03%	2.94%	2.71%	2.49%	2.79%
45mph to 50mph	0.73%	0.72%	0.64%	0.59%	0.65%
50mph to 55mph	0.19%	0.21%	0.17%	0.16%	0.17%
55mph to 60mph	0.07%	0.07%	0.06%	0.06%	0.06%
60mph to 65mph	0.02%	0.02%	0.02%	0.02%	0.02%
65mph to 70mph	0.01%	0.01%	0.01%	0.01%	0.01%

The average and 85th percentile speeds were aggregated over the entire available sample of vehicles for each time period for ANPR SIDs and TVAS sites and the results are presented in Appendix 5 – Speed Data on page 47.

For the purposes of undertaking speed data analysis, statistical testing was conducted using the statistical computing environment R to carry out paired t-tests. A t-test is a statistical test that is used to compare the means of two groups to test hypotheses and determine whether an intervention has had an actual effect on the population of interest – in this case, vehicle speeds.

The p-value is the main measure of the outcome of the tests to measure change and whether or not this change is the result of the intervention or could have occurred by chance. Associated p-values of under 0.05 (or more ideally under 0.01) are considered to be taken that the intervention has had a real effect whereas anything above does not indicate evidence or not of whether this change could have occurred by chance. A p-value greater than 0.1, which all of the sites compared in the analysis correspond to, reveal no evidence of change.

For statistical significance testing, however, only three time periods were selected to gauge the main impact of the intervention. Firstly, measuring Baseline 1 against Post 1 speeds to gauge whether the initial intervention had an impact without publicity of the new devices. Secondly, Baseline 1 against Post 2 to see whether speeds are impacted after a second round of intervention deployment after the publicity, compared to the first baseline. Finally, Post 1 against Post 2 to observe if there was a measurable change that was statistically significant between the first installation and the second installation.

For consistency, sites at Pakenham (ANPR), Charsfield (ANPR) and Rougham (TVAS) were excluded as there were issues with data collection and compromised site integrity. For Pakenham, significance testing was carried out in the analysis for Baseline 1 and Post 1 but excluded for Post 2 as there were issues with data collection during that time period. Charsfield had no intervention as there were site selection issues and Rougham had inconsistent and incomplete data collection issues.

The statistical testing is shown in Appendix 4 – Speed data Analysis on page 44.

INTERVIEWS

PARISH COUNCILS

Pre-interviews

Interviews with 16 of the 20 participating Parishes were conducted at the beginning of the study. These were conducted by telephone or virtually, using Microsoft Teams. Interviewees were asked a range of questions to understand their role within the Parish; as background to the perspectives they might offer; to understand the existing levels of concern within the Parish regarding speeding; and what activities the Parish Council were undertaking to try and tackle the unwanted behaviour. Those interviewed were also asked what other organisations, and the quality of relations with those partners, they work with to deliver speed management activities and what interventions they feel are most effective, that they might like to see more of, to improve road safety within the Parish.

The majority of representatives interviewed are directly linked with the Parish Council as either a Councillor or Parish Clerk. Those not on the Parish Council are either involved as a volunteer or Co-ordinator for Community Speed Watch (CSW), or a local resident with a specific interest in road safety who has become the local contact for such matters.

Every Parish Council representative interviewed felt that speeding is an important issue in the community with speeding described as the “perennial problem”, “the major thing in the village” and “an issue 24/7”.

For some Parishes, it is not just the speeding that is a concern, however, but also the associated consequences of inappropriate speeds, particularly for vulnerable road users. One Parish stated: “We have on our road a lot of sub-standard footpaths and blind bends…if speeds were reduced that would sort of compensate for some of these other deficiencies in the roads.” And another said: “it's about more than just clinical speeding… (it’s) the impact speeding has on quality of life.”

All the participating Parishes are involved in either the Suffolk County Council led temporary VAS initiative or have their own Parish-managed SIDs as a means of tackling speeding. Half of the Parishes interviewed also have CSW teams in place and a few Parishes have initiated their own education interventions by displaying road safety messages on roadside posters or stickers applied to residents’ refuse bins. Two Parishes have installed new road signs to alert drivers to particular safety concerns within the Parish.

The predominant organisation the Parishes engage with to tackle vehicle speeds is Suffolk County Council, the local highway authority (LHA). Some are in regular contact with their respective County or District Councillors. Those with active CSW teams also engage with Suffolk Constabulary for the reporting of CSW activities. Two of the participating Parishes are members of Safer Village Driving Suffolk (SAVID) a group of village representatives “acting together to give … a more effective response to the problem of speeding” (About SAVID, 2022)

The quality of partner relations, however, is generally considered poor, “Relationships couldn’t work any worse”, with most Parishes feeling there is scope for improvement through better co-ordination, within and between partners, and secondly, in the consistency of communications. Many of the Parishes operating their own SIDs are keen to assist with the prioritisation and planning of speed management activities through sharing data collected by their devices but feel they are dismissed/ignored by the Police and Suffolk Highways.

Those happy with existing relations appear to have regular engagement through Councillor or Officer (Police or LHA) attendance at Parish meetings.

Within the Parishes themselves, it is felt that community engagement is good with most residents supportive of Parish-led activities aimed at tackling speeding. However, few feel there is scope to increase community engagement with local demographics (working families with limited spare time) and general overall apathy to local volunteering cited as some of the barriers to achieving this.

When asked what measures Parishes might like to see more of to improve general road safety, many would opt for engineering measures, including better highway verge maintenance to cut back encroaching vegetation; traffic management measures to deter use by larger vehicles; and better planning for the impact of traffic growth as a result of local development.

Finally, interviewees were asked which form of intervention they consider most effective in tackling speeding. The majority felt enforcement is the most effective intervention, with one citing it as "(the) only way that people can change their behaviour". Whilst some felt engineering measures, that physically slow drivers, are effective, the additional enforcement activity that re-affirms real consequences for drivers travelling at inappropriate speeds was needed to truly influence driver behaviours.

Parish Surveys

To understand the views of the parishes after the trial, a survey was issued to the representative involved in the interviews, sent as an email questionnaire (Appendix 2 – Parish Survey). Parish representatives were issued with the same questionnaire regardless of whether their area was subject to either an ANPR SID or TVAS device as part of the trial. The questionnaire was disseminated to representatives from all the involved parishes after all five speed survey periods had taken place. One survey was issued to each Parish council. Out of the 20 original sites where devices where installed, 12 corresponding responses were received. Seven of these responses were based on perceptions of ANPR SIDs, and the remaining five on TVAS devices. Whilst the sample size is relatively small compared to the public perception survey, the data collected from those who completed the questionnaire provides key insights around parish perceptions of speed and driver behaviour, in addition to the utility and practicalities of ANPR SIDs and TVAS as interventions. Given the small sample sizes, tables and charts have not been provided and instead, a commentary on the general feedback is given.

The analysis demonstrates that whilst ANPR SID devices are more often associated with people driving slowly, neither device is associated with faster speeds, with both ANPR SIDs and TVAS associated with positive effects on driver behaviour. Parish representatives overwhelmingly disagreed, however, that both device types could reduce speeds more than speed cameras, with the level of disagreement that they are more effective than speed humps slightly less, despite still being the majority view for both device types.

All of the parish representatives from both village types felt that speeding traffic is a problem in their village.

When asked about the effect on traffic speeds whilst the devices were in place, a greater proportion of respondents in villages with ANPR SID sites reported that 'people drove more slowly' than the TVAS respondents. Notably none of the parish representative respondents stated that 'people drove faster' whilst the devices were in place. A greater proportion of TVAS respondents noted that 'people drove at the same speed as before'.

When asked about the effect on driver behaviour since the installation of the devices, neither set of respondents agreed that 'people are driving faster than before'. Slightly more respondents from TVAS villages agreed that 'people are driving at the same speed as before' than for ANPR SID villages. Notably, more respondents for ANPR SID villages agreed that 'people are driving more slowly than before' than for TVAS villages. Similarly, a greater proportion of respondents for ANPR SID villages felt that the device installed had a positive effect on driver behaviour than for TVAS villages. Whilst a similar proportion of respondents across the two village types agreed that the device in their village had a more positive effect on driver behaviour than

previously used signs, a greater proportion of parish representatives for TVAS villages disagreed with this statement.

Significantly, none of the respondents for villages where ANPR SIDs were installed agreed that the device was more effective at reducing the number of speeding drivers than either speed cameras or speed humps. The overwhelming majority of those answering, for both ANPR SID and TVAS and villages sites, disagreed that the speed indicator device in their village was more effective at reducing speeds than either speed cameras or speed humps.

On the perceived effects of the speed indicator devices, all of the respondents for ANPR SID villages believed that the device would lead to a decrease in road accidents (nearly all for TVAS villages) with neither group believing that the device installed in their village would lead to an increase in road accidents. When asked about changes in the number of people injured and killed in road crashes as result of the devices, all of the respondents for ANPR SID villages thought that the devices would lead to a decrease in both of these outcomes (half of representatives in both instances for TVAS villages). Whilst a minority of respondents for ANPR SID and TVAS villages believed that the devices would lead to an increase in the number of people who choose to walk, the majority thought that they would 'make no difference' to this. This is reflected in the perceived effects by parish representatives on the number of people who choose to cycle, with the majority again stating that the device installed would 'make no difference'. The proportion of those who believed the device installed would lead to an increase in the number of people choosing to cycle was slightly higher for ANPR SID village representatives. Overwhelmingly, parish respondents stated that ANPR SIDs and TVAS 'made no difference' to the number of traffic jams. Whilst none of the respondents for ANPR SID villages stated that the devices would lead to an increase in cleaner air, a third of TVAS respondents thought the device installed would lead to an increase in cleaner air.

When asked about the practicality of the devices and their utility as speed management interventions, a greater proportion of parish respondents for both ANPR SIDS and TVAS villages disagreed that the devices are ineffective at reducing speeds in the long term than those who agreed. Only parish respondents from ANPR SID villages agreed that the devices were too expensive, whilst slightly more TVAS village respondents disagreed that the devices were too expensive. All of the parish respondents from ANPR SID villages agreed that the devices are useful at changing driver behaviour by prompting them about their speed, and that they reduce the general level of speeding locally. A majority of respondents for TVAS villages agreed with these two statements. A greater proportion of respondents for ANPR SID villages agreed that the devices are appropriate for use for short periods of time and that they are an effective intervention for speed management.

There was a general consensus amongst parish respondents for both ANPR SID and TVAS villages that the guidance was straightforward on selecting sites, and a majority of respondents for ANPR SID sites stated that it was easy to get selected sites set up with posts. None of the respondents for TVAS villages disagreed that it took too long to get sites up and running. For both ANPR SID and TVAS villages, parish representatives were more inclined to disagree that communications on site visits were clear. Visits to ANPR SID sites were not frequent enough according to those answering based on this device.

In addition to the closed-questions of the survey, a free-text question asked parish representatives to share any feedback they had pertaining to the general deployment of the speed indicator sign that was installed in their village.

Parish Feedback

From the feedback that was given, those who responded from ANPR SID villages generally felt that the installation of the devices was a positive intervention for local speed management purposes, and that they contributed to reduced levels of speeding behaviour amongst drivers; with some stating that speeds

immediately returned to pre-installation levels once the devices had been removed. A minority of the respondents felt, however, that the devices had little or no effect of speeds in their village, and despite the fact that many were keen to see the data before passing judgement on the trial, a couple of parish representatives were of the view that the intervention would not be successful without "the presence of a clear risk of driver prosecution." Without this follow-up element of driver prosecution, these same representatives felt that the ANPR SIDs would not be any more effective at reducing speeds than existing VAS devices.

A notable number of respondents for ANPR SID villages expressed optimism that the ANPR element would be beneficial to local speed management efforts, noting that whilst standard SIDs are useful at changing behaviour, harnessing the ANPR element could yield "additional benefit". There was a general affinity expressed towards existing VAS schemes regardless of the project's outcomes, with caution noted that the trial encompassed a relatively small timeframe. A number of comments highlighted that the ANPR element of the trial was "underplayed" in that both the publicity and communication were impacted by "a lack of clear information."

Fewer open text responses were given by those parish representatives from villages where TVAS devices were installed as part of the trial. Generally, TVAS devices were perceived to have had a positive effect on driver behaviour, "in most cases" prompting them to slow down. There was a belief that the "continued presence" of the devices was necessary to ensure sustained impact (regardless of which type of device was deployed).

Reflective of responses from ANPR SID villages, it was noted that once the TVAS devices were removed their effects at reducing would wane and driver behaviour would revert back to pre-installation norms. Similarly, there was a level of scepticism about TVAS efficacy without the threat of enforcement, with one response suggesting that only enforcement and physical calming measures would work "to get drivers to obey the limit [in place]".

RESIDENT PERSPECTIVES

PUBLIC PERCEPTION SURVEY

To gauge the response of residents on the effectiveness of ANPR SIDs, a public perception survey was issued to residents as a postal questionnaire (Public Perception Survey). Residents were issued with the same questionnaire regardless of whether their area was subject to either an ANPR SID or TVAS device as part of the trial. The questionnaire was disseminated by hand to households in the vicinity of the device, after all five speed survey periods had taken place. The data collected from those who completed the questionnaire (*n.* 240) provides key insights around resident perceptions of speed and driver behaviour.

The response rates for each question are set out by intervention type (ANPR SID or TVAS), and do not include instances where a response was not given. For many of the questions, some respondents chose not to answer each question (and being paper, it was not possible to force a response).

The analysis demonstrates that ANPR SIDs are more likely to be associated with slower vehicle speeds; positive driver behaviour; diminished frequency of collisions; reduced burden of road traffic injuries and fatalities; increased levels of cycling; and cleaner air. Compared to TVAS devices, the residents surveyed did not consider ANPR SIDs to have a stronger effect on reducing the number of speeding drivers than either speed humps or camera devices. However, they was a slightly higher level of agreement that ANPR SIDs were more effective than previously used signs.

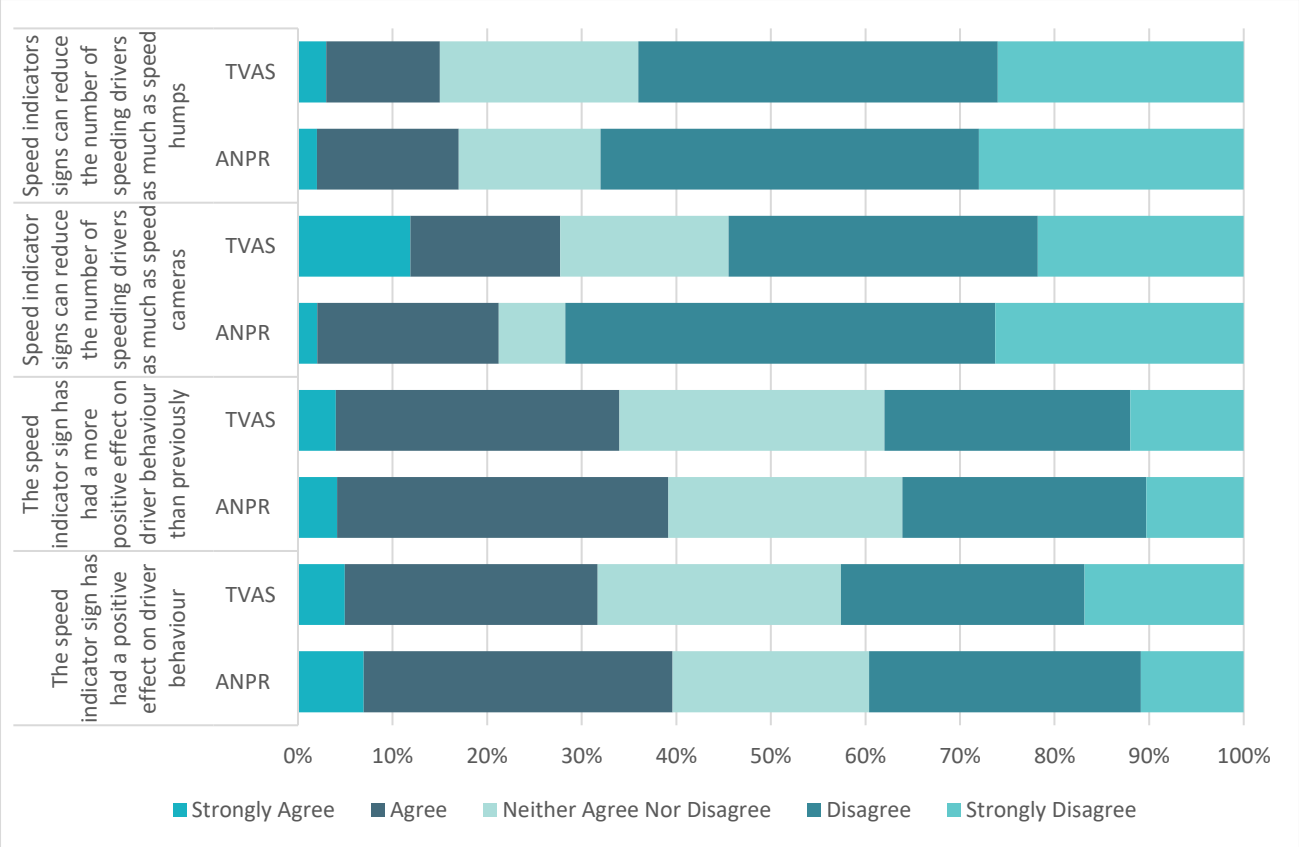
Respondents from both village types felt that speeding traffic is a problem in their village (90% of ANPR SID and 94% of TVAS respondents). There were slight differences in the perceived seriousness of the problem, with 59% of TVAS respondents stating it is a 'very serious problem', compared with 50% of ANPR SID (and 40% of ANPR SID stating it is 'a bit of a problem', compared with 35% of TVAS). The strength of feeling about the severity of the speeding problem could be influencing their subsequent responses.

Table 4 - Perceptions on effect on traffic speeds whilst device was in place

Question	Options	ANPR SID	TVAS
A speed indicator sign was recently placed in the village. What effect do you think it had on traffic speeds (while it was in place)?	People drove at the same speed as before	58%	72%
	People drove faster	2%	5%
	People drove more slowly	40%	23%

When asked about the effect on traffic speeds whilst the devices were in place, a greater proportion of respondents in villages with ANPR SID sites reported that 'people drove more slowly' (40%), than the 23% from TVAS respondents (Table 4). In addition, a slightly larger proportion of respondents in villages where TVAS devices were installed stated the 'people drove faster' (5%); this was 2% for ANPR SID sites. More respondents from villages which had TVAS installed stated that 'people drove at the same speed as before' (72%) than for ANPR SID sites (58%).

Figure 6 - Percentages of respondents agreeing/disagreeing with statements about ANPR SIDs/TVAS

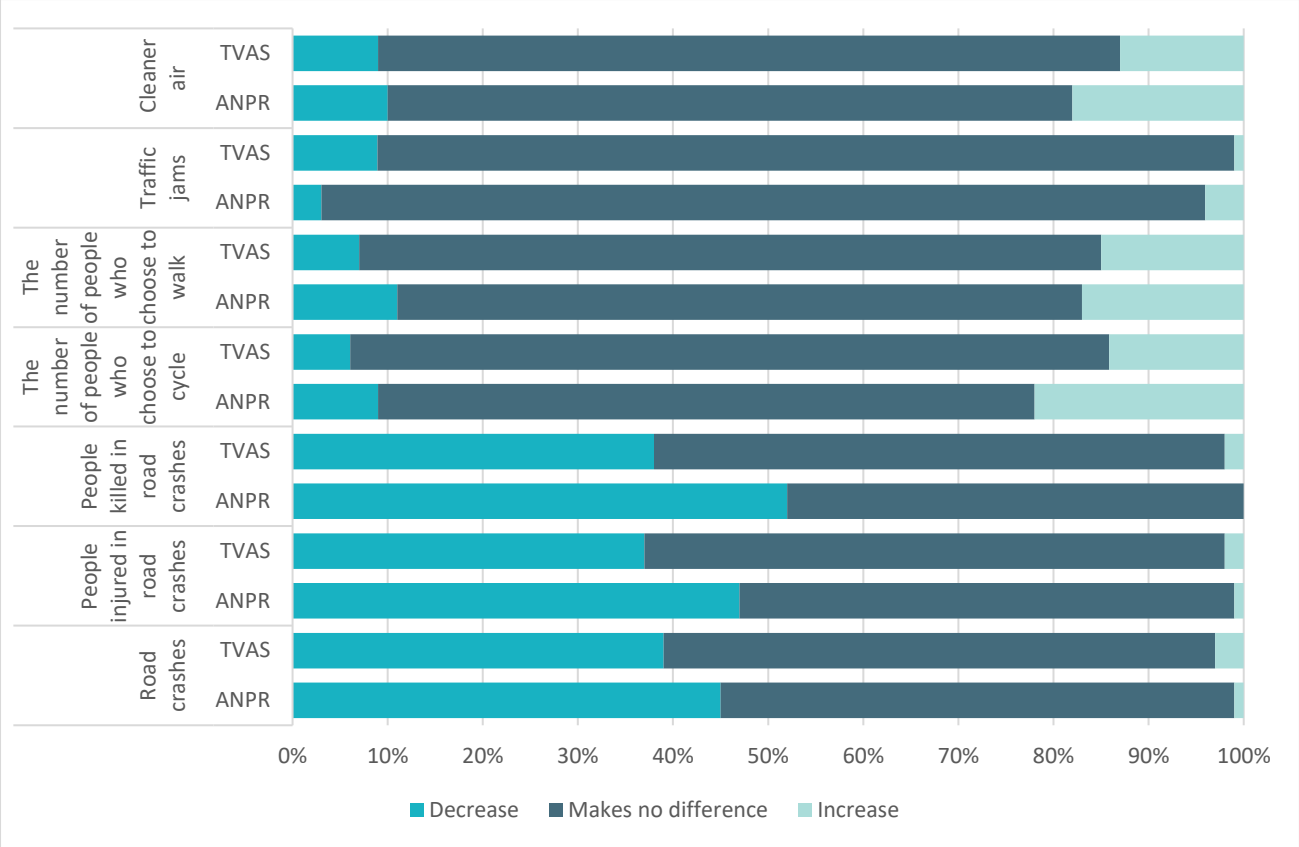


On driver behaviour in general, residents from villages with ANPR SIDs were more likely to strongly agree or agree that the device installed 'has had a positive effect on driver behaviour' (Figure 6). There were also higher proportions of ANPR SID villagers strongly agreeing or agreeing that the sign had had a more positive effect on driver behaviour than previously used signs. Conversely, those from ANPR SID villages were more likely to disagree or strongly disagree than TVAS respondents that speed indicator signs can reduce the number of speeding drivers as much as speed humps or speed cameras.

When asked about other possible road safety impacts of the speed indicator device that was installed in their village, respondents from villages where ANPR SIDs were installed were more likely to agree that the device could lead to a decrease in crashes as well as the amount of people injured or killed in crashes (Figure 7). Residents from villages with ANPR SID sites were also slightly more likely to believe that the device installed could lead to an increase in the number of people who choose to cycle or walk. However, residents from both village types generally felt that the devices would make little difference to these factors.

Whilst the ANPR SID seems to be more positively received by villagers than the TVAS, some residents did believe that both types of signs are effective and are useful tools in the speed management toolkit.

Figure 7 - Percentages of respondents agreeing/disagreeing with statements about the effect of ANPR SIDs/TVAS



SUFFOLK COUNTY COUNCIL LESSONS LEARNT

At the end of the trial, an interview was conducted with Suffolk County Council's ANPR Officer to assess how the operation of the ANPR SIDs had gone and what lessons could be learnt by other authorities.

Firstly, in terms of advice to other authorities considering utilising ANPR SIDs, there are some considerations regarding operations. As warning letters are a fundamental component of the devices, a partner authority is required that can provide registered keeper details via a data sharing agreement. It was not possible to engage with the DVLA in order to set up such an agreement, so it is essential to get the local police on side to perform that function.

Also operationally, the ANPR Officer spoke about how authorities need to think about the capacity for letter sending and how to prioritise which detections to send letters out for. For Suffolk County Council, it was decided to send out 40 letters from each site visit, with 50% of these selected randomly from detections between 35mph and 40mph, with the rest from those over 40mph, working from the fastest speeds downwards. The intention is to send out letters to all drivers over the ACPO threshold with future deployments.

Another operational element to consider is the referral to the police of specific detections, thinking about police capacity. For Suffolk, those who are travelling at double the speed limit or more are referred to the police to receive a visit (when there is capacity to do so). The plan is for those detected at over 60mph and repeat offenders to receive a visit.

It was necessary to get a Service Level Agreement (SLA) in place between Suffolk County Council and Suffolk Constabulary to obtain registered keeper details. Finalising this SLA was a lengthy process with legal teams on both sides, and it took about six months. The reason for this is the Police needed to understand what our expectations were (number of checks, follow up visits from the officers etc) and calculate the resource required, recruit and train staff. The Police were initially hesitant in their adoption of the project and limited us to a maximum of 8 numberplate checks per camera per day, which worked out to only 400 letters being sent to drivers per week. The number of speeding drivers being recorded by the ANPR SIDs far exceeded this and as a result it is difficult to measure the impact the ANPR SIDs had on driver speeds when only a minority of speeding river received a warning letter.

Since the research, the police have been able to process every single driver picked up by the ANPR project over 35mph. Further research would give a more accurate representation of the impact ANPR SIDs have on driver speeds.

In the interview, the ANPR Officer also spoke about being clear on the functionalities of the device and what the authorities require in terms of features. A number of companies were approached to review the available devices and determine what is viable. Considerations included:

- the weight and portability of the device
- power source (battery, solar or both)
- set up (some devices are placed on trailers)
- time to install
- set up procedures

For Suffolk County Council, a primary requirement was for the devices to be mobile so that they can be moved around villages and increase coverage. This meant that the devices need to be light, and quick and easy to install.

When asked about the selection of sites, the ANPR Officer explained that requests were received from parish councils and by county councillor recommendations, via an ANPR SID pro forma. The criteria for sites were a checklist, rather than a hard set of rules, with a subjective judgement made on a site-by-site basis as to whether the device would be suitable. Speed limit is one non-negotiable criteria, with sites ideally being subject to a 30mph limit (and sites only not rejected if it is 20mph). Other criteria related to visibility; parking access for installation; presence of foliage, driveways, and junctions; and features of the pole. All of these elements could have been overcome if the criteria were not fully met. By allowing parishes to identify sites they feel are eligible, there is a degree of empowering local residents to contribute to speed management solutions.

The ANPR Officer was asked whether additional criteria to select sites would be beneficial. It was felt that residents know their area and therefore parishes will nominate appropriate sites. The project has meant that a good working relationship has been developed with the parishes. However, given the findings from the speed analysis, to maximise the potential for speed reductions and to contribute to road safety, the site selection criteria should be reviewed and sites with an observed speed problem should be prioritised.

Only one complaint was received throughout the trial and as a consequence, the warning letter was amended to provide more contact details. The letter itself is kept simple and is shared in Appendix 1 – Warning letter.

In addition to the above reflections, the ANPR Officer advised that data protection risk assessments were required. There were also security considerations in relation to the devices: the authority is considering theft mitigation after one ANPR camera was stolen and stressed that insurance was essential. From an operational perspective, it was suggested that as much of the process should be automated as possible, thinking about the resources required for deployment and letter sending.

The last thought was in relation to controlling the message about the trial and the devices through planned publicity. It was acknowledged that it is a politically charged subject and that there is a balance to be achieved between something that works and something that the public perceive to be good.

CONCLUSIONS AND DISCUSSION

This research study has considered the effectiveness of ANPR SIDs at reducing speeds in rural Suffolk, as an intervention based around a novel configuration of behavioural levers hitherto used separately in the context of local speed management. This experimental intervention has been implemented on a trial basis, combining these carrot and stick approaches. This research study represents the main output of the trial secured through funding by the Road Safety Trust and is presented to Suffolk County Council to inform both the decision-making process surrounding their deployment moving forward, as well as the wider evidence base for local speed management polices more broadly. This report comprises a comprehensive overview of the data, research methodology, and project activities utilised as part of this trial.

PILOT OBJECTIVES

At the outset, this pilot study had a number of objectives:

- To determine if average speeds in rural villages can be reduced through the use of ANPR SIDs
- To determine if the proportion of speeding vehicles can be reduced through the use of ANPR SIDs
- To determine if publicising the use of ANPR SIDs leads to further reductions in average speeds in rural villages
- To determine if ANPR SIDs are more effective than VAS at reducing average speeds in rural villages
- To determine if public awareness and knowledge of warning letters influences the effectiveness of VAS in reducing average speeds in rural villages
- To determine if local residents think ANPR SIDs and/or VAS are effective at reducing average speeds in rural villages

The pilot study was designed to facilitate these objectives, incorporating quantitative and qualitative research methods to provide the evidence necessary to determine the extent to which these objectives have been fulfilled as a result of the trial. The main conclusions of the study are that whilst there was no statistically significant impact of ANPR SIDs in reducing both speeds and the proportion of speeding vehicles at selected sites, the insights generated by parish representatives and residents demonstrate that not only are ANPR SIDs associated with a number of road safety benefits, but that they present a palatable approach to managing speeds in their capacity to combine different behavioural approaches that are perceived to be effective.

The results of this trial have revealed that site selection and integrity are critical in optimising the chances of the selected intervention producing the desired effects; and that a behavioural diagnosis or ‘mapping’ of the road safety issues at play can help to ensure that the intervention designed or selected is relevant to effectively target the problem behaviours identified. The results of this research study also inform possible policy goals for local speed management decision makers. The ANPR SIDs have a high level of support amongst the parish authorities surveyed, and the perceived road safety benefits of them are clear amongst residents when compared to other existing speed indicator devices. Despite these insights regarding ANPR SIDs, parishes and residents still view existing TVAS as a relevant intervention by prompting drivers about their speed. Levels of agreement in the utility of TVAS devices across many of the fields were very strong, indicating that they remain an optimal choice of intervention from the perspective of communities and proactively dealing with concerns around speeding and connected driver behaviour.

REVIEW OF EVIDENCE

A literature review was conducted to assess the collection of interventions currently deployed at the level of local speed management, considering critical questions as to why and how these interventions are deployed, and what the motivations are for using them based on the evidence base. The interventions assessed in this evidence review were:

- Community Speed Watch (CSW schemes)
- Speed indicator device (SID) effectiveness at reducing speed
- Vehicle activated signs (VAS) effectiveness at reducing speed
- The use of warning letters as alternative to active enforcement

The review of the evidence highlighted that whilst SIDs and VAS schemes have been moderately successful at reducing speeds (variations according to contexts), CSW and warning letters are generally deployed because of what these interventions represent for local communities and their high level of concern around vehicle speeds and driver speeds. In particular, CSW offers a unique way to assuage community concerns around speeding, allowing responsible authorities to demonstrate a proactive approach in tackling these concerns and whilst increasing their perceived accountability and engagement with community-orientated strategies.

DATA ANALYSIS

The data were analysed and presented in line with the aims and objectives of this report. Paired t-tests were carried out to compare sites against themselves in different time periods to observe changes and statistical significance. Some issues and recommendations relating to the data are listed below:

- Small sample size of sites which made it difficult to discern the impact of the intervention on speed and driver behaviour in relation to the signs.
- The average speeds were low at the baseline period, meaning the proportion of drivers who could be encouraged to slow down and comply with the speed limit was limited
- The results did not present evidence for a statistically significant relationship between the deployment of either the TVAS or the ANPR SIDs. Any decreases in speed were minor and noted increases cannot be ruled out by random fluctuations as the sample size was very small.

PARISH AUTHORITY PERCEPTIONS

- Whilst the sample size was very low (13 out of the original 20 village sites), the key indications are that parishes believe ANPR SIDs are an effective intervention when used for shorter periods (aligns with literature review)
- Both ANPR SID and TVAS responses suggest that there is belief at the parish level that both these two devices are not as effective as previously used signs, speed cameras, or speed humps.
- A majority of ANPR SID and TVAS respondents (100% of ANPR SID respondents) believe that the devices are useful at changing behaviour by prompting them about their speed, and at reducing speeds generally in their locality.
- In terms of their utility, the majority of respondents noted that both devices are most effective when deployed for a shorter period of time and agreed that they are an effective intervention. Responses were less unanimous on aspects of the practicality of the devices themselves.
- When asked on their general thoughts about the installation on ANPR SIDs and TVAS, parish representatives across both village types (where either ANPR SIDs or TVAS were installed) shared an affinity to the 'ANPR element' of the intervention; believed that both devices should be combined with robust enforcement mechanisms; and that there were opportunities to improve the management of deployment.

LOCAL RESIDENT PERCEPTIONS AND ATTITUDES

Local residents were asked about the device installed in their village via a survey, answering the same questions regardless of which intervention (ANPR SID or TVAS) was installed in their village.

Analysis of the responses collected (*n.* 240) demonstrates that ANPR SIDs are associated with positive perceived benefits, including lower vehicle speeds; positive driver behaviour; a diminished likelihood of collisions; reduced burden of road traffic injuries and fatalities; increased levels of cycling; and cleaner air.

Compared to TVAS devices, the residents surveyed did not consider ANPR SIDs to have a stronger effect on reducing the number of speeding drivers than either speed humps or camera devices. However, there was a slightly higher level of agreement that ANPR SIDs were more effective than previously used signs.

Whilst the responses show a clear distinction between ANPR SIDs and VAS in terms of perceived road safety effects, a moderate consensus around both devices, compared to alternative road safety treatments, suggest a range of speed management tools are considered to be effective.

RECOMMENDATIONS

Recommendations for future deployment to improve effectiveness:

- Site selection is an important factor to consider. Choosing sites that have evidenced speeding issues would potentially have the most impact. Across all the sites selected in this trial, average speeds were already low and so the effect of the intervention was not as statistically significance. With general compliance good before the intervention, it is difficult to determine the impact these devices might have on a larger proportion of offending drivers.
- Budget limitations and affordability meant the sample size of sites was small and constrained. These were a few devices deployed for a few weeks and without targeting sites with high levels of recorded speeding, the results need to be placed in perspective. For future research to result in more conclusive findings, larger sample sizes and relating budgets could be potentially significant.
- There were several site integrity issues, which is why a certain number of sites had to be excluded from the analysis to not skew the rest of the findings. In Charsfield (ANPR, group 2), no intervention was deployed at any of the time periods for the duration of the trial and so was excluded from analysis. In Pakenham (ANPR, group 1) the ATC tubes failed to collect the data for the Post 2 time period and was also excluded. In addition, the ANPR device in Pakenham was vandalised on its 2nd visit and no letters could be sent to speeding drivers as a result. Similarly, Rougham (TVAS, group 2) was also excluded because of failed ATC tubes and incomplete data collection. Ashbocking (ANPR, group 2) and Barham (ANPR, group 2) had CSW activities ongoing at the same time as the intervention was in place on the sites, whilst Holton St Mary (TVAS, group 1) and Rougham (TVAS, group 2) received police enforcement. These sites were not excluded from the analysis but in an ideal world, only one intervention would be deployed during a trial period.
- Grouping sites by corresponding geography could prove to be effective as sites selected for this trial had varying geographical and road types which may have been better analysed disaggregated by road class, function, type, and parallel land use.

EFFECTIVENESS

This study has found that there were no significant changes in average or 85th percentile speed, or the proportions of vehicles in each speed bin, during the trial period for either ANPR SID or TVAS devices. This is across five points in time and two one-week deployments of the devices, with publicity of the ANPR SID devices in the middle of the trial. Other studies of SIDs have detected reductions in speed, albeit for a limited period of time in one deployment. However, for the sites in this trial, selection was based on nomination by villages and then random selection for inclusion in the study. This means that baseline speeds and evidence of an existing speeding problem were not predefined criteria. With pre-existing high levels of compliance with the speed limit, it is difficult to change behaviour to achieve a statistically significant observable effect.

Despite the lack of observed changes in driven speeds, there was positive feedback from the villages, both from residents and from parish representatives. This aligns with evidence on Community Speed Watch, which mobilises residents to proactively engage with their community concerns. Whilst perceived speeds are important to residents for encouraging active travel and for improving quality of life, it should be noted that

the risk of collisions is that the same as before, given that actual speeds did not change. Perceived risk doesn't alter actual collision risk and whilst speeds are low, there is a chance that people could feel safer and therefore behave less cautiously.

The results of this trial have revealed that site selection and integrity are critical in optimising the chances of the selected intervention producing the desired effects; and that a behavioural diagnosis or 'mapping' of the road safety issues at play can help to ensure that the intervention designed or selected is relevant to effectively target the problem behaviours identified. The ANPR SIDs have a high level of support amongst the parish authorities surveyed, and the perceived road safety benefits of them are clear amongst residents when compared to other existing speed indicator devices. Despite these insights regarding ANPR SIDs, parishes and residents still view existing TVAS as a relevant intervention by prompting drivers about their speed. Levels of agreement in the utility of TVAS devices across many of the fields were very strong, indicating that they remain an optimal choice of intervention from the perspective of communities and proactively dealing with concerns around speeding and connected driver behaviour.

APPENDIX 1 – WARNING LETTER

«Title» «Forename» «Surname»
«Address_1»
«Address_2»
«Address_3»
«Address_4»
«Address_5»
«Post_Code»

Dear Sir/Madam,

I am writing to the you as registered owner to inform you that your vehicle's speed has been recorded by one of Suffolk County Council's (SCC) Automatic Numberplate Recognition (ANPR) devices exceeding the posted speed limit:

Date	Time	Location	VRM	Recorded Speed	Speed limit
«Date»	«Time»	«Location»	«VRM»	«Speed»	«Speed_Limit»

As I am sure you are already aware, speeding is a common cause of road collisions and affects the lives of many people in our towns and villages.

SCC and Suffolk Constabulary take the issue of speeding very seriously and they are working with Suffolk Roadsafe, partners, and communities. The aims are to reduce road collisions and anti-social vehicle use, which will directly contribute to saving lives and improving the quality of life within Suffolk's communities.

In 2020, 271 people were seriously injured/killed on Suffolk's roads. The lives of the families and friends of those injured/ killed are changed the instant their loved ones are involved in a road traffic collision. Both the likelihood and severity of a collision are significantly increased because of speeding.

SCC's ANPR devices are used in conjunction with a Speed Indication Device (SID). The SID tells the driver of a passing vehicle their speed and gives a warning for speeding vehicles to slow down. The ANPR camera then takes a picture of the speeding vehicle if the driver chooses to ignore this warning by continuing to exceed the speed limit.

While no further action will be taken in this instance, I am writing to ask for your co-operation to ensure that there are no further reports regarding this vehicle.

Please be aware that SCC will share the information of egregious repeat speeding offences with the police for them to investigate. Information gathered by these devices will also be shared with the police's Safecam team to assist with targeting problem areas for speed enforcement.

Further information about the how speeding is being tackled in Suffolk can be found on the Suffolk Roadsafe website:
https://suffolkroadsafe.com/speed-and-communities-2/speed-prevention-in-the-community/

If you have any further queries, please email them to anpr@suffolk.gov.uk

Yours Sincerely,

ANPR Project Officer
Suffolk County Council

APPENDIX 2 – PARISH SURVEY

This short survey is about understanding what parish councillors in Suffolk think about speeding behaviour and the recent installation of speed indicator signs.
The questions are anonymous, although we are matching responses to villages. Please share your honest opinions - thank you for your participation.

Suffolk County Council

1. Do you think speeding traffic is a problem in your village?

Yes, a very serious problem	
A bit of a problem	
Not much of a problem	
Not a problem at all	

2. A speed indicator sign was recently placed in the village. What effect do you think it had on traffic speeds (while it was in place)?

People drove faster	
People drove at the same speed as before	
People drove more slowly	

3. Thinking about driver behaviour since the recent speed indicator sign was placed in the village, what do you think has happened to vehicle speeds?

People are driving faster than before	
People are driving at the same speed as before	
People are driving more slowly than before	

4. How much do you agree with the following statements about the speed indicator sign which was placed in the village recently?

	Strongly Agree	Agree	Neither agree nor disagree	Disagree	Strongly Disagree
The speed indicator sign has had a positive effect on driver behaviour					
The speed indicator sign has had a **more** positive effect on driver behaviour than previously used signs					
Speed indicator signs can reduce the number of speeding drivers as much as speed cameras can					
Speed indicator signs can reduce the number of speeding drivers as much as speed humps can					

5. What effect do you think the speed indicator sign could have on the following?

	Increase	Makes no difference	Decrease
Road accidents			
People injured in road crashes			
People killed in road crashes			
The number of people who choose to walk			
The number of people who choose to cycle			
Traffic jams			
Cleaner air			

6. How much do you agree with the following statements about the speed indicator sign that was recently installed?	Strongly Agree	Agree	Neither agree nor disagree	Disagree	Strongly Disagree
The signs are ineffective at reducing speeds in the long term					
The signs are too expensive					
The signs are useful at changing driver behaviour by prompting them about their speed					
The signs reduce the general level of speeding locally					
The signs are appropriate for use for short periods of time					
The signs are an effective intervention for speed management					

7. How much do you agree with the following statements about getting a speed indicator sign for your village?	Strongly Agree	Agree	Neither agree nor disagree	Disagree	Strongly Disagree
The guidance on selecting a site is straightforward					
It is easy to get selected sites set up with posts					
It takes too long to get a site up and running					
The communications on sites visits are clear					
Visits are not frequent enough					

8. Please share any feedback you have in regards to the installation and use of speed indicator signs in your village here. Please include any thoughts on site selection, deployment, and the process of using speed indicator signs.

Speeding in your village

This short survey is about understanding what residents in Suffolk think about vehicle speeds and speeding behaviour locally. The questions are anonymous.
Please share your honest opinions - thank you for your participation.
Please return the completed survey in the attached envelope.

Suffolk County Council

1. Do you think speeding traffic is a problem in your village?

Yes, a very serious problem	
A bit of a problem	
Not much of a problem	
Not a problem at all	

2. A speed indicator sign was recently placed in the village. What effect do you think it had on traffic speeds (while it was in place)?

People drove faster	
People drove at the same speed as before	
People drove more slowly	

3. Thinking about driver behaviour since the recent speed indicator sign was placed in the village, what do you think has happened to vehicle speeds?

	Strongly Agree	Agree	Neither agree nor disagree	Disagree	Strongly Disagree
People are driving faster than before					
People are driving at the same speed as before					
People are driving more slowly than before					

4. How much do you agree with the following statements about the speed indicator sign which was placed in the village recently?

	Strongly Agree	Agree	Neither agree nor disagree	Disagree	Strongly Disagree
The speed indicator sign has had a positive effect on driver behaviour					
The speed indicator sign has had a **more** positive effect on driver behaviour than previously used signs					
Speed indicator signs can reduce the number of speeding drivers as much as speed cameras can					
Speed indicator signs can reduce the number of speeding drivers as much as speed humps can					

5. What effect do you think the speed indicator device could have on the following?

	Increase	Makes no difference	Decrease
Road accidents			
People injured in road crashes			
People killed in road crashes			
The number of people who choose to walk			
The number of people who choose to cycle			
Traffic jams			
Cleaner air			

APPENDIX 4 – SPEED DATA ANALYSIS

In the tables overleaf, average speed, 85th percentile speed, and speeds above the ACPO threshold (35mph) are presented. The speeds in relation to traffic flow for the intervention direction, opposite direction and both directions overall are explored in the paired t-tests. The intervention direction is defined as the direction of travel where a driver will be detected by and view the sign. The 'opposite' direction is where the driver is heading towards the back of the device. The channels have been separated on the assumption that any effect is likely to be due to a driver heading towards the front display of the sign.

Negative values in the tables are where speeds increased in relation to the means. An important caveat to remember and place these results in perspective is that sample means were already low and compliance with average speeds and 85th percentile speeds were all below the ACPO enforcement threshold across all ANPR SIDs and TVAS sites.

The sample size for this analysis was small due to the practicalities of the number of devices, resources to deploy the devices and the cost of the speed monitoring. This should be remembered when interpreting the results.

Average Speeds

ANPR sites

Overall, average speeds very slightly reduced from the Baseline to Post 1 time period, but this was not sustained over the other two periods, where speeds slightly increased in the intervention direction of traffic flow from Baseline 1 to Post 2, and Post 1 to Post 2, as presented in Table 5 for ANPR sites. It is important to emphasise the small sample size and the already low average speeds, as exhibited in the sample mean columns. The p-values all present that there is no evidence of statistical significance detected in the values.

Table 5: Significance testing on ANPR sites for average speeds

Average speeds for ANPR sites	First sample mean	Second sample mean	Average reduction	P value	N (sample size of sites per period)
Baseline 1 against Post 1					
Both directions	30.23	30.08	0.15	0.148	22
Intervention direction	29.96	29.82	0.14	0.368	11
Opposite direction	30.50	30.34	0.16	0.285	11
Baseline 1 against Post 2					
Both directions	30.16	30.17	*-0.01*	0.983	18
Intervention direction	29.98	30.26	*-0.29*	0.592	9
Opposite direction	30.35	30.08	0.28	0.310	9
Post 1 against Post 2					
Both directions	30.03	30.17	*-0.14*	0.648	18
Intervention direction	29.93	30.26	*-0.34*	0.528	9
Opposite direction	30.13	30.08	0.05	0.897	9

*Please note that the first sample mean is not consistent for 'Baseline 1' and 'Post 1' as sites were excluded due to site issues at 'Post 2' stage. The exclusion of these two sites at this stage alters the mean average speeds.

TVAS sites

Table 6: Significance testing on TVAS sites for average speeds

Average speeds for TVAS sites	First sample mean	Second sample mean	Average reduction	P value	N (sample size of sites per period)
Baseline 1 against Post 1					
Both directions	29.70	29.64	0.06	0.678	18
Intervention direction	29.61	29.48	0.13	0.529	9
Opposite direction	29.79	29.80	*-0.01*	0.960	9
Baseline 1 against Post 2					
Both directions	29.70	29.61	0.09	0.639	18
Intervention direction	29.61	29.47	0.14	0.468	9
Opposite direction	29.79	29.76	0.03	0.923	9
Post 1 against Post 2					
Both directions	29.64	29.61	0.03	0.905	18
Intervention direction	29.48	29.47	0.01	0.967	9
Opposite direction	29.8	29.76	0.04	0.912	9

All of the sample means measured for TVAS were below 30mph across all sites and directions. The t-tests show that there has been no change in the mean speeds at the sites. Speeds generally stayed the same over the three time periods compared.

85th Percentile Speeds

ANPR sites

For ANPR sites, 85th percentile speeds were largely below the ACPO enforcement threshold of 35mph. Speeds reduced only very slightly, with Baseline 1 against Post 2 in the intervention direction only noting a minor increase. However, with sample sizes this small, any differences could be attributed to random fluctuation. The p-values are all not significant.

Table 7: Significance testing on ANPR sites for 85th percentile speeds

Average speeds for ANPR sites	First sample mean	Second sample mean	Average reduction	P value	N (sample size of sites per period)
Baseline 1 against Post 1					
Both directions	35.15	34.95	0.21	0.132	22
Intervention direction	34.92	34.68	0.24	0.254	11
Opposite direction	35.38	35.21	0.17	0.372	11
Baseline 1 against Post 2					
Both directions	34.95	34.90	*0.05*	0.865	18
Intervention direction	34.93	35.10	*-0.18*	0.760	9
Opposite direction	34.98	34.70	0.28	0.209	9
Post 1 against Post 2					
Both directions	34.79	34.90	*-0.11*	0.725	18
Intervention direction	34.8	35.10	*-0.30*	0.572	9
Opposite direction	34.79	34.70	0.09	0.799	9

TVAS sites

TVAS sites had lower sample means overall for 85th percentile speeds, with minor reductions in speed for the direction of traffic flow with the intervention signs. The p-values are all not significant.

Table 8: Significance testing on TVAS sites for 85th percentile speeds

Average speeds for TVAS sites	First sample mean	Second sample mean	Average reduction	P value	N (sample size of sites per period)
Baseline 1 against Post 1					
Both directions	34.51	34.47	0.04	0.818	18
Intervention direction	34.33	34.22	0.11	0.653	9
Opposite direction	34.68	34.71	*-0.03*	0.895	9
Baseline 1 against Post 2					
Both directions	34.51	34.19	0.31	0.208	18
Intervention direction	34.33	34.00	0.33	0.226	9
Opposite direction	34.68	34.39	0.29	0.509	9
Post 1 against Post 2					
Both directions	34.47	34.19	0.27	0.282	18
Intervention direction	34.22	34.00	0.22	0.428	9
Opposite direction	34.71	34.39	0.32	0.474	9

APPENDIX 5 – SPEED DATA

ANPR Sites and average speed

Table 9: Average speed, intervention direction on ANPR site

Site name	Site direction	Baseline	Post 1	4-weeks post	Baseline 2	Post 2
Flempton	Eastbound	30.1	30.2	30.4	30.4	31.9
Risby	Westbound	28.4	27.9	27.1	27.6	30.9
Bardwell	Southbound	27.6	27.7	28.1	27.4	27.1
Lackford	Northbound	33.9	33.7	33.4	33.9	32.9
Ashbocking	Northbound	31.2	32.1	31.8	32.1	32.5
Grundisburgh	Northbound	30.9	30.4	31.2	30.7	31.2
Barham	Northbound	29.7	29.2	29.2	28.8	28.1
Crowfield	Northbound	28	28.2	27.6	27.6	27.5

Table 10: Average speed, opposite direction on ANPR site

Site name	Site direction	Baseline	Post 1	4-weeks post	Baseline 2	Post 2
Flempton	Westbound	31.8	32	31.9	31.1	30.1
Risby	Eastbound	29.2	28.1	28	28.6	30
Bardwell	Northbound	28.7	28.3	28.2	28.3	28.4
Lackford	Southbound	33.1	32.7	33.3	33.3	32.6
Ashbocking	Southbound	31.6	32	32.3	31.9	31.7
Grundisburgh	Southbound	33.4	33	33.2	33.1	33
Barham	Southbound	28.9	29.1	28.9	29.2	28.6
Crowfield	Southbound	26.1	25.8	26.1	26.3	26.2

TVAS sites and average speed

Table 11: Average speeds, intervention direction on TVAS sites

Site name	Site direction	Baseline	Post 1	4-weeks post	Baseline 2	Post 2
East Bergholt	Southbound	31.3	31.2	31.4	31.3	31.2
Higham	Westbound	25.6	25.2	25.4	25.9	25.7
Lavenheath	Northbound	32.7	33.3	33.6	32.8	32.7
Holton St Mary	Southbound	31	29.6	30.5	30.1	30.5
Hawstead Green	Northbound	30.5	30	30	29.7	30.7
Horringer	Northbound	31.2	31.5	30.6	30.7	30
Maypole Green	Southbound	31.3	31.3	31.5	32	32
Stanningfield	Northbound	24.8	24.6	24.2	24.4	24.1
Hartest	Southbound	28.1	28.6	27.7	27.5	28.3

Table 12: Average speeds, opposite direction on TVAS sites

Site name	Site direction	Baseline	Post 1	4-weeks post	Baseline 2	Post 2
East Bergholt	Northbound	32.3	32	31.8	31.9	31.7
Higham	Eastbound	27.6	26.9	27.5	27.3	28.4
Lavenheath	Southbound	31.9	32.7	32	31.9	31.9
Holton St Mary	Northbound	32.6	32.4	31.9	32.1	32.8
Hawstead Green	Southbound	30.2	29.3	29.6	29.9	30.5
Horringer	Southbound	31.5	31.1	30.6	30.5	29.7
Maypole Green	Northbound	30.7	31.1	31.1	31.3	32
Stanningfield	Southbound	23.5	24.2	24.1	23.9	24.2
Hartest	Northbound	27.8	28.5	26.9	26.8	26.6

ANPR sites and 85th percentile speeds

Table 13: 85th percentile speeds, intervention direction on ANPR site

Site name	Site direction	Baseline	Post 1	4-weeks post	Baseline 2	Post 2
Flempton	Eastbound	34.4	34.3	34.6	35.2	35.7
Risby	Westbound	33.2	33.1	32.3	32.1	35.9
Bardwell	Southbound	33.3	33.4	34	34	33.1
Lackford	Northbound	39.1	38.6	38.3	39.3	37.6
Ashbocking	Northbound	36.2	37.4	36.8	37.1	37.6
Grundisburgh	Northbound	36.1	35.1	36.4	35.9	36.5
Barham	Northbound	33.7	33.1	33.1	32.5	32
Crowfield	Northbound	33.4	33.4	32.5	32.5	32.4

Table 14: 85th percentile speeds, opposite direction on ANPR site

Site name	Site direction	Baseline	Post 1	4-weeks post	Baseline 2	Post 2
Flempton	Westbound	35.7	35.8	35.7	35.2	34.2
Risby	Eastbound	34.4	33.3	33.1	33.3	34.7
Bardwell	Northbound	34.3	34.6	34.7	34.6	34.4
Lackford	Southbound	38	37.5	38.3	38.7	37.5
Ashbocking	Southbound	36.1	36.8	37.1	36.4	36.2
Grundisburgh	Southbound	38	37.2	37.6	37.6	37.8
Barham	Southbound	32.8	33.2	32.8	33.3	32.4
Crowfield	Southbound	30.5	29.9	30.4	30.3	30.4

TVAS sites and 85th percentile speeds

Table 15: 85th percentile speeds, intervention direction on TVAS site

Site name	Site direction	Baseline	Post 1	4-weeks post	Baseline 2	Post 2
East Bergholt	Southbound	36.4	36.2	36.5	36.4	36.4
Higham	Westbound	29.6	29.2	29.4	29.8	29.3
Lavenheath	Northbound	37.4	38	38.6	37.4	37.6
Holton St Mary	Southbound	34.9	33.3	34.4	33.9	34.2
Hawstead Green	Northbound	36.1	35.7	35.5	34.7	35.8
Horringer	Northbound	34.9	35.1	33.9	33.4	33.1
Maypole Green	Southbound	36.9	37.5	36.9	37.5	37.4
Stanningfield	Northbound	29.6	29.2	28.9	28.9	28.5
Hartest	Southbound	33.2	33.8	32.9	32.9	33.7

Table 16: 85th percentile speeds, opposite direction on TVAS site

Site name	Site direction	Baseline	Post 1	4-weeks post	Baseline 2	Post 2
East Bergholt	Northbound	37.2	36.7	36.5	36.6	36.4
Higham	Eastbound	31.9	31.2	31.7	31.2	32.5
Lavenheath	Southbound	37.1	38	37	36.6	37
Holton St Mary	Northbound	37	36.7	36.1	35.9	37.2
Hawstead Green	Southbound	35.7	35.1	34.9	34.1	35.7
Horringer	Southbound	35.7	35.2	34.6	34.4	32.5
Maypole Green	Northbound	36.2	37	36.7	36.8	37.5
Stanningfield	Southbound	28.9	28.9	29.1	28.7	28.9
Hartest	Northbound	32.4	33.6	32.1	32.3	31.8

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