



Home Office

Guidance on ANPR Performance Assessment and Optimisation

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Foreword

Automatic Number Plate Recognition (ANPR) technology is used by the police and other Law Enforcement Agencies (LEAs), to help detect, deter and disrupt criminality at a local, force, regional and national level, including tackling travelling criminals, Organised Crime Groups (OCG) and terrorists. ANPR provides lines of enquiry and evidence in the investigation of crime and road traffic offences throughout England, Wales, Scotland and Northern Ireland.

The law enforcement National ANPR Service (NAS Automatic Number Plate Recognition (ANPR) technology is operated within the scope of Part 3 [Data Protection Act 2018](#) (DPA) and ANPR systems must also conform to the [Surveillance Camera Code of Practice](#) (SCCP) issued under provisions of the Protection of Freedoms Act 2012. The DPA and SCCP include requirements for data accuracy and the National ANPR Standards for Policing and Law Enforcement ([NASPLE](#)) detail camera performance standards that support those requirements. Assessment of camera performance on installation and periodically thereafter is mandated within [NASPLE](#).

Accurate data is important in order for the police and LEAs to obtain maximum benefit from ANPR in meeting their law enforcement purposes, and to ensure public confidence in its use. It is therefore essential that ANPR infrastructure is deployed and maintained effectively, in line with the requirements of [NASPLE](#).

This guidance document suggests how to set up, maintain, monitor and maximise the performance of an ANPR system. It is written for law enforcement ANPR operatives and commercial installers on behalf of the National ANPR Strategy Board. It applies to ANPR systems that are part of the National ANPR Infrastructure (NAI) and may feed data into the NAS.

Chief Constable Charlie Hall

Hertfordshire Police

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1 Introduction

This document provides guidance for ensuring that an Automatic Number Plate Recognition (ANPR) system meets the needs of the end user in typical operational scenarios. It also explains important factors involved in the set-up and maintenance to ensure that the system achieves and maintains its optimum performance.

The guidance is generic in nature and includes suggestions on the information that should be given to potential suppliers in order to obtain the most appropriate system that will be capable of giving the maximum performance at the required location. A rigorous performance measurement technique is suggested with a recommendation that it should be used on installation in order to obtain accurate capture and read rates that can then be compared to the requirements laid out in [NASPLE](#). Ongoing performance monitoring is also required. If resources allow, the rigorous measurement technique should be repeated at later dates to enable any change in performance over time to be investigated. Alternative, less resource intensive methods of performance monitoring are available and some of these are also discussed along with their associated limitations.

The guidance is structured in terms of the chronological lifecycle of an ANPR device, i.e. pre-purchase requirements capture, site survey, installation and ongoing maintenance, including performance measurement techniques. This guidance is intended to apply to fixed, redeployable and mobile ANPR devices; it does not cover handheld devices. For the purposes of this document an ANPR device is defined as the roadside detection device and associated recognition software.

The advice given here has been obtained through consultation with a range of stakeholders including colleagues within the Home Office and ANPR manufacturers.

This document has been produced by the Home Office Police and Public Protection Technology (PPPT) with input provided by the Defence Science and Technology Laboratory (Dstl); enquiries relating to it should be addressed to:

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2 Pre-purchase

Prior to purchasing ANPR systems it is important that full consideration is given to the operational requirements. A thorough set of operational requirements will help ensure the system's compliance with the [Surveillance Camera Code of Practice](#) issued under Part 2 of the [Protection of Freedoms Act 2012](#). This code applies in England and Wales and sets out a framework of good practice that includes existing legal obligations, including the processing of personal data under the [DPA](#) and a public authority's duty to adhere to the [Human Rights Act 1998](#). It is clear in stating that:

“The decision to use any surveillance camera technology must be consistent with a legitimate aim and a pressing need. Such a legitimate aim and pressing need must be articulated clearly and documented as the stated purpose for any deployment.”

The following factors should be considered in writing the operational requirement:

- The operational requirement should include a full definition of the outcomes required, inclusive of the enforcement or intelligence aspects. It is important that this requirement concentrates on the required outcomes and not any assumptions about the equipment that might be used.
- The complete ANPR system should be considered, including the camera, the back-office facilities and the data storage systems. It should be stipulated whether the procurement will be for an entirely new system or components that will integrate with existing equipment.
- Any relevant permissions for access to power, equipment etc. should also be gained at an early stage.
- Any hardware or software security requirements should be included.
- The maximum readable number plate height should be considered. Rear plates can be at a significant height.
- The importance of capturing motorcycle plates should be considered. This can be achieved only with cameras facing the rear of vehicles.
- The maximum vehicle speed for which [NASPLE](#) performance is expected should be stated.
- The ongoing maintenance and support of the system should be considered. Whether this will be completed in house or by an external contractor should be stipulated at the outset and an appropriate budget should be included in the overall cost considerations. The expected lifetime of the system should be considered and taken into account in the budget.
- The bodies responsible for ensuring that the system adheres to the [NASPLE](#) should be stipulated at the outset. This includes those responsible for the measurement of the performance levels required by the standard.

- It should be understood that there may be a balance between the performance achieved and the location of the individual system. For example, even though a particular location has been identified as being operationally necessary it may not be possible to set up a system there such that a high-performance level can be achieved, as the geometry of the location may prevent the device from operating optimally. If at all possible, the location of the device used should be reconsidered if the performance level can be improved without a loss of operational outputs. All installations, however, must meet [NASPLE](#) performance criteria.
- All relevant stakeholders should be included in identifying the requirements and specifications, including interfaces, image and data format requirements. This will include, amongst others, the end users, IT departments involved in setting up the back-office and the owners of all relevant interfaces.

It is important to make sure that the potential suppliers are given the information they need to ensure that their systems will meet the requirements. Basic site surveys should be completed of all intended locations to identify any specific requirements for each location. The possible suppliers should also be allowed to complete a site survey to ensure that they provide quotes for the appropriate equipment.

At a minimum the following information should be provided to possible suppliers:

- as much about the intended location of the ANPR system as possible, i.e. exact, indicative, or type of location, such as an open road or in a tunnel, road layout, or whether associated with other infrastructure, such as an access control system;
- the number of lanes to be covered, the stand-off distance between the camera and target vehicles, mounting requirements, the range of the road requiring illumination;
- the expectation that the ANPR system will read all vehicle plates, including those from the British Isles, EU and the Schengen Community, in addition to other plates that the LEA might identify;
- any equipment restrictions at the required location, such as size restrictions;
- the field of view that must be provided to cover the full width of all of the required lanes.

The vertical and horizontal resolutions of the number plates within the image must be large enough to allow the ANPR processing algorithms to recognise the individual characters. The exact values required will be dependent on the capabilities of the system being used and the manufacturer should be consulted to determine them. In particular these will vary depending on whether analogue, standard or high definition digital cameras are being used. If a single high definition camera is used to cover multiple lanes it should be remembered that the achieved resolution per lane may be reduced.

3 Site Survey

Once an ANPR manufacturer has been chosen a pre-installation site survey will be required to ensure that they have all the necessary information and that any pre-installation preparation can take place. Some of this information will already have been covered at the prepurchase stage, however further details will be needed prior to installation, for example:

- the specific location and GPS coordinates;
- traffic volumes and behaviour, e.g. whether there is any turning traffic or proximity to bends or turns, which could affect the angle of the number plate with respect to the camera or obscure the target traffic;
- road widths;
- the number of lanes and their widths;
- any traffic management issues;
- lane discipline issues;
- whether front or rear plates will be detected;
- the orientation of the camera and any sun effects;
- the lighting available;
- whether the installation will be fixed, redeployable or mobile;
- the power requirements and availability;
- how direction detection will be provided;
- any lane labels painted on the road;
- communications availability;
- the mounting infrastructure;
- the angle of view (camera/road geometry);
- any civil works needed for installation and maintenance;
- susceptibility to vandalism or other interference by the public;
- any health and safety requirements during installation and maintenance;
- health and safety implications of intense infrared illumination for pedestrians or other road users;
- dazzle to motorists from intense visible light or flashes;
- radiofrequency interference from nearby electrical or electronic equipment;

- radiofrequency interference from emergency services vehicles, e.g. if near a hospital or police station;
- the proximity of any trees or other items that could obscure the camera's view at certain times of the year;
- the prevailing location conditions that might affect performance, such as frequent morning fogs, or proneness to dust or splashing with dirty water;
- whether pedestrians regularly enter the scene, particularly where they might pass across the field of view and obscure the plates; and
- whether the camera will be prone to vibration from traffic/wind. This could result in camera shake and hence blurring of the image.

4 Installation

On installation it is essential that the camera is set to provide optimum performance. Specifically:

- It is essential that the manufacturer's guidance is fully consulted.
- If an external contractor is used, they should be able to demonstrate that they have full knowledge of the specific system.
- It should be remembered that all locations are different, and the individual cameras should be set up in an appropriate way for each location.
- It should be ensured that the correct components are installed. For example, where separate imaging components are combined then the illuminator, optical filters and sensor must be appropriately chosen for the location and must match the other components.
- Appropriate health and safety procedures and training should be followed at all times during the installation process, particularly those that relate to working by roadsides and possibly at height. Some traffic management may be necessary to allow safe access to the number plate reading devices.
- If redeployable cameras are used in multiple sites it should be ensured that those cameras are only ever used at appropriate sites, for example they should only be used at sites with appropriate stand-off distances etc. available.

There are a number of other factors concerning the set-up of a camera that should be taken into consideration.

- **The field of view:** If this is too great the number plates may appear too small to be recognised by the ANPR device; however, if it is too narrow the complete number plates may not be captured. It should be ensured that the vehicles are visible within the field of view for long enough for the ANPR device to capture and successfully read the VRM.
- **Number plate skew and rotation with respect to the camera:** There is considerable variation in how successful individual ANPR systems are at reading number plates when the plates themselves are not straight on to the camera. Problems may be caused either by the vehicle turning with respect to the camera or the steep angle of the camera with respect to the road when installed. Depending on the system being used there will be a limit on the degree to which the camera can be angled. Some ANPR devices may allow skew settings to be configured.
- **Light:** The amount of light reaching the camera is a critical factor in the success of ANPR devices. The source and quantity of light will need to be appropriate for the type of camera in use, for example visible light from daylight or street lighting or infrared light from dedicated illuminators. It is essential that any artificial illumination used covers the

whole field of view within which number plates might be captured. The positioning of a permanent camera system will have to be carefully surveyed. In particular:

- avoid low light levels;
- for visible light cameras avoid glare from headlights and intense sun reflection by considering the angle of the camera and the possible use of a lens hood;
- avoid uneven illumination;
- night time use can be a problem for cameras using visible light illumination only. These problems can be reduced by using infrared illumination and appropriate cameras;
- sunlight contains a considerable amount of infrared light that may reflect from the road and other surfaces and cause glare affecting infrared cameras.

Some ANPR systems may not allow specific settings to be adjusted; however, for those situations where more adjustment is available the following factors should be borne in mind.

- **Motion blurring:** Depending on how far a vehicle moves whilst the ANPR camera's shutter is open, excess motion blurring might appear within the resultant image, preventing the ANPR device from accurately reading the number plate. In order to avoid this, the shutter speed of the camera must be set to be appropriate for the road speed. It should be noted that reducing the amount of time for which the shutter is open may reduce the system's low light capability.
- **Depth of field:** The depth of field is the distance over which an item is in acceptably sharp focus within the image. Depending on the ANPR device used multiple frames of each vehicle may be needed to obtain an accurate VRM output. If multiple frames are required it must be ensured that the number plate will be in focus across the entire field of capture. The depth of field can be affected by the aperture size, which can also affect the light levels reaching the camera sensor. It is essential that these light levels remain sufficient to produce the optimum output.
- **Image noise:** The ANPR device needs the image to be as free of electronic noise as possible. As a good indication the number plate should be easily readable by the human eye on the plate patch image. It may be necessary to use the original manufacturer/installer to correct problems related to noise. Electronic noise can occur for a number of reasons such as problems caused by the sensor itself, the camera processing circuit, poor connections, interference or excessive electronic gain.
- **Software settings:** Some devices allow changes to various software settings, for example the camera settings and any crop zones, i.e. areas that are discounted from the ANPR searches. The settings should be regularly checked to make sure they remain appropriate.

4.1 Performance measurement on installation

On installation or re-installation of any component of ANPR infrastructure, the performance standards detailed within [NASPLE](#) must be adhered to and this should be recorded.

Performance standards apply for all VRMs that comply with correctly represented EU and Schengen Community number plates, are within the ANPR field of view and are visible to a human. VRMs that are visible to a human are defined in the [NASPLE](#) as:

‘Visible to the Human eye’ should be determined from the viewpoint of the camera within the ANPR system. A number plate visible to a ‘human eye’ at that location should also be visible by the ANPR system.’

Therefore, plates that are not visible to the ANPR camera do not have to be included; however non-standard plates and foreign number plates must, if present, be included in the testing. Any problem plate that cannot be detected should be recorded in a form similar to that shown in Appendix A.

The suggested processes discussed here are intended for gathering data and analysing performance and do not provide guidance regarding storage or protective marking. Data should be stored in accordance with policy within the relevant LEA and should be appropriately protectively marked.

4.1.1 Evaluation conditions

Performance should be assessed for a range of conditions, but as a minimum during daylight and night time conditions. Financial constraints permitting, it is strongly advisable to also assess performance in bright daylight at both dusk and dawn, and also for overcast daylight conditions. A broad range of weather and traffic conditions should also be considered.

4.1.2 ANPR performance measurements

The measurements used within the [NASPLE](#) to describe the ANPR system performance are:

- **Capture rate:** the number of VRMs detected and logged by an ANPR device in comparison with the total number of VRMs passing through the field of view that are visible to a human. This is expressed as a percentage irrespective of whether they are correctly read or not.
- **Read rate:** the number of VRMs captured by an ANPR device that are accurately read in comparison with the total number captured expressed as a percentage.

It is desirable for all of the capture and read rates to be as high as possible.

Details for any VRM that is not captured or read correctly should be noted and reported in a form similar to that given in Appendix A. This may provide information to enable the performance of the device to be improved. It may also assist with the identification of factors relevant to the performance of similar devices or locations and any potential deliberate or unintentional countermeasures. Information about plates that have not been captured will only be easily obtainable if an independent video is recorded of the traffic flow.

4.1.3 Minimum evaluation sample

The recommended evaluation sample is no fewer than 250 consecutive vehicles displaying a VRM within the field of view of an ANPR device. This number of vehicles is suggested as it gives a reasonable confidence that the results obtained are an accurate representation of results that would be obtained for the full population of cars passing that camera. ¹

4.1.4 Comparison with NASPLE

In order to confirm agreement with the [NASPLE](#), minimum success rates must be achieved in each of the tests. For example, in the case of fixed and movable ANPR systems the [NASPLE](#) states that:

“Systems must capture 98% of all VRM that are visible to the human eye and accurately read 95% of captured VRM.”

For other types of installation, for example in a moving vehicle, lower capture rates are allowed however the number of plates that are captured that must then be accurately read remains at 95%.

The [NASPLE](#) does not require any component parts to be tested and accredited as ‘[NASPLE](#) Compliant’. It is therefore the responsibility of LEAs to ensure that all components of infrastructure have the capability to conform to the [NASPLE](#) once they have been installed.

This document does not provide information regarding confirmation of whether the ANPR system conforms to other standards within the [NASPLE](#), such as communication methods.

4.1.5 Procedure 1: Ground truth video

This procedure involves an independent video log (the ground truth) of the full sample of vehicles being compared against the details for the same vehicles monitored by an ANPR device. In some cases, the ground truth video can be obtained from an ANPR camera that gives access to the video outputs that have not been processed and are still independent of the ANPR equipment. Alternatively, an entirely separate video camera that provides the same view as the ANPR camera may be used to obtain the ground truth video. If used at

¹ Should it be impractical to wait for 250 vehicles to pass the camera, (if the camera is situated on a low traffic volume road) the decision may need to be taken to measure all vehicles that pass the camera within a two-hour time span. However, it should be noted that the results will not be as robust.

night the ground truthing video camera must be capable of operating in low light levels for example by detecting near infrared light.

Prior to commencing the assessment all camera settings should be noted, and the light levels and approximate average traffic speeds should be recorded. Figure 1 shows possible layouts for the performance measurements in two example situations.

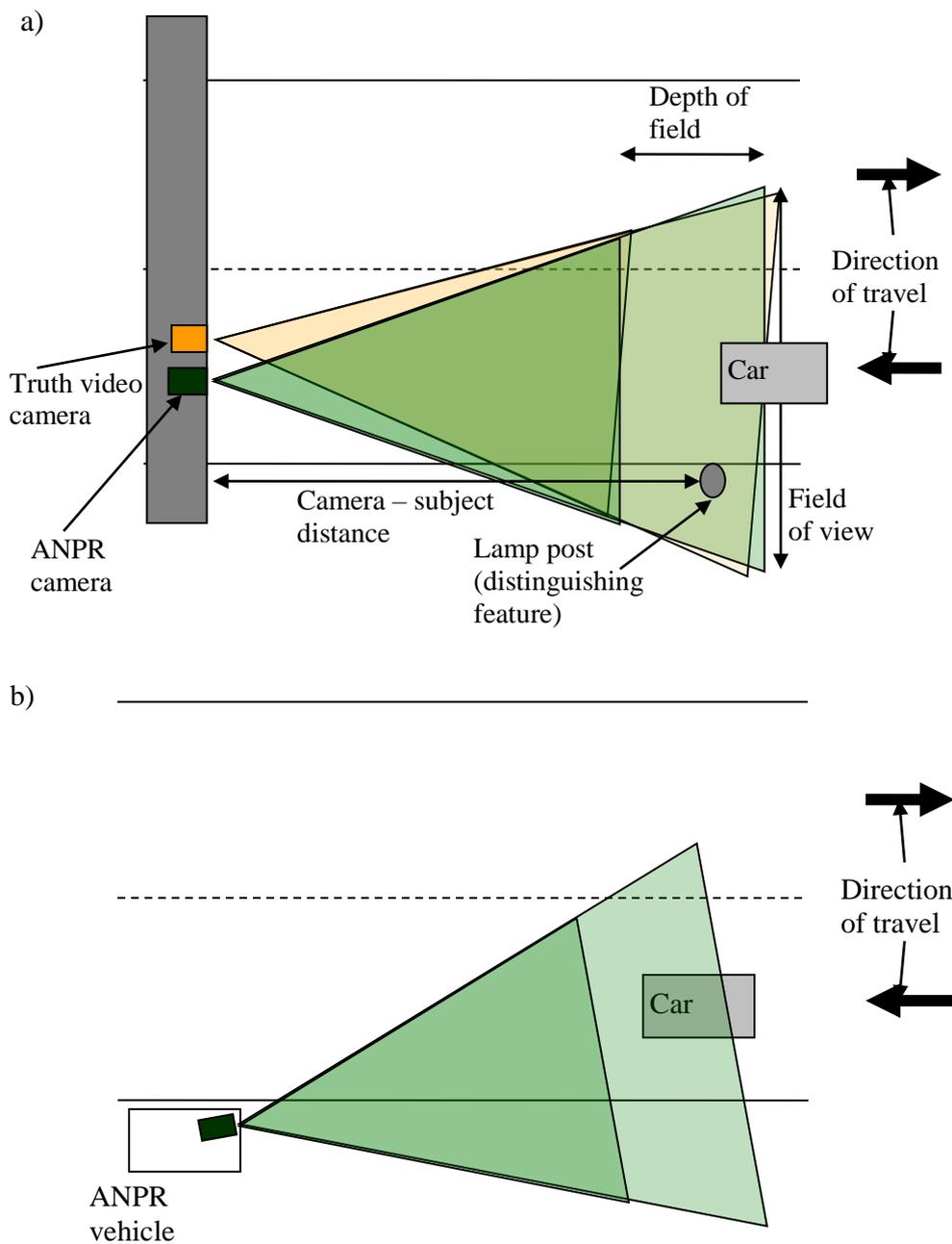


Figure 1 Schematic diagram of possible layouts for performance measurement:

a) Assessment of fixed ANPR device used on a gantry (assuming separate video log required)

b) Assessment of vehicle-based ANPR device (assuming ANPR system provides video output)

The procedure is as follows:

- 1 Ensure that the ANPR unit and separate camera (if used for recording the ground truth video) is appropriate for the location, for example both devices have lenses with the appropriate focal lengths.
- 2 Set up the ANPR unit according to the manufacturer's instructions and the specific operational situation, with particular reference to the required focal length, depth of field and field of view.
- 3 When using a separate camera to produce the ground truth video, it should be set up as close to the ANPR camera as is reasonably practicable. Ensure that the camera is focused in the same place, covers the same 'target area' and has the same or better depth of field as the ANPR camera.
- 4 The ground truthing video camera should be set up so the number plate details can be easily read on viewing the video and compared with the ANPR log file recorded by the device. Care should be taken when selecting the shutter speed mode, since an incorrect choice may give blurry characters for vehicles moving rapidly. As with the ANPR camera, the ground truth video camera shutter speed should be set according to the appropriate road speed. This can be checked by reviewing the images produced for a few vehicles before testing begins, ensuring that the VRMs can be clearly read. The camera should be manually focused. High levels of electronic gain, often used to compensate for low light levels, may need to be avoided as this can amplify noise levels within the image, which may make accurate reading of the characters difficult.
- 5 Record the traffic for the full sample of vehicles passing through the field of view.
- 6 Obtain the ANPR log for this period.
- 7 Review the ground truth video recording of the vehicles and note each VRM from this video. These should be assessed by a human viewer, i.e. not by computer, in order to ensure that there are no software-based assumptions within this process. The reviewer will also be able to identify whether or not the plate was visible, as defined above, and the ANPR system could reasonably be expected to read it.
- 8 Compare each manually extracted VRM from the video with the corresponding ANPR log entry to determine whether or not the VRM has been captured and accurately read by the ANPR system.
- 9 Note all instances where a VRM visible to a human has not been captured, where a captured VRM has been incorrectly read, or where there is any difference between the ANPR log and the ground truth video and if possible, establish and record the reason for any differences.
- 10 All characters must be accurately read. Where similar characters, such as 'S' and '5', are mistakenly interpreted a misread must be recorded.
- 11 Determine the number of plates that are on both the ground truth video and the ANPR log and input them into the equations below to calculate performance

12 capture rate = $\frac{\text{number of VRMs captured in the ANPR log}}{\text{number of VRMs known to pass the ANPR camera}} \times 100$

13 read rate = $\frac{\text{number of VRMs correctly read}}{\text{number of VRMs captured in the ANPR log}} \times 100$

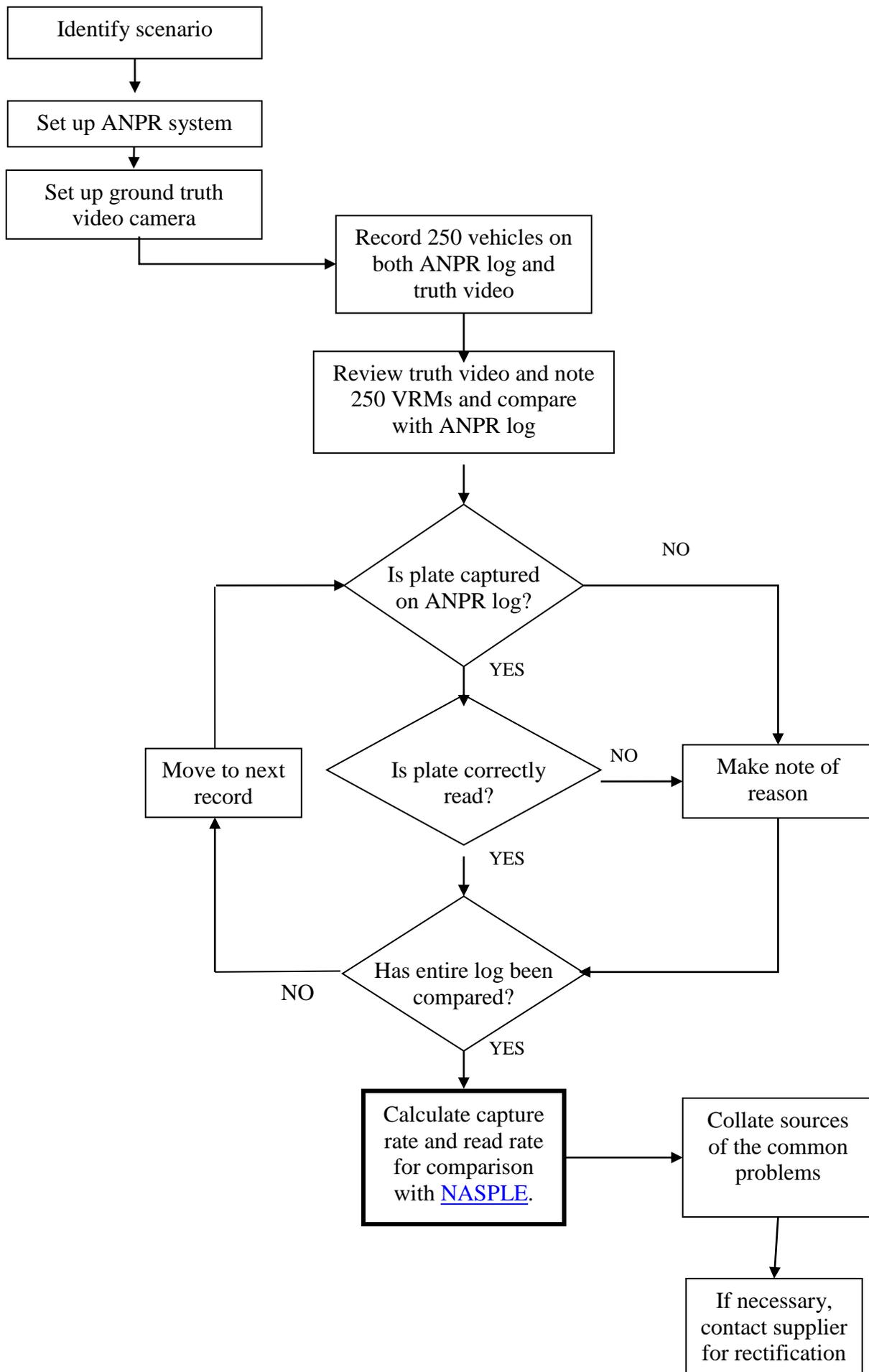


Figure 2 Main stages of the ground truth performance measurement technique

5 Regular maintenance and system checks

It is essential that regular maintenance takes place on all ANPR systems to ensure continued optimum performance. Regular system checks should also take place to ensure no faults have developed. This should be undertaken at least every 12 months, however, as discussed below some situations may require more frequent attention. This maintenance should be completed using appropriate health and safety protocols by qualified staff. The maintenance regime should include the following:

- Identifying any problems with the communication or IT systems.
- Measurement of capture and read rates. Some ANPR systems may include a self-diagnosis tool that may give information on any drop in performance.
- Cleaning the camera and especially the front of the lens. The regularity with which this is needed will be site dependent, for example cameras used near seaports are likely to be more prone to salt damage. Also, more cleaning may be needed at certain times of year, for example in winter road gritting may lead to accumulation of salt on the lenses.

Drops in performance may be caused by:

- False triggering or blocked views, such as caused by foliage or new signage;
- Changes in the camera alignment, for example caused by vibration or strong winds;
- Changes in focus;
- Faults that have developed with the camera or illumination;
- Changes in traffic patterns – if necessary, the camera should be adjusted to account for this;
- New sources of radiofrequency interference, e.g. nearby mobile phone masts, or Wi-Fi or other communication devices on the same post;
- Changes in traffic patterns – if necessary, the camera should be adjusted to account for this;
- Vandalism.

Any other changes to the site should be investigated to see if they have had any effect on the ANPR performance.

5.1 Ongoing performance measurement techniques

In order to ensure that the performance remains at its optimum level throughout the lifetime of the ANPR device regular testing of its performance should take place. The full ground truth technique, as described in procedure 1, should ideally be used. Simpler but

less rigorous techniques are described below. These have limitations, however, and therefore cannot be used to prove that the system agrees with the [NASPLE](#).

5.1.1 Procedure 2: Counted plates

Prior to commencing the assessment all camera settings should be noted, and the light levels and approximate average traffic speeds should be recorded. This technique relies on the availability of an overview or plate patch image. If these are not an integral part of the ANPR system a separate video camera will be needed to record each of the passing vehicles used in the test.

As with the full ground truthing method it is preferable for 250 vehicles to be sampled.²

The suggested procedure is as follows:

- 1 Record the time, date, and VRM of a vehicle passing through the field of view of the ANPR device (first vehicle).
- 2 Count 248 subsequent consecutive vehicles with a VRM within the field of view of the device and visible to a human (there is no requirement to note details of these vehicles).
- 3 Record the time, date and VRM of the final vehicle passing through the field of view of the device.
- 4 Search the ANPR log for the first and final vehicle, and obtain a plate patch, or equivalent, for those vehicles and compare them to the ANPR log, ensuring that they have been read correctly.
- 5 The number of VRMs recorded on the ANPR system for that device should be noted and compared to the total number expected.
- 6 Obtain the plate patch, or equivalent, for all captured VRMs and compare the VRMs as recorded by the ANPR device with the plate patch image recording to identify whether the VRM has been correctly read or has been misread. Use these in the following equations to calculate performance. The log should be checked for multiple entries arising from the one vehicle passage: If there are multiple entries in the ANPR log from the one vehicle passage, only one VRM should be counted; if any of these multiple entries is incorrectly read, the vehicle passage should count as an incorrect read.
- 7
$$\text{capture rate} = \frac{\text{number of VRMs captured in the ANPR log}}{\text{number of vehicles counted}} \times 100$$
- 8
$$\text{read rate} = \frac{\text{number of VRMs correctly read}}{\text{number of VRMs captured in the ANPR log}} \times 100$$

² Should it be impractical to wait for 250 vehicles to pass the camera, (if the camera is situated on a low traffic volume road) the decision may need to be taken to measure all vehicles that pass the camera within a two-hour time span. However, it should be noted that the results will not be as robust.

It should be noted that this method does not allow identification of reasons why vehicles may have been entirely missed by the system.

A block diagram of the main stages of this technique is shown in Figure 3.

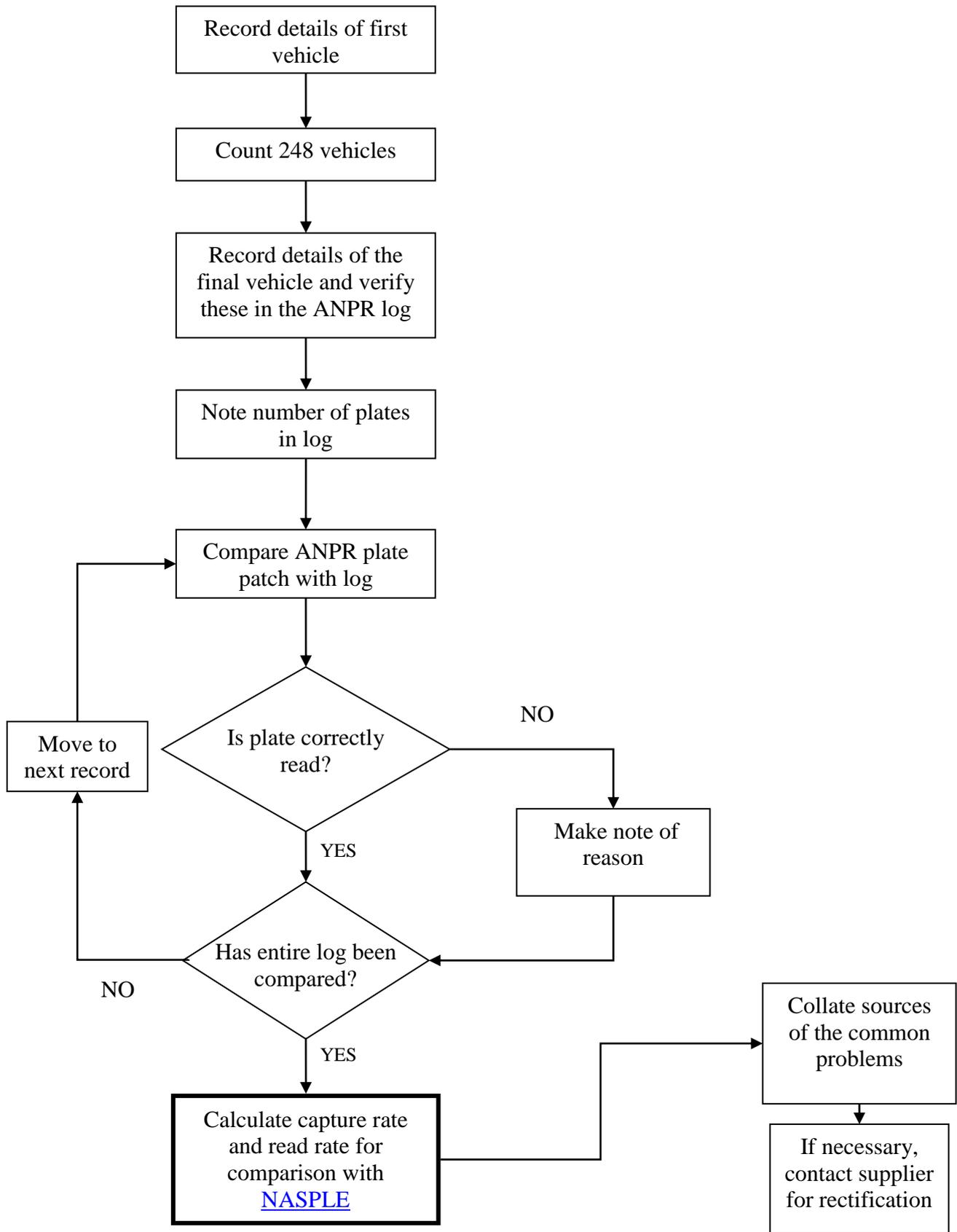


Figure 3 Block diagram of main stages for counted plate measurement technique

5.1.2 Procedure 3: Known plates

Once the full ground truth method has been used on installation it may be possible to carry out ongoing monitoring by noting the date and time vehicles with known number plates pass a specific camera. A measure of the number of times known plates are recognised by the ANPR device may then be used for comparison. It must be noted that this technique will not be statistically significant and can only be used for indication purposes.

The vehicles used should drive along specific routes past ANPR cameras. A record can then be made of exactly when the camera was passed. Whether specific vehicles are tasked for this purpose or vehicles passing by ANPR cameras during their normal operation are used is a decision for the individual force according to their operational capacity.

It is suggested that the known vehicles pass the given ANPR cameras preferably 20 times, or at least no fewer than 10 times, on a specific day once every 12 months. The same vehicles can be used numerous times as long as other vehicles pass by the camera in between so that they are clearly separate events. Alternatively, different vehicles can be used provided that there are 20 known passes on that day.

The suggested procedure is as follows:

- 1 On specific days an ANPR camera is chosen to be monitored. Known vehicles pass the chosen camera and a note is made of the VRM and the specific time of that occurrence. This may be done by the officer involved or the central office.
- 2 The central ANPR back-office staff can then note whether that specific VRM has been correctly logged on the ANPR database at the specific time of the occurrence. It may be possible to do this automatically.
- 3 Step 2 is repeated for each known VRM.
- 4 The approximate capture and read rates are calculated as shown:
- 5
$$\text{capture rate} = \frac{\text{number of VRMs captured in the ANPR log}}{\text{number of VRMs known to pass the ANPR camera}} \times 100$$
- 6
$$\text{read rate} = \frac{\text{number of VRMs correctly read}}{\text{number of VRMs captured in the ANPR log}} \times 100$$

As previously mentioned, these figures are not statistically significant as relatively few samples are used; however, they do give approximate levels that would indicate any substantial drop in performance. Also, it is important to note that if fleet vehicles are used then the VRMs are likely to be very similar, they may be newer and cleaner than the general population and do not represent a random situation so may not fully test the capability of the ANPR device.

If the values obtained are lower than the levels obtained when the system was baselined as described in procedure 1, then the causes of any reduction will need to be identified and corrective action taken. For systems just meeting the minimum NASPLE capture and read rates, corrective action is recommended when 2 or more VRMs are not captured out of 10 or 20 passes, or 3 or more VRMs are incorrectly read out of about 20 passes or 2 or more incorrectly read out of about 10 passes.³ It will be necessary to test the cameras again to ensure that the required performance improvements have been obtained.

5.1.3 Procedure 4: Performance monitoring

A coarse method of performance monitoring can be achieved by regularly keeping a note of the number of plates seen by a device over a representative period (e.g. 24 hours on a weekday). If there is an unexpected reduction in this number during standard operation this may indicate a drop in the performance of the device. This may result from temporary factors such as increased foliage cover, road works changing the traffic flow, or it may be caused by a fault in the camera system. If a drop in performance is noted for a specific camera it may be possible to use a technique such as that described in procedure 3 to investigate further.

Whatever the cause, it will be necessary to rectify the problem and ensure the performance returns to its optimum level.

³ For 20 passes and baseline capture or read rates in excess of 97% or 99.5%, a loss of 2 or 1 VRMs respectively is significant. For 10 passes and capture or read rates in excess of 99%, a loss of 1 VRM is significant. Corrective action should be taken when these losses are observed.

References

- [1] [National ANPR Standards for Policing and Law Enforcement](#)
- [2] [Surveillance Camera Code of Practice 2013](#)
- [3] [Protection of Freedoms Act 2012](#)
- [4] [Data Protection Act 2018](#)
- [5] [Human Rights Act 1998](#)

Glossary

ANPR Log

The record of all VRMs read by an ANPR device.

Capture Rate

The percentage of all passing vehicles that have had their VRMs read and captured in the ANPR log, regardless of read accuracy.

Depth of Field

The range of distances imaged and focussed acceptably by a camera.

Field of View

That part of the environment seen and captured by a camera.

Ground Truth

VRM data read by humans that can be used to establish the accuracy of VRM data read by ANPR devices.

Read Rate

The percentage of passing vehicles captured in the ANPR log that have had their VRMs read correctly.

Video Log

The ground truth video used to establish the capture and read rates of an ANPR device.

List of abbreviations

ANPR	Automatic Number Plate Recognition
DPA 2018	Data Protection Act 2018
Dstl	Defence Science and Technology Laboratory
GPS	Global Positioning System
LEA	Law Enforcement Agency
NAI	National ANPR Infrastructure
NAS	National ANPR Service
NASPLE	National ANPR Standards for Policing and Law Enforcement
OCG	Organised Crime Groups
PPPT	Home Office Police and Public Protection Technology
SCCP	Surveillance Camera Code of Practice
VRM	Vehicle Registration Mark

Appendix A Examples of reasons for test failure

The capture and read rates must include all plates that were visible in the ANPR device field of view. Any errors found should be recorded as shown below.

Error summary:

Reason for missed plate	Number of plates missed
Vehicle out of field of view	
Alternative item mistaken for plate	
Incorrect lighting	
Other	

Reason for misread plate	Number of plates misread
Number plate partly out of field of view	
Fixings (inappropriately located)	
Fixings (damaged or rusting)	
Mud	

Delamination	
Cracks	
Water damage	
Illegal font	
Illegal character spacing	
Illegal spacing	
Illegal background	
Illegal plate layout	
Illegal logos	
Foreign plate	
Different reads in visible and IR images	
Character appearance alterations (black tape, IR-absorbing tape, ink etc.)	
Alterations to retroreflective properties of background or characters	
Other	