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	Document No: <b>ITSO/OCC/SOP/NOP02.015</b>	<b>Effective Date:</b> <b>Xx Dec 2020</b>
<div style="text-align: center; margin-top: 200px;"> <h2>EMAS Arterial Operations</h2> </div>		

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## DOCUMENT CONTROL

REV	DOCUMENT TITLE & COPY NUMBER	Date	Prepared by	Reviewed by	Approved by
0	Handling of Abandon Items & Abandon Vehicles Copy____of ____	1 <sup>st</sup> July 2012	Lye Keng Fatt (DySOE)	Chua Teck Leong (AOM)	Soh Ling Tim (MOPN)
1	Handling of Abandon Items & Abandon Vehicles Copy____of ____	XX October 2013	Chiam Zhi Wei (DysOE) Chua Teck Leong (AOM, ITSO OCC)	Ng Soon Han, Frankie (DOM, ITSO OCC)	Yeo Se Lay (SM,Ops)
2	Handling of Abandon Items & Abandon Vehicles Copy____of ____	XX December 2020	Daniel Wu (AOM) Lye Keng Fatt (DM, ITSO OCC)	Ng Soon Han, Frankie (Mgr, ITSO OCC)	Yeo Se Lay (DDIT)

**AMENDMENT HISTORY RECORD**

Rev . No.	Effective Date of Change	Section & Sub-Section Amended	Amendments/ References	Party Requesting for Change
1	XX Oct 2013	Whole Document	Due to organization change of division name from ITSC to ITSO.	DOM, ITSO OCC
2	XX Dec 2020	Whole Document	Due to change of Staff Designations in ITSO OCC. Delete SOE, insert DM Delete DySOE, insert DyAM	Mgr, ITSO OCC

## Section 1. Overview of EMAS Arterial

### 1.1 Introduction

All expressways in Singapore are monitored under the Expressway Monitoring and Advisory System (EMAS) whereby live-video traffic surveillance, incident detection and traffic advisory functions are performed on the network. The capabilities provided by EMAS enable our traffic operators in the traffic control centre to effectively monitor and manage traffic situation on the entire expressway network. In addition, incident recovery will be provided through the vehicle recovery service and real-time traffic information will be disseminated to road users via variable message signboards, radio broadcast and ONE.MOTORING website.

To further enhance our transport provision and improve our services to road users, LTA has taken the initiatives to extend the capabilities of EMAS to the major arterial road network, known as EMAS on Major Arterial Roads (EMAS Arterial). The primary objectives of EMAS Arterial are to synergise the management of traffic along both expressways and major arterial roads, encourage efficient utilisation of spare network capacity and facilitate the dissemination of comprehensive and quality traffic information on the road network of Singapore.

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## 1.2 Operational Strategy

Based on our experience from operating EMAS on the expressways, traffic management strategy in the Intelligent Transport Systems Operations (ITSO) is being regularly reviewed and fine-tuned to meet the increasing demands from road users. Advisory messages on the VMS showing only traffic information can no longer meet the expectations of motorists for a pleasant driving experience. Our traffic message scheme has been constantly reviewed and enhanced to include traffic advisory information such as the type of incident, extent of congestion and advisory message in graphical form to give advance notice of the prevailing traffic conditions to our road users. In addition, our traffic management strategy had been enhanced to include the number of VMS to be displayed upstream to forewarn motorists of the traffic condition ahead of their journey.

From our daily expressway operations, we observed that as congestion continues to build on the expressway network, it is usual to experience congestion spillovers from the expressway to urban road networks. This can result in a heavy congestion on the entire road network if it remains uncontrolled by a traffic agency. To minimize the adverse effect that the congestion would bring to the overall performance on both the road networks, LTA has taken the initiative to extend the EMAS capabilities to 10 designated major arterial road networks for an integrated traffic management operation and to provide better synergy in the management of traffic incidents along the expressway and major arterial road corridors.

With the extension of EMAS capabilities to urban roads, our operational strategy has gradually evolved to a corridor-based one. The initial 5 zonal segmentation of the expressway network has been expanded to 10 zones to provide better synergy in traffic management along both the expressways and arterial road networks. The traffic operations are managed by our traffic operators at the Operations Control Centre (OCC), who perform traffic management on a 3-shift work cycle for a 24x7 operation. By extending live video traffic surveillance, early incident detection and traffic advisory capabilities to urban roads, it had further advanced our OCC's efficiency to detect, verify, confirm and monitor incidents along various parts of the expressways and major arterial road networks. It also improved our traffic operators' confidence in liaison with other agencies such as the Traffic Police and Singapore Civil Defence Force, etc for quick and precise response on incident recovery actions, and at the same time for ability to provide appropriate assistance to the affected motorists in a timely manner. This indirectly helps to reduce the risk of secondary incidents occurring. Electronic signboards on expressways are spaced apart at regular intervals. Due to space limitations, the same is not to be implemented on major arterial corridors. Hence, the messaging strategy, or Affected Equipment Range (AER) differs for EMAS arterial corridor from expressways. On expressways, up to three signboards upstream of the incident location or end of congestion

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will be implemented with advisory messages. On EMAS arterial corridor, there will be only one of such advisory messages.

An illustration is an example of a major incident occurring on the urban road traversing an expressway. It is often experienced that a congested road network causes most delays and inefficiencies to the motorists. Assuming there is no EMAS traffic monitoring capabilities on the urban roads, our traffic operators at the OCC is unable to have up-to-date traffic incident information. Without advanced warning of the impending wave of motorists on the congested urban roads, traffic operators are unable to effectively manage traffic operations along both the expressway and urban road networks. Urban road space capacity becomes over-saturated. However, spare capacity on the expressway network remains unknown and hence unused by the frustrated motorists caught in the jam on the urban roads.

In another expressway incident scenario, motorists may not be motivated to divert off the expressway if they are unaware of the traffic conditions along the adjacent urban road networks. In this case, space capacity on the expressway is completely saturated while the adjacent urban roads continue to operate at normal conditions, or may possibly be under-utilised by road users.

The introduction of EMAS Arterial operations on the urban road networks provides the platform to enhance our OCC's traffic operators' efficiency and to synergise traffic management along both expressways and major arterial roads. Operating with live video traffic surveillance and early incident detection alerts along the urban roads, our traffic operators are in full control of the incident scene in any part of the road networks ( refer to Section 2 – Overview of EMAS Arterial Corridors ). From the earlier illustration, if the traffic operators in the OCC had been alerted to the incident occurrence along urban roads, they can effectively perform the following traffic management operations to mitigate the traffic incident congestion:

- ✓ zoom in to incident scene for continuous monitoring and verification of the incident progress.
- ✓ take appropriate actions by implementing traffic action plans to mitigate traffic congestion.
- ✓ closely liaise with other agencies such as Traffic Police, Civil Defence Force , etc for quick and precise response on incident recovery actions.
- ✓ execute pre-arranged traffic signal timing plans to respond to the incident to mitigate congestion.
- ✓ activate recovery resources to urban roads to mitigate congestion especially if the incident is critical and causes a congestion with a tailback of more than 3 traffic light junctions;

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- ✓ provides a real time traffic incident information on the affected VMS along both the expressway and arterial road network.

From years of operations, EMAS has proven to be an effective traffic management tool and has reduced substantially the response time to incidents. Without EMAS, our traffic operators at the OCC will have to depend on the public or police patrols for information on incidents along the expressways. On average, the OCC would be alerted of an incident 10 minutes after its occurrence. It would then take another 25 minutes to arrive on site.

With EMAS, the average time taken to detect and verify an incident is 3 minutes. The EMAS resources then take an average of 8 minutes to reach the site. With EMAS in place, help arrives in 11 minutes as compared to 35 minutes without EMAS, resulting in a saving of 24 minutes per incident.

It has also facilitated the response time of various emergency services (e.g. SCDF, Traffic Police) through the provision of dedicated communication links. Often, the prompt response of ambulances and fire engines results in the saving of human lives and properties

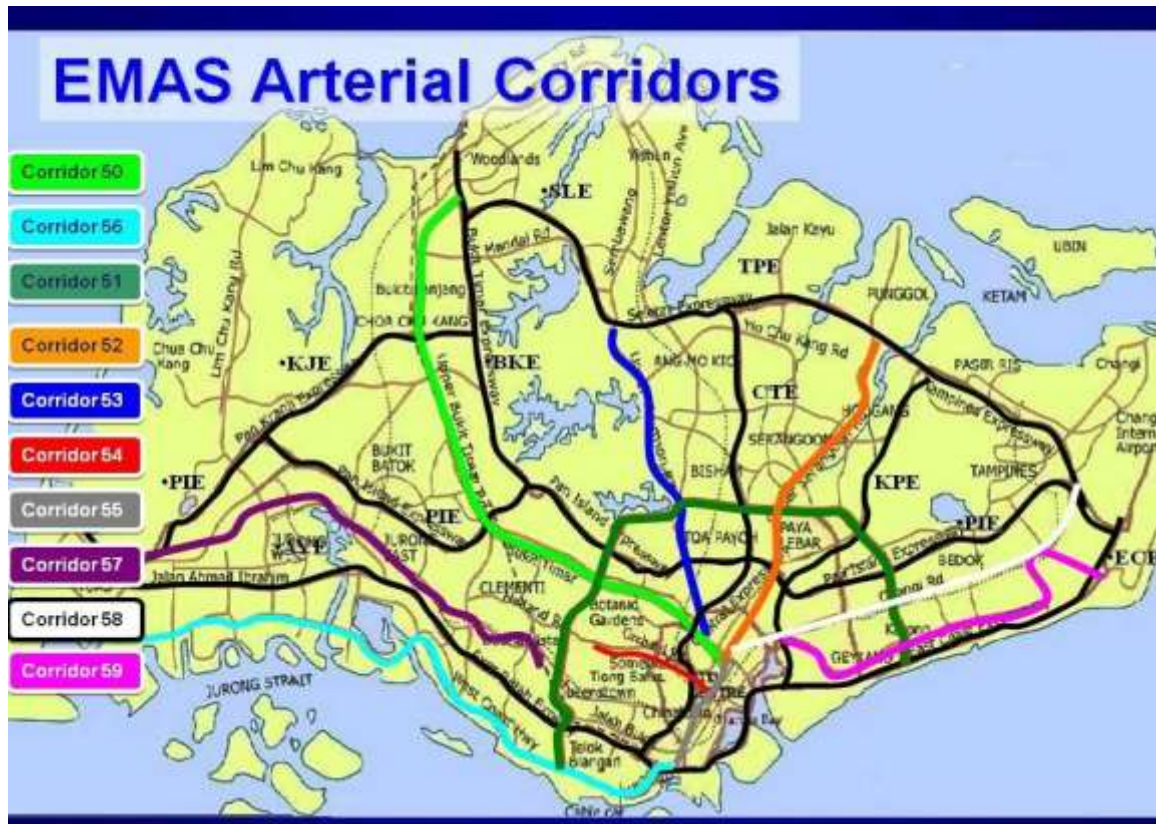
In addition, its role in effective information dissemination also results in better lane control and traffic flow. Motorists are able to take better precaution i.e. lane diversion during an accident and this helps to reduce the risk of secondary incidents occurring. Besides referring to EMAS signboards, traffic information from EMAS is also available to public via LTA Traffic News over the radio for real-time traffic updates. Motorists may also sign on to the LTA Twitter account, use the MyTransport@SG app on their smartphones or access LTA website at [www.onemotoring.com.sg](http://www.onemotoring.com.sg) for the latest traffic information prior to their travel. These platforms serve as a convenient source of information to road users.

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## Section 2 Overview of EMAS Arterial

### 2.1 EMAS Arterial Road Network



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## 2.2 List of EMAS Arterial Corridors

Phases	Major Arterial Corridors	Dist (km)	Strategic Importance
Phase 1 (Sector 1)	Woodlands Road–Upper Bukit Timah–Jalan Anak Bukit –Bukit Timah Road–Dunearn Road (Northern)	18	<ul style="list-style-type: none"> <li>Alternative to BKE &amp; PIE</li> </ul>
Phase 1 (Sector 2)	Serangoon Road–Upper Serangoon Road (Northern)	12	<ul style="list-style-type: none"> <li>Links PIE and TPE</li> <li>Alternative to CTE and KPE</li> </ul>
Phase 1 (Sector 2)	Thomson Road–Upper Thomson Road (Northern)	10.4	<ul style="list-style-type: none"> <li>Links PIE and SLE</li> <li>Alternative to CTE</li> </ul>
Phase 1 (Sector 2)	Portsdown Ave–Still Rd South (Outer Ring Road)	21	<ul style="list-style-type: none"> <li>Major bypass</li> <li>Links AYE, PIE, CTE, KPE and ECP</li> </ul>
Phase 1 (Sector 2)	Orchard Road–Bras Basah Road (Central)	3.1	<ul style="list-style-type: none"> <li>Links to Marina Centre</li> <li>Major shopping destination</li> </ul>
Phase 1 (Sector 2)	Nicoll Highway–Shenton Way (Central)	5.7	<ul style="list-style-type: none"> <li>Links KPE</li> <li>Alt. to ECP</li> </ul>
Phase 1 (Sector 1)	West Coast Highway (between Keppel Road/Shenton Way and Pasir Panjang Road/South Buona Vista Road) (Western)	7.3	<ul style="list-style-type: none"> <li>Serves ports</li> <li>Alt. to AYE/ECP</li> </ul>
Phase 2 (Sector 3)	West Coast Highway (between Pasir Panjang Rd and Pioneer Rd) (Western)	17.7	<ul style="list-style-type: none"> <li>Alt. to AYE</li> </ul>
Phase 2	Commonwealth Avenue–Boon Lay	16.7	<ul style="list-style-type: none"> <li>Alt. to AYE &amp; PIE</li> </ul>

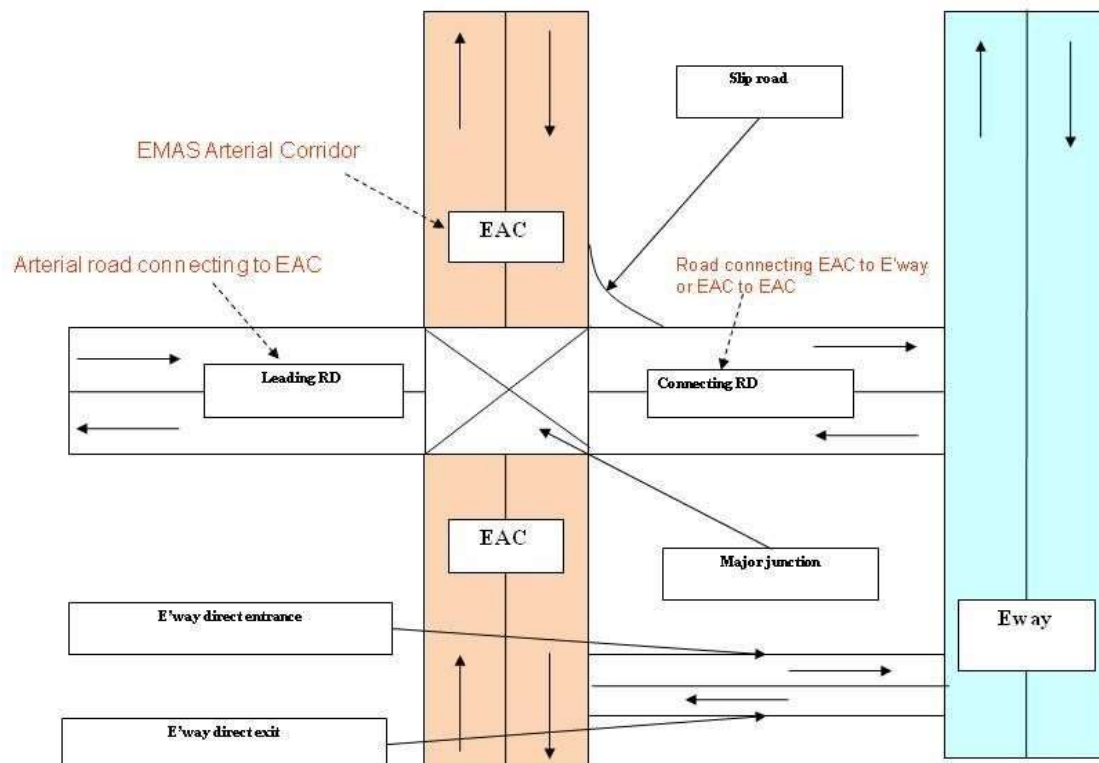
<b>ITSC/OCC/SOP/EAOP07.001</b>	<b>EMAS Arterial Operations</b>
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(Sector 3)	Way–Upper Jurong Rd (Western)		
Phase 2 (Sector 3)	Sims Avenue–Geylang Road–Upper Changi Road East (Eastern)	16.2	<ul style="list-style-type: none"> <li>• Alt. to PIE</li> <li>• Links to TPE</li> </ul>
Phase 2 (Sector 3)	Mounbatten Road–Upper East Coast Road–Xilin Avenue (Eastern)	13.4	<ul style="list-style-type: none"> <li>• Alt to PIE &amp; ECP</li> </ul>

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### Section 3 EMAS Arterial Operations

#### 3.1 Definitions of Locations and Directions



### 3.2 Message Structure Range

Message Structure Range (MSR) specifies different ranges along the EMAS Arterial corridor for defining different message structures for VMS equipments. It includes the Alert Zone, Jam Zone and Guide Zone.

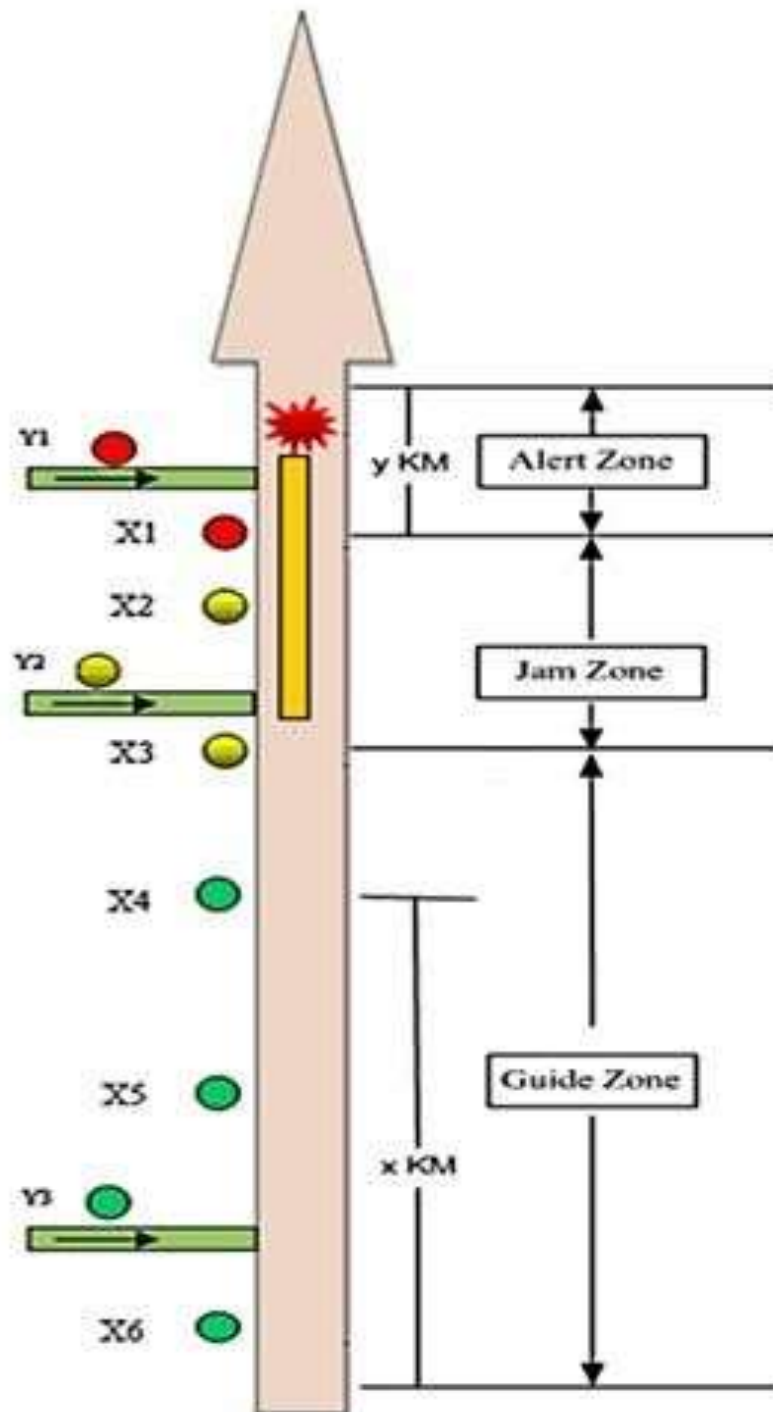
#### 3.2.1

The following table shows the general guidelines for zones:

Zone (Short Form)	Description
Alert Zone (AZ)	Informs motorists of the event type, and recommended action
Jam Zone (JZ)	Inform motorist the downstream end of congestion. It may or may not contain description of the event, location and/or advisory message depending on the type of AVMS and the location of the AVMS
Guide Zone (GZ)	Inform motorists the tail end of the congestion (upstream end point). It may or may not contain description of the event, location and/or advisory message depending on the type of AVMS and the location of the AVMS
Within AZ, JZ, GZ	This is applicable when we consider the AVMS on connecting/leading road with the connecting point within AER of the incident on EAC.

## 3.2.2

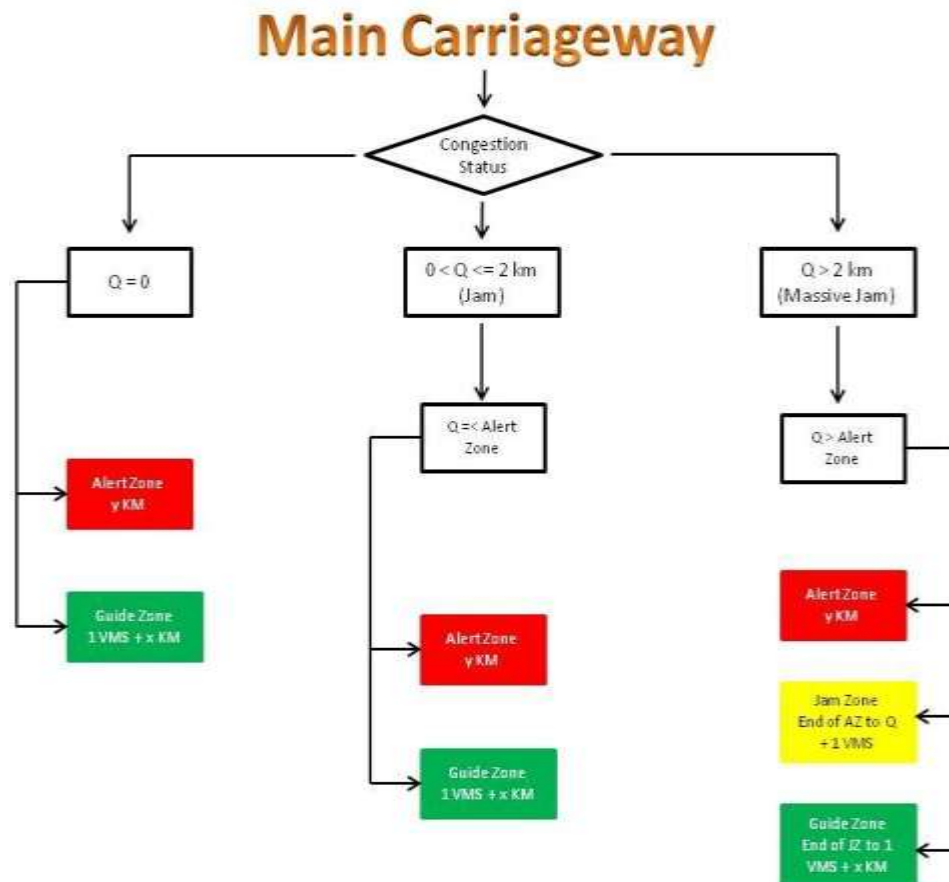
The following diagram shows an example of zone definition when an incident occurs on EAC main carriageway with massive jam:



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### 3.3 AER Rules

#### 3.3.1 Overview



Default Distance for y : 2

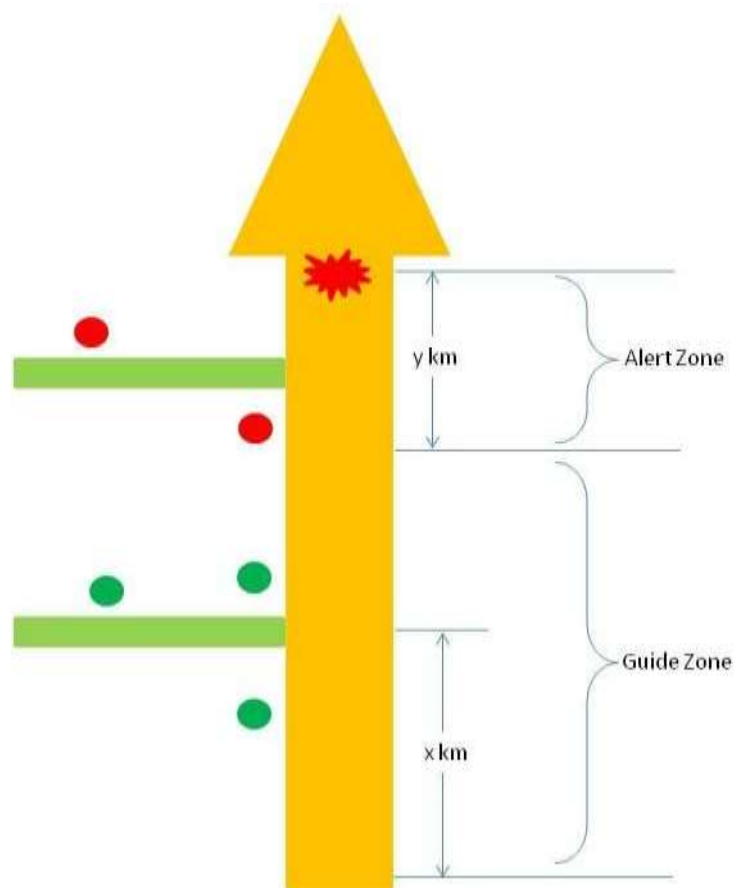
Default Distance for x : 0 (non total closure)

Default Distance for x : 4 (total closure)

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### 3.3.2 AER on main carriageway when there is no congestion ( $Q = 0$ )

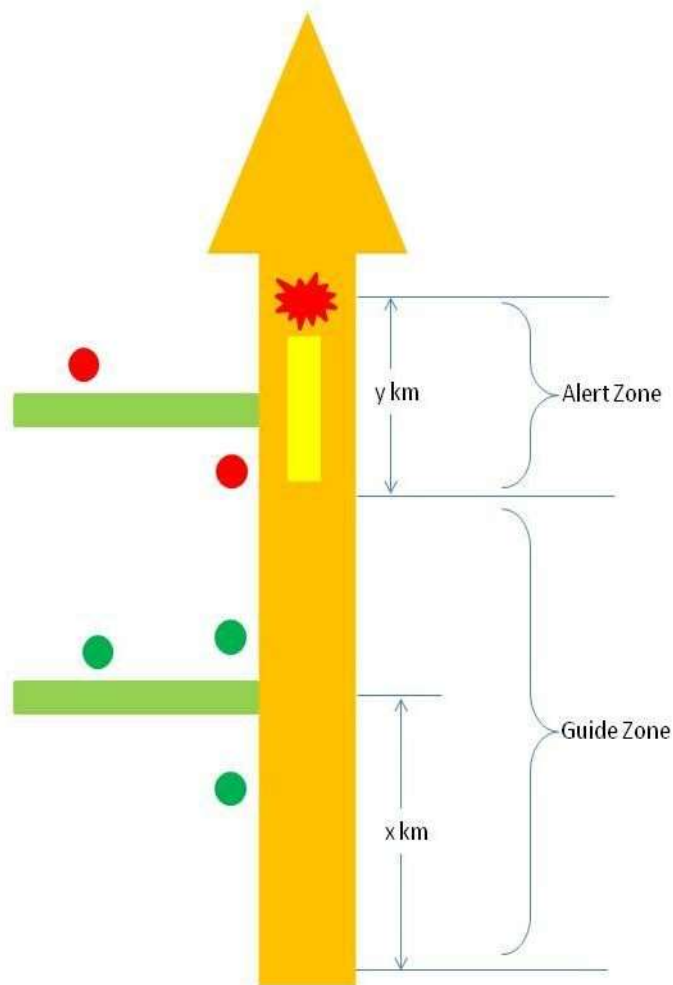
- Alert Zone:
  - 1 AVMS within  $y$  km upstream of incident location (The value of  $y$  is configurable and is set to 2 by default)
- No Jam Zone
- Guide Zone:
  - 1 AVMS upstream after the end of Alert Zone and all the AVMS within  $x$  km after that (The value of  $x$  is configurable and is set to 0 by default for non-total closure events and 4 for total closure event)





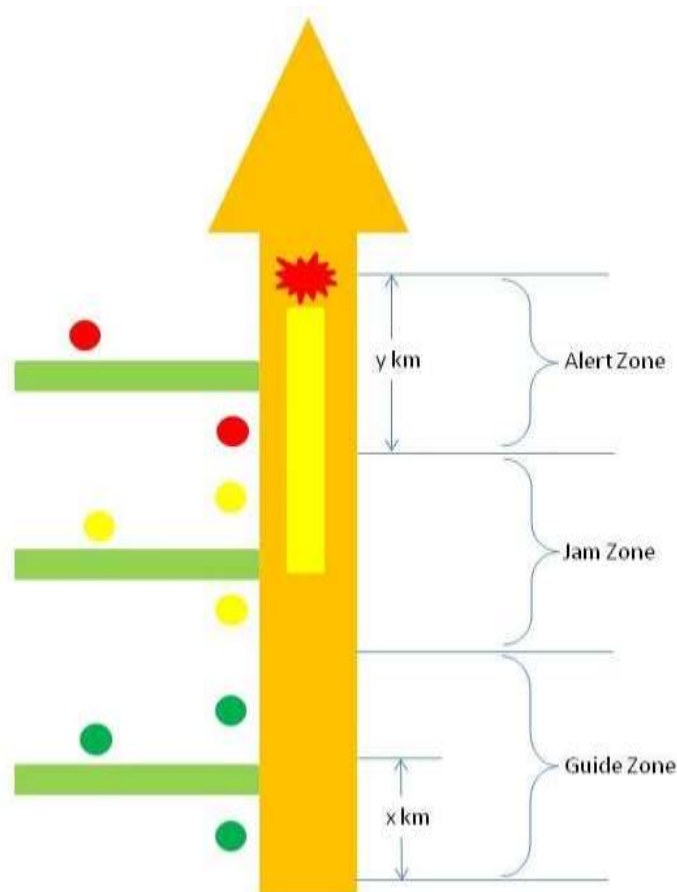
### 3.3.3 AER on main carriageway when the congestion is JAM ( $0 < Q \leq 2$ km)

- Alert Zone
  - 1 AVMS within **y** km upstream of incident location (The value of y is configurable and is set to 2 by default)
- Jam Zone:
  - If congestion end point is within Alert Zone, there's no Jam Zone
- Guide Zone:
  - 1 AVMS upstream after the end of Alert Zone and all the AVMS within x km after that. (The value of x is configurable and is set to 0 by default for non-total closure events and 4 for total closure event)



### 3.3.4 AER on main carriageway when the congestion is Massive JAM (Q > 2 km)

- Alert Zone
  - 1 AVMS within **y** km upstream of incident location (The value of y is configurable and is set to 2 by default)
- Jam Zone:
  - 1 AVMS upstream after the end of Alert Zone
- Guide Zone:
  - 1 AVMS upstream after the end of Jam Zone and all the AVMS within x km after that. (The value of x is configurable and is set to 0 by default for non-total closure events and 4 for total closure event)



### 3.3.5 AER on Connecting/Leading Road at entrance to EAC

There is at most 1 AVMS at entrance to EAC. When the event happens on EAC and the connecting/leading entrance is within the AER on main carriageway, AVMS located at connecting/leading road will show the message according to the AER on main carriageway respectively to inform motorist about the situation on main carriageway.

- If the connecting point is within Alert Zone: AVMS at entrance will show Alert Zone message
- If the connecting point is within Jam Zone: AVMS at entrance will show Jam Zone message
- If the connecting point is within Guide Zone: AVMS at entrance will show Guide Zone message

### 3.4 Message Display Mode

There are 2 possible display modes for EMAS Arterial AVMS:

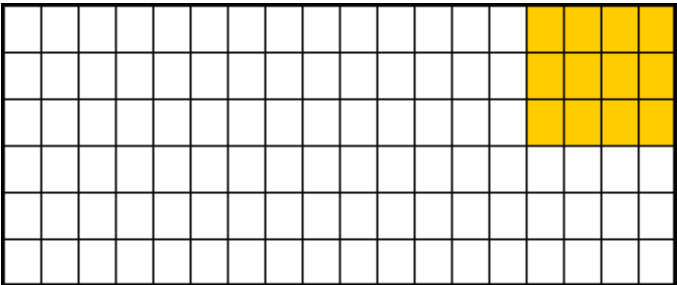
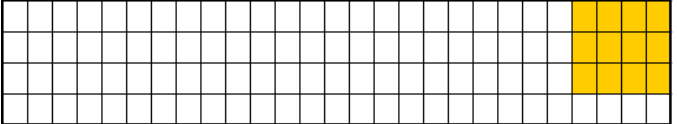

1. Text display – the message displayed on the AVMS is text messages plus pictogram;
2. Full graphic display – the message include a stick picture to indicate the incident location and the surrounding road information near the AVMS, plus the picture (or text) information of the incident.

The scenarios of which display mode should be used are listed below:

<b>AVMS Location IR Location</b>	<b>EAC Main Carriageway</b>	<b>Connecting Road</b>	<b>Leading Road</b>
EAC Main Carriageway	Full Graphic	Text	Text
EAC Slip Road	Text	Text	Text
Connecting Road	Text	Full Graphic	Full Graphic
Leading Road	Text	Full Graphic	Full Graphic
EAC Flyover/Underpass	Full Graphic	Text	Text

### 3.5 Equipment Message for Text Display

Equipment message for text display specifies pictogram and/or message contents on VMS. The components in messages shall include event name, road name, reference location, congestion condition, and action recommended. The message shall be predetermined and stored based on KB, and display with taking into consideration the limitation of text length, toggling, which are illustrated in following table:

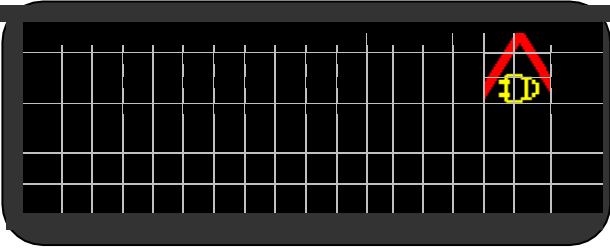
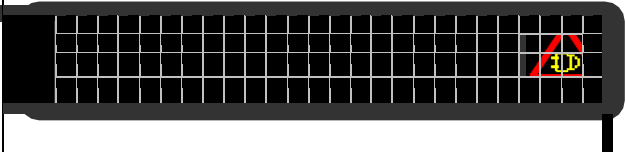
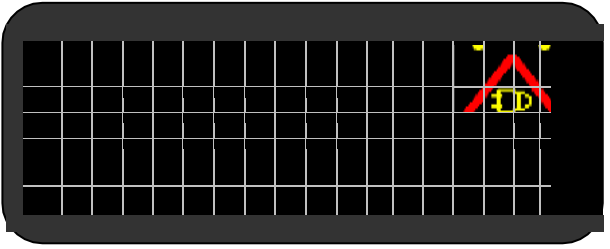
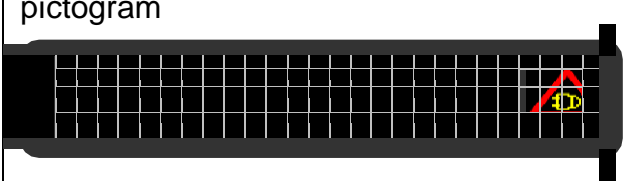
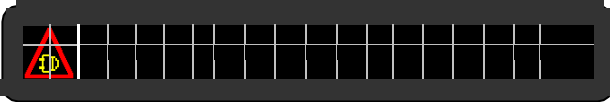
EMAS Arterial		
RVMS	<ul style="list-style-type: none"> <li>- First 3 lines of 14 characters with pictogram</li> <li>- Last 3 lines of 18 characters</li> <li>-Toggling allowed</li> </ul>	
CVMS	<ul style="list-style-type: none"> <li>- First 3 lines of 23 characters with pictogram</li> <li>- Last 1 line of 27 characters</li> <li>-Toggling allowed</li> </ul>	
Expressway		
TIP	<ul style="list-style-type: none"> <li>- 2 lines of 18 characters</li> <li>-Toggling allowed</li> </ul>	

The first character of each word in the message shall be in upper case while the rest in lower case.

### 3.6 Equipment Template for Text Display

#### 3.6.1 Template Layout

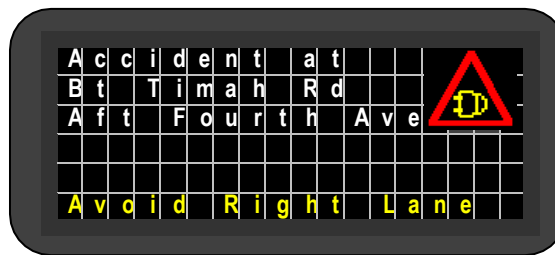
Templates specify the allocation of different components of messages on the equipments. In EMAS Arterial, two different templates are used for RVMS and CVMS, and one template for TIP. The principle to design the equipment is to catch motorist's attention without compromising the richness of messages. As demonstrated as below, template 1 is used when there is message or graphic toggling. To catch motorist's attention, Template 2 is used if there is only 1 one page of message (excluding the page for travel time information display). Please refer to appendices for the detailed rules of template selection.

AVMS Template: Template 1	
RVMS: Contains text messages and pictogram.	CVMS: Contains text messages and pictogram
	
AVMS Template: Template 2	
RVMS: Contains text messages, pictogram and 2 blinking lights on top of the pictogram	CVMS: Contains text messages, pictogram and 2 blinking lights on top of the pictogram
	
TIP	
	
Contains text messages and pictogram	

### 3.6.2 Message Colour

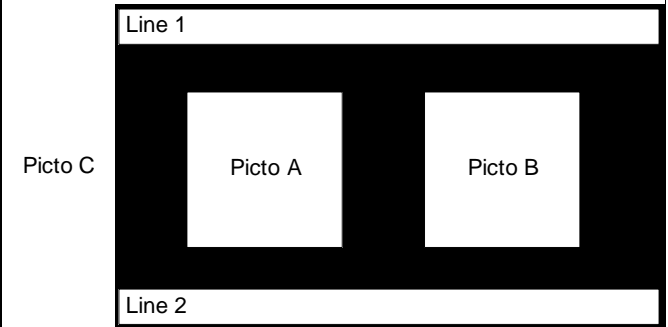
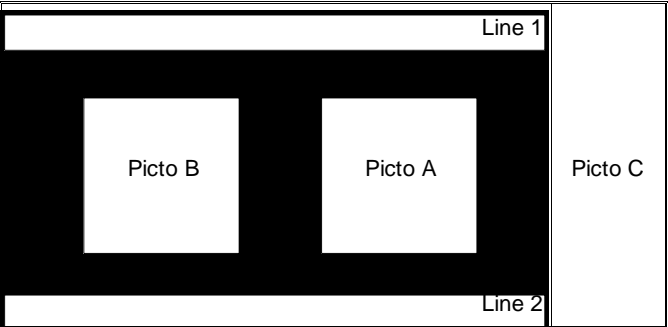
For 1 page of AVMS (which can be template 1 or 2), the color of messages is as following:

- Incident/Jam message: white color
- Action message: yellow color



### 3.7 Equipment Template for Full Graphic Display

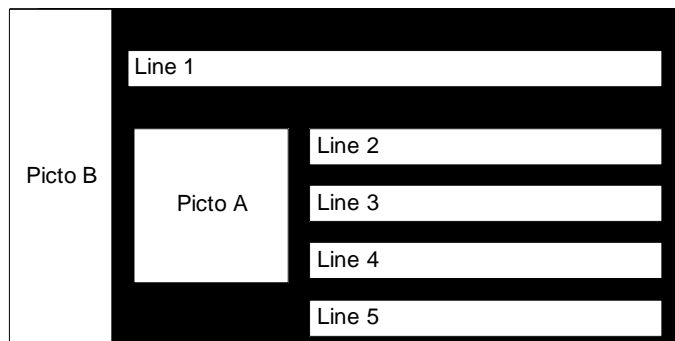
#### 3.7.1 Template Layout

EMAS Arterial RVMS	
<ul style="list-style-type: none"> <li>- For RVMS in Alert Zone</li> <li>- Line 1 &amp; 2: Road name, Maximum 15 characters, align left</li> <li>- Picto A: Incident icon</li> <li>- Picto B: Lane merging icon (if applicable)</li> <li>- Picto C: Picture that indicates incident location and surrounding roads</li> </ul>	 <p>The diagram shows a rectangular display area. At the top is a white bar labeled 'Line 1'. Below it is a black rectangular area containing two white squares labeled 'Picto A' and 'Picto B'. To the left of this black area is a white vertical bar labeled 'Picto C'. At the bottom is another white bar labeled 'Line 2'.</p>
<ul style="list-style-type: none"> <li>- For RVMS in Alert Zone</li> <li>- Line 1 &amp; 2: Road name, Maximum 15 characters, align right</li> <li>- Picto A: Incident icon</li> <li>- Picto B: Lane merging icon (if applicable)</li> <li>- Picto C: Picture that indicates incident location and surrounding roads</li> </ul>	 <p>The diagram shows a rectangular display area. At the top is a white bar labeled 'Line 1'. Below it is a black rectangular area containing two white squares labeled 'Picto B' and 'Picto A'. To the right of this black area is a white vertical bar labeled 'Picto C'. At the bottom is another white bar labeled 'Line 2'.</p>

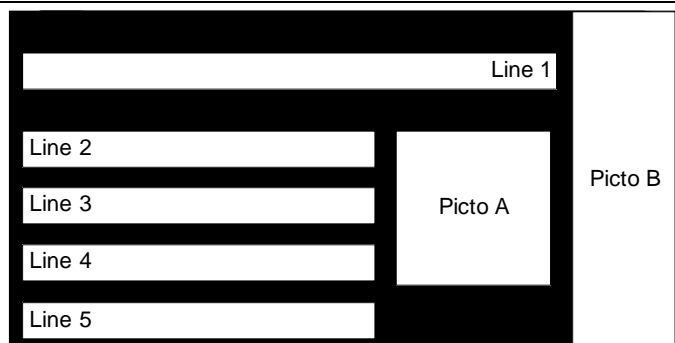


**EMAS Arterial RVMS**

- For RVMS in Jam Zone and Guide Zone
- Line 1 : Road name, Maximum 15 characters, align left
- Line 2,3,4 & 5: Maximum 10 characters, align left
- Picto A: Incident icon
- Picto B: Picture that indicates incident location and surrounding roads



- For RVMS in Jam Zone and Guide Zone
- Line 1 : Road name, Maximum 15 characters, align right
- Line 2,3,4 & 5: Maximum 10 characters, align left
- Picto A: Incident icon
- Picto B: Picture that indicates incident location and surrounding roads



**EMAS Arterial CVMS**

- For CVMS in Alert Zone
- Line 1 & 2: Road name,  
Maximum 15  
characters,  
align left
- Picto A: Lane merging icon  
(if  
applicable)
- Picto B: Incident icon
- Picto C: Picture that  
indicates  
incident location  
and  
surrounding roads

Picto A	Picto B	Picto C	Line 1
			Line 2

- For CVMS in Alert Zone
- Line 1 & 2: Road name,  
Maximum 15  
characters, align  
right
- Picto A: Lane merging icon  
(if  
applicable)
- Picto B: Incident icon
- Picto C: Picture that  
indicates  
incident location  
and  
surrounding roads

Line 1	Picto C	Picto B	Picto A
Line 2			

**EMAS Arterial CVMS**

- For CVMS in Jam Zone and Guide Zone

- Line 1: Road name, Maximum 24 characters, align left

- Line 2 & 3: Maximum 20 characters, align left

- Picto A: Incident icon

- Picto B: Picture that indicates incident location and surrounding roads

Picto B

Line 1

Picto A

Line 2

Line 3

- For CVMS in Jam Zone and Guide Zone

- Line 1: Road name, Maximum 24 characters, align right

- Line 2 & 3: Maximum 20 characters, align right

- Picto A: Incident icon

- Picto B: Picture that indicates incident location and surrounding roads

Line 1

Line 2

Line 3

Picto A

Picto B

**3.7.2 Message Colour**

The color of messages used in full graphic display is white color is as following:

- Incident/Jam message: white color
- Action message: yellow color

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### 3.8 Picture and Message Rules for Full Graphic Display

#### Rule 1 – selection of reference road name

- From the incident location, use the first upstream reference road of incident as reference point:
  - (1) If the first reference point belongs to the right hand side road only, then choose the right hand roads as reference roads;
  - (2) If the first reference point belongs to the left hand side road only, then choose the left hand roads as reference roads;
  - (3) If the first reference point belongs to both left hand side road and right hand side road, then choose the left hand roads as reference roads.
  - (4) If there is no reference point on upstream of incident, the default direction is left hand side road direction.

#### Rule 2 – number of reference road(s) besides the stick picture

- (1) AVMS in Alert Zone and Guide Zone without jam:

Use 2 reference roads (1 before the incident location and 1 after the incident location) if applicable;

Use 1 reference road if there is only 1 reference road between the incident location and the RVMS.



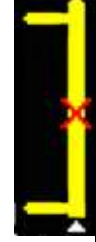











- (2) AVMS in Jam Zone and Guide Zone with jam:





Use 1 reference road before the incident location.

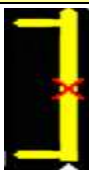









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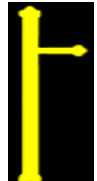




### Rule 3 – selection of incident location picto

The selection of incident location picto for single IR follows the rules listed below:


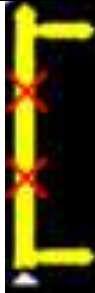
Event Type	RVMS Location	Possible Incident Location Picto			
Incident	Alert Zone Guide Zone (without jam)				
	Jam Zone Guide Zone (with jam)				
Total Closure	Alert Zone Guide Zone (without jam)				
	Jam Zone Guide Zone (with jam)				
Heavy Traffic	Within Queue				





Event Type	RVMS Location	Possible Incident Location Picto			
	Outside Queue				
Event on Flyover/Underpass	Alert Zone Jam Zone Guide Zone				
Event on at-grade road	Alert Zone Jam Zone Guide Zone				


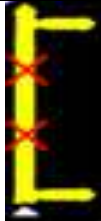




Event Type	CVMS Location	Possible Incident Location Picto			
Incident	Alert Zone Guide Zone (without jam)				
	Jam Zone Guide Zone (with jam)				
Total Closure	Alert Zone Guide Zone (without jam)				

Event Type	CVMS Location	Possible Incident Location Picto			
	Jam Zone Guide Zone (with jam)				
Heavy Traffic	Within Queue				
	Outside Queue				
Event on Flyover/Underpass	Alert Zone Jam Zone Guide Zone				
Event on at-grade road	Alert Zone Jam Zone Guide Zone				

The selection of incident location picto for multiple IRs follows the rules listed below:

Event Type	RVMS Location	Possible Incident Location Picto	
Incidents on the same EAC	Alert Zone Guide Zone (without jam)		

Event Type	RVMS Location	Possible Incident Location Picto	
	Jam Zone Guide Zone (with jam)		
Incidents on Flyover/Underpass and at-grade road	Alert Zone Jam Zone Guide Zone		

Event Type	CVMS Location	Possible Incident Location Picto	
Incidents on the same EAC	Alert Zone Guide Zone (without jam)		
	Jam Zone Guide Zone (with jam)		
Incidents on Flover/Underpass and at-grade road	Alert Zone Jam Zone Guide Zone		



Rule 4 – text display for AVMS in Jam Zone and Guide Zone with jam

The template structures for RVMS in Jam Zone and Guide Zone with jam are listed in the following table:

S/N	Possible RVMS Template Structure
1	
2	

The text displayed in RVMS in Jam Zone and Guide Zone with jam follows the following rules:

- Line 2: to display “Massive”, if the jam is not a massive jam, then keep this line blank.
- Line 3: to display “Jam to” for RVMS in Jam Zone, to display “Jam aft” for RVMS in Guide Zone with jam.
- Line 4: to display the first part of reference road name, if the reference road name is within 10 characters, then it only occupy Line 3.
- Line 5: to display the second part of reference road name if the reference road name is longer than 10 characters.

The template structures for CVMS in Jam Zone and Guide Zone with jam are listed in the following table:

S/N	Possible CVMS Template Structure
1	
2	

The text displayed in CVMS in Jam Zone and Guide Zone with jam follows the following rules:

- Line 2: to display “Massive Jam to” for CVMS in Jam Zone (massive jam), to display “Jam to” for CVMS in Jam Zone (normal jam); to display “Massive Jam aft” for CVMS in Guide Zone (massive jam), to display “Jam aft” for CVMS in Jam Zone (normal jam)
- Line 3: to display reference road name.