



From mountain to sea

Variable & vehicle-activated signs

Manual

April 2018



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1 Introduction

1.1 Legal & policy background

The *Road Traffic Regulation Act 1984* empowers local authorities to regulate or restrict traffic on a road in the interests of safety and Section 5 of this act allows them to place traffic signs (including lines and markings) on or near the road. All such signs and road markings used on public roads must be as prescribed in the current edition of the *Traffic Signs Regulations and General Directions* or must have been granted site approval by the Scottish Government.

This *Variable & Vehicle-Activated Signs Manual* is directly referred to in Aberdeenshire Council's approved *Variable & Vehicle-Activated Signs Policy* and shall be considered as mandatory guidance for all variable and vehicle-activated signs in Aberdeenshire.

1.2 General

Variable and vehicle-activated signs are used in situations where conventional signing would be inadequate.

The types of variable and vehicle-activated signs considered in this manual can be categorised as follows:

- permanent vehicle-activated signs emphasising speed limits
- temporary vehicle-activated signs emphasising speed limits
- vehicle-activated signs warning of hazards
- signs for part-time 20mph limits at schools
- other signs with flashing amber lights to warn of intermittent hazards

The use of these signs is now widespread throughout all areas of Aberdeenshire however there are concerns regarding their use or overuse: they can prove to be expensive to maintain, there is evidence that the effectiveness of some types may reduce with time and there are concerns that they can dilute the impact of other signs.

This manual aims to promote a consistency of application across Aberdeenshire by giving specific criteria for their installation and retention.

The requirements in this manual shall apply to all roads managed by Aberdeenshire Council and also to all roads proposed for adoption by Aberdeenshire Council. Any proposal which does not comply with this manual shall be considered as a departure from standards and will need specific approval by the council's Roads Standards Group.

All diagram numbers referred to in this manual are those given in the *Traffic Signs Regulations and General Directions*.

2 Permanent Vehicle-Activated Signs Emphasising Speed Limits

2.1 Type of sign to be used

New signs shall be of the type shown (see right). The LED display shall consist of the speed limit roundel with the legend “SLOW DOWN”. The roundel shall have a diameter of 600mm and the text height shall be at least 150mm high. Flashing amber lights shall not be used.

Signs shall have automatic dimming to ensure optimum visibility in varying light conditions. Loop or radar detectors shall be used to measure the speed of approaching vehicles and the sign shall only be activated by vehicles exceeding the speed limit.



2.2 Usage

New permanent vehicle-activated speed signs shall only be installed where they meet the criteria given in Section 7 or as part of specific measures in an accident reduction scheme proposed by the Road Safety Unit (RSU). Vehicle-activated signs should not be considered until the fixed signing and road markings have been checked to ensure that they comply fully with the guidance in Chapters 4 and 5 of the Traffic Signs Manual in terms of correct size, siting, visibility and condition.

Existing vehicle-activated speed signs of different designs may remain in place while operational but should be removed once they stop working. All signs should be re-assessed before being replaced to ensure that their retention is still warranted. Redundant sign posts should be removed following an unsuccessful reassessment.

3 Temporary vehicle-activated signs emphasising speed limits

3.1 Type of sign to be used

Each area shall have a speed-indicator device (SID) with a LED dot matrix display capable of displaying both the real-time measured speed (see right) and appropriate symbols or messages. These signs shall be mobile and have the capacity to record speeds of vehicles as they both enter and leave the range of radar detection along with dates and times for downloading and analysing.



3.2 Usage

SIDs shall be used in the circumstances given in the flowchart in Section 7. Where a SID is used in a rotation programme it shall be located at a site for between 2-3 weeks before being removed. A minimum period of 12 weeks should elapse before re-erection at the same location.

They may be used within roadworks to help protect the workforce by highlighting temporary speed limits and can also be used to emphasise new, reduced speed limits in the period after they have been introduced.

Police Scotland should be permitted to operate SIDs on Aberdeenshire roads but they shall consult with the local roads office on each location prior to use. We shall not permit the use of SIDs by any other body or person.

SIDs shall be mounted with a clearance to the kerb of at least 0.6m and at a minimum height of 2.3m above the ground. Each site should be risk assessed in advance of initial installation to minimise the risk during erection, operation and removal and to ensure that the installation does not impede visibility to other signs or to and from junctions. The use of demountable posts in permanent underground bases should be considered for regular rotation sites.



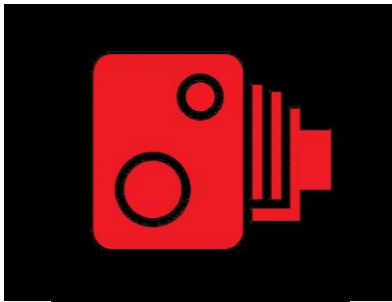



3.3 Messages to be displayed

SIDs should display positive messages for drivers complying with the speed limit and warnings for those who are not. Speeds above the threshold values (speed limit + 10% + 2mph) shall not be displayed as doing so may encourage irresponsible drivers to drive at even greater speeds.

Suggested messages are shown in table 3.1.

Records from the SID log should be reviewed after each installation. Police Scotland shall be notified where instances of excessive speed persist.

Table 3.1: Suggested messages for display on SIDs

vehicle speeds		
within limit	over limit and up to threshold value	over threshold value
30 mph limit		
0 - 30 mph	31 – 35 mph	>35 mph
40 mph limit		
0 - 40 mph	41 – 46 mph	>46 mph
Messages		
		
		

NOTE: the speed camera image should only be used on routes or in areas which are subject to occasional camera enforcement. The exclamation mark (right) should be used in its place elsewhere.



4 Vehicle-activated signs warning of hazards

4.1 General

Provision is made in the *Traffic Signs Regulations and General Directions* for certain junction or bend warning signs (diagrams 504.1, 505.1, 506.1, 507.1, 510, 512, 512.1, 512.2 and 513) when displayed by means of light-emitting characters or symbols also to display below the sign (and any associated plates), the legend “SLOW DOWN” in characters not less than one quarter of the height of the triangle. (e.g. Diagram 512 shown right).



These signs will be triggered by vehicles exceeding a pre-determined safe speed on the approach to a junction or bend. Department for Transport guidance¹ suggests that a suitable threshold speed for activating the sign would be the 50th percentile speed measured before installation.

4.2 Location

Such signs should be installed close enough to the hazard to allow drivers to associate the sign with the hazard but also should give drivers sufficient time to respond. Depending on approach speeds, distances of 50-100m in advance of the hazard would be appropriate. Sites with limited lines of sight to the detector, such as those on curves or with encroaching vegetation, should be avoided as should locations with pedestrian crossings or other junctions, where the sign may distract drivers. Only one sign, on the left-hand side of the road, should be necessary in most instances.

4.3 Criteria for new and replacement signs

Vehicle-activated hazard signs shall only be installed as part of a casualty-reduction scheme promoted by the Road Safety Unit (RSU), when identified as the most appropriate remedial measure to deal with an accident problem associated with inappropriate speed.

Vehicle-activated hazard signs shall be used only to supplement fixed signing, and not as a substitute for it. Vehicle-activated signs should not be considered until the fixed signing and road markings have been checked to ensure that they comply fully with the guidance in Chapters 4 and 5 of the *Traffic Signs Manual* in terms of correct size, siting, visibility and condition.

The RSEU must be consulted prior to replacing any existing vehicle-activated hazard sign to ensure that its retention is still warranted.

¹ [Traffic Advisory Leaflet 1/03 - Vehicle Activated Signs](#)

5 Signs for part-time 20 mph limits at schools

5.1 General

Aberdeenshire Council policy² states that speed limits of 20 mph will be applied outside schools. These will be full-time mandatory 20 mph speed limits in locations where the appropriate criteria for such limits are met however in other locations they will be part-time limits.

All part-time 20mph limits must be covered by a traffic order prohibiting vehicles from being driven at speeds exceeding 20mph when the flashing speed-limit signs are activated. When introducing new part-time 20 mph limits at schools, consideration should be given to the location and access point of the school in relation to adjoining roads, community severance and routes used by pupils. It is, however important that drivers identify the lower limit with the school and unnecessarily long lengths of variable speed limit must be avoided.

5.2 Signs to be used

A number of non-prescribed signs have been authorised for use with part-time 20 mph limits at schools in Scotland however, in Aberdeenshire, all new and replacement signs shall be of the types shown below. This will not only give a consistent message to motorists approaching such limits but also help reduce maintenance costs and downtime.



The “flashing 20 sign” (left) shall be used as a terminal sign showing where the part-time 20 mph limit starts. These signs shall have a permanently visible retroreflective sign face with LED flashing amber lights in each corner and shall be manufactured by Aberdeenshire Council’s Sign Shop.

Signs of this type shall be used singly, on the left-hand side of the road, entering the 20 mph limit and the appropriate terminal sign (Diagram 670/671) must be provided, singly, on the opposite side of the road to indicate to drivers that they are leaving the lower limit.

A number of different designs for flashing 20 signs have been used previously, including fully electronic signs on both sides of the carriageway. When any of these other flashing 20 signs fail they should be replaced by one of the standard type. Where non-standard signs exist on both sides of the carriageway, if one fails both shall be removed but only the left-hand one replaced with a standard flashing 20 sign.

² “[Assessment of Speed Limits in Aberdeenshire](#)” - Report to Infrastructure Services Committee on 24th January 2008

Standard flashing 20 signs must be used on all routes fronting the school however, within 30mph limits only, the alternative flashing 20 sign (shown right) may be used on quiet side roads junctions (see typical layout given in Figure 5.1 below). Additional signing is not required for small cul-de-sacs (serving 20 or less houses) within the part-time 20 mph limit.

Flashing 20 signs should be programmed to ensure that they are only active at times and dates when children are going to and from school. Times will vary across the school network and should be discussed with individual schools but will typically include the period leading up to the start of the school day, lunchtimes and a period after the end of the school day. It will be appropriate to extend the periods covering when pupils are going to school by 5 minutes after the bell to include latecomers. In certain circumstances, such as at academies where pupils are allowed to leave the school premises and walk to local shops, it may be appropriate to include breaktimes.



Figure 5.1: Typical signing layout for school part-time limit in 30mph limit.



Advance warning signs shall be used where a part-time 20mph limit is on a road with a speed limit greater than 30mph (see Figure 5.2 below). These must be linked or have their timings synchronised with the terminal flashing 20 signs. A single advance warning sign should be adequate for each approach to the part-time 20mph limit.



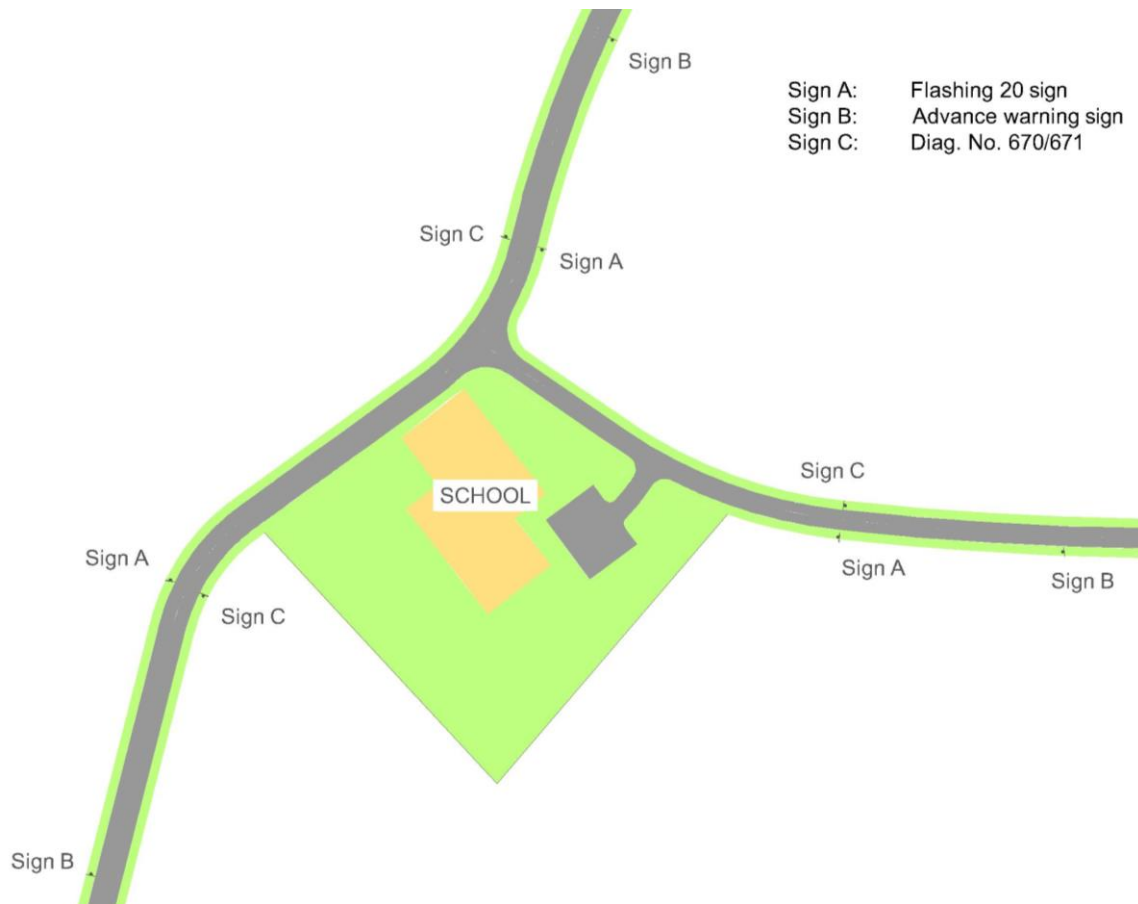
Two standard sign types shall be used for new or replacement advance warning signs in Aberdeenshire. In both signs, the warning triangle and associated “School” plate shall be permanently visible and retroreflective while the “20 limit ahead” will only be visible when the part-time limit is in operation.



The sign with LED flashing amber lights (shown left) should normally be used however the alternative (shown right) may be used on low-flow roads

or on remote sites where it is considered that the intermittent sign will be sufficiently conspicuous without the flashing lights.

Figure 5.2: Typical signing layout for school part-time limit within limit of more than 30mph

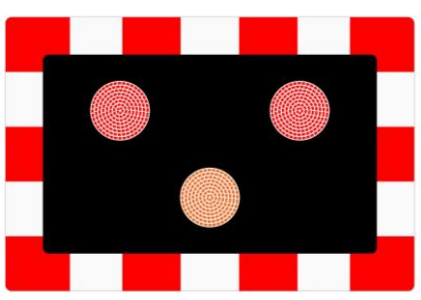


6 Other signs with flashing lights to warn of intermittent hazards

6.1 General

Other signs with flashing lights prescribed by the *Traffic Signs Regulations and General Directions* include wig-wag signals (diagram number 3014), flashing amber lights for school crossing places (diagram number 4004) and signalled cattle crossings (diagram number 4005). These shall only be installed at locations meeting the criteria below. National guidance shall be complied with for associated signage, positioning and specification.^{3 4 5}

6.2 Wig-wag signals



Wig-wag signals (left) are used to control traffic where the need for a vehicle to stop is critical but the frequency of occurrence may be difficult for road users to anticipate. Prescribed locations for use include level crossings and premises used regularly by fire, police or ambulance vehicles. Wig-wags at level crossings will be situated beyond the stop line at the crossing so shall be the responsibility of Network Rail and are not considered further in this document.

Wig-wag signals for emergency vehicles shall only be considered for full-time police, ambulance or fire stations where emergency vehicles leave the station directly on to a road with at least 10,000 vehicles per day.

6.3 Flashing amber lights for school crossing places

Twin flashing amber lights (right) are used to give added emphasis to the children going to school or playground warning sign (diagram number 545).

The Traffic Signs Regulations and General Directions state that amber lights must only be used in conjunction with this sign together with a plate bearing the legend “School”, “Patrol” or “Disabled children”. In Aberdeenshire however these shall only be used at school crossing patrol sites where the 85th percentile speed exceeds 35 mph.

Flashing amber lights must not be used to warn of children crossing at signalled or zebra crossings.



³ [Traffic Advisory Leaflet 1/08 Wig-wag Signals](#)

⁴ [TA 56/87 - Hazardous Cattle Crossing: Use of Flashing Amber Lamps](#)

⁵ [Traffic Signs Manual Chapter 4 – Warning Signs](#)

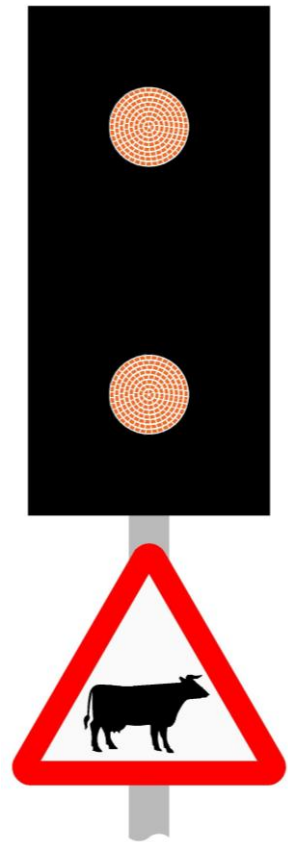
6.4 Cattle crossings

Warning lights for cattle crossings (right) may be considered where farmers need to regularly move cattle across a road and are unable to do so safely due to the speed or volume of traffic. Both of the following criteria must be met:

1. The cattle need to cross the road at least once in each direction daily on a minimum of 200 days in each year, **and**
2. The clear visibility to the crossing point is less than the distances shown in table 6-1 **or** the traffic flow exceeds 10,000 vehicles per day with 85%ile speeds between 30-60mph.

Table 6-1 Cattle crossing places

85th percentile speed (mph)	Visibility distance (m)
Up to 30	70
31 to 40	110
41 to 50	150
51 to 60	200
Over 60	Not suitable



In many sites, the fixed warning sign (diagram number 548) may give sufficient warning of cattle crossings. Remedial measures such as the cutting back of foliage or the re-siting of the crossing point should also be considered before installing flashing lights.

A cattle crossing point which does not satisfy the above criteria may be considered for the provision of flashing lights if, within half a mile on the same road, there is another cattle crossing point with flashing lights.

Flashing lights at cattle crossing points shall be operated by the farmer but shall be maintained and remain in the ownership of the council. The installation shall have key operated access to the switch and an automatic time-out sequence to ensure that they are not active unnecessarily. This should be of sufficient duration to cover the crossing operation and set to between 1 and 5 minutes. The inhibit function shall be set to prevent reactivation within 5 minutes.

7 Site assessment for vehicle-activated speed signs and SIDs

7.1 Initial considerations

While it has been shown that vehicle-activated speed signs and speed-indicator devices can be effective in reducing speeds their use is not appropriate at all locations. In accordance with the approved Variable & Vehicle-Activated Signs Policy, Aberdeenshire Council shall target their use at sites where they are most needed and will be most effective. To help achieve this the assessment procedure detailed below shall be followed.

Where there is concern about speeding in a particular location the site should be inspected to ensure that existing fixed signs and road markings:

1. comply with the guidance given in the Traffic Signs Manual for provision and size;
2. are in good condition; and
3. are not obscured by vegetation or otherwise compromised.

Any issues shall be addressed before considering the provision of vehicle-activated speed signs or speed-indicator devices.

7.2 Selecting a location

Selected sites for consideration should be located at least 100 metres into the speed limit - to give drivers sufficient time to react, the detector should be set to first detect vehicle speeds at around 100 metres before the sign and, as the warning messages should only be targeted at drivers exceeding the signed speed limit, it would be inappropriate to have the detection range extend into a higher speed limit.

Sites with limited lines of sight to the detector, such as those on curves or with encroaching vegetation, should be avoided as should locations with pedestrian crossings or junctions, where the VAS or SID may distract drivers.

Research into effectiveness of SIDs has found that speed reduction after 200m downstream of the SID was less than a quarter of the speed reduction at the SID site and suggested that any speed reduction after 400m would be negligible. This localised effect should be recognised when selecting the optimum position for installation.

7.3 Initial survey

Once a suitable site has been selected a speed survey shall be undertaken to determine the baseline 85th percentile speed of cars at the proposed sign location in the targeted direction only. This will usually be carried out with automatic vehicle detectors over a period of one week.

The results shall be reviewed to see if there are any particular times with excessive speed issues that may benefit from targeted police enforcement. If such times are identified the information shall be passed to Police Scotland.

The baseline 85th percentile speed shall be compared against the threshold values (speed limit + 10% + 2mph). Only sites where the baseline 85th percentile speed exceeds this value shall merit further consideration for the provision of vehicle-activated speed signs and speed-indicator devices.

No further action is necessary at sites where the baseline 85th percentile speed is equal to or less than the threshold values.

7.4 Scoring system

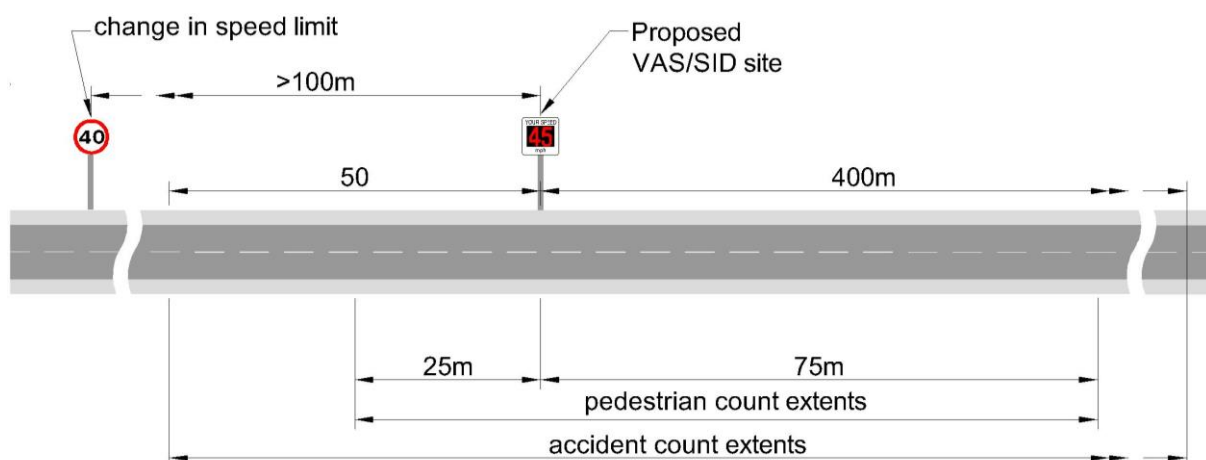
To reflect the potential for conflict between vehicles and pedestrians, the scoring system to be used is based on a version of the PV^2 calculation modified to reflect accident history. **(Please note that different methods are used to calculate PV^2 values for pedestrian crossing and school crossing patroller assessments.)**

The combined pedestrian and vehicular count shall be undertaken manually and recorded in blocks of 15 minutes. The survey period should aim to include the hour likely to score most highly and should last a minimum of 2 hours.

7.4.1 Pedestrian count

Pedestrian activity shall be recorded along a 100m stretch of road from a point 25m in advance of the proposed installation to a point 75m downstream of it (see Figure 7.1). Pedestrians crossing within survey area (P_x) shall be recorded along with pedestrians walking along either footway or verge (P_p). Pedestrians can be recorded for both parallel and crossing movements but any pedestrian shall not have more than one parallel movement and one crossing movement recorded for a single journey.

Figure 7.1: Extents for pedestrian and accident counts



7.4.2 Vehicle count

All vehicles (including cycles) shall be counted for the targeted direction only (**V**).

7.4.3 Modifying factor

The modifying factor (**m**) shall be based on the number of recorded injury accidents involving pedestrians or cyclists where the vehicle was travelling in the targeted direction, along the length of road from a point 50m in advance of the proposed sign site to a point 400m downstream of the proposed sign site, within the last 3 years. The baseline modifying factor shall be 1.0. This shall be increased by 0.2 for each accident.

7.4.4 Assessment score

The assessment score (AS_{VAS}) shall be calculated using the equation below:

$$AS_{VAS} = m \times (P_p + 2P_x) \times V^2 / 1,000,000$$

The P_p , P_x and V values used shall be for the single contiguous 60-minute period which gives the highest score.

7.4.5 VAS/SID criteria

Once the assessment score has been calculated it, and the previously recorded baseline 85th percentile speed shall be plotted on to the chart in Figure 7.2 to determine the appropriate zone.

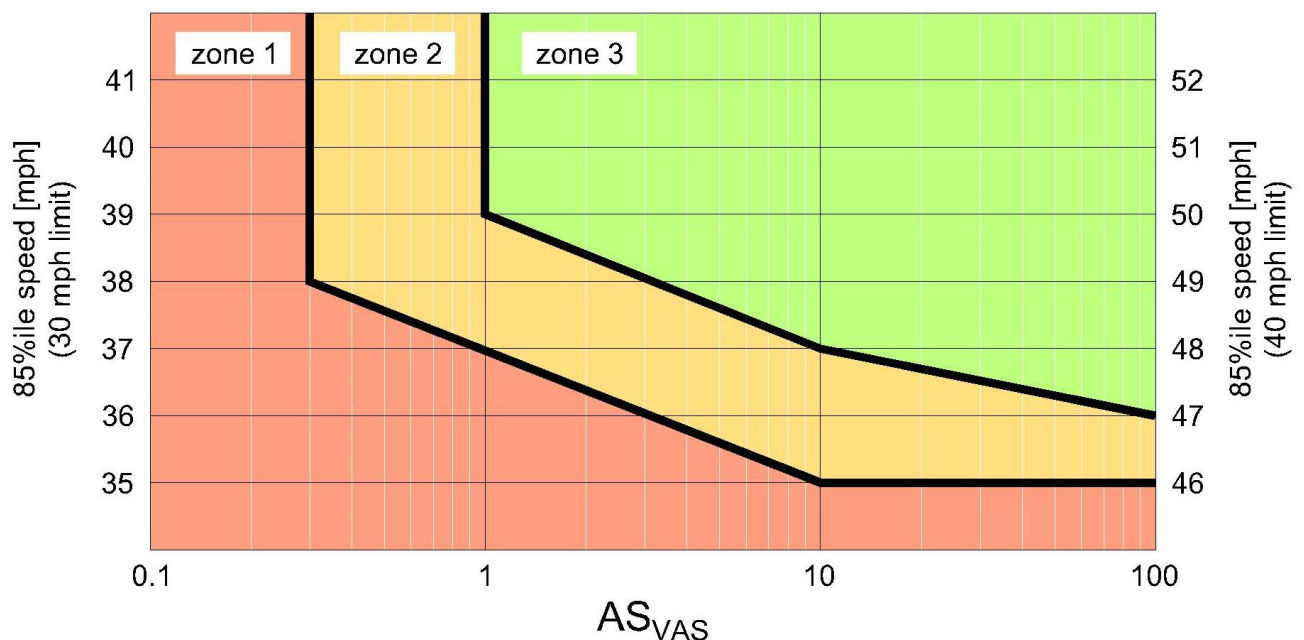


Figure 7.2: VAS/SID assessment chart

Zone 1 sites do not qualify for the provision of vehicle-activated speed signs or speed-indicator devices. Zone 2 & 3 sites may continue to the trial stage.

7.4.6 Trial stage

A mobile speed indicator device shall be located at zone 2 sites for one week and at zone 3 sites for 3 weeks. Speeds shall be recorded in the first and, at zone 3 sites, in the third weeks. The reduction in 85th percentile speed in the relevant direction shall be compared with the previous baseline 85th percentile measurement and the appropriate outcome determined from table 7.1.

Table 7.1: Trial outcomes

zone	week one 85 th percentile reduction	week three 85 th percentile reduction	outcome
2	< 3 mph	n/a	VAS/SID not appropriate
2	≥ 3 mph	n/a	add site to SID rotation programme
3	< 2 mph	< 2 mph	VAS/SID not appropriate
3	< 2 mph	≥ 2 mph	repeat speed measurement with SID removed and re-assess with new baseline
3	≥ 2 mph	≥ 2 mph	provision of fixed VAS may be appropriate
3	≥ 2 mph	< 2 mph	add site to SID rotation programme