CTOC TTM Local Operating Procedures (LOP)_v3

This document outlines the Christchurch Traffic Operations Centre (CTOC)'s view on Temporary Traffic Management (TTM) applications within the area administered by CTOC (Christchurch City and Banks Peninsula). The NZTA Code of Practice for Temporary Traffic Management (COPTTM) is the primary reference standard, and this LOP document explains variations to COPTTM that CCC and NZTA consider to be acceptable in our area. Roads are classified as Level LV, 1 or 2. Relevant sections of COPTTM and other documents are referenced.

The LOPs are intended to be applied to all roads in the CTOC area to become the 'new normal' approach. Justification will be required if STMSs wish to apply the traditional COPTTM approach.

The LOPs aim to clarify RCA expectations and outline differences to traditional COPTTM practice. Details not mentioned, are expected to follow standard COPTTM practice. Please aggregate LOPs together into each TMP to achieve maximum benefit and consistency throughout our area.

Where differences to CCC's Construction Standards Specification (CSS) exist, this document takes precedence.

Note that TTM activities on roads outside of the area administered by CTOC must meet normal COPTTM or RCA requirements. CTOC (CCC) boundaries can be found at:

http://www.ccc.govt.nz/thecouncil/policiesreportsstrategies/policies/groups/streetsroads/speedlimits/speedlimitregister/index.aspx

LOP CHAPTERS

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1. Submitting Traffic Management Plans

All TMPs must be submitted through the www.tmpforchch.co.nz website.

2. Real Time Operations (RTO) Contact Ref E1.8.3

All work within 50m of a signalised intersection must be notified to CTOC's RTO team. This includes sign deployments, and detouring significant volumes of traffic through signalised intersections. RTO contact details are: **03 941 8620** (6am – 6pm and for Emergencies) or signals@ccc.govt.nz

When major modifications to signal operations are likely to be required, Contractors must contact RTO during the TMP planning phase to discuss requirements. This must occur a minimum of **two weeks prior** to scheduled Start Date on site to enable pre-planning and signal controller personality changes.

Notifications confirming scheduled deployment:

- **24 to 48 hours before work commences** on site (email preferred). They will automatically have received a copy of the TMP from TMPforChch once this is accepted – please refer to the TMP number. If specific intersection details and impacts are not already covered in the TMP, then a detailed plan or drawing must be provided to help explain these.
- **At the time of TTM deployment** (phone call preferred). For night deployments, provide confirmation of scheduled deployment during the preceding business hours.
- **Before any significant changes** are made to established TTM.
- **24 to 48 hours before disestablishment** from site (phone call preferred).

These notifications enable implementation of pre-planned signal changes.

CITTM 1.1 **3. T1 ROAD WORKS Signs** **Ref C3.2.3, B1.4.1, C3.2.1**

T1 ROADWORKS signs should be omitted in 50kph speed limit areas where the STMS judges the risk to be low.

At least one stand-mounted sign of size appropriate to the level of the road must be deployed a Warning Distance B prior to each closure.

STMSs must consider:

- Visibility of the remaining signage. Minimum Sign Visibility Distance must be maintained to the first sign encountered, and management of vehicle parking may be required.
- Whether the site is within an area of 'intense' roadworks, or is more 'isolated' from other worksites. The STMS should consider how alert approaching road users will be to the roadworks ahead, and then select the appropriate amount of signage for the approach.

STMSs are empowered to judge when the standard T1 signage is warranted, and deploy it without needing to gain further approvals. However if this is deployed, then the STMS must be able to justify its use if queried.

Note regarding COPTTM definitions: If T1 signs were to be the only Advance Warning sign normally deployed in the Advance Warning zone for the site, then application of the above would result in omission of the 'Advance Warning zone' as defined by COPTTM. In this situation, the first signs and devices encountered would be part of the 'Direction and Protection' zone as defined by COPTTM. Given the risk assessment approach and minimum Warning Distance requirements above, this is considered to be acceptable.

The 'Advance Warning' zone definition in COPTTM is not considered to need amendment to reflect the omission of T1 signs.

CITTM 1.1 **4. Omission of TG2 WORKS END signs** **Ref C3.2.2 (diagram), C3.2.5**

TG2 WORKS END signs should be omitted on all worksites. This includes the TG2, TG31 THANK YOU combination.

The ‘End of Works’ zone is redefined as: *“The last sign or TTM device used”.* Where a Temporary Speed Limit (TSL) has been deployed, the ‘End of Works’ zone will usually be defined by the Permanent Speed Limit reinstatement signs. Where a TSL has not been deployed, it will usually be defined by the last TTM device (eg cone) used in the Direction and Protection zone around the closure, or the first sign for the opposing approach.

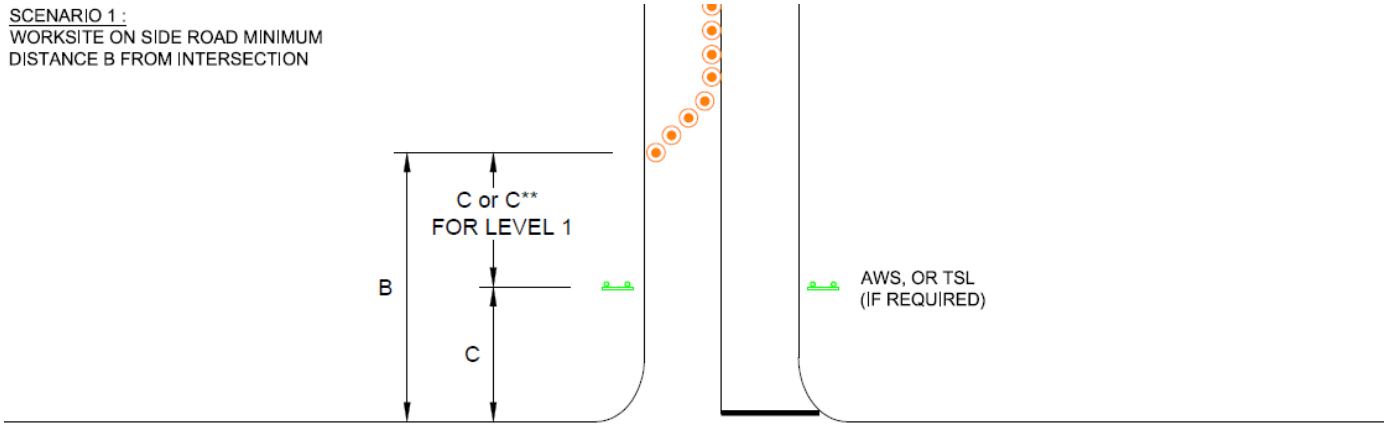
CITTM 1.2

5. Side Road Signage **Ref Section F Layout Diagrams, C3.2.2 (diagram), C3.2.3**

In Scenarios 1, 3 & 4 below, T1 ROAD WORKS signs should be omitted from the main road. In Scenario 2 they may be omitted in certain situations.

Scenario 1: Closure on Side Road a Minimum Distance of B from Intersection ***Ref F2:19***

- T1 ROAD WORKS signs to be omitted from the main road.
- For Level 1 roads, refer to Diagram F2:19 for C** Table. A minimum Warning Distance B of 50m must be provided wherever possible, and especially if cornering speeds are above 30kph.
- For Level 2 roads, use C as per Level 2 Layout Distances Table.
- At least one stand-mounted sign of size appropriate to the level of the road must be provided prior to the closure. For example, this could be a suitable Advance Warning Sign (AWS) or TSL signs (if TSL required).

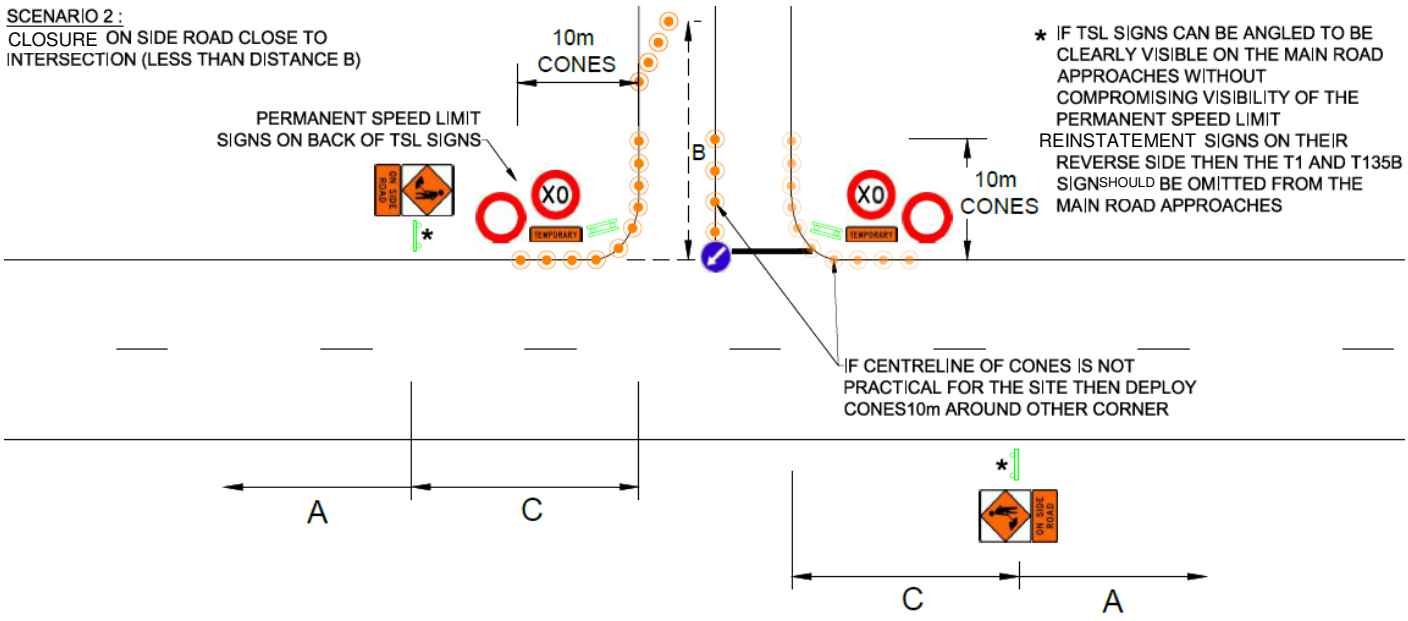


Scenario 2: Closure on Side Road close to Intersection (less than Distance B) ***Ref F2:20***

(i) When most vehicles (85%ile) travel around the corner at speeds less than 30kph, and
(ii) Sign Visibility Distance A is available to the sideroad intersection, and
(iii) When there is low risk of queuing on the sideroad, then the following layout may be used instead of diagram F2:20:

- T1 ROAD WORKS and T135B ON SIDE ROAD signs deployed on main road approaches (if necessary)*
- Gated TSL signs deployed at the sideroad intersection, with the Permanent Speed Limit reinstatement signs on their reverse side.
- Cones deployed for 10m lengths along the main road LHS shoulder, and down the sideroad shoulder and centreline (or RHS shoulder) to provide side-friction / threshold treatment for turning vehicles.
- A cone-mounted RD6L KEEP LEFT arrow deployed on the first cone on the sideroad centreline.

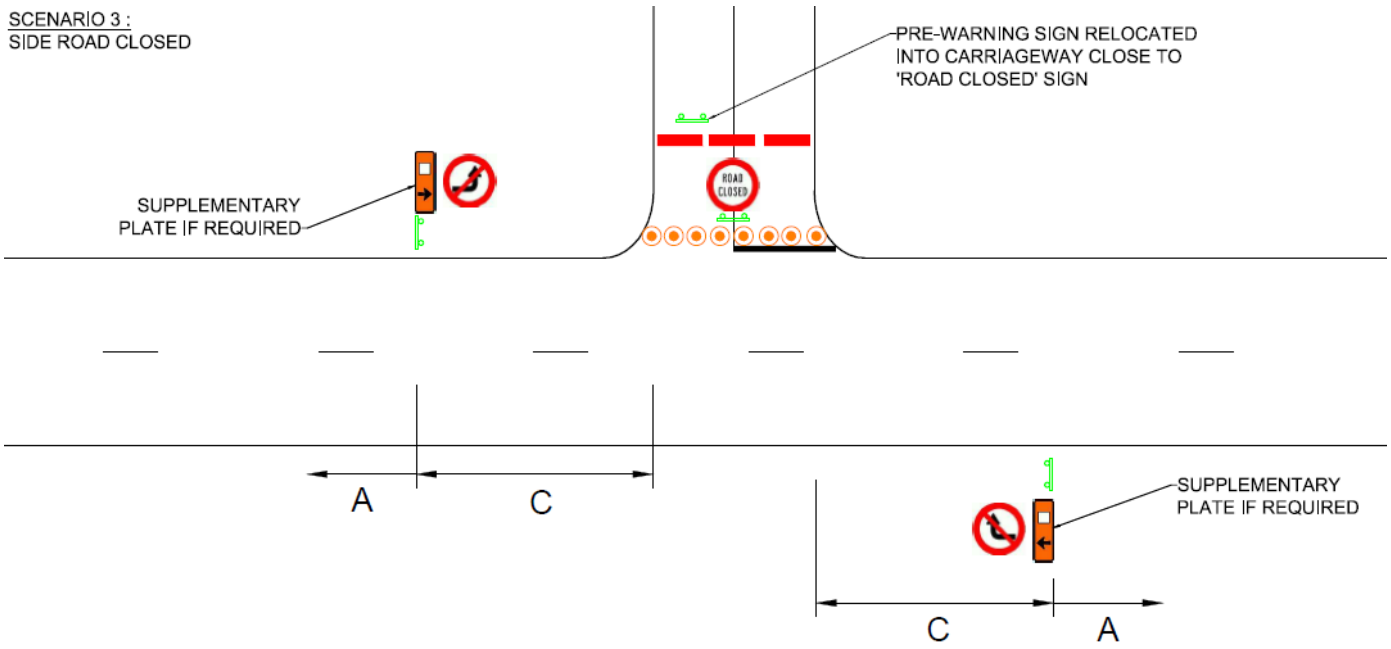
* T1 and T135B signs should be omitted from the main road approaches if TSL signs can be angled to be clearly visible on the main road approaches, without compromising visibility of the Permanent Speed Limit reinstatement signs on their reverse side. Refer to LOP chapter 3 for further guidance on T1 omission.



Where significant hazards exist on the sideroad close to the main road intersection, then STMSs must enhance or extend signage on the main road approaches to provide sufficient warning. This may require deploying the normal F2:20 layout.

Scenario 3: Side Road Closed ***Ref F2:25***

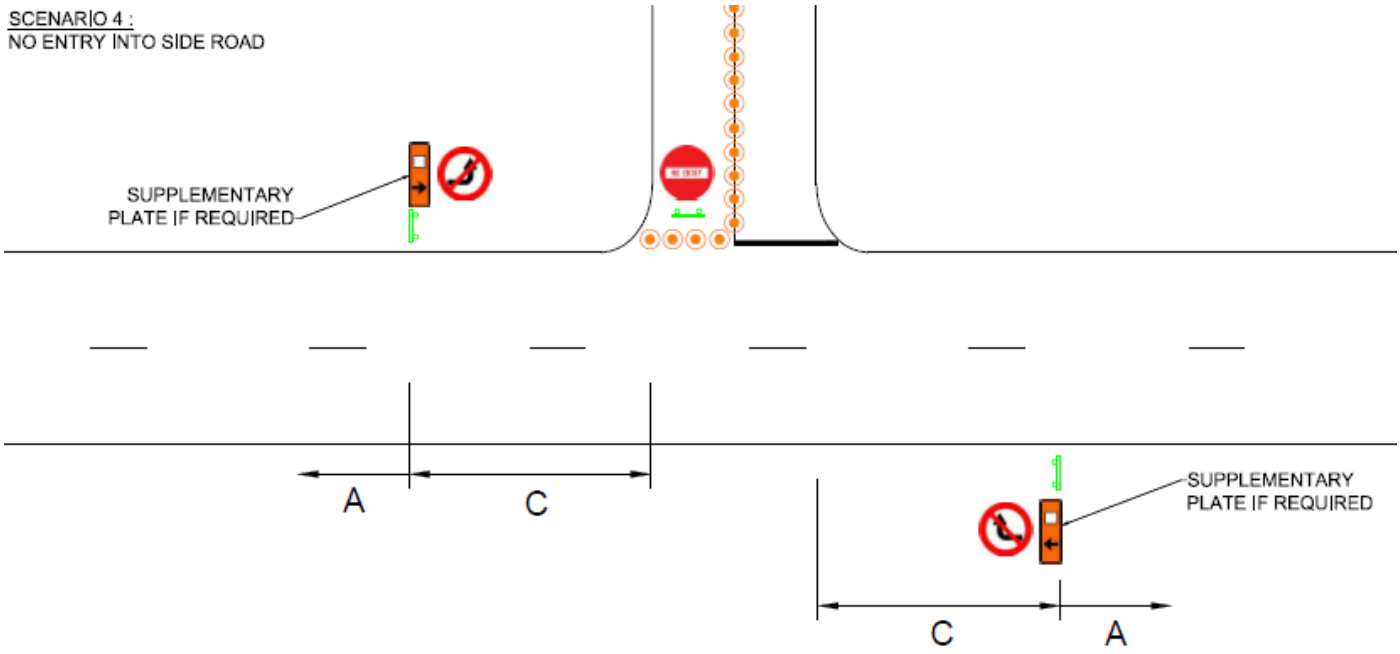
- T1 ROAD WORKS signs should be omitted from the main road.
- TD1 Variant SIDE ROAD CLOSED AHEAD signs should be omitted from the main road.
- TD3A DETOUR AHEAD FOLLOW □ signs should be omitted from the main road.
- RD1R/L NO RIGHT/LEFT TURN, with supplementary TDA6 FOLLOW ↑ (if appropriate) must be installed.
- RD3 ROAD CLOSED at intersection must be installed.



In speed environments greater than 65kph, or where major risks exist (eg tight geometrics, restricted visibility, narrow road carriageway, rough / unsealed surface etc), then STMSs must enhance or extend warning signage on the main road approaches to provide sufficient warning. This may require deploying the normal F2:25 layout.

Scenario 4: Side Road is Exit Only (Entry closed)

- T1 ROAD WORKS signs should be omitted from the main road.
- TD1 Variant SIDE ROAD CLOSED AHEAD signs must be omitted from the main road.
- TD3A DETOUR AHEAD FOLLOW □ signs should be omitted from the main road.
- RD1R/L NO RIGHT/LEFT TURN, with supplementary TDA6 FOLLOW ↑ (if appropriate) must be installed.
- RD2 NO ENTRY at intersection must be installed.



In speed environments greater than 65kph, or where major risks exist (eg tight geometrics, restricted visibility, narrow road carriageway, rough / unsealed surface etc), then STMSs must enhance or extend warning signage on the main road approaches to provide sufficient warning. This may require deploying the normal F2:25 layout.

CITTM 2

6. Speed Management

Ref 'Best Practice for Speed Management at Roadwork Sites'

If Speed Management is required to create safe vehicle operating speeds through a site, then the 'Best Practice for Speed Management at Roadwork Sites' guideline must be followed. CTOC acceptance must be specifically obtained for any use of Temporary Speed Limits and/or Speed Humps.

CITTM 2

7. Temporary Speed Limits

Ref C4, 'Best Practice for Speed Management at Roadwork Sites', E2 App B

Temporary Speed Limits (TSLs) must be appropriate to provide an acceptable level of safety at the site, but to not unduly delay traffic. They must not be used in every situation, but only where TSLs can be justified as part of an overall Speed Management treatment for a site.

Refer to the 'Best Practice for Speed Management at Roadwork Sites' document for techniques, guidance and direction for applying appropriate TSL use. Refer also to the TSL decision matrix in COPTTM E2 Appendix B for further guidance.

Note: Clause 5.2(2)(b) of the Land Transport Rule: Setting of Speed Limits 2003 requires TSLs to be "at least 20kph less than the Permanent Speed Limit" (PSL) in roadwork situations. This prevents use of 40kph TSLs on 50kph PSL roads.

CITTM 1.3

8. Signage Gating

Ref C3.3.1, Land Transport Rule 2003_Setting-Speed-Limits-2003

Signage gating is not required on two-lane two-way, and any other 'single approach lane per direction' roads, except for the initial set of speed limit signs that must still be gated.

Gating is required as per normal:
1. On multi-lane carraigeways, where the left hand side sign may become obscured by traffic in Lane 1.
2. Where other site specific factors (eg sight-distance limitations, need for good speed management etc) necessitate additional signs.

CITTM 1.4

9. Cone Mounted KEEP LEFT / RIGHT signs — Ref B1.4.2

To assist in guiding traffic around the closure, 400mm diameter RD6L/R KEEP LEFT/RIGHT (single) arrows may be mounted onto cones in low risk situations.

Cone-mounted RD6L/R signs are not intended for use at the start and end of lane closure tapers and chicanes. These (high risk) situations must be signed as per normal COPTTM requirements.

10. Traffic Delays — Ref C16, Guideline for TTM Efficiency, SWIF Flowchart

Traffic impact must be considered during development of each TMP, and a suitable balance of safety, construction efficiency and network impact be proposed by the TTM methodology. The TMP Designer must identify if traffic volumes are likely to exceed the available capacity at the site, and along detour routes.

COPTTM C16 and the CTOC 'Guideline for TTM Efficiency' document, provide tools for TMP Designers to use. More detailed Network Modeling and impact assessment / coordination may be necessary to provide assurance of the expected capacity.

TMPs must summarise the assessment undertaken, identify when network efficiency impact is likely to occur, and outline mitigation measures to minimize impact.

11. Mitigation Measures when Network Impact Unavoidable — Ref Mitigation Measures Flowchart

When Network Impacts are unavoidable, mitigation measures must be considered, planned and delivered alongside the TMP. Specific details of Communication and Notification Strategies do not need to be included in the TMP, however the TMP must at least outline the measures being planned.

12. Barrier Systems — Ref B12 &C18, SHGDM Section 7.3

Where barrier systems are proposed as a safety device for closure protection, the following elements must be clearly explained in the TMP:

- Test Level in terms of NCHRP 350 or AASHTO MASH. The proposed product must be included in NZTA's authorised product list.
- Layout details:
  - Upstream End Treatment
  - Flare sections
  - Protection Zone (Length of Need)
  - Downstream End Treatment (if required)
  - Offset to live lanes
  - Delineation*
  - Transition details (if required)
  - Deflection Distance

  A close-up scale drawing and cross-sections are recommended to fully explain the proposed barrier system configuration.
- How key elements will be installed so that performance will replicate crash-tested performance**. Any differences to the crash-tested configuration may result in the system performing poorly and being non-compliant with NZTA M23: 2009. Components must be installed in accordance with manufacturer instructions wherever practicable.
- Maintenance standards proposed for the barrier system. Note that water-filled systems may require higher levels of monitoring and maintenance than other types.

* The minimum Delineation for barriers used to channel traffic at speeds less than 65kph is reflective markers (chevrons) at 10m spacing. Additional delineation is necessary for any worksites with a speed limit higher than 65kph, or where significant risks exist.

** Where the crash-tested configuration (especially deflection distances) cannot be provided, the TMP must explain why the configuration is proposed, the expected performance, and any mitigation measures to be adopted to manage risks.

13. Peak Traffic Hours

(General) "Peak Hours" are defined as:

07:00 – 09:00 Monday to Friday
16:00 – 18:00 Monday to Thursday
15:30 – 18:00 Friday
Any weekday prior to a public holiday assumes Friday timing.

On Strategic Routes, the AM and PM Peak Hours above may require adjusting to reduce risk of severe network congestion. The TMP Designer should present an initial opinion on this as part of their Traffic Impact Analysis, with review and confirmation of acceptable timings from AEs and TMCs.

14. Work during Peak Hours

Ref A3 & C16

Road Level	TTM Operations	Construction Work within established TTM worksite
2	Not permitted	Permitted, provided that capacity is not reduced below what is accepted in the TMP. Disruptive vehicle maneuvering for site accessing, and operations that significantly distract passing traffic are not permitted.
1	Permitted*	Permitted*
LV	Permitted*	Permitted*

* Provided that traffic delays do not exceed 5 minutes, or as accepted in the TMP.

15. Site Accessing

Ref C15 & A3

Site accessing methodologies must be planned for each TMP. Specific access points must be detailed into TMPs wherever possible, to confirm that both the work and the necessary site accessing methodologies are viable without compromising sign spacing, safety zones, traffic flow, safe road operating conditions etc.

Where site accessing cannot be accomplished in the normal direction of traffic (eg reversing into site, using oncoming lanes), then a safe methodology must be designed, explained clearly in the submitted TMP, and resources allowed for site operations.

16. Mobile Variable Message Signs (mVMS)

Ref B10, NZTA ITS-06-04 (VMS Specification), NZTA VMS Policy, NZTA VMS Procedures, NZTA ITS-06-04 Notes, CTOC SWIF flowchart

The following information is intended to cover the operational application of mVMS trailers used to warn / advise of TTM activities. AWVMS are not covered by this policy. Equipment capabilities and standard requirements must meet NZTA specifications unless noted otherwise.

Appropriate Usage

Due to the risk of diminished impact caused by overuse of mVMSs, these devices must be reserved for **operationally critical purposes only.** These are defined as: **"Significant TTM operations where road user behaviour modification or awareness is essential".**

'Significant' means either delays greater than 5 minutes on Strategic Routes, or where severe localised impacts have a high probability of occurring and high consequence for network, safety or site operations.

The focus of messages must generally be on Journey Management only (not other purposes), and for VMSs to remain credible, messages must provide timely, reliable, accurate and relevant information for that journey. Messages must be blanked or signs removed completely from site when messaging is no longer necessary.

For the above reasons, mVMSs should generally **not** be used to warn of Nightworks, for localised minor impacts eg carpark access changes, or as a 'Contingency' for missing static signage, because the impact from these activities is usually small and mVMS usage would be excessive. The initial lead-in to a long-duration impact (greater than 1 week), may justify prewarning and mVMS usage during the initial 'acute' impact phase, however once this has passed, other channels for ongoing messaging are likely to become more appropriate eg static signs or Traveller Information releases.

Refer to the CTOC *'Significant Works Identification Flowchart'* for further guidance on when mVMS use is appropriate.

Before displaying any message on a mVMS, the wording of the message, the dates/times it will be operational and blanked, and deployment location(s), must be documented in a TMP and approved / accepted following normal TMP authorisation process. Where more than one Message Phase is required, the operational details of each phase must be clearly documented.

mVMS Strategy Design

Site Specific consideration and design is required for all situations. Designers should keep the following questions in mind throughout the process:

(i) *What is the key message that needs to be conveyed for this phase of the TTM operation, to mitigate or warn of the effects created?*

(ii) *How do I make this message effective for the majority of approaching road users?*

Solving the second question usually answers: *'How many signs will I need, and where do they need to be located?'*

Site Specific Design

The objective of the following sections is to assist in identifying what message is required for each phase of the TTM operation, and how to make the message effective.

Message Construction

Units of Information can be identified by the following questions:

QUESTION	ELEMENT	UNIT OF INFORMATION	CONDENSING
What happened / Is going to happen?	**(Problem)**	ROAD CLOSED	Usually included
Where?	(Location)	OPAWA ROAD	When needed
What is the Effect?	(Effect)	ROUTE CLOSED	Optional
Who is Affected?	(Audience)	ALL TRAFFIC	When needed
What Action is Advised?	**(Action)**	FOLLOW DETOUR	Usually included

The message must be condensed down to the most important elements only, ideally using four units of information or less, and eight words or less, by eliminating non-critical information and information the traveller will reasonably infer. Core elements that are usually needed are the Problem and Action descriptors.

The above example would be condensed down to:

Frame 1	*Frame 2*
OPAWA ROAD CLOSED	**FOLLOW DETOUR**

"Chunking" Units of Information

Each unit of information should be kept on the same line or frame display. Where portions of different units have to be displayed together, it is acceptable to place a hyphen between units.

Days of the Week / Calendar Dates

Days of the week should be used in preference to calendar dates when the impact is less than 7 days away eg:

Frame 1	*Frame 2*
ROAD CLOSED WED – FRI	

For an impact greater than 7 days away a combination of days of the week and calendar dates should be used eg:

Frame 1	*Frame 2*
ROAD CLOSED	**WED 6 NOV - DEC**

Message Viability Check

Each trial message must be tested for viability against the capabilities of the mVMS equipment allocated for the site. To ensure message viability on *any* mVMS equipment, it is good practice to design messages assuming maximum 9 character width and 3 line depth being available per frame. This is the approach taken in the examples above and below. More complicated messages could be designed, and number of frames potentially reduced, if the equipment is capable of displaying additional characters per line, or numbers of lines, and that particular equipment can be guaranteed to be allocated to the site.

Message Phases

For planned TTM operations where mVMS use is justified, there are usually two phases required:

1. Prewarning Phase: this occurs for (usually) 1 week prior to the full TMP deployment, to warn regular commuters of the upcoming impact. This encourages them to plan ahead and adjust behaviour (eg travel patterns) to accommodate the change. It also minimizes complaints by setting expectations ahead of time. mVMS must be located close to the point of impact (the future worksite) during this phase.

2. During Deployment Phase: this occurs for (usually) 1 week after the date of full TMP deployment. The Prewarning mVMS must be relocated upstream of the worksite to a location that is effective to achieve the purpose of this phase. eg this could be to provide either advance warning of the worksite, or remote messaging to encourage rerouting onto alternative roads. Additional mVMSs may be needed to supplement the first mVMS and cover other key approach roads. After 1 week, the mVMSs should be replaced with Static Signage displaying a similar message.

Example of Prewarning Phase message:

Frame 1	*Frame 2*
MONTREAL ONE LANE FROM TUES	**CONSIDER ALTERNATE ROUTE**

Example of During Deployment Phase message:

Frame 1	*Frame 2*
MONTREAL ONE LANE	**EXPECT DELAYS**

The dates for each phase to be active must be clearly detailed in the TMP, and coordinated around the date for full TMP deployment. To maintain credibility of all parties and support Traveler Information and other Mitigation Strategies, this means that full TMP deployment dates must be certain at least 1 week prior, and late date changes must be minimized.

Examples of During Deployment Phase Messages, including possible LED colour choice

(black = standard yellow LED colour):

Frame 1	*Frame 2*
MAJOR ROADWORKS DURHAM ST	**EXPECT DELAYS APR - JUN**
MAJOR ROADWORKS AHEAD	**TAKE EXTRA CARE**

SALISBURY ST CLOSED	**USE ALTERNATE ROUTE**
E-BND TRAFFIC	**FOLLOW DETOUR**
TRAFFIC CONTROL CHANGE	**STOP AHEAD**
ALL TRUCKS	**USE LEFT LANE**
PILOT CAR AHEAD	**PREPARE TO STOP**

Message Format

- Three lines of 300-350mm character height. (200mm character height may be considered in low speed environments, or where local requirements dictate).
- Ability to display a minimum of 9 characters per line.
- Upper case (capitals) to be used for all characters, except the abbreviation for kilometres (km).
- Spacing, Font and Visual Performance to be as per NZTA ITS-06-04 Specification.
- Text to be centre justified.
- If Pictograms are proposed instead of standardized text, CTOC will consider these applications on a case-by-case basis.

LED Colour

The current NZTA national position is that only yellow LEDs are permitted. Research is underway to assess the human factor impacts and any additional value from other colours / combinations of colour.

The CTOC position is that for most warning or advisory messages, the standard yellow LED colour is appropriate and this is therefore the default expectation for most mVMS deployments.

However in the interim period prior to an updated NZTA position being released, CTOC is willing to consider trialling colours other than yellow under the following conditions:

- A single colour must be used per Unit of Information.
- The colour(s) used in the message must be suitable and effective for the site (eg blue and green can be difficult to read in some situations).
- The colour must logically match the Unit of Information (eg green could be used for a 'permissive' message, while red could be used for a 'restrictive' message).
- The brightness and legibility of each colour in a mixed-colour message must be equal.
- The message must be understandable (self-explaining) on its own, and not rely on the colour to be understood. This enables colour-blind road users to still comprehend it.

Some examples of possible colour choice are provided above.

Frames and Timing

- Single, two and (only where absolutely necessary) three-frame message displays are permitted.
- The minimum number of frames must be used to clearly convey the message.
- Single frame messages must be displayed continuously. Two frame messages must use 2 second timing per frame. Three frame messages must use 1.6 second timing per frame.
- Scrolling messages across/down, and flashing messages, are not permitted.

Location

Location(s) must be chosen to best fit the road environment and be effective in achieving the purpose of the message. The key objectives are to select location(s) on the network that will be: (i) effective in conveying the message to the main approaches flowing towards the worksite, and (ii) enable the desired road user reaction to occur (eg rerouting).

The following factors must be considered:

- Left Hand Side Preferred - Should be positioned to the left of the approaching road user.
- Minimise Hazard to Traffic - Must be positioned or protected to minimise the risk of any vehicle strikes eg ideally located outside of clear zones, as far as practicable from edge of live lanes (while still remaining visible), behind TTM device protection, behind barrier protection, removed when not required etc.
- Clear Sight Distance - in speed environments of 60kph or less, the desirable minimum CSD is 100m. A minimum CSD of 75m must be available. In higher speed environments, normal CSD

requirements apply (usually 3 x Speed Limit). Management of parking areas may be required to guarantee CSD.

- Road Geometry - avoid locating immediately before a sharp bend, blind crest, or intersection, where the sign may distract attention at a critical moment.
- Glare - avoid positioning directly in front of a rising or setting sun, beneath bright lighting sources, and where sun reflection on the board may reduce legibility.
- Distance from Key Intersection – where a mVMS is intended to advise of a travel route diversion, the sign must be located sufficiently in advance of the intersection to allow users to react in time, including changing lanes if necessary.
- Presence of Other Signage and Traffic Control Devices – a mVMS must not compete with other signage, or interfere with traffic control devices both proceeding and beyond the site. Minimum spacings must therefore be achieved to these features.
- Impact on Cyclists and Pedestrians – placement must not impede cycle lanes or footpaths.
- Number of mVMSs – A sufficient number of mVMSs must be allocated to display the message to the main approach flow(s) towards the worksite.

Since two Message Phases will be required for most TTM operations, two mVMS Strategy Plans will usually be required within TMPs to explain the proposed messages and mVMS locations for each phase.

17. mVMS Used for Speed Management

Ref 'Best Practice for Speed Management at Roadwork sites'

mVMS could be used to improve Speed Management through worksites or to treat severe issues at TTM worksites. In accordance with the principle of reserving mVMSs for operationally critical purposes, these options must only be considered for worksites on strategic routes, and/or where severe localised risks / issues are occurring:

1. Additional Messaging: mVMS used to advise of a reason for reducing speed, to support the various speed treatments employed through the TTM site.

2. Speed Feedback: mVMS used to display either nothing, the approaching vehicle's speed up to the posted or temporary speed limit, or a "**SLOW DOWN**" message as appropriate.

Where a mVMS is used for speed feedback, the display controller must incorporate an adjustable lower threshold which, when it is not exceeded, results in the sign remaining blanked. This threshold will typically be set 20kph below the posted or temporary speed limit.

When the nominated lower threshold is exceeded, the words "**YOUR SPEED**" must be displayed with the approaching vehicle's speed displayed as a figure in kph.

When the nominated upper threshold (usually the posted or temporary speed limit) is exceeded, the message "**SLOW DOWN**" must be displayed.

18. Fixed VMS for TTM messages

CTOC controls a number of fixed VMSs in strategic locations on the network (currently SH1 Main North Rd, SH1 Main South Rd & SH74 Tunnel Rd). Where practicable, messages could be displayed on these VMSs to support roadworks in close proximity to the signs. Please contact CTOC to discuss possibilities if TMPs are located near to these locations. A reduced number of characters / lines may be available compared to mVMS equipment.

19. Cyclist Impacts

A5.7.1, C3.3, C13, 'Best Practice for Cyclists' Guide

Where marked cycle lanes, CTOC endorsed cycle routes, or any road with high cyclist demand (eg near schools, universities, suburban shopping centres, key activity areas etc) are affected by TTM operations, the 'Best Practice for Cyclists' Guide must be followed. The principles must be considered during both the TMP Design phase and also (continuously) during onsite operations.