NZ TRANSPORT AGENCY
WAKA KOTAHI

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MOBILE VARIABLE MESSAGE SIGN NOTES ITS-06-04

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Title & Subtitle: NZ Transport Agency Notes for Mobile Variable Message Signs		**Author(s):** Neil Garnett Stuart Fraser
Management Details Project Sponsor: Henry Pretorius Project Manager: Russell Pinchen Address: Private Bag 6995, Wellington Web site:		Contact Details of Client E-mail: Henry.pretorius@nzta.govt.nz Tel: 04 894 6492 E-mail: Russel.pinchen@nzta.govt.nz Tel: 09 928 8721
Author(s) Organisation Name & Address: Neil Garnett Opus International Consultants Ltd Stuart Fraser NZ Transport Agency		Contact Details of Author(s): Tel: neil.garnett@opus.co.nz E-mail: (03) 363 5480 Tel: Stuart.fraser@nzta.govt.nz E-mail: (04) 894 6355
Acknowledgments – Name, Organisation & Address: This document is an updated version of the Design Guide & Specification for Mobile Variable Message Signs (VMS)		Tel: E-mail: Fax:
Document Purpose The purpose of this document is to assist site selection, positioning & alignment, and posting of messages for Mobile VMS on the State Highway network and local roads. A separate document titled NZTA Specification for Mobile Variable Message Signs is available to provide a set of specifications for the design and procurement of NZTA Mobile Variable Message Signs.		
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1. Introduction

1.1. Scope

These Notes provide guidance to the operation of Mobile VMS.

Accordingly the scope of this document has been defined as follows:

1. Site selection.
2. Positioning and alignment of the trailer.
3. Posting of messages through reference to the NZTA VMS Operating Policy and Procedures.

A separate document titled NZTA Specification for Mobile Variable Message Signs is available to provide a set of specifications for the design and procurement of NZTA Mobile Variable Message Signs. The Specifications document should be read in conjunction with these Notes.

NZTA also has two other separate documents titled National Operating *Policy* for NZTA Variable Message Signs, and National Operating *Procedures* for NZTA Variable Message Signs. These documents provide assistance for the composing and setting of messages on Mobile VMS.

1.2. Definitions and Acronyms

Term/Acronym	Definition
Approved font	A slightly compressed font approved by NZTA which must be used for NZTA Mobile VMS
Barrier Protection	Generic term covering various roadside protective barrier systems including rails, fences, and crash cushions, which are designed to restrain vehicles which are out of control.
Bezel	The border area surrounding the VMS enclosure, mounted flush with the polycarbonate front panel.
cd	Candela.
CDMA	Code Division Multiple Access. The term refers to a cellular telecommunication network.
CIS	(NZTA) Customer Information Services
COPTTM	NZTA Code Practice for Temporary Traffic Management.
Design Wind Speed	Ultimate wind speed at the site based on terrain and return period.
DHCP Delivered IP	Dynamic Host Configuration Protocol - it allows devices to configure their own network settings by querying a host server about the details of the network.
Dynac	The NZTA's software that monitors and controls most ITS applications, and is used to change VMS messages.
Enclosure	The enclosure housing the display and the electronics systems immediately associated with the display.
Ethernet Protocol	Industry standard network Broadcast technology.
FAT	Factory Acceptance Test

FCD	Field Controller Device
GDM	NZTA Geometric Design Manual.
GSM	Global System for Mobile communication.
GVM	Gross vehicle mass.
ITS	Intelligent Transport Systems.
Lantern	In the context of this document, a lantern consists of multiple LEDs in a circular grouped array.
LCD	Liquid Crystal Display.
LED	Light Emitting Diode
MACA	Monitoring And Control Application. NZTA's software that monitored and controlled VMS message changing was replaced by DYNAC in 2012.
MIB	Message Information Block
Motorway	Roads designated as motorways, generally characterised by high volume multilane carriageways.
MOTSAM / TCDM	The NZTA Manual Of Traffic Signs And Markings, and its progressive replacement, the Traffic Control Devices Manual.
NCHRP 350	National Highway Cooperative Research Programme report. Recommended Procedures for the Safety Performance Evaluation of Highway Features.
NTCIP	National Transportation Communications for ITS Protocol.
NZTA	NZ Transport Agency
Pixel	A single point in a graphic image. In the context of this document pixels must achieve the viewing angle, luminance, and other performance characteristics described in this Specification. The performance characteristics may be achieved with a pixel consisting of a single LED, or closely grouped LEDs, that present a single point of light at a normal viewing distance.
RCA	Road Controlling Authority
Road Reserve	The area from the legal boundary on one side to the legal boundary on the other side.
RS-232/485	Is a standard for serial connections
SNMP	Simple Network Management Protocol
TCDM	Traffic Control Devices Manual.
TTM	Temporary Traffic Management.
UMTS	Universal Mobile Telecommunications System
VMS	Variable Message Sign.

1.3. Mobile VMS Applications

Mobile VMS are commonly used as part of a traffic management system for:

- **Hazard warnings**
  Provide information on unusual or hazardous driving conditions (e.g. planned maintenance activities)
- **Event notifications**
  Provide road information on future events including major sporting/cultural events and planned road closures or diversions these events may require
- **Route advisory**
  Provide guidance on alternative routes where applicable
- **Travel time information**
  Provide information on travel times to downstream locations when there is prior knowledge of possible delays
- **Incident management**
  Provide advance warning to motorists of incidents including crashes and non-recurrent or unusually severe congestion, when there is sufficient time to deploy them
- **Safety advisory notices**
  Provide generic safety messages that have been sanctioned by NZTA, as part of an approved safety campaign

2. Mobile VMS Site Selection

2.1. Selection Criteria for Mobile VMS

Mobile VMS site selection must take into account a large number of factors.

2.1.1. Positioning for Approaching Motorists

Unless there are operational requirements that necessitate variations, the Mobile VMS must be positioned to the left of the approaching motorist. In virtually all situations it is considered unsafe to position a Mobile VMS on the right hand side of approaching traffic because it may confuse motorists' point of reference under night time conditions and lead to a head on collision.

2.1.2. Minimum Distance from Key Intersections

If the Mobile VMS is intended to advise route diversions, the sign should be located sufficiently in advance of the alternate route intersection to allow motorists to assimilate the message and respond accordingly, including changing lanes if necessary.

For Motorways, the Mobile VMS should be placed a minimum distance of 1,500 meters prior to an access/diversion point. This distance provides the motorist with roughly 50 - 60 seconds from the time they have read the message until they reach the access/diversion point.

On an urban/arterial roadway segment, the distance may vary dependent on issues such as speed limits, local factors, and right-of-way constraints.

On a rural single lane roadway, with no need to change lanes, but acknowledging the complexity of some decisions and the route choices, a distance equating to at least 1,000 meters in a 100 km/h zone, or a proportionally reduced distance in lower speed zones, is suggested.

For low traffic volumes (e.g. 2,000 AADT) where the Mobile VMS may display a message advising motorists to turn back, consideration should be given to choosing a site that has a suitable pull over / turning area just after and within view of the sign for map reading / turning around.

With high traffic volumes and a high-speed environment a level is reached where pulling over or turning around is unsafe. Professional judgement should be exercised as to where pull over / turning areas are appropriate.

2.1.3. Clear Sight Distance

In motorway and high volume urban (HVU) settings there are typically many other signs and distractions that compete for motorists' attention. Visibility and impact, proportional to the environmental context, are particularly important considerations of site selection.

For roadways with a speed environment of 100kph, sites that allow motorists clear sight distance to the sign of at least 300 metres should be sought. In lower speed environments the distances can be reduced proportionally.

Ensure that road side trees or other structures will not obscure the sign.

2.1.4. Avoiding Sunlight Glare

If possible avoid positioning the Mobile VMS directly in front of a rising or setting sun as this may significantly reduce its effective visibility. Similarly, reflections of the sun on the display face may reduce its legibility even with louvers or an anti-glare mask.

Where these display visibility factors cannot be mitigated by e.g. taking advantage of a natural backdrop of a hill or trees, or a downhill slope, then the use of a hood or louvers should be considered to shield the display.

2.1.5. Road Geometry

Avoid positioning a Mobile VMS immediately before a sharp bend, blind crest, or intersection, where the sign may distract attention at a critical moment and could lead to loss of driver control.

Also the Mobile VMS must not be positioned where the display may be seen from a neighbouring road if this will result in motorists receiving confusing or conflicting information.

2.1.6. Presence of Other Signage

Mobile VMS should not compete with other existing signs and or strong light emitting sources or interfere with traffic control devices both proceeding and beyond the site.

As a guide, MOTSAM requires different signs to be located a minimum of ($0.6V_{85}$) apart, where V_{85} is the 85^{th} percentile speed of traffic, in km/h, at the sign location.

2.1.7. Avoid Creating a Hazard or Hindrance

In the Motorway context, Mobile VMS will normally need to be positioned behind barrier protection.

In the HVU and Rural context, for speed environments at or above 70kph, Mobile VMS should be sited outside the clear zone or behind barrier protection.

For speeds below 70 km/h Mobile VMS should be located as far from the road edge as practicable.

Consideration must be given to visibility, illumination, and safety under night time or adverse weather conditions

Placement of Mobile VMS must not impede pedestrian footpaths or cycle lanes.

2.1.8. Access to Mains Power

Check access to a suitable power source if the Mobile VMS is required to run off mains power.

2.1.9. Communications Coverage

If messages for the Mobile VMS are to be controlled remotely, the site must have the appropriate communication system coverage.

2.1.10. Alignment on Site

Figures 3 and 4 illustrate the optimum alignment of the illumination cone for a Mobile VMS on straight and curved sections of road. When aligning a Mobile VMS, the total cone width is 20 degrees. I.e. 10 degrees either side of the optical axis. The right side of the LED cone (looking towards the approaching motorist) should be aligned to run along the road reserve parallel with the road, while the left side of the LED cone will follow a tangent across the road. This alignment maximises the distance that an approaching motorist will spend within the LED cone.

Figure 1: Alignment of a Roadside VMS (Straight Road)

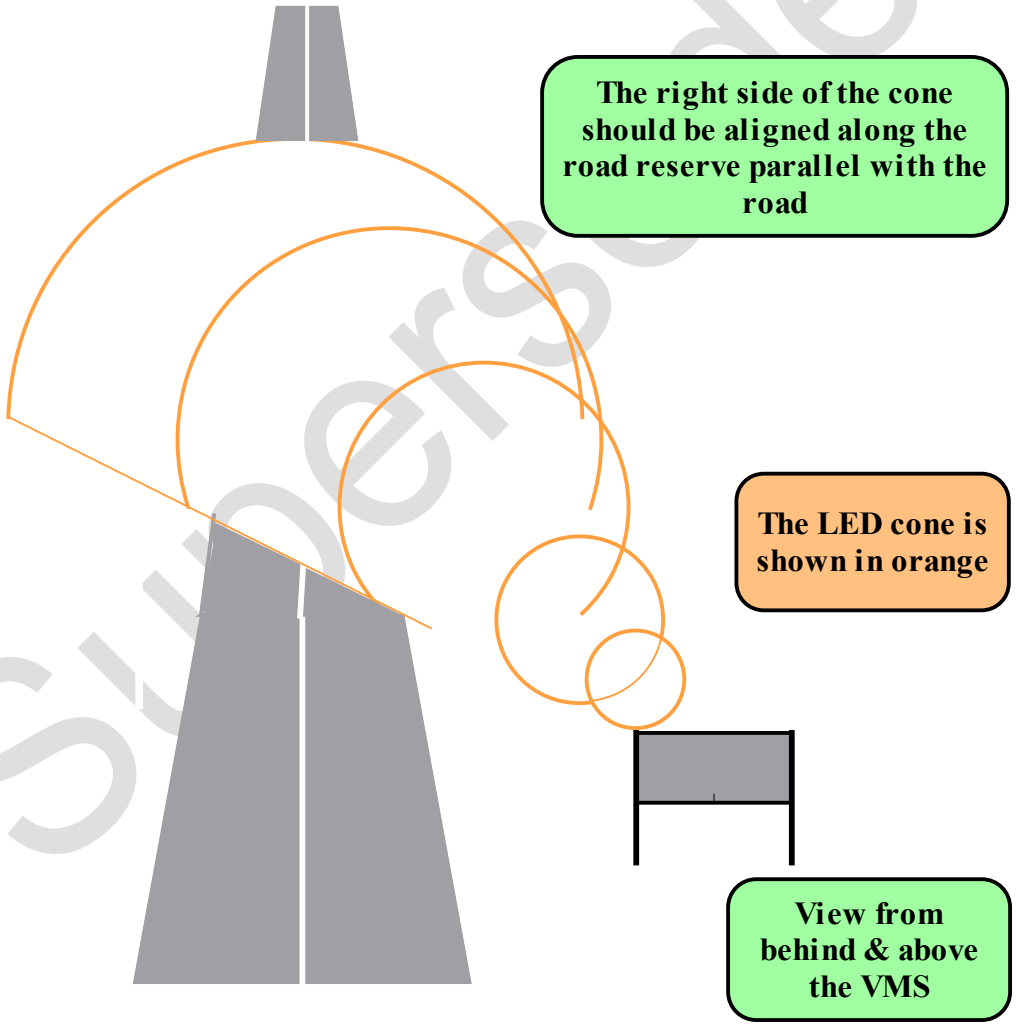
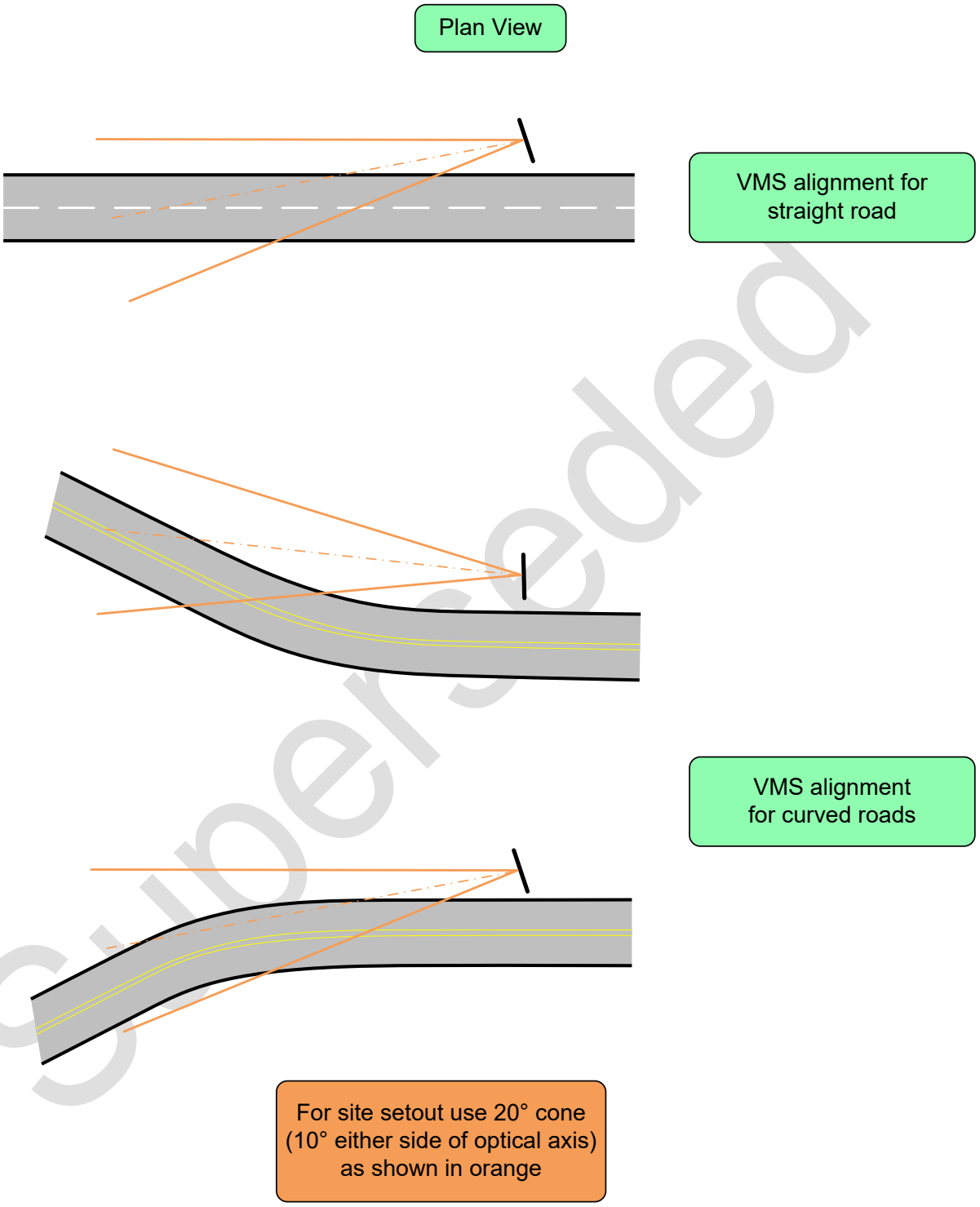


Figure 2: Optimum Alignment for Straight and Curved Road



3. Deployment

3.1. General Deployment Requirements

When deploying a Mobile VMS, operators shall ensure:

- The rear of the trailer faces oncoming traffic
- The handbrake is on
- The wheel clamps are fitted and locked
- The stabiliser legs are extended firmly to the ground

3.2. Deployment in Wind

The “sail area” of the raised display will exert large overturning forces on the trailer in moderate to high winds.

In addition to the requirements listed in Section 3.1, operators shall also employ some, or all, of the following measures if there is a risk of overturning in high wind:

- Use the lash down straps provided, to anchor the trailer to the ground or some other fixed object. The most important lash down points are those on the windward side
- Only raise the display to the lowest operational configuration. (However it must be noted that a fully raised display provides better visibility in moderate to high traffic volumes)
- If very high winds are expected, the display should be placed in transportation mode, or the Mobile VMS moved to a position of safety until the winds abate

4. Mobile VMS Messages

Messages posted on Mobile VMS shall comply with the standard message design processes outlined in the NZTA National VMS Operating Procedures, and where possible shall utilise the standard messages provided in this document.

Inconsistent or contradictory messages may arise between Mobile VMS and fixed VMS. To ensure road users receive consistent information, the appropriate Traffic Operation Centre must be made aware of the proposed Mobile VMS message before it is displayed.