

## **INTERIM ADVICE NOTE 179/14**

### **Guidance on the Use of Vehicle Mounted High Level Variable Message Signs to provide advance warning of lane closures for Relaxation Works on Dual Carriageways with a Hard Shoulder**

#### **Summary**

Guidance on the use of vehicle mounted high level variable message signs to provide advance warning of lane closures within the lane change zones at road works where “relaxation scheme” works criteria apply, in order to reduce risks to road workers.

This IAN introduces an optional Temporary Traffic Management (TTM) technique which uses vehicle mounted high level light emitting variable message signs, as an alternative to the use of fixed plate signs on A frames at ground level. The TTM technique described in this IAN reduces the number of advance warning signs provided on the approach to road works on dual carriageways with a hard shoulder.

#### **Instructions for Use**

This guidance is supplementary to (but does not replace any elements of) the existing guidance provided in the DfT Traffic Signs Manual – Chapter 8 (2009) and IAN 150/14.

## Executive Summary

The Highways Agency (HA) set out its overarching Aiming for Zero (AfZ) Strategy in April 2010. As part of this, the AfZ Road Worker Safety Strategy has an overall aim of significantly reducing health and safety risks to road workers, eliminating road worker fatalities and serious injuries and significantly reducing road worker personal injury accidents and road worker “near miss” incidents.

The HA has carried out research projects, including on road trials of an alternative temporary traffic management (TTM) technique which uses vehicle mounted high level light emitting Variable Message Signs (VMS) to provide advance warning of lane closures at relaxation scheme works. This significantly reduces the need for signs on A frames at ground level, compared to the traditional TTM techniques shown in the plans in the DfT Traffic Signs Manual (TSM) Chapter 8. Use of the technique described in this IAN reduces the number of advance warning signs provided on the approach to road works on dual carriageways.

Vehicle mounted high level light emitting VMS may be used to provide advance warning of lane closures ahead, if the eligibility criteria are met, instead of using an appropriate alternative TTM techniques, or using one of the traditional TTM techniques shown in the plans in the TSM Chapter 8.

The service provider should determine whether an alternative TTM technique, or a traditional TTM technique, should be used at a specific location in accordance with a location specific risk assessment and consideration of all appropriate factors.

### Alternative TTM Technique – Vehicle Mounted High Level VMS

Vehicle mounted high level light emitting variable message signs (VMS) should normally have Statutory Approvals and mounted on a vehicle fitted with a lorry mounted crash cushion (LMCC) conforming to the technical requirements of TD49/07. The distance from carriageway level to the top of the VMS panel, when the VMS panel is in the highest position, should normally be no greater than 5.0 metres.

The vehicle mounted high level light emitting VMS panels are to be capable of displaying authorised traffic signs of a size suitable for advance warning of lane closures on high speed roads. The VMS panel should display the advance warning “wicket” sign and distance plate in accordance with Diagrams 7202 and 7208 of the Traffic Signs Regulations and General Directions 2002 (with appropriate signs authorisation by the Highways Agency).

This IAN provides guidance to the service provider, with regard to the use of vehicle mounted high level VMS for advance signing in the approach and lane change zones for a single offside lane closure, a single nearside lane closure, or closure of two nearside lanes for relaxation scheme works, on a motorway / dual carriageway with three lanes and a hard shoulder. The use of 3 No. vehicle mounted high level VMS at 800, 500 and 200 yards prior to the start of the entry taper means that, for these types of lane closure, there will normally be no need to provide any temporary advance warning signs on A frames at ground level upstream of the taper on either side of the carriageway, provided that the eligibility criteria described in this IAN are met.

For the avoidance of doubt, this means 1 No. light emitting VMS panel per vehicle, with 3 No high level signs vehicles in one equipment set. The 3 No. high level signs vehicles are normally located on the hard shoulder, when the wicket sign and distance plate is being displayed.

By eliminating the need for all nearside and offside TTM signs on A frames at ground level during relaxation scheme works, the time spent installing and removing TTM is reduced and live lane crossings by the HA supply chain operatives are eliminated. This significantly reduces road worker risk without adversely affecting road user safety.

This IAN gives the supply chain the option to vary from the TSM Chapter 8 Part 1 relaxation scheme guidance provided in Plans DZA3, DZB6 and DZB7 (for a single offside lane closure, a single nearside lane closure or closure of two nearside lanes).

With immediate effect, provided that the eligibility criteria are met and where the service provider considers (based on an appropriate location specific risk assessment) that it is safe to do so, advance warning signs on A frames at ground level (the "road works ahead" sign and distance plate and the "lane closed to traffic ahead" signs each with a distance plate) may be omitted from both sides of the carriageway for a single offside lane closure, a single nearside lane closure, or closure of two nearside lanes, for relaxation scheme works on a motorway / dual carriageway with three lanes and a hard shoulder, provided that 3 No. vehicle mounted high level light emitting VMS are used to provide advance warning to road users.

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## 1. Introduction

### 1.1 Background

The Highways Agency (HA) set out its overarching Aiming for Zero (AfZ) Strategy in April 2010. As part of this, the AfZ Road Worker Safety Strategy has an overall aim of significantly reducing health and safety risks to road workers, eliminating road worker fatalities and serious injuries and significantly reducing road worker personal injury accidents and, road worker “near miss” incidents.

The HA and service providers have carried out research to determine alternative ways of providing temporary traffic management (TTM) which have the potential to significantly improve road worker safety without adversely affecting road user safety. This research included on road trials of alternative TTM techniques at relaxation scheme works, which use a reduced number of advance warning signs provided on A frames at ground level, compared to the traditional TTM techniques shown in the plans in the DfT Traffic Signs Manual (TSM) Chapter 8. Guidance has been published in Interim Advice Note 150/12, which provides alternative TTM plans that can reduce risk to road workers.

Further research and development work has investigated methods to remove all temporary advance warning signs on A frames at ground level, yet still providing advance warning to road users of lane closures ahead by other arrangements. The on road trials have indicated that eliminating all advance warning signs on A Frames at ground level and instead providing 1 No. equipment set comprising 3 No. vehicles, with each vehicle having 1 No. vehicle mounted high level light emitting variable message signs (VMS), for specified types of lane closures, is an effective method of providing advance warning at relaxation scheme road works. Details of this research can be found at Annex A.

This Interim Advice Note (IAN) provides guidance to the service provider for alternative TTM techniques, in the approach zone and lane change zone, at relaxation scheme works on dual carriageways with a hard shoulder.

For the avoidance of doubt, the term “dual carriageway with a hard shoulder” in this IAN, also includes “motorway with a hard shoulder”.

This IAN builds upon the guidance given in the Traffic Signs Manual Chapter 8 Part 1: Design and Part 2: Operations. In particular, this document builds upon the guidance given in those sections of the TSM Chapter 8 dealing with relaxation scheme works.

Any work activity involving installation, maintenance and removal of TTM on high speed roads is hazardous. The selection of the actual method of work should be made by a competent service provider and should reflect the risks of the planned work.

This IAN applies to the HA network in England. Application of this document on any other road is subject to approval for its use being given by the appropriate Highway Authority.

The omission of all temporary traffic signs from relaxation scheme TTM and their replacement with vehicle mounted high level light emitting VMS will help the HA to fulfil its future vision for improving road worker safety, by significantly reducing risks to road workers involved in the installation, maintenance and removal of TTM.

This IAN has the potential to make a significant contribution towards the HA road worker safety strategy targets:

- Aim to eliminate the need for road workers to cross live carriageways on foot.
- Aim to eliminate the need for road workers to be on foot on a live carriageway,
- Substantially reduce the risks to those working on the rear of, or around, works vehicles.

The intention is that the guidance given in this document may be included within future revisions of the Traffic Signs Manual Chapter 8.

## 1.2 Scope

This interim guidance makes an alternative approach to relaxation scheme TTM advance signing available for consideration by the service provider:

- Removal of all temporary advance warning signs on A frames at ground level in advance of the taper when closing one nearside lane, two nearside lanes, or one offside lane, on a three lane dual carriageway with a hard shoulder for which the national speed limit applies and provision of advance warning to road users by means of 3 No. vehicle mounted high level light emitting variable message signs at 800, 500 and 200 yards upstream of the taper.

This guidance is supplementary to (but does not replace any elements of) the existing guidance for TTM at road works, provided in the DfT Traffic Signs Manual Chapter 8, Parts 1 and 2.

This IAN applies only to relaxation scheme TTM, on three lane dual carriageways with a hard shoulder, including relaxation scheme works which are being provided as part of major schemes. It does not apply to standard scheme TTM.

## 1.3 Temporary Traffic Management Options

The vehicle mounted high level VMS alternative technique may be used if the eligibility criteria are met, instead of using one of the more traditional techniques shown in the plans in the TSM Chapter 8, or one of the permitted alternative layouts shown in Interim Advice Note 150/12.

It is the responsibility of the service provider to determine the most suitable technique for temporary traffic management, in order to minimise safety risks to road workers to As Low As Reasonably Practicable, whilst managing safety risks to road users to a tolerable level. This is in accordance with the general principles applied in the Traffic Signs Manual Chapter 8.

The service provider should determine whether an alternative TTM technique or a more traditional TTM technique should be used at a specific location by carrying out a location specific risk assessment and considering the type of work being undertaken and all other appropriate factors such as those given in TSM Chapter 8 Part 1 2009 paragraphs D1.6.3 to D1.6.5, D3.8 and TSM Chapter 8 Part 2 2009 paragraphs O1.6.3 to O1.6.5, with the definition of "low traffic flows" given in TSM Chapter 8 Appendix A2.41. In all cases, the selection of temporary traffic management technique should be based on a location specific risk assessment which considers the balance of risks between road users and road workers.

The use of vehicle mounted high level VMS eliminates the need for road workers to cross live carriageways or be on the nearside of live carriageways, to install, maintain and remove TTM signs providing advance warning of lane closures ahead. This will significantly reduce risks to road workers on foot on or near a live carriageway.

In order to ensure risks to all road workers are reduced to a level that is as low as reasonably practicable:

- The assumption is that, when using the vehicle mounted high level VMS technique described in this IAN, after completion of the installation of the TTM, the 3 No. high level VMS vehicles would normally be parked on the hard shoulder unattended, with the signs and signals switched on and working.
- The location specific risk assessment should give detailed consideration to reducing the risks to the drivers of the vehicle mounted high level VMS vehicles during the period of the works.

This may, for example, be achieved by ensuring that the drivers exit their high level VMS vehicles after setting up the works advance signing, move to a place of safety until the works have been completed and only return to the 3 No. high level VMS vehicles at the time when the advance signing is to be removed, therefore reducing their risk while the works are in progress.

#### 1.4 Eligibility Criteria

The alternative technique “vehicle mounted high level light emitting VMS” detailed in this document apply only to TTM which meets all of the generic and specific eligibility criteria shown below:

- relaxation scheme TTM, as defined in TSM Chapter 8.
- the permanent mandatory speed limit that would normally apply to the carriageway without road works is the national speed limit (as defined in TSM Chapter 8 Part 1: Design, paragraph D6.14.2).
- the service provider has carried out a suitable location specific risk assessment, which indicates that it is safe to implement the selected alternative technique.
- the TTM layout used is consistent with drawing B2 or, B4 or B6 (at Annex B) in this IAN.
- prior to implementation of the lane closure, the dual carriageway has three running lanes and a hard shoulder.
- road user safe viewing of the vehicle mounted high level VMS should not be blocked by large numbers of high sided vehicles in Lane 1, existing infrastructure, or by vegetation.
- the vehicle mounted light emitting VMS should be in accordance with section 2.3 of this IAN.
- use of the vehicle mounted light emitting VMS should be in accordance with section 2.4 of this IAN.
- a minimum of one running lane will remain open during the works.

For the avoidance of doubt, it is not appropriate to use the alternative TTM technique “vehicle mounted high level light emitting VMS”:

- at a location where the permanent speed limit is less than the national speed limit; or
- on standard scheme TTM; or
- on dual carriageways without a hard shoulder; or
- on single carriageways.

## **2. Guidance for use of Vehicle Mounted High Level Variable Message Signs to provide advance warning of lane closures**

### **2.1. Introduction**

Section 2 of this IAN provides interim guidance to the service provider with regard to the advance signing in the approach and lane change zones for a single nearside lane closure, closure of two nearside lanes, or a single offside lane closure, on relaxation scheme TTM on a dual carriageway with three lanes and a hard shoulder.

This interim guidance provides an alternative TTM technique where, for these types of lane closure, all TTM signs upstream of the taper may be omitted and replaced with three vehicle mounted high level light emitting variable message signs, showing a sign equivalent to Diagram 7202 and Diagram 7208 in the Traffic Signs Regulations and General Directions 2002, provided that all of the eligibility criteria described in section 1.4 in this IAN are met.

### **2.2 Issues**

HA research and on road trials have shown that at relaxation scheme works, on a dual carriageway where the national speed limit applies, all of the advance warning signs upstream of the taper shown within the current TTM layout drawings within the TSM Chapter 8 may be omitted and replaced with three vehicle mounted high level light emitting variable message signs (1 No. high level VMS panel per vehicle), without affecting the safety of road users. This alternative temporary signing arrangement eliminates one of the major risks to road workers (it removes the need for road workers to cross the live carriageway to install, maintain and remove the signs on the central reserve) without any identifiably increased risk to road users. The installation of a sign on the central reserve usually means a road worker has to cross the carriageway three times, to carry the sign mounting A frame, the sign face and the sand bags, to the central reserve. In addition to the carriageway crossings, there is additional time needed for the road worker to be on the central reserve, to assemble the sign in position, as well as on the verge to install the corresponding nearside sign.

The service provider may consider this alternative TTM technique as an option when planning the TTM and assessing the risks and benefits of the various alternatives. The safety benefit that this alternative TTM technique can deliver for road workers is significant.

### **2.3 Definition of a vehicle mounted high level variable message sign**

The vehicle mounted high level light emitting variable message sign panel should normally be fitted to a TTM works vehicle, with a variable height mechanism for the VMS panel which allows the operator to raise and lower the VMS panel, in the vertical plane. This is to facilitate the safe and cost effective maintenance of the VMS panel (when the panel is vertical and in the lowest position), as well as allowing the sign to be raised to a suitable height above ground level to minimise the risk of sign obscuration by high sided vehicles in nearby lanes during TTM.

This guidance is issued on the basis that the vehicle mounted high level light emitting variable message sign panels have Statutory Approvals and are mounted on a TTM works vehicle fitted with a lorry mounted crash cushion (LMCC).

The distance from carriageway level to the top of the VMS panel, when the VMS panel is in the highest position, should normally be no greater than 5.0 metres.

The variable message sign should normally be capable of displaying either:

- a lane closure (“wicket”) sign and distance plate that appears to road users to be in accordance with the lane closure (“wicket”) sign to Diagram 7202 and the distance plate to Diagram 7208, in the Traffic Signs Regulations and General Directions 2002; or
- a lane closure (“wicket”) sign and distance plate that has HA signs authorisation for a non-prescribed traffic sign covering its use for advance warning of relaxation scheme lane closures at the intended location.

The size of the legend, i.e. on the distance plate below the lane closure (“wicket”) sign, displayed on the VMS panel should normally be the same as for a temporary advance warning sign, as defined in Table A1.2 of Appendix A1 of TSM Chapter 8 Part 1: Design (2009), or should be as defined in the HA signs authorisation for a non-prescribed traffic sign at the intended location.

Where a non-prescribed sign is authorised by the HA, the service provider must:

- ensure that the sign complies with the signs authorisation drawings; and
- comply with any restrictions on the use of the non-prescribed signs detailed in the signs authorisation.

#### **2.4 Use of vehicle mounted high level variable message signs**

The omission of all advance warning signing and its replacement with three vehicle mounted high level variable message signs follows the design principles given within TSM Chapter 8 Part 2: Operations (2009) for mobile lane closures. It has been shown that these principles can be safely applied in the approach zone of relaxation scheme works, for a single nearside lane closure, or closure of two nearside lanes, or a single offside lane closure, where the maximum flow is no more than 1200 vehicles per hour per lane left open throughout the period in which the works are taking place.

Therefore, with immediate effect, where the eligibility criteria described in section 1.4 in this document are met, the service provider may choose to omit advance warning signs on A frames at ground level, i.e. omit the A frame mounted “road works ahead” sign and distance plate (TSRGD 2002 sign diagrams 7001 & 572) and omit the A frame mounted “lane closed to traffic ahead” signs (TSRGD 2002 sign diagrams 7202 & 7208) from both sides of the carriageway, subject to their replacement with 3 No. vehicle mounted high level variable message signs being deployed on the hard shoulder showing light emitting signs, normally in accordance with the “lane closed to traffic ahead” signs (TSRGD 2002 sign diagrams 7202 & 7208) at 800, 500 and 200 yards:

- Annex B, section B1, shows the current TSM Chapter 8 relaxation scheme plan for approach and lane change zones, for closure of a single offside lane (adapted from Plans DZA3 and DZB6 in TSM Chapter 8 Part 1).
- Annex B, section B2, shows the alternative relaxation scheme plan for closure of a single offside lane, with all advance signs on A frames at ground level omitted and replaced with three vehicle mounted high level VMS (adapted from Plans DZA3 and DZB6 in TSM Chapter 8 Part 1).
- Annex B, section B3, shows the current TSM Chapter 8 relaxation scheme plan for approach and lane change zones, for closure of a single nearside lane (adapted from Plans DZA3 and DZB6 in TSM Chapter 8 Part 1).
- Annex B, section B4, shows the alternative relaxation scheme plan for closure of a single nearside lane, with all advance signs on A frames at ground level omitted and

replaced with three vehicle mounted high level VMS (adapted from Plans DZA3 and DZB6 in TSM Chapter 8 Part 1).

- Annex B, section B5, shows the current TSM Chapter 8 relaxation scheme plan for approach and lane change zones, for closure of two nearside lanes (adapted from Plans DZA3 and DZB7 in TSM Chapter 8 Part 1).
- Annex B, section B6, shows the alternative relaxation scheme plan for closure of two nearside lanes, with all advance signs on A frames at ground level omitted and replaced with three vehicle mounted high level VMS (adapted from Plans DZA3 and DZB7 in TSM Chapter 8 Part 1).

For the avoidance of doubt, this means 1 No. light emitting VMS panel per vehicle, with 3 No high level signs vehicles in one equipment set. The 3 No. high level signs vehicles are normally located on the hard shoulder, when the wicket sign and distance plate is being displayed.

The relaxation scheme TTM plans, contained within the TSM Chapter 8, apply the general principle that signing for relaxation schemes is a subset of signing for standard schemes. This alternative TTM technique "vehicle mounted high level light emitting VMS" does not use any fixed plate signs on A frames at ground level. Therefore, service providers should make appropriate contingency plans to ensure that the TTM signing can be removed or brought up to the level of a standard scheme TTM if necessary, for example if weather or traffic conditions at the site deteriorate. This should be taken into account when planning the works.

Any decision to omit advance warning signs on A frames at ground level and use three vehicle mounted high level variable message signs, within relaxation scheme TTM should take account of all appropriate factors, including traffic flows per hour per lane and the percentage of HGVs per hour per lane. Factors to be taken into account should include those given in TSM Chapter 8 Part 1 2009 paragraphs D1.6.3 to D1.6.5, D3.8 and TSM Chapter 8 Part 2 2009 paragraphs O1.6.3 to O1.6.5, with the definition of "low traffic flows" given in TSM Chapter 8 Appendix A2.41.

If appraisal of the aspects given in these sections of TSM Chapter 8 indicates that the use of vehicle mounted high level variable message signs is inadvisable, the use of other appropriate TTM, for example the current Chapter 8 relaxation scheme for a single lane closure, or two lane closure may need to be specified, as shown in TSM Chapter 8 Part 1 2009 Plan DZA3 or DZB6 or DZB7, combined versions of which are shown in Annex B, sections B1, B3 and B5 in this IAN.

The Motorway Regulations do not permit HGVs to use the offside lane on motorways of three lanes or more, unless authorised TTM signing is provided to advise HGV drivers that they are permitted to use lanes during the works which they are not normally permitted to use.

### 3. **Withdrawal Conditions**

This IAN will remain in force until such time as this guidance can be incorporated permanently in to a future revision of the DfT Traffic Signs Manual Chapter 8, or superseded by revised HA guidance.

Interim Advice

#### 4. Contacts

Further information may be obtained from:

Mark N. Pooley,  
National Health and Safety,  
Highways Agency,  
GA Federated House,  
London Road,  
Dorking,  
Surrey, RH4 1SZ.

Tel: 01306 87 8282.

GTN: 3904 8282.

Email: [Standards\\_Feedback&Enquiries@highways.gsi.gov.uk](mailto:Standards_Feedback&Enquiries@highways.gsi.gov.uk)

## **5. National Highway Sector Schemes - Training**

The development of an accredited training module for the Temporary Traffic Management techniques introduced by this IAN will not be available on the day that this IAN is published. Training materials (including production of presentation material, the drafting of suitable test questions and where appropriate determining the assessment criteria) need to be developed and piloted before the training and assessment module can be provided to recognised training instructors and training bodies by the Awarding Organisation.

The training committee, which has been established by industry via National Highway Sector Scheme 12 for Temporary Traffic Management, is fully aware of these Temporary Traffic Management techniques and development work has been included in their current programme of work.

## 6. Normative References

- DfT Traffic Signs Manual (TSM) Chapter 8 (2009) Traffic Safety Measures and Signs for Road Works and Temporary Situations, Part 1 - Design & Part 2 - Operations.  
<http://www.dft.gov.uk/publications/traffic-signs-manual/>
- Statutory Instrument 2002 No. 3113 Traffic Signs Regulations and General Directions 2002 (TSRGD).  
<https://www.gov.uk/government/policies/managing-improving-and-investing-in-the-road-network#bills-and-legislation>

## 7. Informative References

### 7.1 Highways Agency - Aiming for Zero and Road Worker Safety

The following documents can be downloaded from the HA web site using the links provided:

- Highways Agency Aiming for Zero introduction.  
<http://www.highways.gov.uk/aboutus/27625.aspx>
- Aiming for Zero overarching strategy.  
Road Worker Safety Strategy.  
<http://www.highways.gov.uk/aboutus/27625.aspx>
- Guidance for Safer Temporary Traffic Management.  
<http://www.highways.gov.uk/aboutus/10848.htm>

### 7.2 TRL Reports

The following documents are available from the HA Knowledge Compendium.

- TRL Report RPN2084 (2012): Use of High Level Signs for Static Relaxation Works, Stage 1.
- TRL Report RPN2366 (2012): Advance Warning of Road Works by Vehicle Mounted High Level VMS, Stages 3a and 3b.

## **Annex A: Background Information: Research and On-road Trials – Vehicle Mounted High Level Variable Message Signs**

The requirement for the omission of signing on the central reserve (offside) to provide advanced warning of relaxation scheme lane closures on dual carriageways was investigated by means of a notional review and a series of on-road trials of an alternative, replacement technique that would eliminate all TTM signs on A frames at ground level. These activities aimed to reduce the risks associated with installing and removing advance warning signs during TTM, by evaluating the option of omitting all of the ground level signs and their replacement with 3 No. vehicle mounted high level VMS, with these three vehicles parked on the hard shoulder.

### **A1 Highways Agency Report: “Safety Risk Perspective of Offside Signing”**

This research (completed in August 2011) examined the perceived worst-case scenario of omitting all central reserve (offside) signing, seeking to identify whether the change in risk for road users and road workers would be acceptable.

The work demonstrated that, despite the use of conservative assumptions in the research, it was considered unlikely that omission of offside signing would give rise to intolerable additional safety risk for road users and that the individual safety risk to road users arising from change (i.e. the omission of offside signs) would remain within the “broadly acceptable” region.

The report recommended that either an immediate change in guidance to service providers should be implemented, or that a trial period of removal of offside signing should be undertaken to further inform a decision on change in guidance to service providers.

### **A2 TRL Report RPN2084 (2012): Use of High Level Signs for Static Relaxation Works: Stage 1**

Following the Safety Risk Perspective research work by the Highways Agency, a monitored on road trial of the use of vehicle mounted high level light emitting signs, for advanced warning of relaxation scheme lane closures, was commissioned by the Highways Agency and carried out by the service provider in Area 12. The monitored on road trial sought to establish the effect on driver behaviour of replacing advanced warning signs (normally mounted on A frames at ground level in accordance with TSM Chapter 8) with vehicle mounted high level signs.

On road trials were carried out in HA Area 10 and analysis of over 52,000 data points for vehicles travelling through an offside lane closure on three lane motorways using advance warning signing in accordance with Chapter 8 (control) and with vehicle mounted high level signs (experimental) showed:

- That lane occupancy did not differ statistically between the experimental and control conditions.
- No hazardous manoeuvres or dangerous occurrences were identified throughout the 10 nights where experimental data was collected.
- Operational feedback suggested that substantial time-savings during deployment and removal of road works could be achieved, improving working windows and reducing the effect of road works on Journey Time Reliability (JTR).

On the basis of this data, the monitored roll-out provided a firm indication that the use of the alternative TTM technique “Vehicle Mounted High Level Light Emitting VMS” is a suitable method for the provision of advance warning signing, at offside single lane Relaxation Scheme lane closures, on dual carriageways of up to three lanes with hard shoulders.

### **A3 TRL Report RPN2366 (2012): Advance Warning of Road Works by Vehicle Mounted High Level VMS: Stages 3a and 3b**

Following on from the success of the initial on-road trials of vehicle mounted high level VMS in Area 12, for a single offside lane closure, a monitored on-road trial of the same technique was undertaken in Area 10, to establish the effect of a change in advanced signing on driver behaviour when closing a single nearside lane.

On road trials were carried out in HA Area 10 and analysis of over 110,000 data points for vehicles travelling through a nearside lane closure on three lane motorways using advance warning signing in accordance with Chapter 8 (control) and with vehicle mounted high level signs (experimental) showed:

- That statistical differences in lane occupancy existed between the control and experimental conditions, with a significantly reduced proportion of traffic occupying the closed lane.
- Visual analysis of video data indicated that although lane selection and change behaviour differed between the two conditions, no 'significant dangerous occurrences' were identified during the 15 nights where experimental data was collected.
- That an approximate 60% reduction in time for the deployment and removal of road works could be achieved by using vehicle mounted high level VMS, allowing multiple closures to be conducted using the same technique during a single night.

On the basis of this data, the monitored roll-out provided a firm indication that the use of the alternative TTM technique "Vehicle Mounted High Level Light Emitting VMS" is a suitable method for the provision of advance warning signing at nearside single lane Relaxation Scheme lane closures, on dual carriageways of up to three lanes with hard shoulders.

### **A4 Consultation: Road Worker Safety (RoWSaF) Working Group and Technical Project Board**

The HA has consulted key internal and external stakeholders on this change in guidance to service providers and has considered any feedback received. The consultation group consisted of RoWSaF members plus other key stakeholders consulted via a "Technical Project Board".

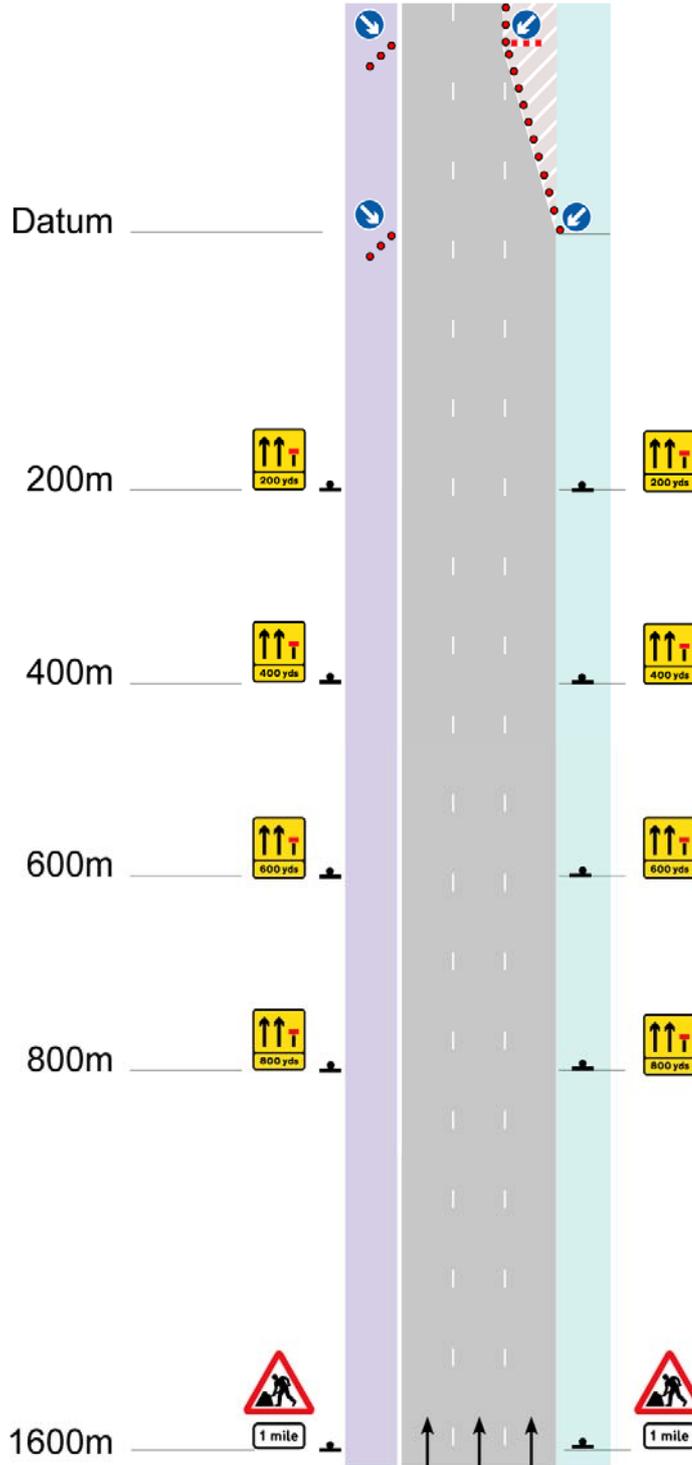
### **A5 Conclusions**

The results of this research indicated that the provision of vehicle mounted high level VMS are capable of providing comparable or reduced closed lane occupancy to that of the existing methods defined within the TSM Chapter 8. The research indicated that drivers behaved in a consistent manner and that no changes in behaviour likely to negatively impact on safety were identified.

The Highways Agency has accepted the use of this alternative TTM technique "Vehicle Mounted High Level Light Emitting Variable Message Signs" to provide advance warning of a single nearside lane closure, or closure of two nearside lanes, or a single offside lane closure at relaxation scheme works, on a dual carriageway with three lanes and a hard shoulder,, where the national speed limit applies, as an operationally valid alternative to the current Chapter 8 TTM scheme arrangements detailed in Plans DZA3, DZB6 and DZB7 of TSM Chapter 8 Part 1: Design 2009.

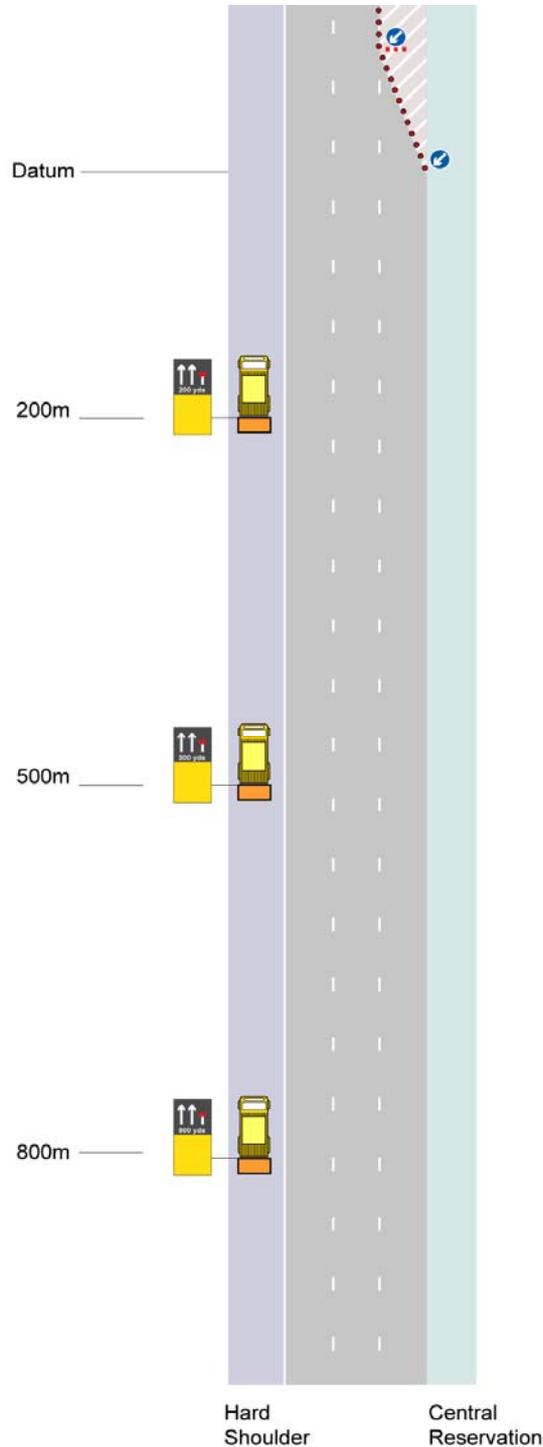
**Annex B: TTM Layout Drawings – Temporary Traffic Management Vehicle Mounted High Level Variable Message Signs**

**B1 TSM Chapter 8 relaxation scheme signing plan for approach and lane change zones, for a single offside lane closure on a dual carriageway road for which the national speed limit applies (adapted from Diagrams DZA3 and DZB6).**



**Note 1:** The temporary mandatory speed limit signing has been omitted for clarity; where required, it should be placed at the distances from the datum shown in Plan DZB6, TSM Chapter 8 Part 1: Design 2009.

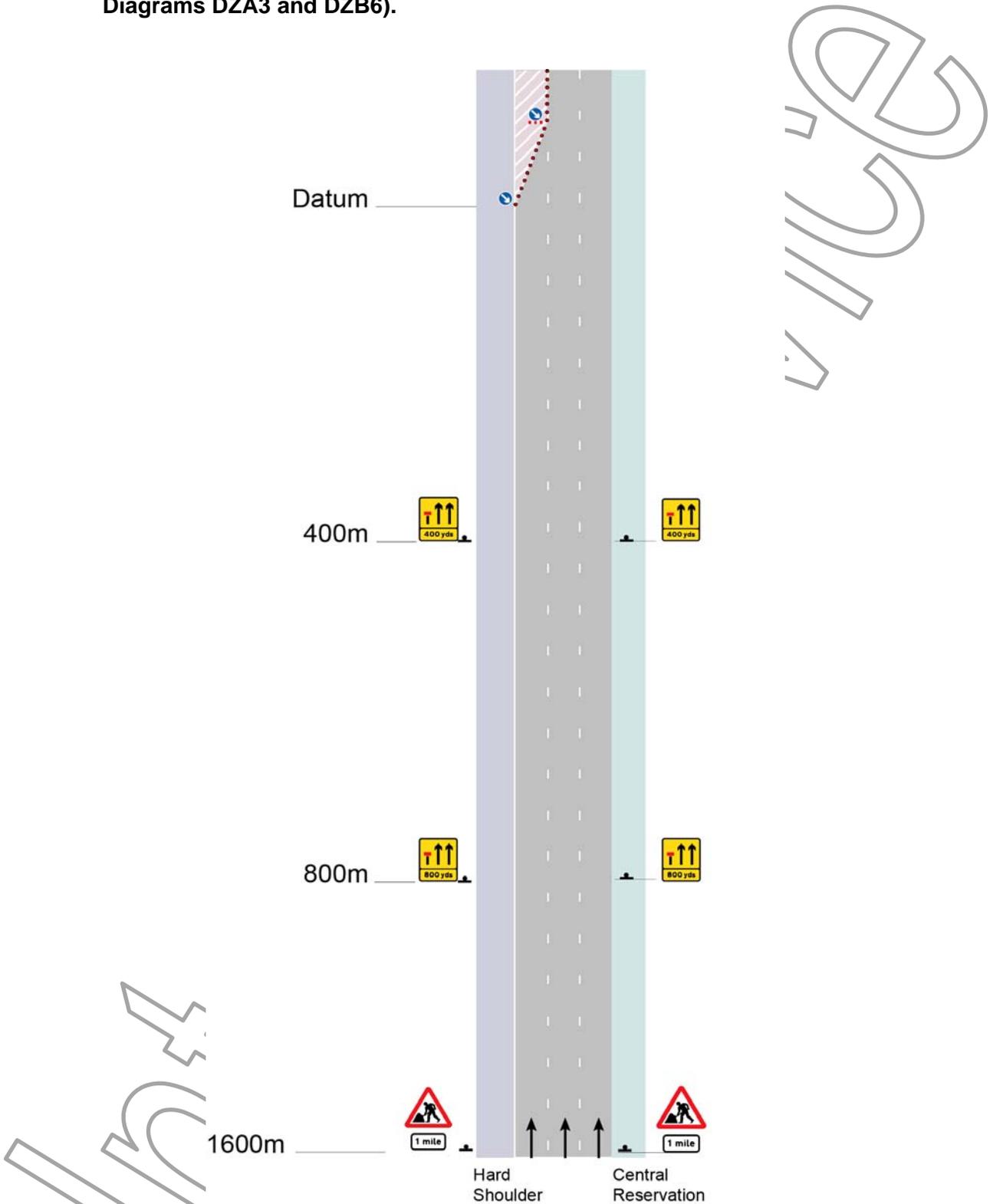
**B2 TSM Chapter 8 relaxation scheme signing plan for approach and lane change zones, for a single offside lane closure on a dual carriageway road for which the national speed limit applies, using vehicle mounted high level variable message signs to provide advance warning of lane closure (adapted from Diagrams DZA3 and DZB6).**



**Note 1:** This layout may only be used for a single offside lane closure on relaxation scheme TTM on a dual carriageway with hard shoulder where the national speed limit applies.

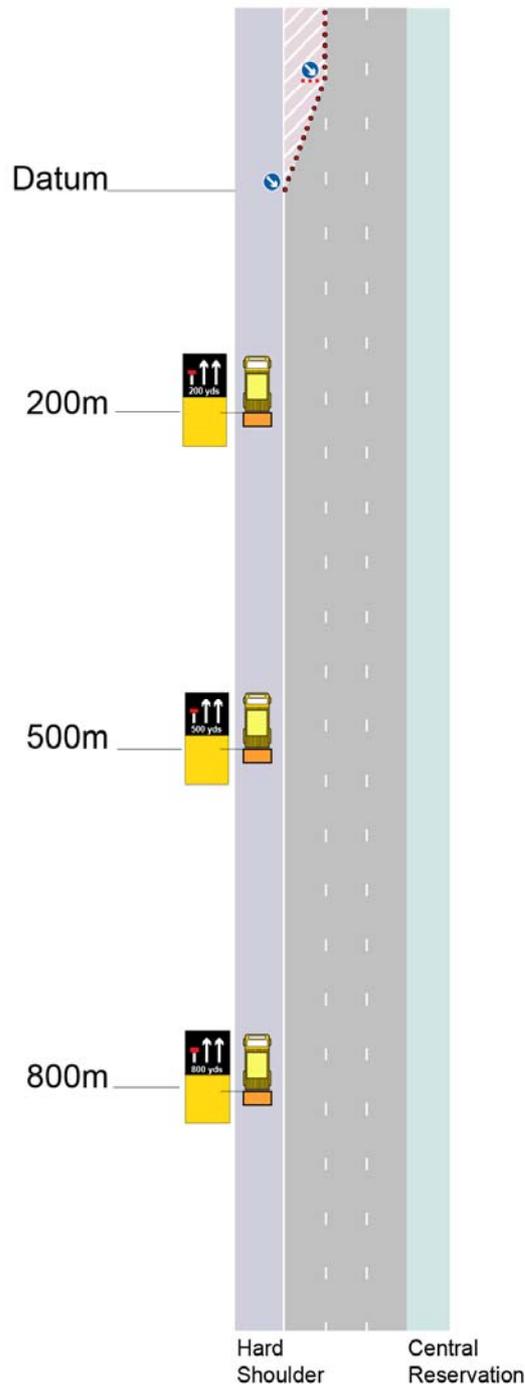
**Note 2:** Refer to section 1.4 Eligibility Criteria in this document.

**B3 TSM Chapter 8 relaxation scheme signing plan for approach and lane change zones, for a single nearside lane closure on a dual carriageway road for which the national speed limit applies, with simplified TTM signing (adapted from Diagrams DZA3 and DZB6).**



**Note 1:** The temporary mandatory speed limit signing has been omitted for clarity; where required, it should be placed at the distances from the datum shown in Plan DZB6, TSM Chapter 8 Part 1: Design 2009.

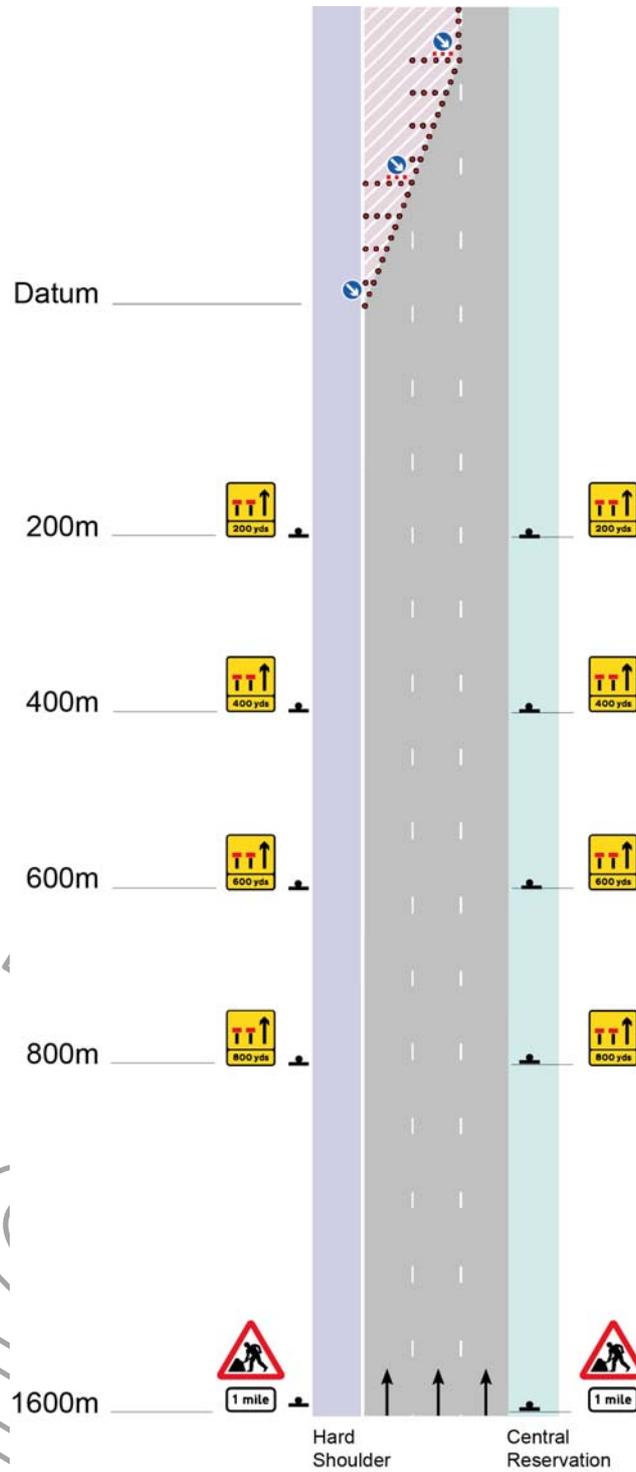
**B4 TSM Chapter 8 relaxation scheme signing plan for approach and lane change zones, for a single nearside lane closure on a dual carriageway road for which the national speed limit applies, using vehicle mounted high level variable message signs to provide advance warning of lane closure (adapted from Diagrams DZA3 and DZB6).**



**Note 1:** This layout may only be used for a single lane closure on relaxation scheme TTM on a dual carriageway with hard shoulder for which the national speed limit applies.

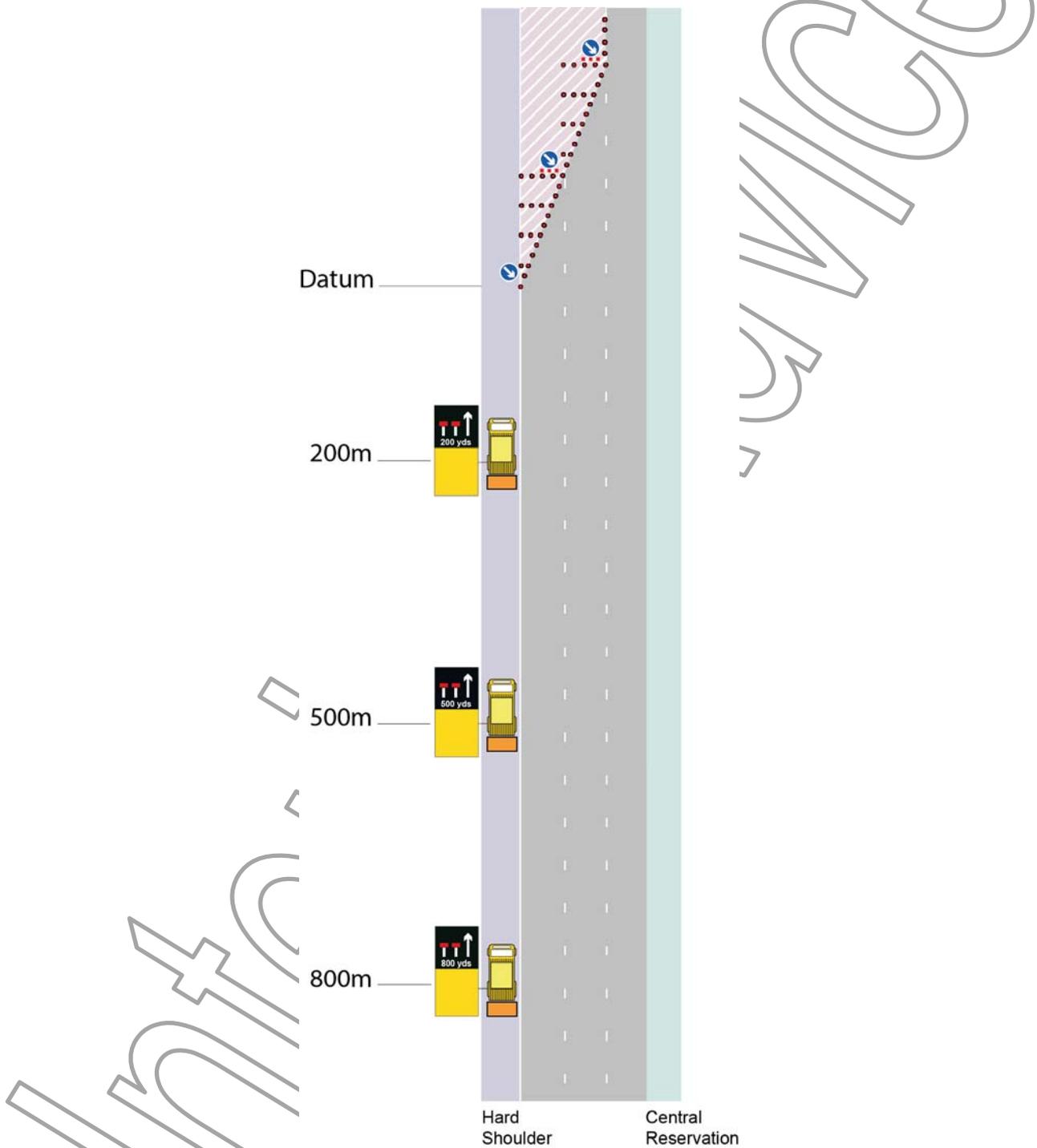
**Note 2:** Refer to section 1.4 Eligibility Criteria in this document.

**B5 TSM Chapter 8 relaxation scheme signing plan for approach and lane change zones, for closure of two nearside lanes on a dual carriageway road for which the national speed limit applies (adapted from Diagrams DZA3 and DZB7).**



**Note 1:** The temporary mandatory speed limit signing has been omitted for clarity; where required, it should be placed at the distances from the datum shown in Plan DZB6, TSM Chapter 8 Part 1: Design 2009.

**B6** TSM Chapter 8 relaxation scheme signing plan for approach and lane change zones, for closure of two nearside lanes on a dual carriageway road for which the national speed limit applies, using vehicle mounted high level variable message signs to provide advance warning of lane closures (adapted from Diagrams DZA3 and DZB7).



**Note 1:** This layout may only be used for a two lane closure on relaxation scheme TTM on a dual carriageway with hard shoulder for which the national speed limit applies.

**Note 2:** Refer to section 1.4 Eligibility Criteria in this document.