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Singapore, 30 January 2019
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Intelligent Transport System Centre (ITSC)
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Attn: Mr. Oh Kok Wee
Engineer's Representative

Our Ref No: CTT231/SSA/D19.001.000/(19/022)

CONTRACT TT231
UPGRADING OF I-TRANSPORT SYSTEM
SUBMISSION OF KAP REPORT (UNPLANNED EVENT) (VERSION C)

Dear Sir/Mdm,

Please find attached to this letter the official submission of the following document:

1. TT231 – KAP Report (Unplanned Event) (Version C)

Document Ref: CTT231/SSA/D19.001.000/KAP/RPT

Version: C

Dated on: 30 January 2019

Yours faithfully,



Oscar Jiang

Project Manager

Encl

30 January 2019 - RESTRICTED

KAP Report (Unplanned Event)

RESTRICTED

Land Transport Authority

Contract Reference: TT231

Upgrading of i-transport System

Sopra Steria Asia Pte. Ltd.

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1. Introduction

1.1. Overview

This document describes the requirement specifications in the upgraded i-transport's enhanced Knowledge Base (KB), as well as knowledge domain, relevant knowledge definitions, and descriptions of generic plans and special cases. The enhanced KB is the product of the Knowledge Acquisition Process (KAP) which was jointly conducted by Sopra Steria Asia Pte Ltd (SSA) and Land Transport Authority (LTA).

1.2. Tender specifications



Pages from
20_TT231 - TS03 - Sy

1.3. Scope

This document only covers new / enhanced unplanned event KB rules in all KAP sessions conducted with users for the below topics. Refer to KBRS for the remaining rules with no changes.

- 1) Super corridor concept
- 2) Plan for event at centre divider
- 3) Plan for event on at-grade road
- 4) Advisory for alternate route
- 5) Tunnel fire plan
- 6) GLIDE control for expressway exit
- 7) Train disruption
- 8) Multiple linked events
- 9) Multiple congestion end point
- 10) Plan for slow moving vehicle
- 11) Extended event on KPE/MCE

Various rounds of KAP sessions are conducted to understand the user needs to enhance the rules for the upgraded system.

1.4. User groups

OCC Operator, as known as Ops, is the only user group in charge of managing ad-hoc events. Refer to Appendix 14.8 Event Types (Incident) for the event types and sub-types managed by Ops.

1.5. Reference documents

Table 1.1 Reference Documents

Document reference	Document Name	Reference	Version	Date
[REF1]	TEM Knowledge Base Requirement Specification	SAPL/RP147/D19.001.002/TEM-KBRS	7.10	20 Mar 18
[REF2]	Master List of Abbreviations	TT231/SSA/ Master List of Abbreviations	A	6 Dec 18

1.6. Abbreviations

Please refer to [REF2] for the list of abbreviations.



2. Knowledge acquisition process sessions

Various rounds of KAP sessions conducted with different teams to refine the requirements

2.1. KAP kick-off

Detailed KAP schedule and plans were discussed in KAP kick-off meeting. KAP kick-off meeting completed on 10th Jul 2018.

2.2. KAP sessions

Various rounds of KAP sessions for unplanned event management have been conducted with different user groups. Below sections provides the summary of the sessions.

Table 2.1 KAP Sessions

S/N	Topic	Date
KAP Meeting 1	Events Types on Expressway/Tunnels Events on GLIDE, Shoulder and Centre Divider Total Closure on Expressway	12 Jul 2018
KAP Meeting 2	Fire Plan of CTE General Plan for Short Tunnel Multiple IR on Expressway	17 Jul 2018
KAP Meeting 3	Multiple IRs Rules for Priority (EWAY & EA)	18 Jul 2018
KAP Meeting 4	Single Events on EMAS Arterial Road Multiple Events on EMAS Arterial Road Special Cases on EMAS Arterial Road	20 Jul 2018
KAP Meeting 5	Multiple Congestion End Point Proposal Super Corridor	24 Jul 2018
KAP Meeting 6	GLIDE Control for Expressway Exit Junction GLIDE Junction Hotspots Introduction of Planned Event Event of MRT Breakdown	1 Aug 2018

3. Super corridor concept

3.1. Definition

Super Corridor refers to the road stretch (with direction) of expressway, EMAS arterial road or major arterial road with seamless connections defined by LTA to allow extension of affected equipment range (AER), input of congestion end point, association between incidents and information dissemination. Refer to Appendix 14.1 for List of Defined Super Corridors.

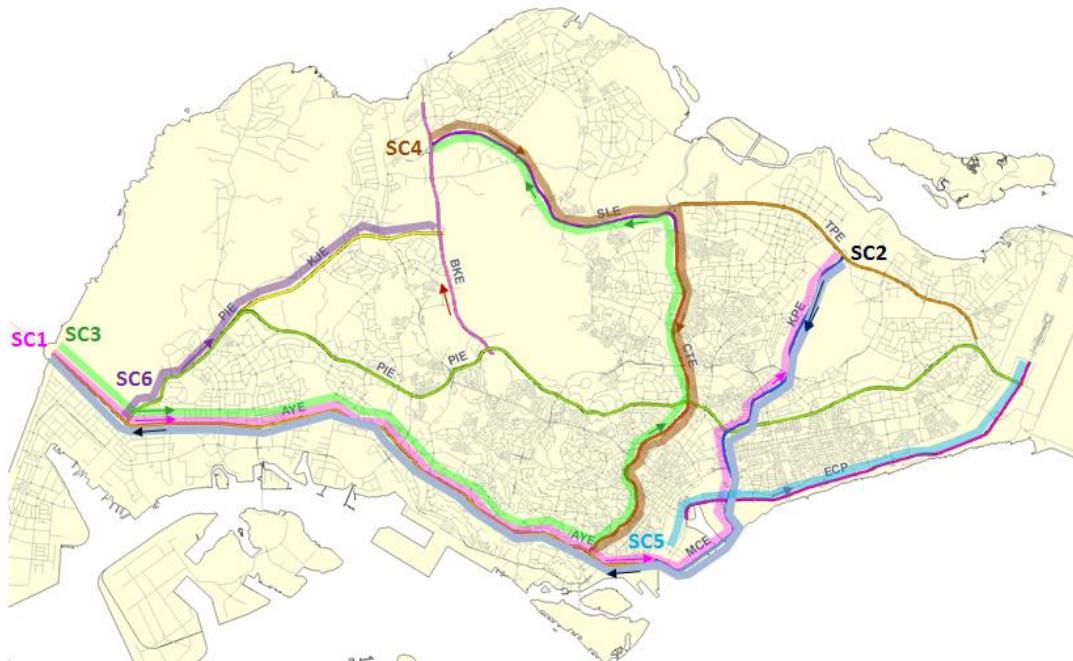


Figure 3.1 Example of Defined Super Corridor (Expressway)

3.2. Use case of super corridor concept

3.2.1. AER extension and message dissemination

Affected equipment range is extended along defined super corridor automatically. For example, as shown in Figure 3.2 and 3.3, an incident happens on SLE, instead of proposing the adjoining expressway message for CTE, system proposes guide zone message for CTE because the affected equipment range automatically extend along the SLE-CTE super corridor.

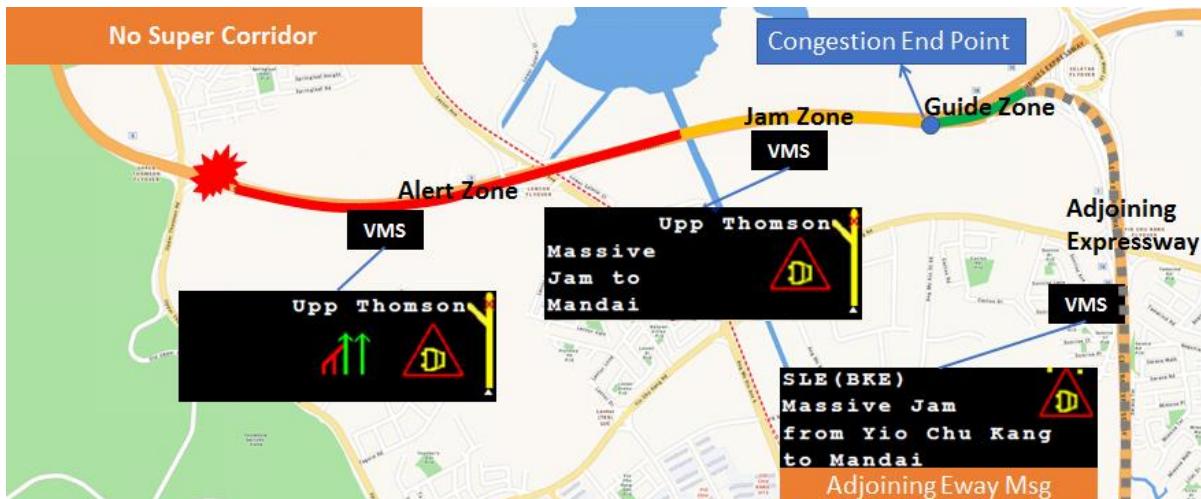


Figure 3.2 Affected Equipment Range & Message without Super Corridor Concept

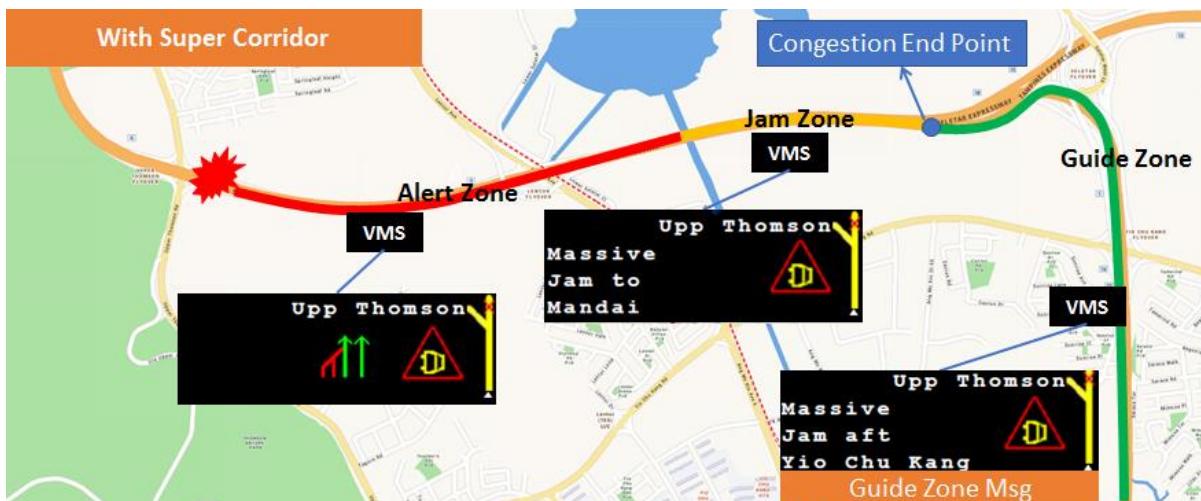


Figure 3.3 Affected Equipment Range & Message with Super Corridor Concept

3.2.2. Congestion extension

When congestion spills over to adjoining road, new heavy traffic incident record is needed to be created at the joint point to monitor the congestion on adjoining road separately, the congestion spilled over is not monitored as continuous congestion from the incident location. Super corridor concept allows the congestion to be extended along the defined super corridor without creating multiple IRs to monitor, as illustrated by Figure 3.4 and 3.5.

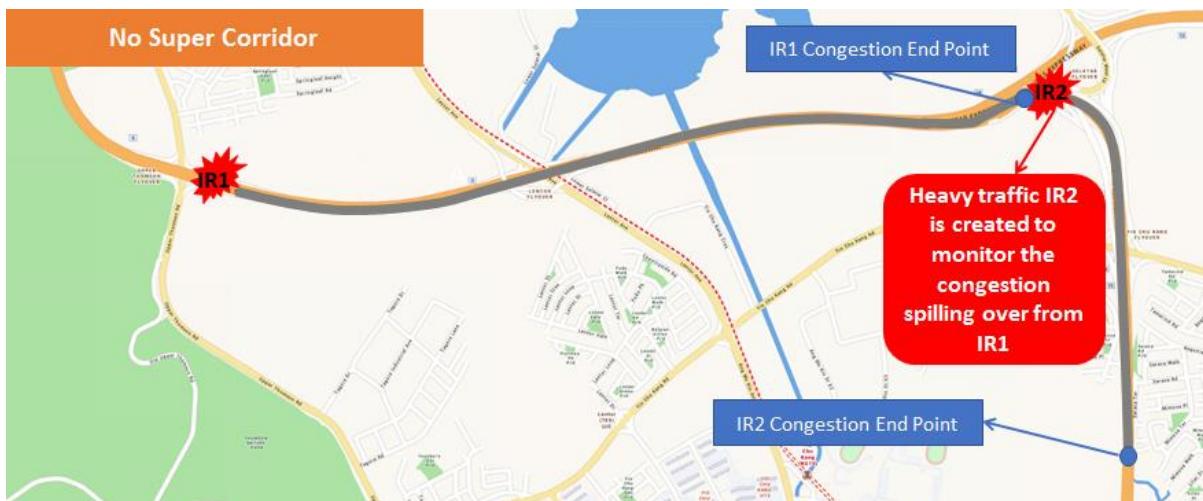


Figure 3.4 Congestion Monitoring for Adjoining Road without Super Corridor Concept

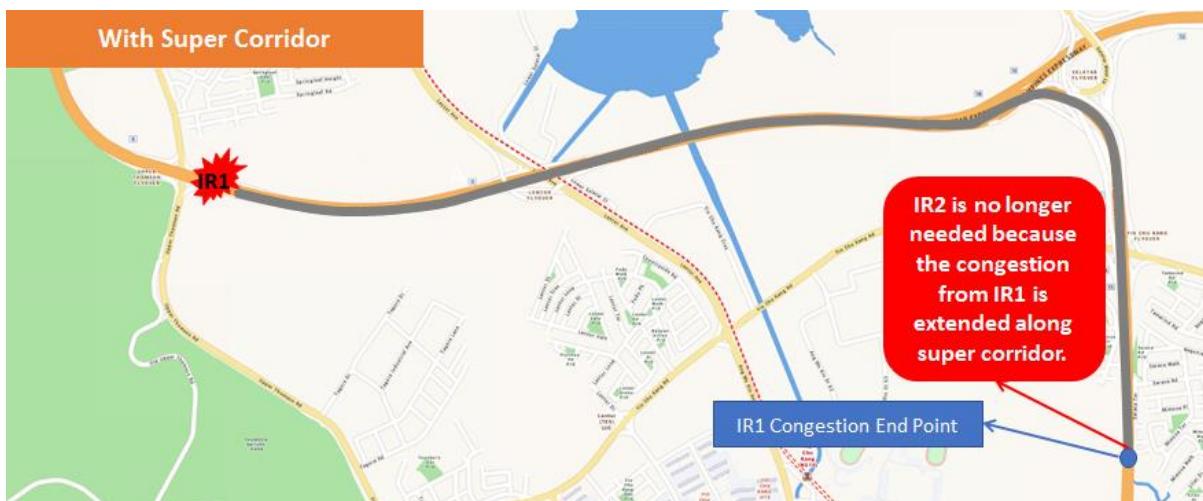


Figure 3.5 Congestion Monitoring for Adjoining Road with Super Corridor Concept

3.2.3. Incident records association

Up to 3 incident records along the same expressway, EMAS arterial corridor and defined super corridor are allowed to be linked. Refer to section 11 for more details.

4. Plan for event at centre divider

4.1. Allowed event type for event at centre divider

There are two event types allowed for event at centre divider:

- 1) Miscellaneous
- 2) Road Works

The sub-types of miscellaneous IR and roadworks IR are applicable to centre divider, for example: plant pruning. Refer to Appendix 14.8 for more details of event types and sub-types.

4.2. Event status, affected equipment range (AER) and VMS message

Events at centre divider (CD) are categorized into 3 scenarios:

- 1) Scenario 1: Event at CD, no lane is affected, no lane closure

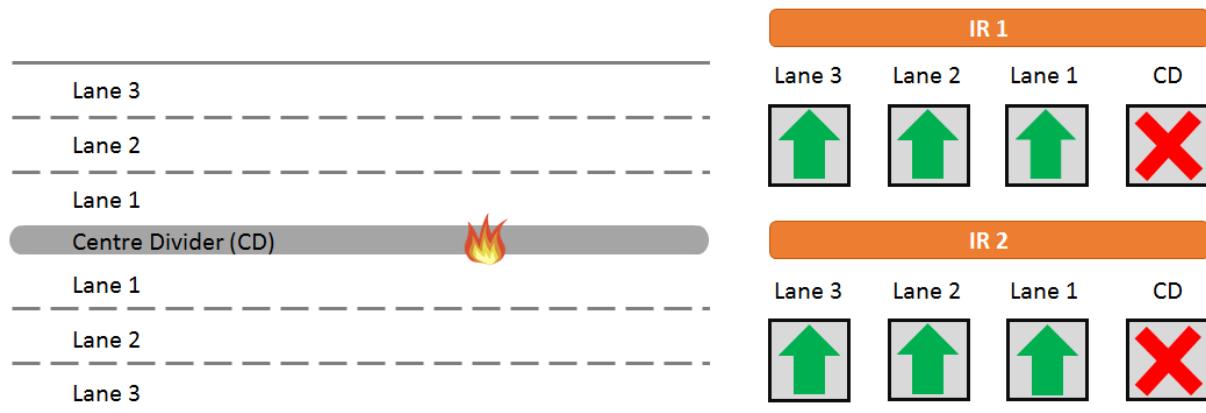


Figure 4.1 Event at CD without Affecting Lane

In this scenario, Ops to select 1 bound to create IR, only close the centre divider, system shall propose message for both bounds. Only the alert zone of the event road of standard AER is applicable, no message to be proposed for adjoining road. For event at centre divider on super corridor, expressway and EAC main carriageway, only the VMS on the incident road will be proposed with messages, adjoining road or connecting / leading road of EAC will not be proposed with messages. Similarly, if event happens on connecting road / leading road, only the VMS on connecting / leading road or the direct connecting / leading road will be proposed with messages, VMS on EAC will not be proposed with messages, as shown in Figure 4.2 & 4.3.

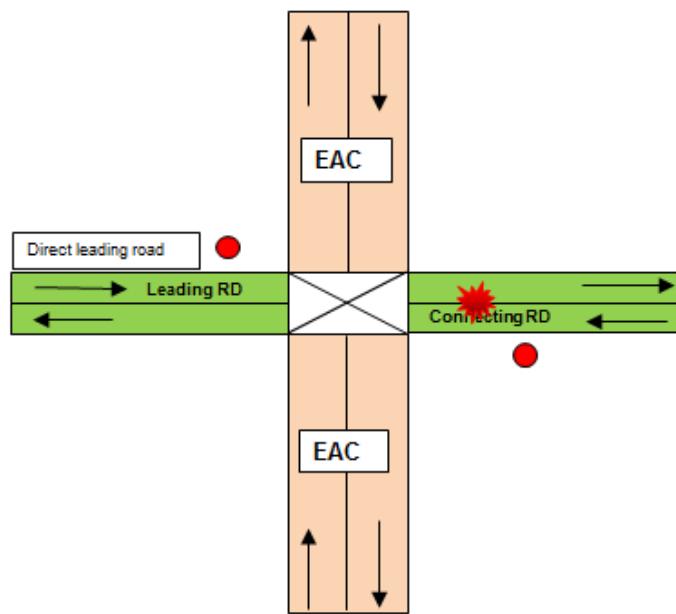


Figure 4.2 AER of Event on Centre Divider on Connecting Road

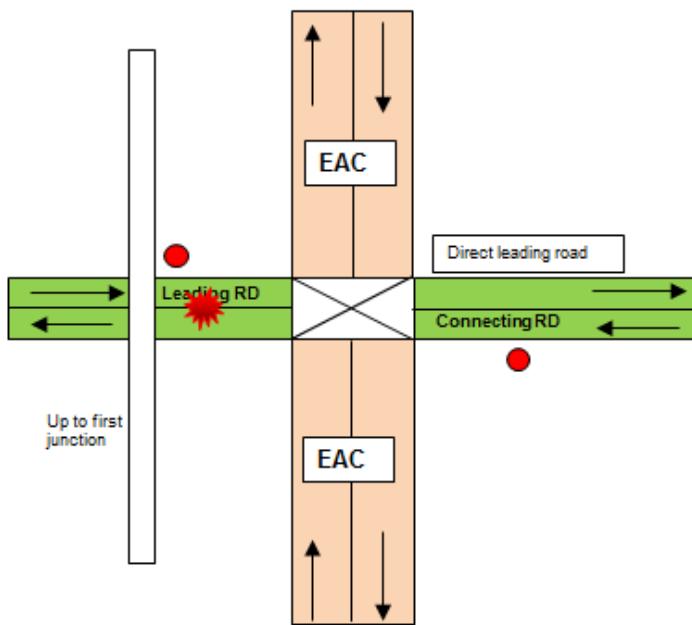
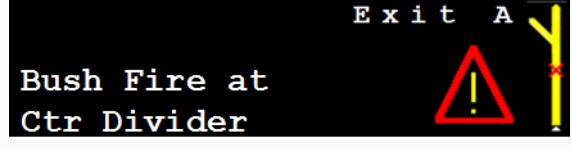
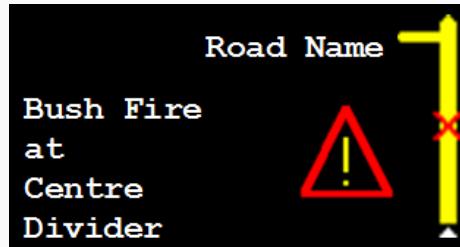
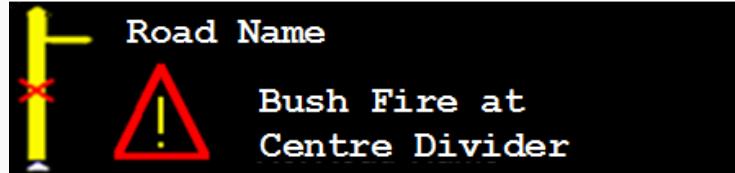


Figure 4.3 AER of Event on Centre Divider on Leading Road

The summary of AER and message details is as below (Table 4.1):

Table 4.1 AER and Message Structure for Event at CD

Road Type for event at CD not affecting lane	Affected Equipment Range	Message
Super Corridor	Alert Zone* (AZ)	Depends on event location.
Expressway	Alert Zone* (AZ)	TIP: 
EAC Main Carriageway	Alert Zone* (AZ)	RVMS: 
Connecting/Leading Road	1 AVMS upstream of the event location on the connecting/leading road or the direct connecting/leading road	CVMS: 

*Note: In current KB, the length of alert zone (AZ) is 2km upstream of the event location.

- 2) Scenario 2: Event at CD, one bound is affected and has lane closure

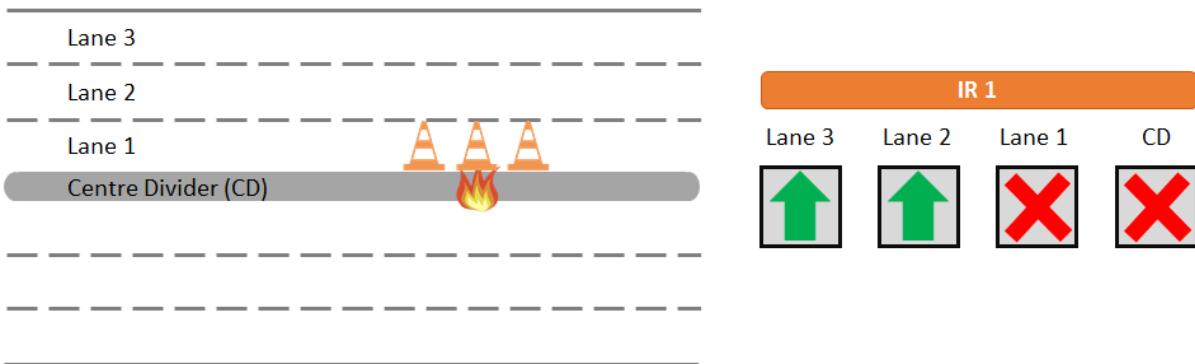


Figure 4.4 Event at CD Affecting 1 Bound

In this scenario, Ops to select the affected bound to create IR, close the affected lane and centre divider. Standard lane closure AER applies except that no message to be proposed for adjoining road. Refer to corresponding non-total closure Appendix in KBRS. In the situation where Scenario 1 IR is already created and the event starts to affect lane, Ops can edit the existing Scenario 1 IR by selecting the affected lane or create another IR if the existing Scenario 1 IR is not on the bound of the lane affected, and system shall automatically propose the Scenario 2 message to override the existing Scenario 1 message on the affected bound, the Scenario 1 IR message on the non-affected bound will retain.

3) Scenario 3: Event at CD, both bounds are affected and has lane closure

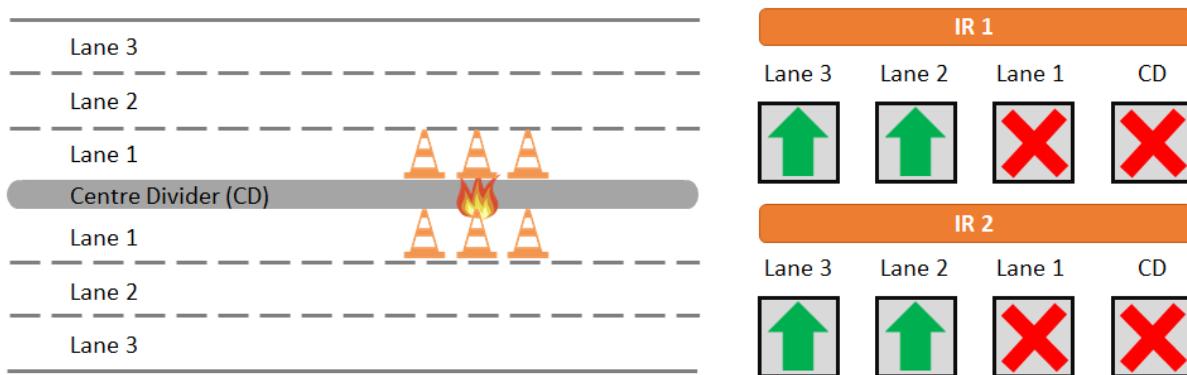


Figure 4.5 Event at CD Affecting 2 Bounds

In this scenario, Ops to create 2 individual IRs (1 IR for each bound), close the affected lane and centre divider. Standard lane closure AER applies for each individual IR except for adjoining roads, no message to be proposed for adjoining road. Refer to corresponding non-total closure Appendix in KBRS.

5. Plan for event on at-grade road

5.1. Affected equipment range for event on at-grade road

Events on at-grade road shall have the same affected equipment range (AER) as EMAS arterial corridor (EAC). Ops shall be able to create congestion end point to main EMAS arterial corridor (EAC) when IR happen on at-grade road.

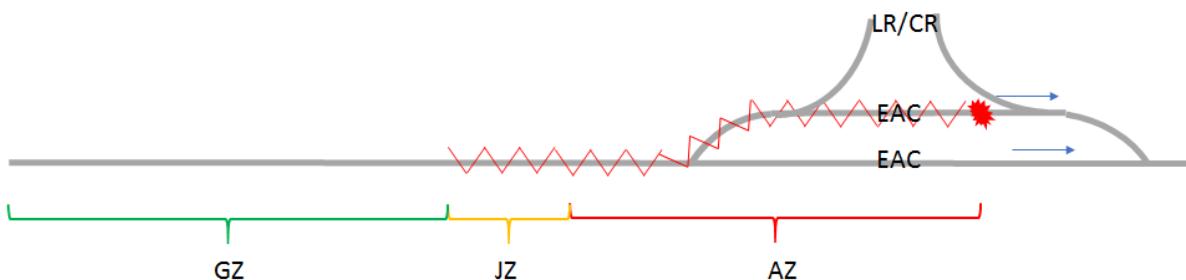
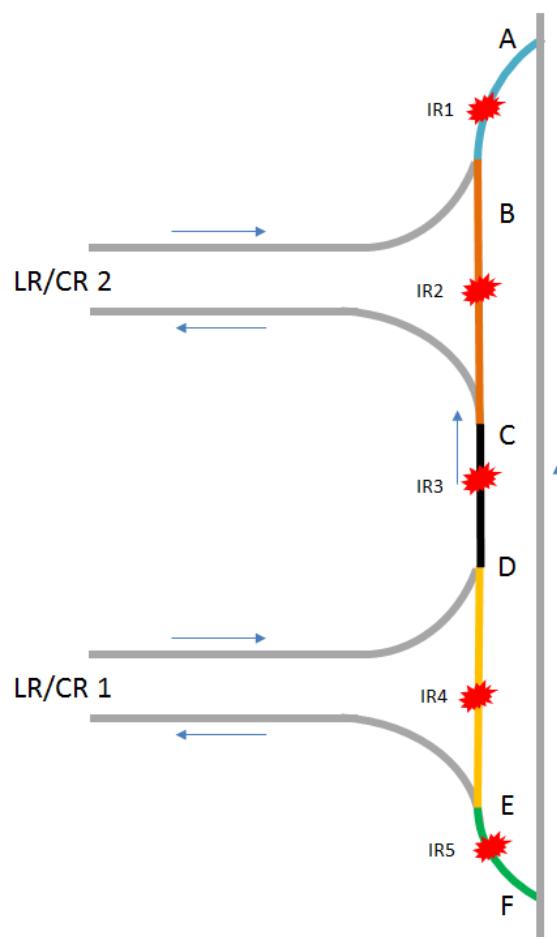


Figure 5.1 Affected Equipment Range for Event on At-Grade Road

5.2. Message for event on at-grade road

As shown in Figure 5.2, main carriageway can be defined from point A to point E of both at-grade road and flyover. If incident happens on at-grade road, VMS on at-grade road shall be proposed with full graphic message and VMS on leading road (LR) / connecting road (CR) shall be proposed with text message. The stick usage and message proposal for VMS on EAC depend on the exact location of the event on at-grade, refer to the illustration below for more details.



Event location	Alert Zone	Jam Zone	Guide Zone	LR/CR 1	LR/CR 2
IR1				Depends on AER	YES
IR2				YES	No message proposal
IR3				YES	No message proposal
IR4				No message proposal	No message proposal
IR5				No message proposal	No message proposal

Figure 5.2 Message Proposal for Event on At-grade Road

5.3. Multiple events on underpass/flyover and at-grade road

Refer to KBRS Appendix DDDD FULL GRAPHIC MESSAGE STRUCTURE FOR MULTIPLE EVENTS ON EMAS ARTERIAL (d and e) for Multiple IR on both Underpass/Flyover and At-grade Road with/without Jam. Note that in the scenario with jam, the reference road of text message should base on the event that causes the jam.



6. Advisory for alternate route

Advisory for 'Use Alternate Route' is to be provided as an UI feature for Ops to decide if to include for major incident in guide zone message for expressway, EMAS arterial, and defined super corridor. The last line of guide zone message will be replaced by the advisory of 'Use Alternate Route'. Refer to Appendix 14.2for details.



Figure 6.1 Standard KB Message Proposal for Guide Zone



Figure 6.2 Enable Advisory for Alternate Route for Guide Zone

7. Tunnel fire plan (CTE tunnel & short tunnel)

7.1. Overview

The plan for fire case consists of 2 parts: inside tunnel and outside tunnel, as shown in Figure 7.1 below:

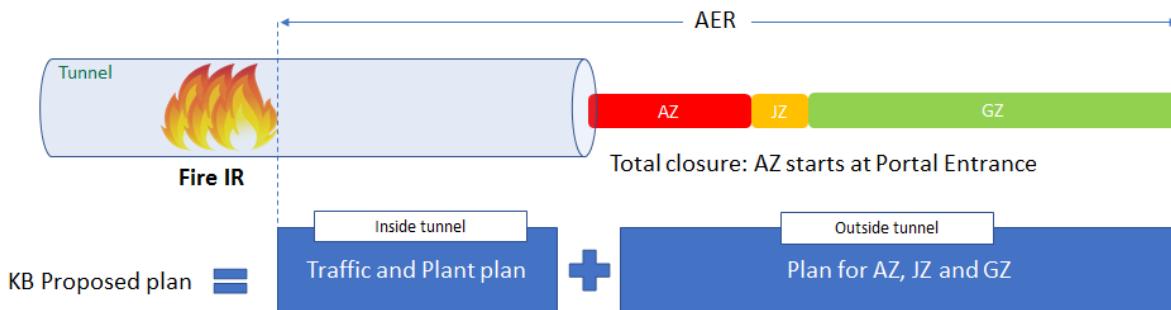


Figure 7.1 Fire IR KB Proposal Overview

7.2. Traffic and plant plan

7.2.1. Tunnel closure in fire IR

Table 7.1 Tunnel Closure in Fire IR

Fire IR Location	CTE Tunnel	Short Tunnel
Entrance	Close affected entrance	Total closure
Exit	Total closure	Total closure
Main Carriageway	Total closure	Total closure

7.2.2. Default traffic and plant plan

Current pre-defined traffic plan and plant plan in i-transport 1.0 will be integrated into the knowledge base (KB) of i-transport 2.0 as the default plan proposed by KB for fire incidents. Fire Pre-defined Plan (Fire PP)

Fire Pre-define Plan (as known as PP) is a set of pre-defined traffic plan and plant plan based on fire zone in PP Library. Ops have the access to modify the PP and save in PP library but no access to execute PP from PP library. When a fire IR happens, Ops can choose to override the KB proposed I-TRANSPORT traffic plan and plant plan with the ones from PP library (tied to fire zone) within IR, without affecting PP library. Refer to Appendix 14.5 for more details.

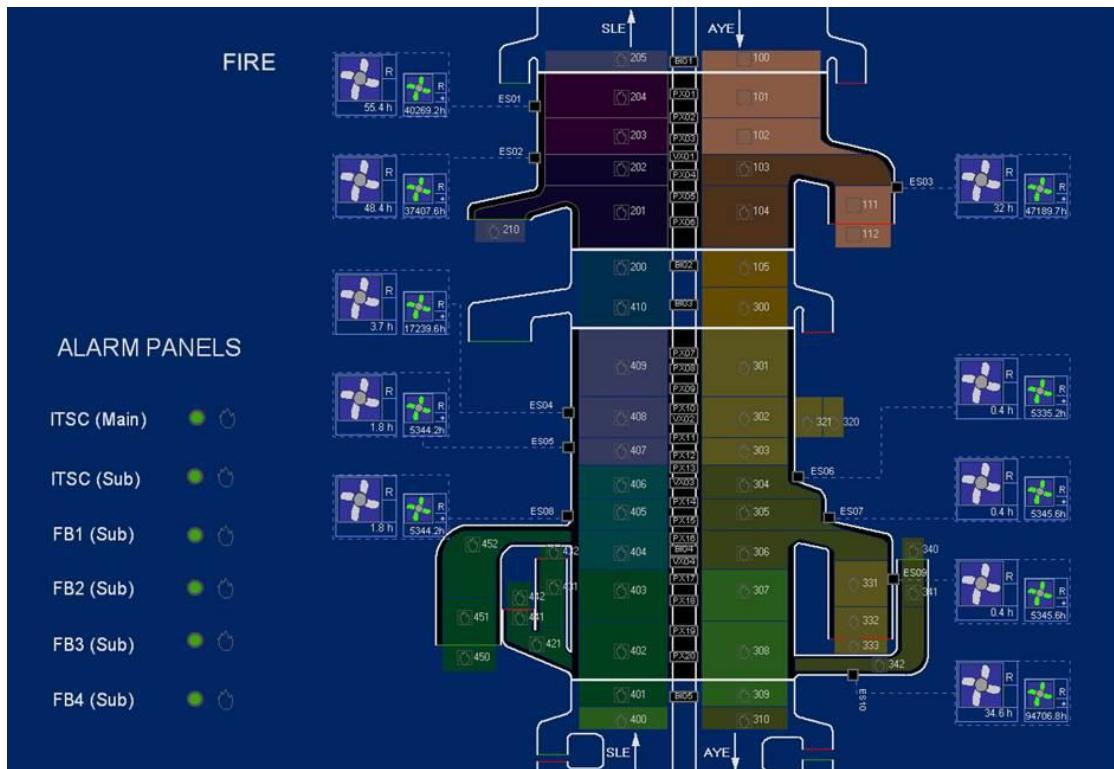


Figure 7.2 Fire Zone of CTE Tunnel

7.2.3. CTE LUS plan (part of traffic plan)

LUS plan to be proposed by system as part of traffic plan for fire in tunnel main carriageway is summarized as below:

- 1) LUS on incident bound upstream of incident location: red
- 2) LUS on non-incident bound lane 1 full stretch: red
- 3) 2 rows of LUS at the nearest PX/VX upstream of incident on non-incident bound: flash amber

For fire happens at CTE tunnel entrance / exit, LUS on non-incident bound will not be activated to red.

Refer to Appendix 14.3 for more details of CTE Tunnel LUS plan.

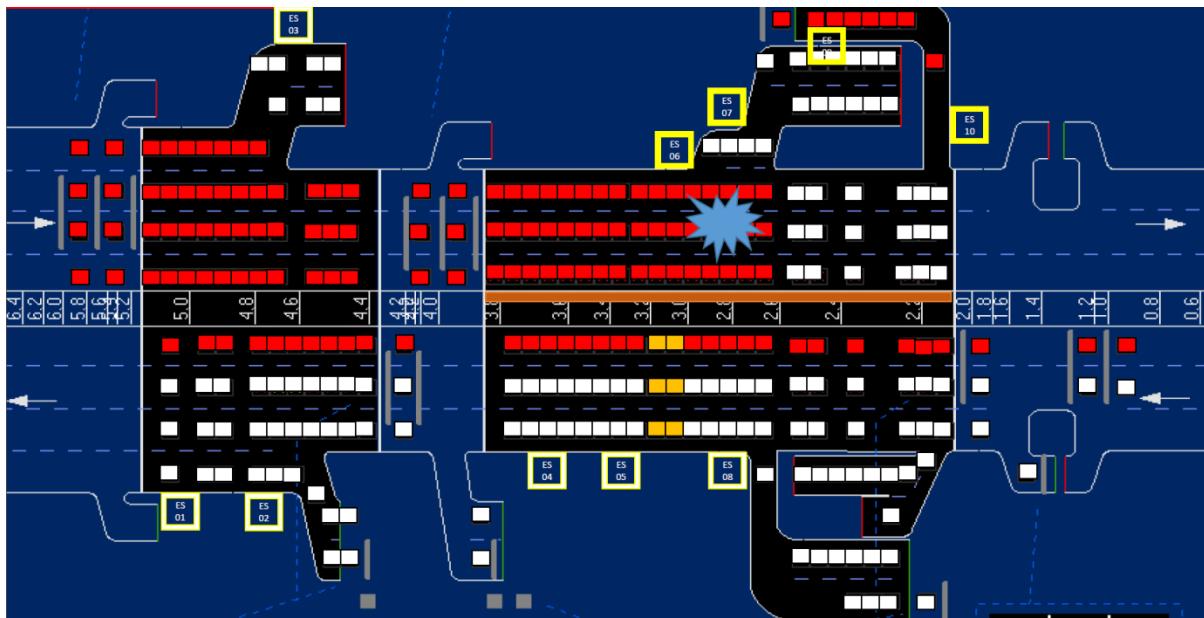


Figure 7.3 LUS Plan Illustration for CTE Tunnel

7.2.4. Mass editing of PP

Ops has the flexibility to select and visualize the selection of equipment by PP or by equipment type, the change shall be applied to all the selected equipment.

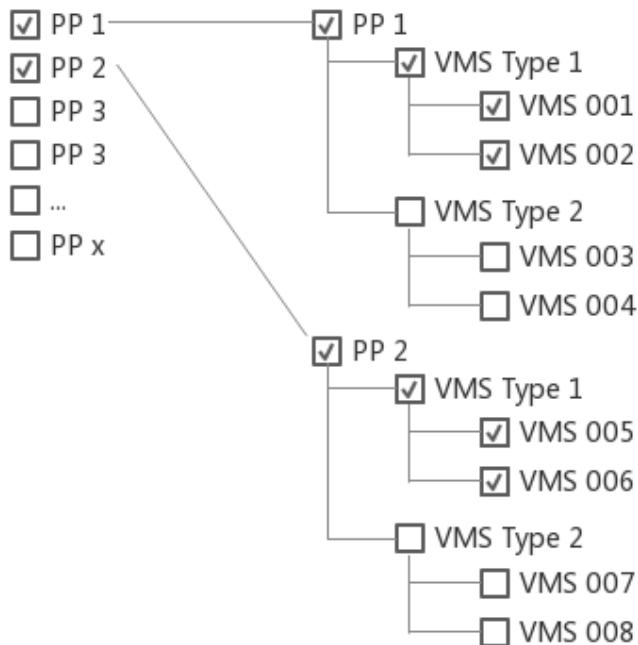


Figure 7.4 Illustration for Pre-defined Plan Mass Editing

7.3. VMS message

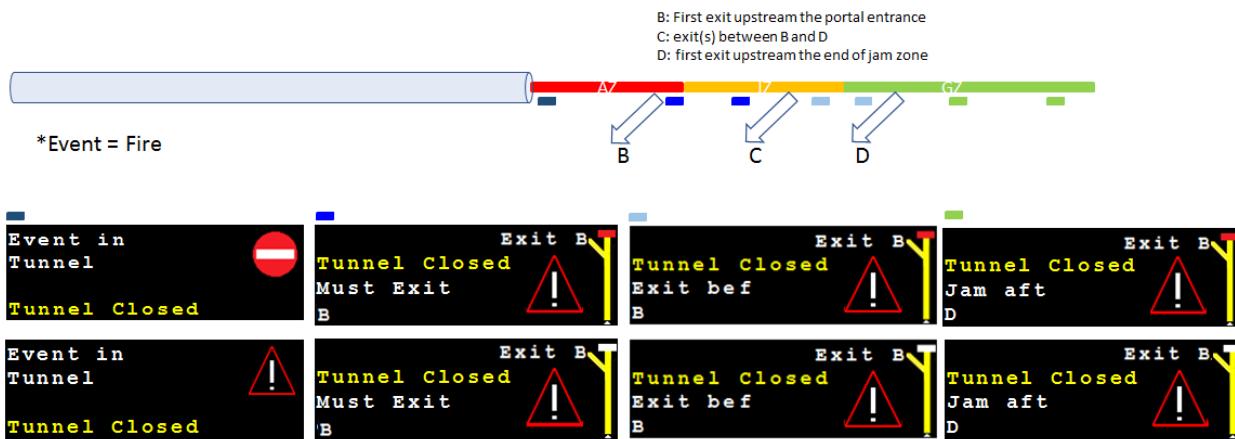


Figure 7.5 CTE Tunnel VMS Message - Fire IR – Incident Bound

Refer to Appendix 14.4 or tunnel fire case in CTE tunnel VMS message outside tunnel for both incident bound and non-incident bound.

7.4. Canning message

The rules for fire case canning message are:

- 1) Specific to event type: fire
- 2) Use full spelling for short tunnel
 - FCT: Fort Canning Tunnel
 - WVT: Woodsville Tunnel
 - SGT: Sentosa Gateway Tunnel (regardless of SGW/SGL/SGK)
- 3) For KPE/MCE, if fire happens in KPE, use 'KPE and MCE tunnel closed'; if fire happens in MCE, use 'MCE and KPE tunnel closed'.

Refer to Appendix 14.6 for more details of fire case canning message.

8. GLIDE control for expressway exit

8.1. Affected GLIDE site

Current KB proposes 4% increment for affected phase lasting for 15 minutes for 1 immediate GLIDE site all the exits within the incident congestion range (alert zone + jam zone). The new rule covers 1 immediate GLIDE site of all the exits within whole affected equipment range (AER).

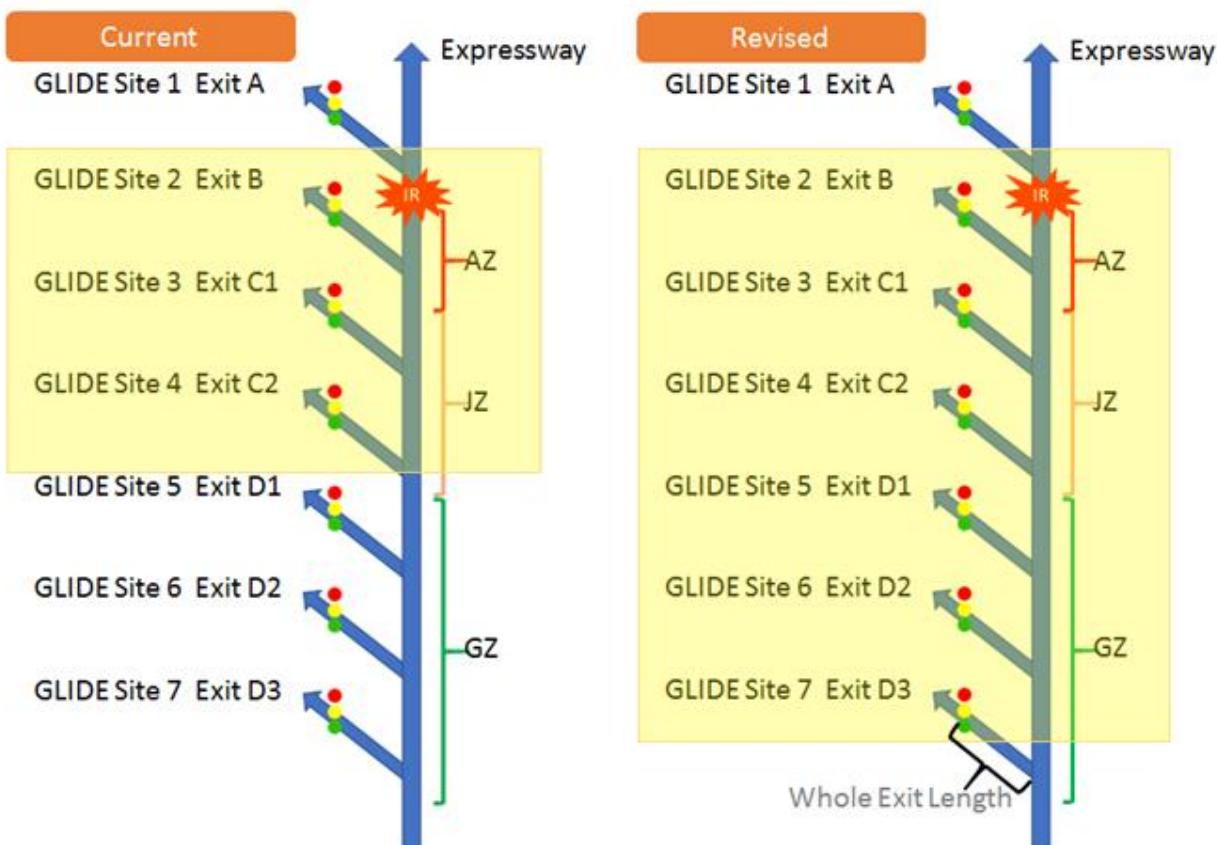


Figure 8.1 Affected GLIDE Site at Expressway Exit

8.2. GLIDE plan

The current KB proposal is seldom implemented because the actual traffic situation of those GLIDE sites cannot be visualized by Ops. The event on expressway may or may not cause congestion on the junctions on expressway exit. The details of GLIDE plan for expressway exit are summarized as below:

- 1) 4% increment for affected phase for 15 minutes
- 2) System to propose the plan above only when average link speed of the whole exit length fall in to dark red range (<20km/h) for a time period (configurable). The definition of average link speed of the whole exit length is as shown in Figure 8.2.

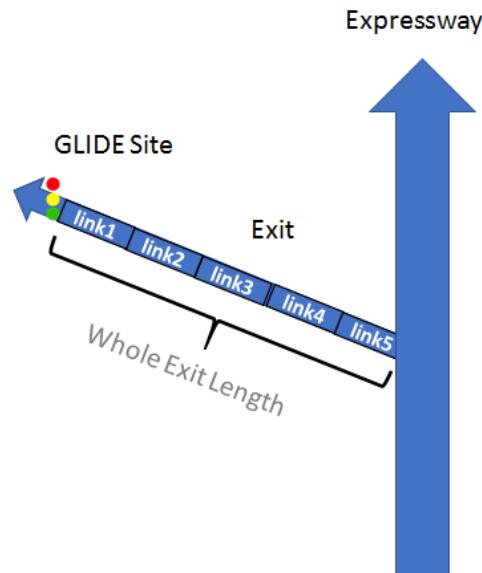


Figure 8.2 Illustration of Whole Exit Length

- 3) If speed is still in dark red range after 15 minutes with 4% increment in affected phase timing, system to automatically propose GLIDE plan with additional 4% for 15 minutes until the increment meets the upper bound of increment which is 12%.

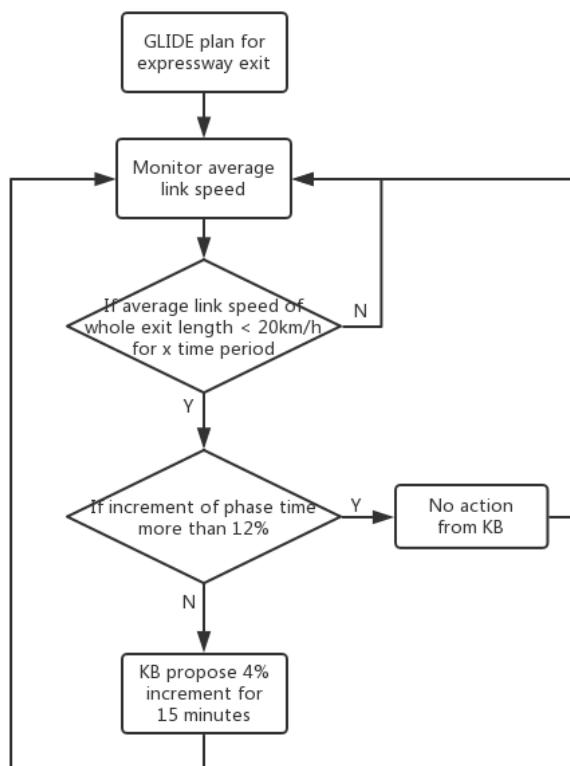


Figure 8.3 Logic to Propose GLIDE Plan for Expressway Exit

9. Train disruption

9.1. Train disruption IR creation

MRT disruption for unplanned event refers to the ad-hoc train fault, planned train disruption will be covered in planned event chapter. The IR creation page for train disruption is different from other incident type, Ops needs to input the following information to create a train disruption IR:

- 1) MRT / LRT line
- 2) Start station
- 3) End station
- 4) If affect both direction
- 5) Train fault reason
- 6) If free bus activated
- 7) If bus bridging service activated

Multiple linked IR is not applicable for train disruption IR.

9.2. System responsibility for train disruption

9.2.1. Populate bus bridging route

System shall automatically populate bus bridging route along the affected train stretch with direction. In TT231 phase 1, full stretch of bus bridging route will be displayed in train disruption IR as an overlay on GIS with the start and end station highlighted. In phase 2, bus bridging route information might be obtained through Authority Information Hub (AIH) interface. The affected bus bridging route stretch will be displayed instead of the full bus bridging route.

9.2.2. Identify and highlight GLIDE junction hotspot

Hotspot along the bus bridging route shall be highlighted so that Ops can better monitor the junction and the traffic situation nearby. The criteria to identify hotspot can be based on historical unusual congestion detection, junction delay and etc. Details shall be further discussed in design stage.



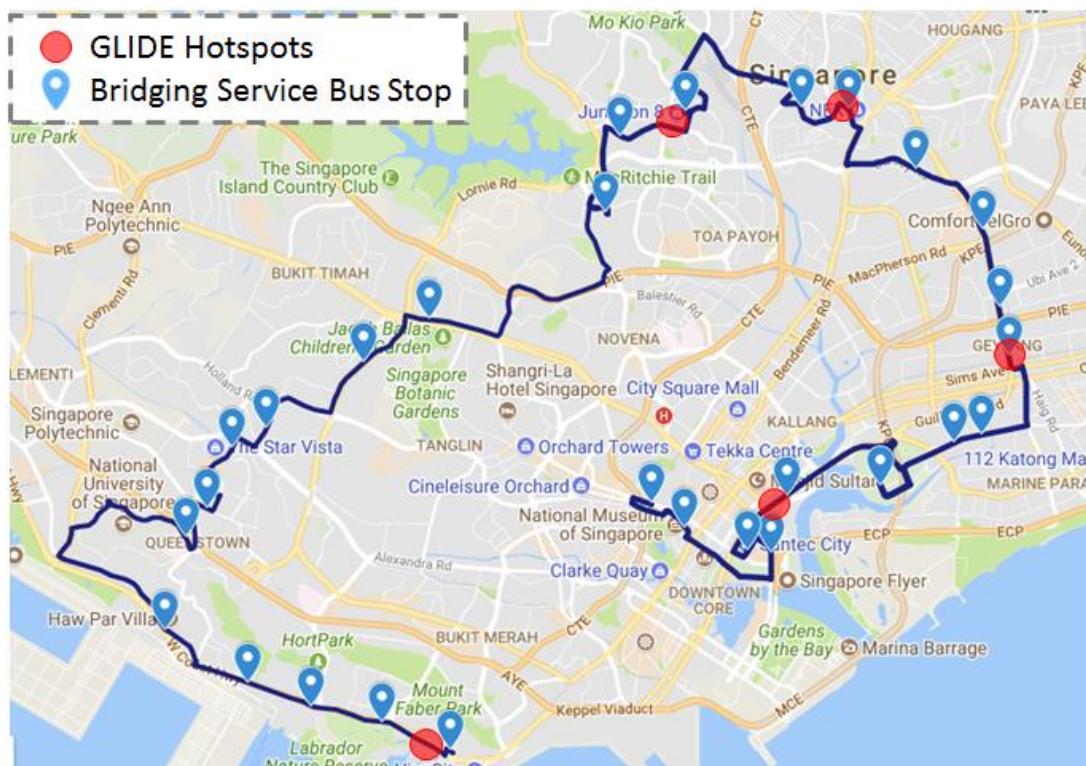


Figure 9.1 Bus Bridging Route and GLIDE Hotspots

9.2.3. Radio broadcast

Radio broadcast for train disruption shall be generated from IR with the flexibility to be edited and be sent to MediaCorp via email server in i-transport system or through the existing dissemination link to MediaCorp. The dissemination method will be confirmed during design stage. Refer to Appendix 14.7 for radio broadcast template for train disruption. The template shall be editable and can be saved.

9.3. Traffic monitoring for train disruption

Any congestion that considered as related to train disruption by Ops can be created as normal heavy traffic sub-IR then related to train disruption IR for better management and easier analysis of the traffic impact. The sub-IR can only be heavy traffic. VMS message, One Motoring message and Twitter message for heavy traffic sub-IR will be proposed as usual.

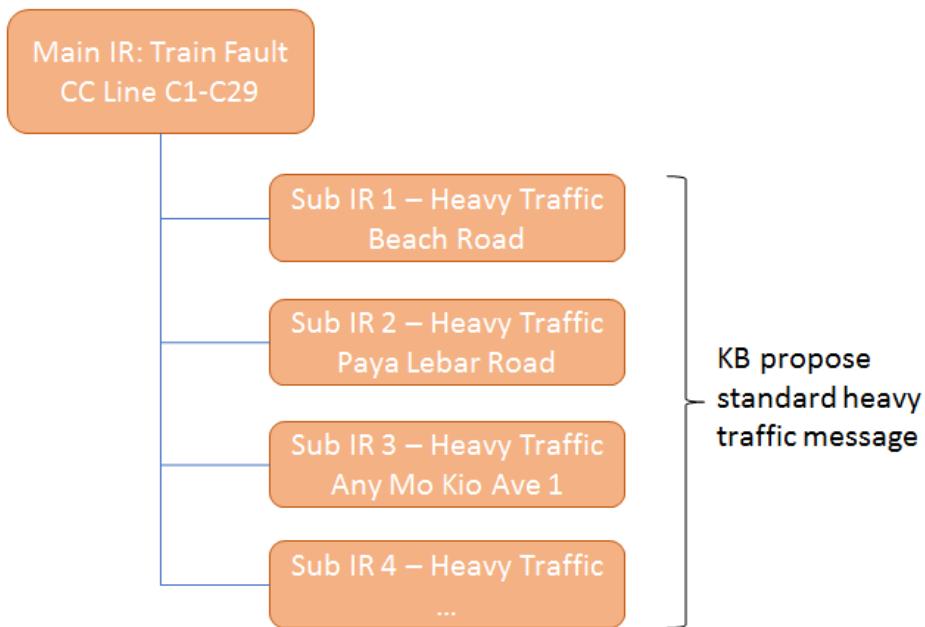


Figure 9.2 Traffic Situation Monitoring for Train Disruption

10. Multiple congestion end point

10.1. Overview

When congestion caused by incident spreads to adjoining roads, Ops have to create multiple heavy traffic incident record at the joint point to monitor the traffic situation. The relationship between the main incident and heavy traffic on adjoining road are not reflected in the system. The heavy traffic IR on adjoining roads only informs motorist the congestion to the joint point, the congestion information of the main incident location is not shown on the VMS on adjoining road because the heavy traffic starts from joint point only.



Figure 10.1 Current OCC Practice to Monitor Multiple Congestion

By having the multiple congestion end point concepts:

- 1) only 1 IR is needed even if the congestion spread to various branches
- 2) the correlation between the main incident and the congestions are recorded in single IR for easier reporting or incident analysis
- 3) congestion end point are automatically proposed by system for Ops's verification
- 4) the message on adjoining road will display the main incident message with the congestion info

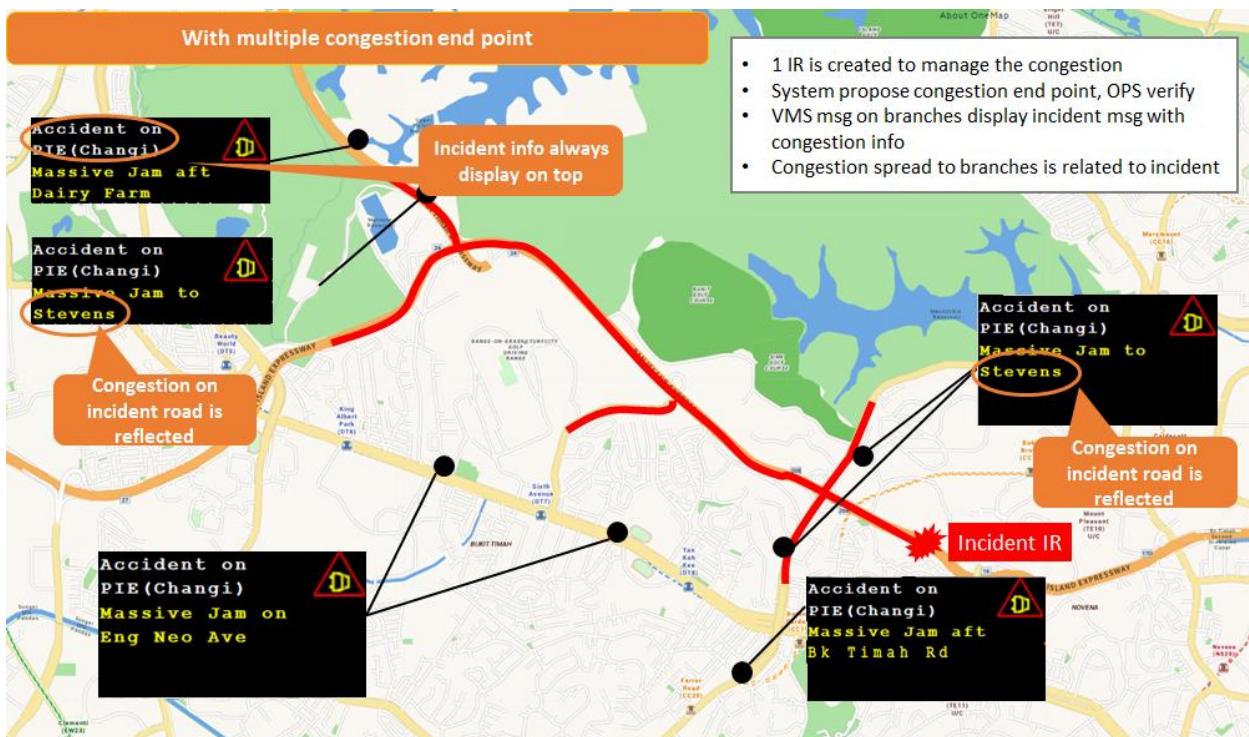


Figure 10.2 After Adopting Multiple Congestion End Point Concept

10.2. Event location to enable multiple congestion end point

Multiple congestion end points shall only be proposed for the events on expressway, EMAS arterial road or super corridor, and spread to expressway, EMAS arterial road, arterial road directly link to the road of event.

System shall stop searching for new congestion end point when congestion spread over to the second level of congestion branch, which has no direct link to the road of location.

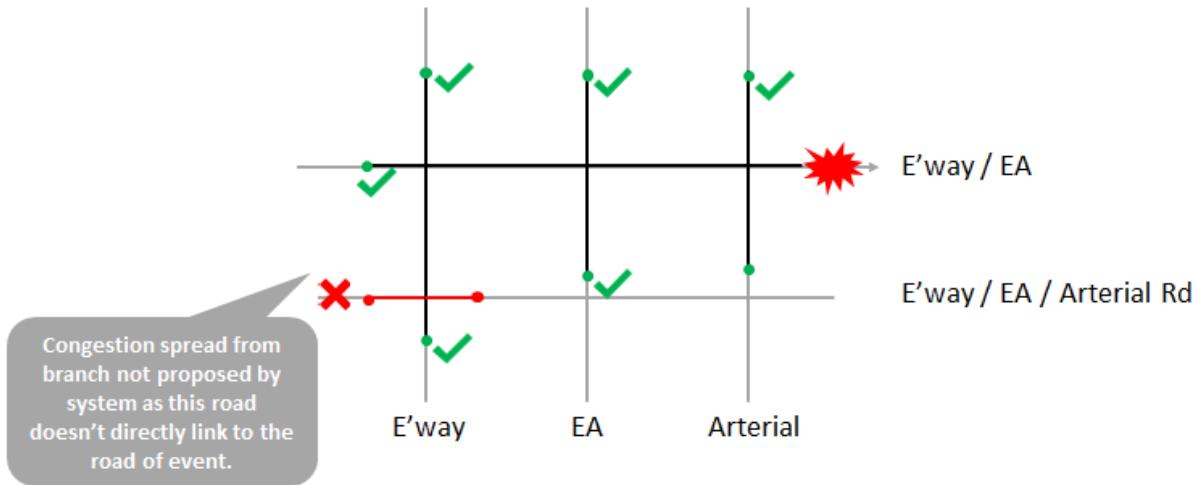


Figure 10.3 Situation that Multiple Congestion End Point Concept is Not Applicable for

10.3. Mechanism to propose congestion end point

System will propose congestion end point for IR with the logic below:

- 1) System starts searching the upstream link whose fused speed is greater than threshold (configurable, 20km/h for expressway, 10km/h for EMAS arterial, tally with dark red speed band). System stops searching on the branch once the 1st link that meets the criteria is found, link 1 & 2 in Figure 10.4.
- 2) System examines the fused speed and searches for new congestion end point every 5 minutes.
- 3) The immediate link downstream of link 1 & 2, which refers to link 3 & 4, are recognized as the end of congestion.
- 4) The upstream link includes the upstream link of the road itself and the expressway or EMAS arterial road that directly link to the road of event.
- 5) Check if the path distance from end of congestion to the event location is greater than distance threshold (configurable, 500m for expressway, 250m for EMAS arterial, for super corridor, the threshold will be based on the incident location. For incident happen on arterial road and EA, will use 250m as threshold, incident on expressway will use 500m as threshold.).

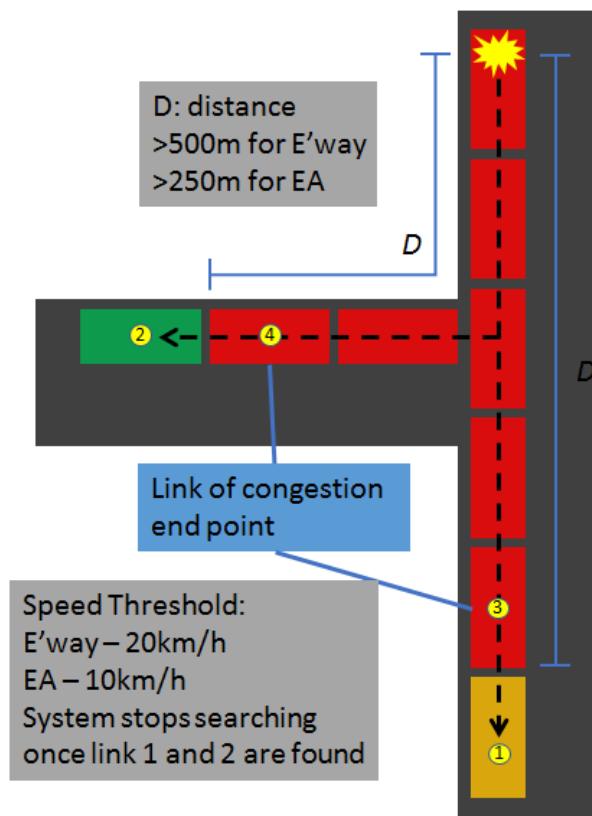


Figure 10.4 Mechanism to Propose Congestion End Point

- 6) System translates link ID to km mark with road name, proposes new congestion end point to Ops by highlighting the IR.
- 7) Ops to verify and confirm the new congestion end point.
- 8) System to refresh the plan upon confirmation of new congestion end point.

10.4. New congestion end point information

The details to be included in the newly proposed congestion end point are:

- 1) Start time
- 2) End time
- 3) Road name
- 4) Direction
- 5) KM mark

10.5. Adjoining road affected equipment range

Affected equipment range for the congestion of the road (expressway / EMAS arterial / super corridor) of incident follows standard KB rule. For the congestion spread to adjoining road, jam zone for adjoining road starts from joint point and ends at the end of congestion. Guide zone follows standard KB affected equipment range (AER), depending on the road type of adjoining road.



Figure 10.5 Affected Equipment Range for Adjoining Road

10.6. Adjoining road message

Adjoining road (branches of congestion) message shall reflect both:

- 1) the incident that cause the congestion
- 2) The actual congestion condition on the road of incident (jam to Exit A). Refer to KBRS Appendix B DEFINITION OF LOCATIONS AND SHORT FORMS IN VMS MESSAGES for the definition of Exit A.

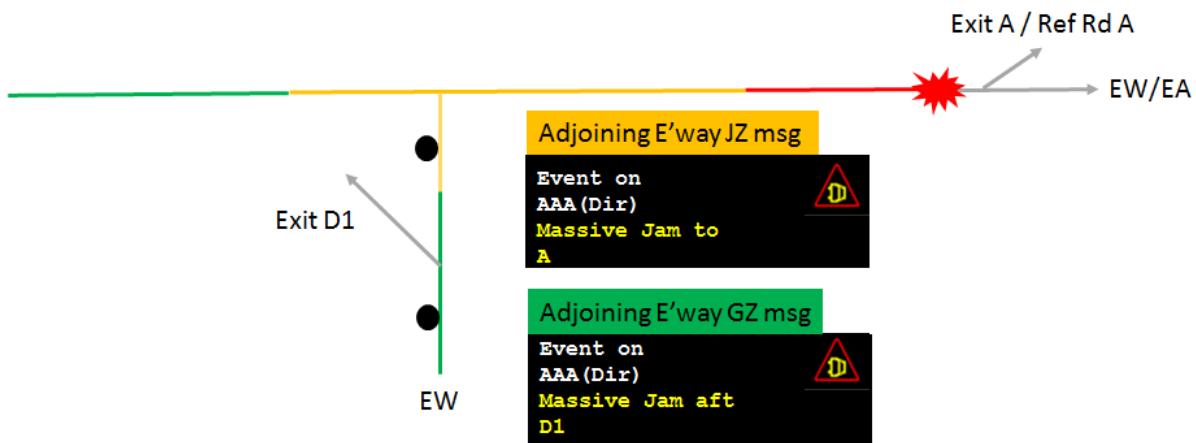


Figure 10.6 Adjoining Expressway VMS Message Structure When Congestion Spread to Adjoining Expressway

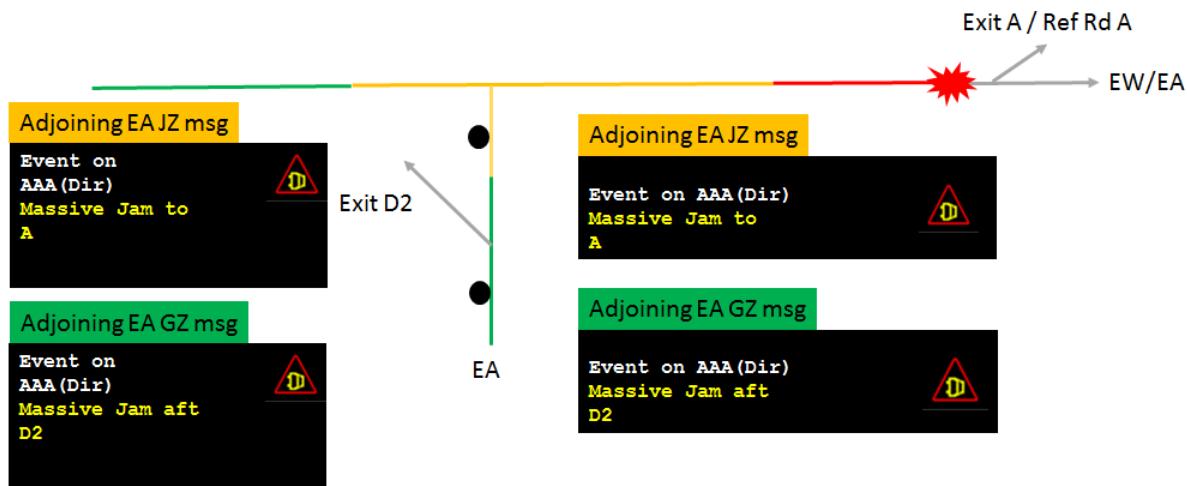


Figure 10.7 Adjoining EA VMS Message Structure When Congestion Spread to EA

11. Multiple linked IR

11.1. Event location to enable multiple linked IR

Multiple linked IR is only applicable for the events along the same:

- 1) Expressway
- 2) EMAS Arterial Corridor (EAC)
- 3) Defined Super Corridor

11.2. Affected equipment range (AER) priority

When there is overlapping in affected equipment range, alert zone message always has higher priority than jam zone message, and jam zone message always has higher priority than guide zone message. As shown in Figure 11.1 below:

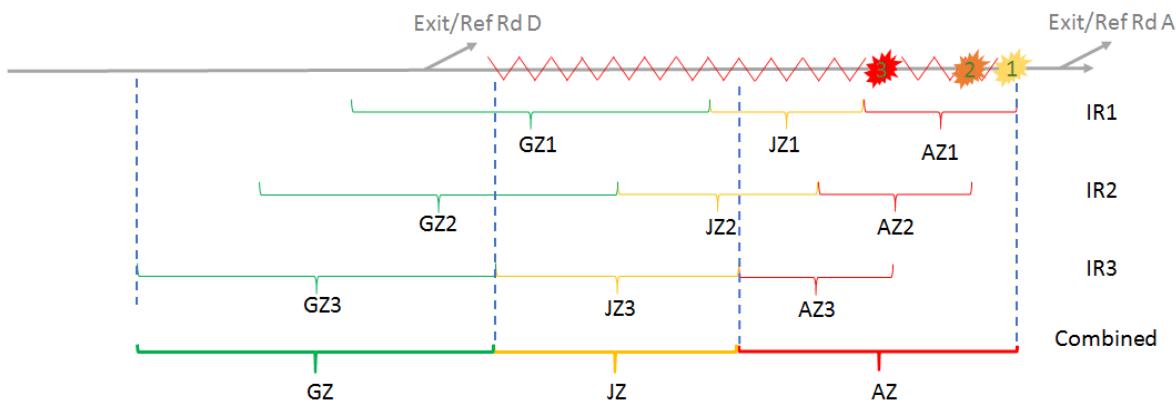


Figure 11.1 Illustration for Combined AER of Linked Events

11.3. Message content

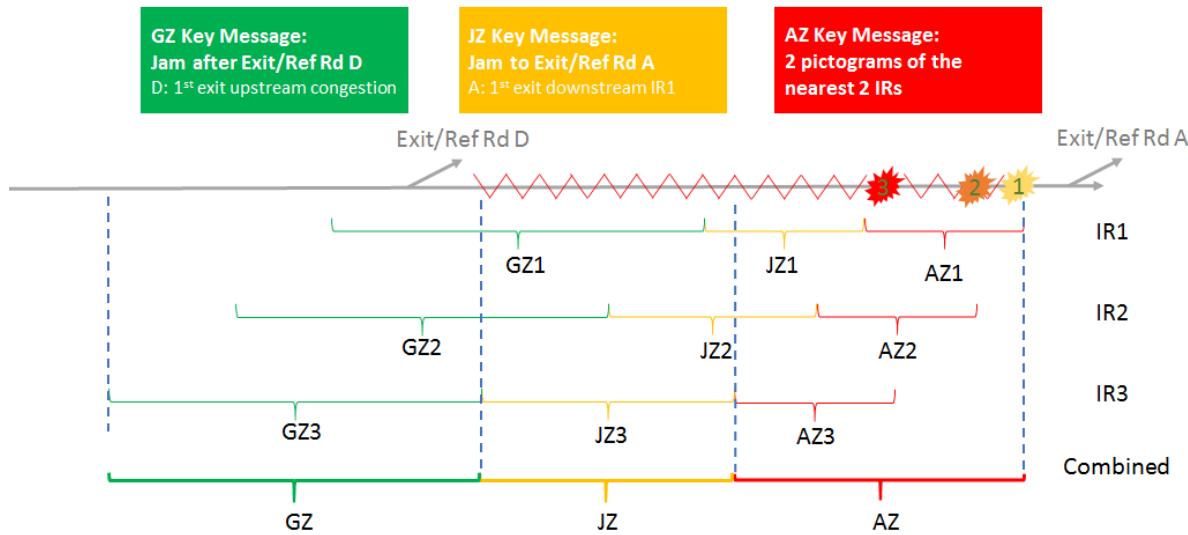


Figure 11.2 Key Message Information of VMS on Road of Event for Linked Events

- 1) Combined alert zone: 2 pictograms of nearest 2 IRs.
- 2) Combined jam zone: 1 pictogram of the nearest downstream IR and message of 'Jam to Exit A'
- 3) Combined guide zone: 1 pictogram of the nearest downstream IR and message of 'Jam to Exit D'. Refer to KBRs Appendix B DEFINITION OF LOCATIONS AND SHORT FORMS IN VMS MESSAGES for the definition of Exit A.



Figure 11.3 Alert Zone Message of VMS on Road of Event for Linked Events

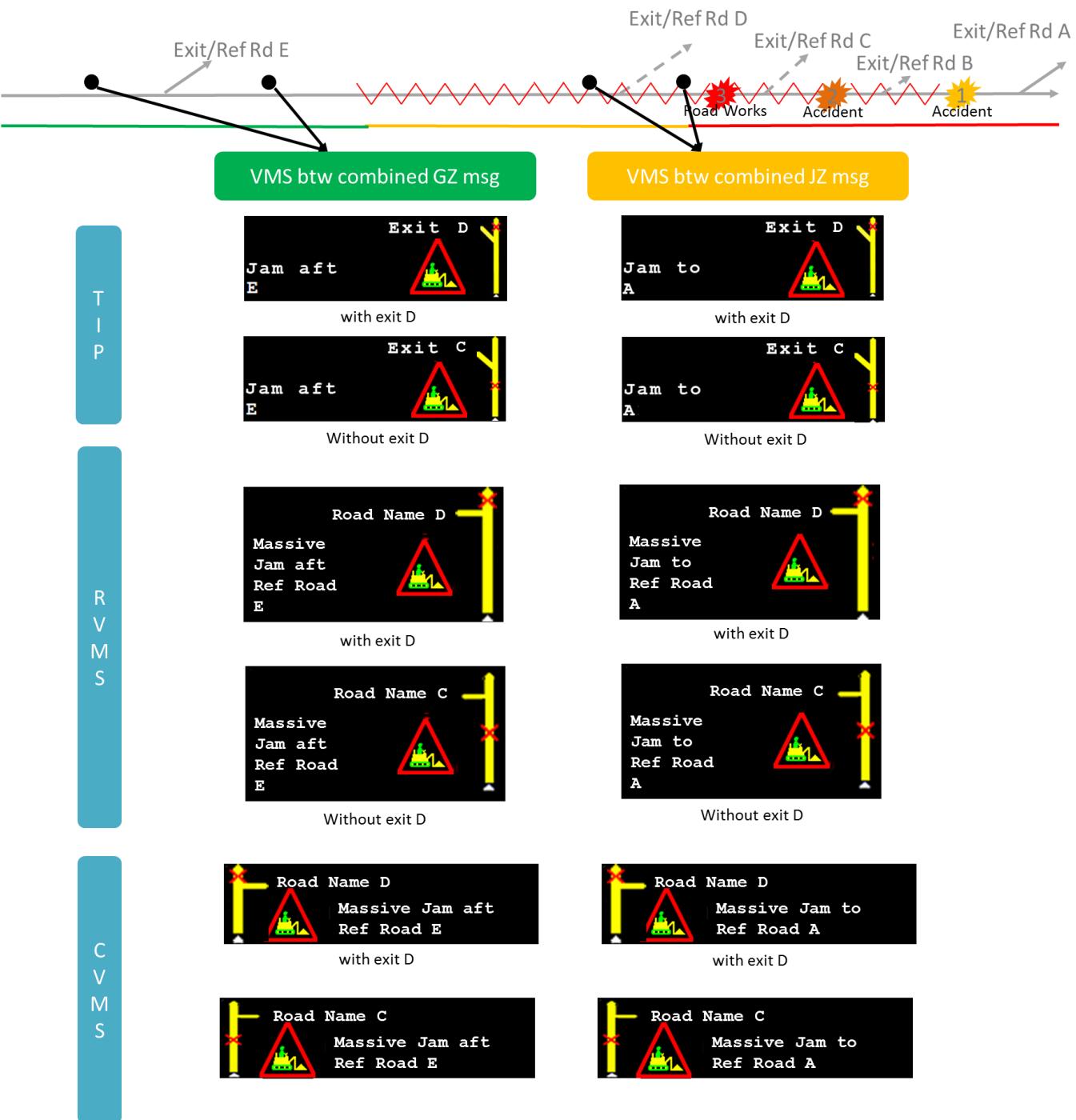


Figure 11.4 Jam / Guide Zone Message of VMS on Road of Event for Linked Events

11.4. Multiple congestion end point case

For linked events with multiple congestion points, when congestion spread to adjoining road, adjoining jam zone VMS shall display the congestion to the exit A of the most downstream IR, adjoining guide zone VMS shall display the congestion after the exit D of the adjoining road.

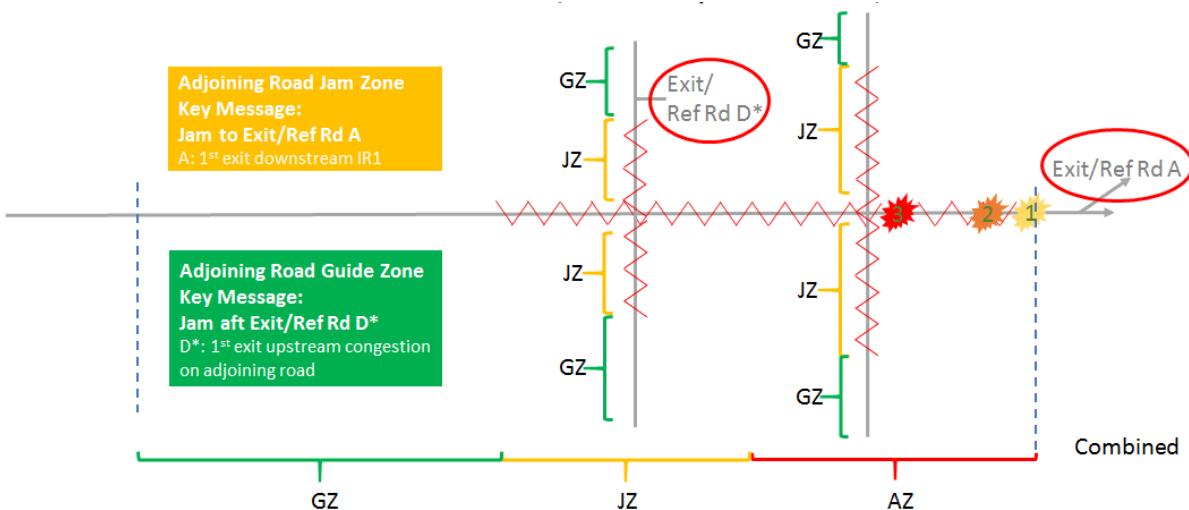


Figure 11.5 Key Message Information of VMS on Adjoining Roads for Linked Events

12. Plan for slow moving vehicle

The location of slow moving vehicle for mobile road works like plant watering and litter picking are trackable via the location information from ERP2. KB shall propose based on real-time location information to broadcast road conditions to motorists to ensure safety of both motorists and contractors. Affected equipment shall change accordingly in the defined concept as the mobile roadworks move.

12.1. Affected Equipment Range (AER)

The affected equipment range for slow moving vehicle will be based on the number of VMS downstream and upstream the vehicle, as shown in Figure 12.1 below. AER by default is 2 upstream plus 2 downstream VMS (pending confirmation from LTA), the number of downstream and upstream VMS is configurable.

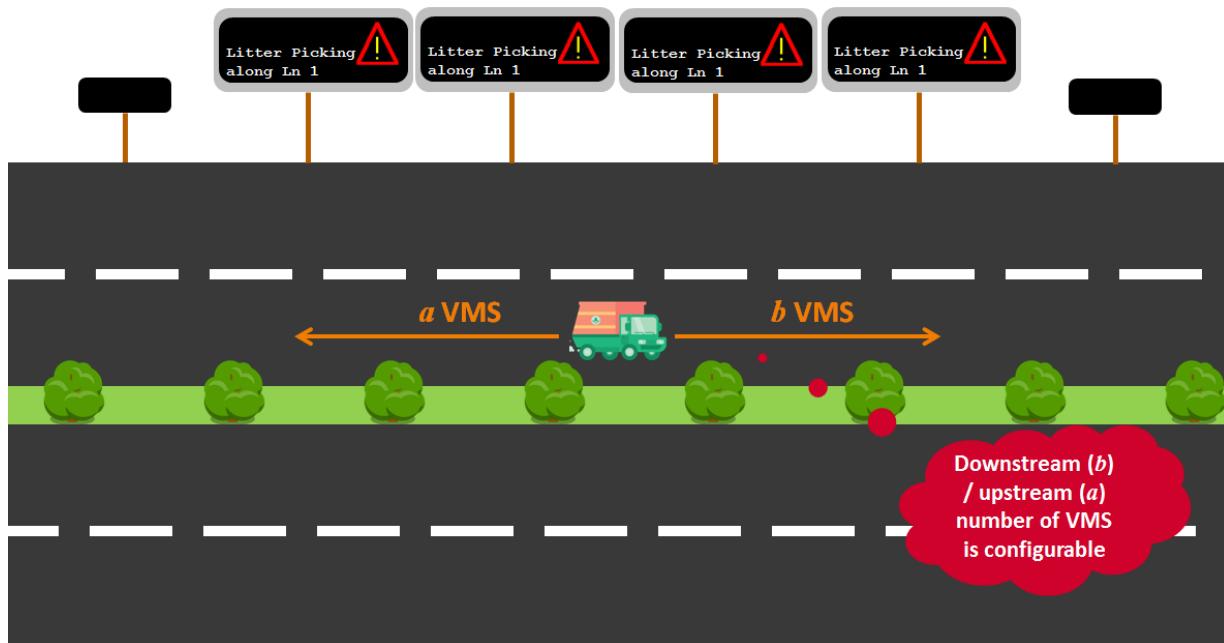


Figure 12.1 Affected Equipment Range for Slow Moving Vehicle

12.2. VMS message content

The mobile road works types are:

- 1) Plant Watering
- 2) Litter Picking
- 3) Road Sweeping
- 4) Tunnel Washing

Refer to Figure 12.2 for more details of VMS messages.

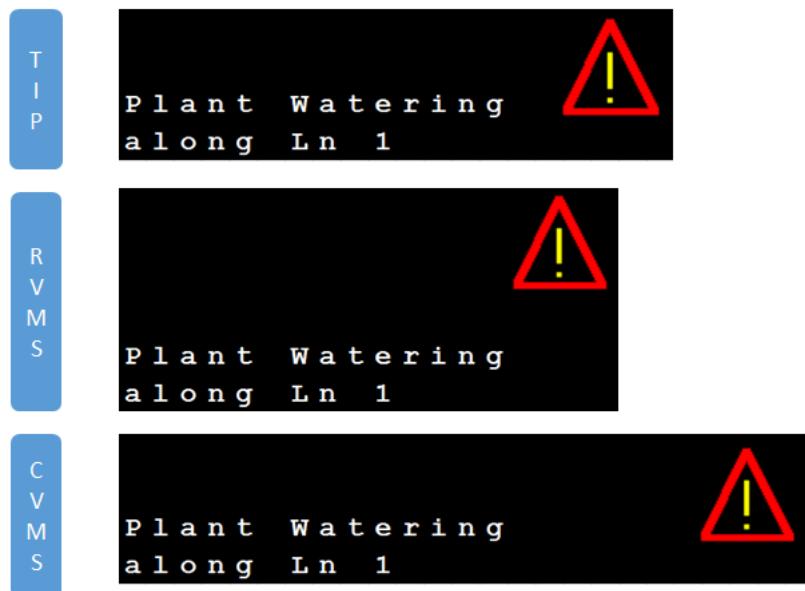


Figure 12.2 VMS Message Template for Mobile Road Works

13. Extended event on KPE/MCE

Events happen on KPE/MCE are managed separately by KPE/MCE OCC separately. When incident happen on KPE/MCE affecting adjoining expressway, ITSC OCC to create heavy traffic IR and relate to KPE/MCE IR. When incident happen near ITSC boundary affecting KPE/MCE, adjoining expressway IR for KPE/MCE with proposed messages will be automatically populated. Details of rules are as below.

13.1. Event on KPE/MCE affecting adjoining ITSC expressway

13.1.1. No congestion spread to adjoining expressway

When there is no congestion spread from KPE/MCE to adjoining ITSC expressway, the affect equipment range (AER) of ITSC adjoining expressway (AE) follow 2/2 rule, message follow Appendix E (NEW VMS (TIP, TTP AND TSP) LOGIC FOR EVENT (ACCIDENT) ON OPEN EXPRESSWAY, NON-TOTAL CLOSURE EVENT ON OPEN EXPRESSWAY) and L (NEW VMS (TIP, TTP AND TSP) LOGIC FOR EVENT (ACCIDENT) ON OPEN EXPRESSWAY, TOTAL CLOSURE EVENT ON OPEN EXPRESSWAY) of KBRS adjoining expressway section. The key information of the message is to inform motorist the incident and the congestion (if any) on KPE/MCE. For the VMS on AYE within guide zone, standard KB rule for message applies because AYE-MCE-KPE is a defined super corridor, and AER extends from KPE/MCE to AYE.

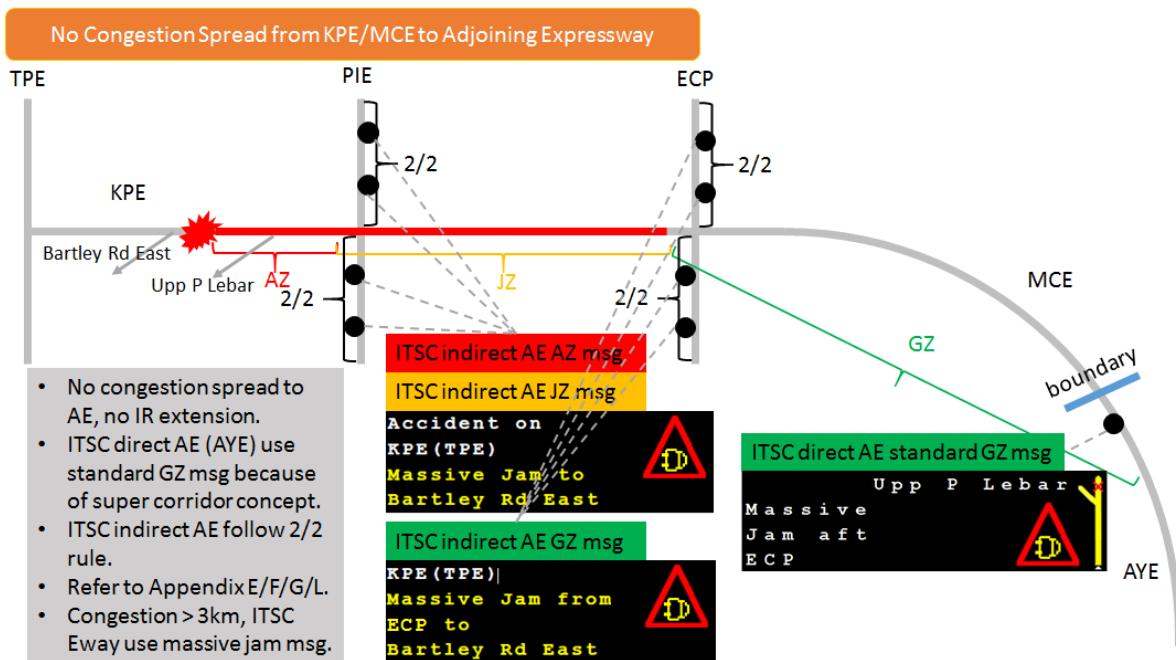


Figure 13.1 Event on KPE/MCE, No Congestion Spread to Adjoining Expressway

13.1.2. Congestion spread to adjoining expressway with direct entry/exit

The only adjoining expressway with direct entry/exit of KPE/MCE is AYE. For the VMS on AYE within jam zone and guide zone, standard KB rule for message (Appendix E NEW VMS (TIP, TTP AND TSP) LOGIC FOR EVENT (ACCIDENT) ON OPEN EXPRESSWAY, NON-TOTAL CLOSURE EVENT ON OPEN EXPRESSWAY) applies because AYE-MCE-KPE is a defined super corridor, and AER extends from KPE/MCE to AYE.

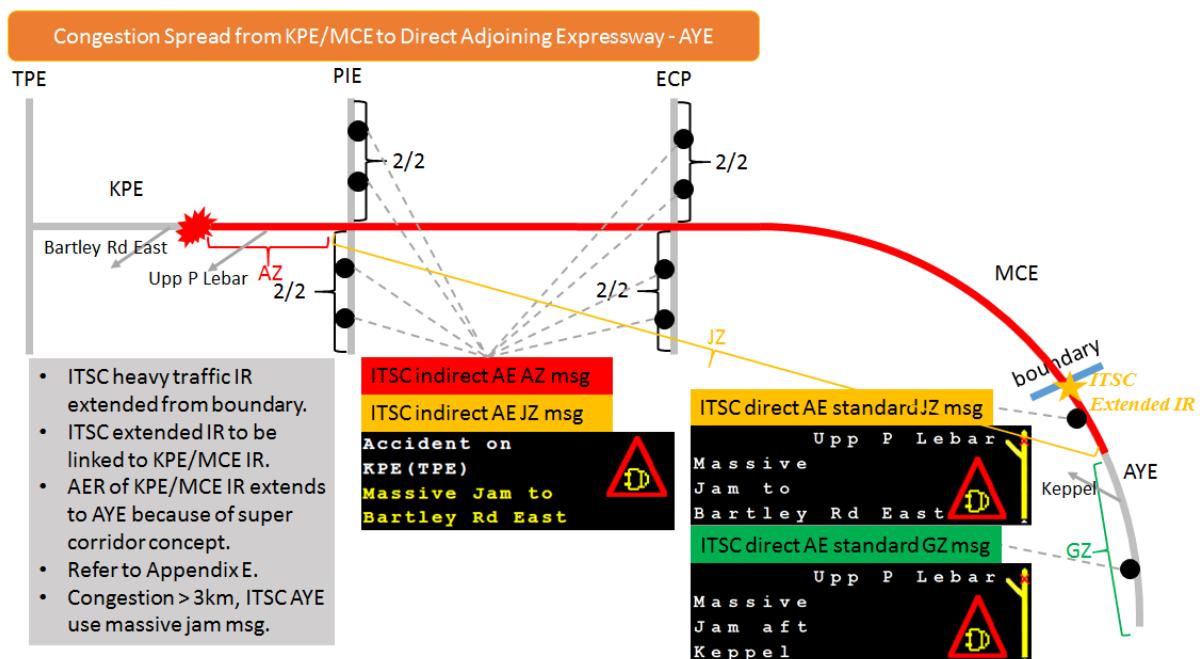


Figure 13.2 Event on KPE/MCE, Congestion Spread to Adjoining Expressway with Direct Entry/Exit

13.1.3. Congestion spread to adjoining expressway with indirect entry/exit

The adjoining expressways with indirect entry/exit of KPE/MCE are TPE, PIE and ECP. None of the 3 expressways are defined as super corridor with KPE/MCE but congestion can still be extended to adjoining expressway according to multiple congestion end point concepts. . Jam zone for adjoining expressway starts from joint point and ends at congestion end point, guide zone follows 3/3 rule starting from the congestion end point. Adjoining expressway jam zone uses message of 'Jam to Exit A of KPE/MCE IR' and adjoining expressway guide zone uses message of 'Jam to Exit D of Adjoining Expressway Exit D'. Exit A refers to the immediate exit downstream the event location. Exit D refers to the immediate exit upstream the end of the queue.

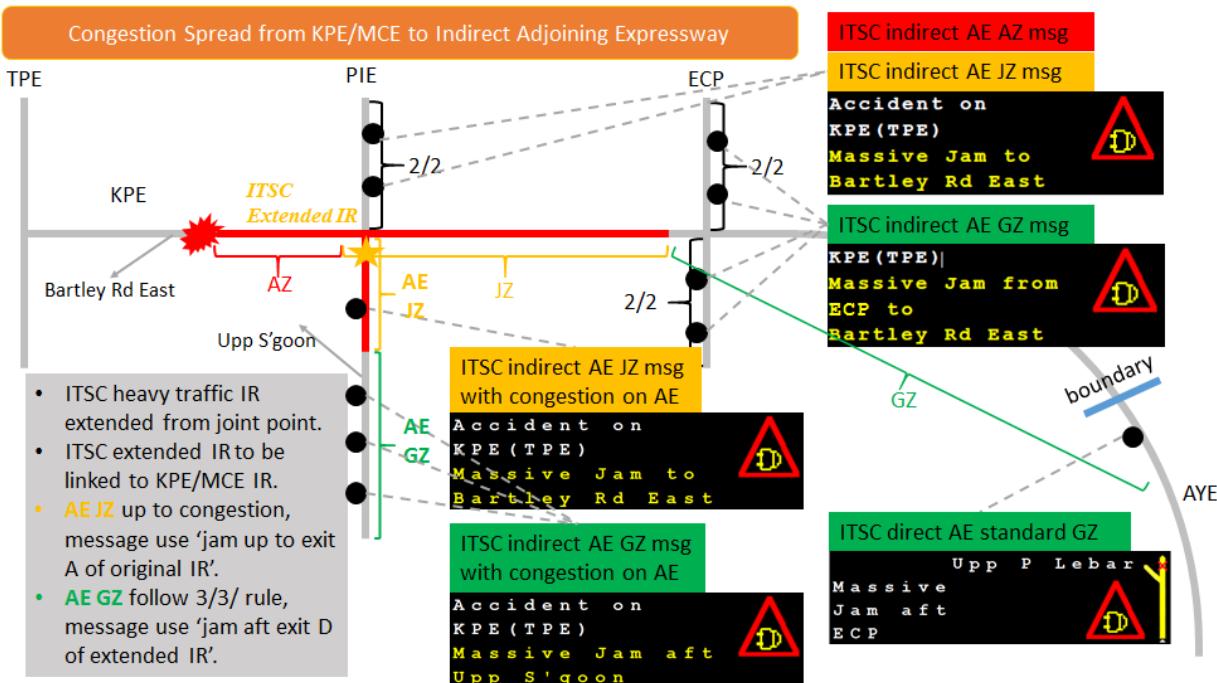


Figure 13.3 Event on KPE/MCE, Congestion Spread to Adjoining Expressway with Indirect Entry/Exit

13.2. Event on ITSC expressway affecting KPE/MCE

13.2.1. Events on adjoining expressway of KPE/MCE with direct entry/exit

When event happens on AYE, 1 adjoining expressway IR for KPE/MCE shall be automatically populated with proposed message. Full range of affected equipment range (AER) for events on expressway shall apply, extending to KPE/MCE based on super corridor concept.

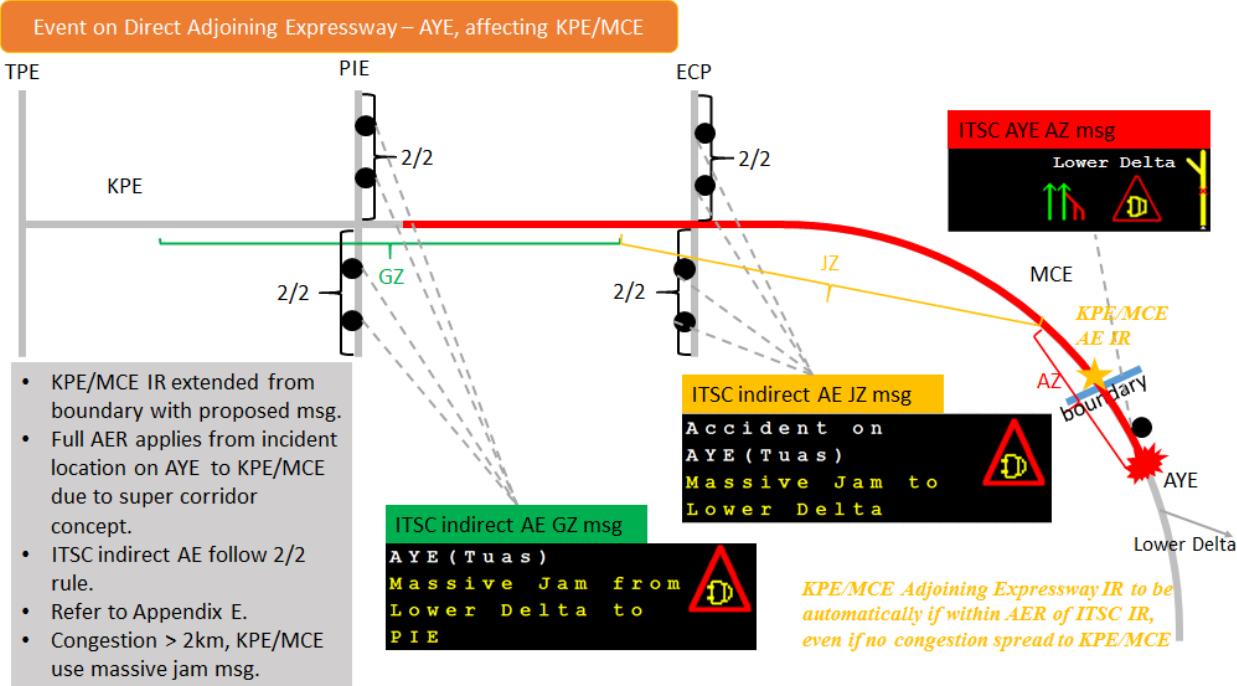


Figure 13.4 Event on Direct Adjoining Expressway – AYE, affecting KPE/MCE

13.2.2. Events on adjoining expressway of KPE/MCE with indirect entry/exit

When incident happens near ITSC boundary, 2 adjoining expressway IRs for KPE/MCE, one for each direction affected, shall be automatically populated with proposed messages. KPE/MCE OCC shall adjust the congestion on KPE/MCE (if any) in the adjoining expressway IR to reflect the actual AER for messages.

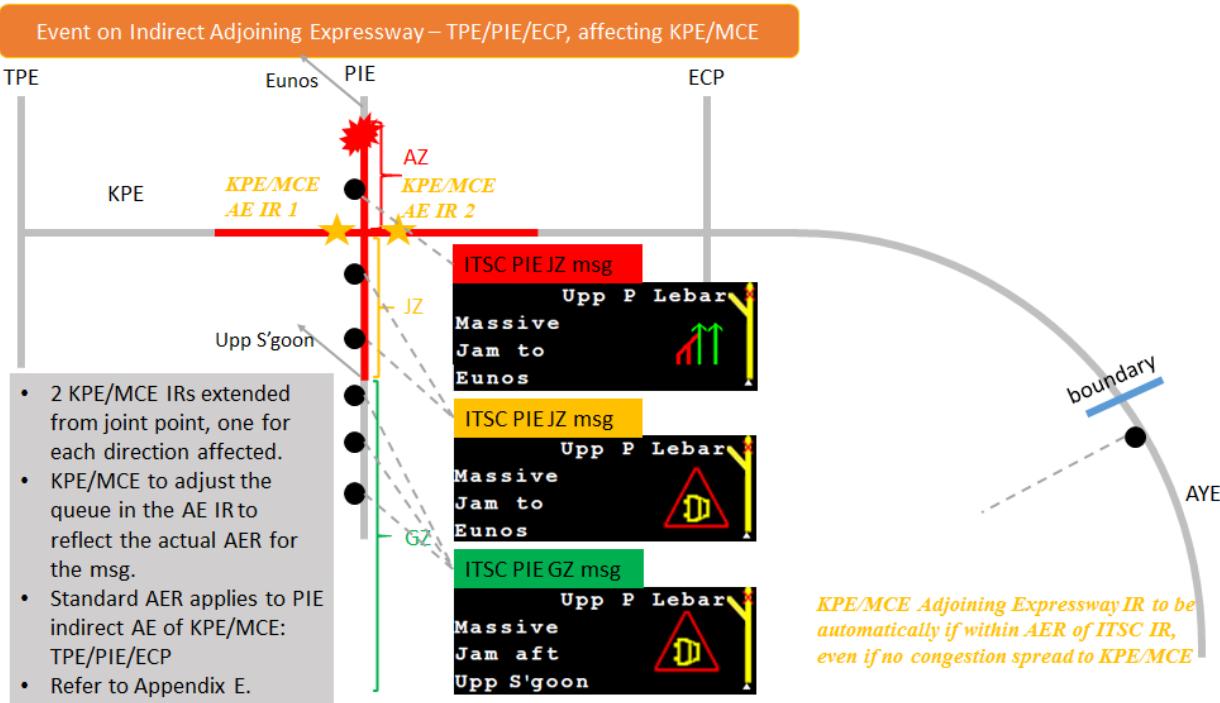


Figure 13.5 Event on Indirect Adjoining Expressway – TPE/PIE/ECP, affecting KPE/MCE

14. Appendix

14.1. Super corridor list

S/N	Category	Super Corridor	Direction	End Junction
1	Expressway	AYE – MCE – KPE	TPE	
2	Expressway	KPE – MCE - AYE	Tuas	
3	Expressway	AYE - CTE – SLE	BKE	
4	Expressway	SLE - CTE	City	
5	Expressway	Sheares Ave – ECP	Changi	
6	Expressway	PIE – KJE	BKE	
7	EMAS Arterial	Bedok Road - EA 59 - EA 55 - EA 56	Pioneer Rd	
8	EMAS Arterial	EA56 - EA55 - EA59 -Bedok Rd	Bedok Rd	
9	EMAS Arterial	Central Blvd - Cross Str - Upp Cross Str - Havelock Rd - Ganges Ave - Alexandra Rd - EA 57	Upp Jurong Road	
10	EMAS Arterial	Sheares Ave - ECP - Rochor Rd - Rochor Canal Rd - EA 50	Woodlands	
11	EMAS Arterial	Prinsep St - Selegie Rd - EA 52 - Punggol East	Punggol Central	
12	EMAS Arterial	Punggol East- EA 52 – Bencoolen St	Bencoolen St	
13	EMAS Arterial	EA51 - EA 53 – Sembawang Ave – Canberra Rd	Sembawang	
14	EMAS Arterial	Canberra Rd - Sembawang Rd - EA 53	Lornie Rd	
15	EMAS Arterial	Ulu Pandan Rd - Holland Rd - Napier Rd - EA54	Bras Basah	
16	EMAS Arterial	Queensway - Jln Bt Merah - Eu Tong Sen - Kallang - EA 58	Upp Changi Rd East	
17	EMAS Arterial	EA57 – Commonwealth Ave – Marina Blvd	PIE	
18	EMAS Arterial	EA50 – Ophir Rd	ECP	
19	EMAS Arterial	EA58 – Victoria St – Hill St – New Bridge Rd – Jln Bt Merah - Queensway	Queensway	

S/N	Category	Super Corridor	Direction	End Junction
20	Arterial Road	Bedok Rd – EA59 (East Coast Road – Mountbatten) – Sims Way	Both directions	PIE
21	Arterial Road	Sims Way > Mountbatten Rd > Fort Rd	ECP	ECP
22	Arterial Road	AMK Ave 1 > Lor Chuan > Boundary Rd > Paya Lebar Rd > Upp Paya Lebar Rd > Guillemard Rd > EA55 (Nicoll Highway > Esplanade Drive > Collyer Quay > Raffles Quay > Shenton Way)	Keppel	Keppel Rd
23	Arterial Road	EA55 (Anson Rd > Robinson Rd > Collyer Quay > Esplanade Drive > Nicoll Highway) > Guillemard Rd > Upp Paya Lebar Rd > Paya Lebar Rd > Boundary Rd > AMK Ave 1	Upp Thomson	Upp Thomson Rd
24	Arterial Road	Keppel Rd – EA56 (Telok Blangah Rd - Pasir Panjang Rd – West Coast Hwy) – West Coast Rd (and Buroh Flyover)	Both directions	Penjuru Rd
25	Arterial Road	EA56 (Jln Buroh – Pioneer Rd)	Both directions	Tuas West Dr
26	Arterial Road	EA57 (Commonwealth Ave, Commonwealth Ave West, Boon Lay Way, Upp Jurong Rd)	Both directions	PIE
27	Arterial Road	Alexandra Rd > Ganges Ave > Havelock Rd > Upp Pickering St > Church St > Marina Blvd	MCE	MCE
28	Arterial Road	Central Blvd > Cross St > Upp Cross St > Havelock Rd > Ganges Ave > Alexandra Rd	West Coast Hwy	West Coast Hwy
29	Arterial Road	Woodlands Ave 3 > EA50 (Woodlands Rd, Upp Bt Timah, Jalan Anak Bukit, Dunearn Rd, Bukit Timah Rd) > Sungei Rd > Ophir Rd	ECP	ECP
30	Arterial Road	Rochor Rd > Rochor Canal Rd > EA50 (Bt Timah Rd, Upp Bt Timah Rd)	Upp Bt Timah	Jalan Anak Bukit
31	Arterial Road	Clementi Rd - Jln Anak Bukit - Upp Bt Timah - Woodlands Rd - Woodlands Ave 3	Woodlands	Woodlands Ave 5
32	Arterial Road	Woodlands Ave 3 > Woodlands Rd > Upp Bt Timah Rd > Jln Anak Bukit > Clementi Rd	West Coast Hwy	West Coast Hwy
33	Arterial Road	Ulu Pandan Rd > Holland Rd > Napier Rd > EA54 (Orchard Rd, Bras Basah Rd) > Raffles Blvd	Republic Blvd	Republic Blvd
34	Arterial Road	Raffles Ave > Stamford Rd > Fort Canning Tunnel > Penang Rd > Somerset Rd > Grange Rd >	Clementi Rd	Clementi Rd

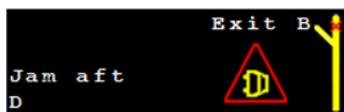
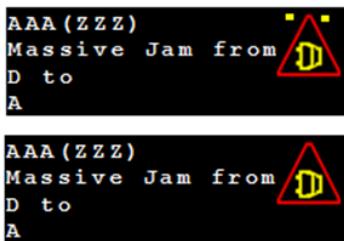
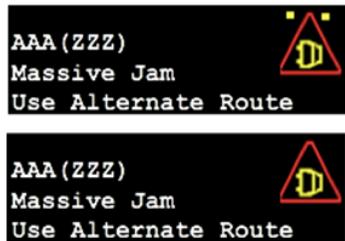
S/N	Category	Super Corridor	Direction	End Junction
		Orchard Blvd > Grange Rd > Napier Rd > Holland Rd > Ulu Pandan Rd		
35	Arterial Road	EA 51 (Portsdown Rd > Portsdown Ave > Queensway > Farrer Rd > Adam Rd > Lornie Rd > Macritchie Viaduct) > EA 53 (Upp Thomson Rd) > Sembawang Rd	Sembawang	Gambas Ave
36	Arterial Road	EA51 (Portsdown Rd > Portsdown Ave > Queensway > Farrer Rd > Adam Rd > Lornie Rd > Lornie Viaduct > Braddell Rd > Bartley Rd East) > Tampines Ave 10	Tampines	TPE
37	Arterial Road	Tampines Ave 10 > EA51 (Bartley Rd East > Braddell Rd > Lornie Viaduct > Lornie Rd > Adam Rd > Farrer Rd > Queensway > Portsdown Ave > Portsdown Rd)	Portsdown	AYE
38	Arterial Road	Sembawang Rd > EA53 (Upper Thomson Rd), EA51 (MacRitchie Viaduct, Lornie Rd)	Lornie	Lornie Rd
39	Arterial Road	Woodlands Ave 7 - Sembawang Way - Canberra Link - Yishun Ave 2 - Lentor Ave - AMK Ave 6 - Marymount Rd - Thomson Rd – Keng Lee Rd – Kg Java Rd	Both directions	Bt Timah Rd
40	Arterial Road	Queensway (junction with Portsdown Ave) > Jalan Bt Merah > Kg Bahru Rd > Eu Tong Sen St > Hill St > Victoria St > EA58 (Kallang Rd > Sims Ave > Sims Ave East > New Upp Changi Rd > Upp Changi Rd East)	PIE	PIE
41	Arterial Road	EA58 (Upp Changi Rd East > New Upp Changi Rd > Changi Rd > Geylang Rd > Kallang Rd) > Victoria St > Hill St > New Bridge Rd > Kg Bahru Rd > Jalan Bt Merah > Queensway (junction with Portsdown Ave)	Portsdown	Portsdown Ave
42	Arterial Road	Prinsep St > Selegie Rd > EA52 (Serangoon Rd (including Woodsville Tunnel) > Upp Serangoon Rd) > Sengkang East Dr > Punggol East	Punggol	Punggol Central
43	Arterial Road	Punggol East > Sengkang East Drive > EA52 (Upp Serangoon (including Woodsville Tunnel), Bendemeer Rd) > Bencoolen St	City	Stamford Rd
44	Arterial Road	Crawford St > Lavender St > Balestier Rd >	Keppel	Keppel Rd

S/N	Category	Super Corridor	Direction	End Junction
		Moulmein Rd > Newton Rd > Scotts Rd > Paterson Rd > Paterson Hill > Irwell Bank Rd > Kim Seng Rd > Outram Rd > Cantonment Rd		
45	Arterial Road	Cantonment Link > Cantonment Rd > Outram Rd > Zion Rd > Hoot Kiam Rd > Paterson Hill > Paterson Rd > Scotts Rd > Newton Rd > Moulmein Rd > Balestier Rd > Lavender St > Crawford St	Crawford St	Beach Rd
46	Arterial Road	AMK Ave 3 – Hougang Ave 2 – EA51 (Hougang Ave 3 – Eunos Link – Jln Eunos – Still Rd – Still Rd Sth)	Both directions	ECP
47	Arterial Road	Sentosa Gateway Tunnel > Kg Bahru Rd > Lower Delta > River Valley Rd	Hill St	Hill St
48	Arterial Road	River Valley Rd > Lower Delta > Kg Bahru Rd	Telok Blangah Rd	Telok Blangah Rd
49	Arterial Road	North Bridge Rd > South Bridge Rd > Neil Rd	Kg Bahru Rd	Kg Bahru Rd
50	Arterial Road	North Bridge Rd > South Bridge Rd > Tg Pagar Rd	Keppel Rd	Keppel Rd
51	Arterial Road	Yio Chu Kang Rd – Serangoon Central	Both directions	Upp Serangoon Rd
52	Arterial Road	AMK Ave 5 – Buangkok Green – Sengkang East Rd – Punggol Way	Both directions	Seletar Nth Link
53	Arterial Road	Jln Bahar – Jln Boon Lay – Jurong Pier Rd	Both direction	Jln Buroh
54	Arterial Road	Jurong Town Hall Rd – Bt Batok Rd – Choa Chu Kang Rd – Bt Panjang Rd	Both directions	BKE
55	Arterial Road	Pioneer Road – Pioneer Rd Nth	Both directions	PIE
56	Arterial Road	Jurong Port Rd – Corporation Rd	Both directions	Jurong West Ave 2
57	Arterial Road	Upp Aljunied Rd – Aljunied Rd – Lor 22 Geylang	Both directions	Guillemard Rd

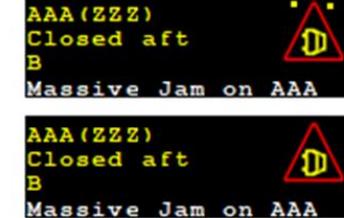
14.2. 'Use Alternate Route' advisory in guide zone

The tables in this section illustrate massive jam guide zone message in different scenarios with/without advisory for alternate route. The 'massive jam' can be replaced with 'jam' when jam length is less than massive jam length (3km currently).

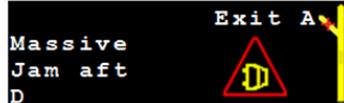
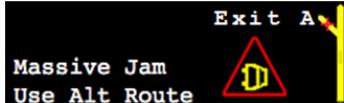
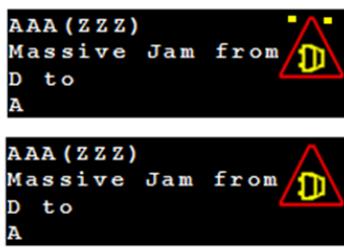
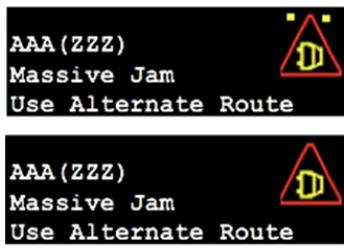
14.2.1. Non-total closure event on expressway

Non-total Closure Event on Open Expressway	Jam > MJL	
	<input type="checkbox"/> Use Alternate Route	<input checked="" type="checkbox"/> Use Alternate Route
Main Carriageway Guide Zone TIP		
Adjoining Expressway Guide Zone TIP		

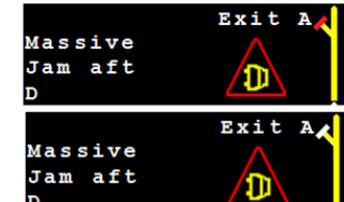
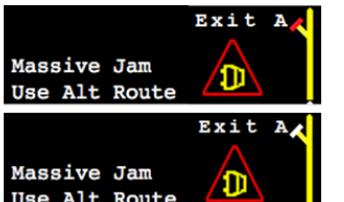
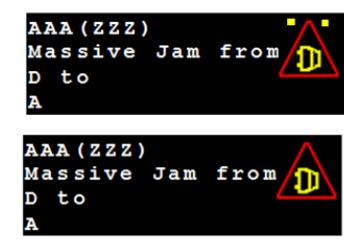
14.2.2. Total closure event on expressway

Total Closure Event on Open Expressway	Jam > MJL	
	<input type="checkbox"/> Use Alternate Route	<input checked="" type="checkbox"/> Use Alternate Route
Main Carriageway Guide Zone TIP		
Adjoining Expressway Guide Zone TIP		

14.2.3. Non-total closure event on expressway exit

Non-total Closure Event on Open Expressway Exit	Jam > MJL	
	<input type="checkbox"/> Use Alternate Route	<input checked="" type="checkbox"/> Use Alternate Route
Main Carriageway Guide Zone TIP		
Adjoining Expressway Guide Zone TIP		

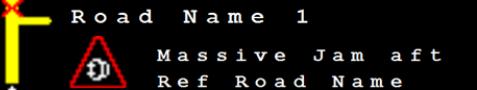
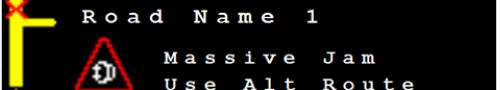
14.2.4. Total closure event on expressway exit

Total Closure Event on Open Expressway Exit	Jam > MJL	
	<input type="checkbox"/> Use Alternate Route	<input checked="" type="checkbox"/> Use Alternate Route
Main Carriageway Guide Zone TIP		
Adjoining Expressway Guide Zone TIP		

14.2.5. Event on expressway affecting EAC

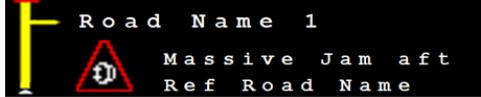
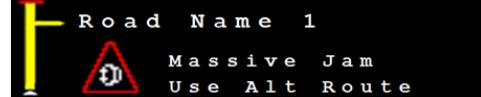
Event on Expressway Affecting EAC	EAC Main Carriageway Guide Zone AVMS (Text)	
	<input type="checkbox"/> Use Alternate Route	<input checked="" type="checkbox"/> Use Alternate Route
RVMS	<p>Event At AAA (DIR) Massive Jam At </p> <p>AAA (DIR)</p> <p>Advisory</p>	<p>Event At AAA (DIR) Massive Jam At </p> <p>AAA (DIR)</p> <p>Use Alt Route</p>
CVMS	<p>Event At AAA (DIR) Massive Jam At </p> <p>AAA (DIR)</p>	<p>Event At AAA (DIR) Massive Jam </p> <p>Use Alternate Route</p>

14.2.6. Non-total closure event on EAC main carriageway

Non-total Closure Event on EAC Main Carriageway	Main Carriageway Guide Zone AVMS (Full Graphic)	
	<input type="checkbox"/> Use Alternate Route	<input checked="" type="checkbox"/> Use Alternate Route
RVMS		
CVMS		

Non-total Closure Event on EAC Main Carriageway	Connecting / Leading Road / Adjoining EAC Guide Zone AVMS (Text)	
	<input type="checkbox"/> Use Alternate Route	<input checked="" type="checkbox"/> Use Alternate Route
RVMS	<p>MASSIVE JAM AT XXX (DIR)</p>  <p>Advisory</p>	<p>MASSIVE JAM AT XXX (DIR)</p>  <p>Use Alt Route</p>
CVMS	<p>MASSIVE JAM AT XXX (DIR)</p>  <p>Advisory</p>	<p>MASSIVE JAM AT XXX (DIR)</p>  <p>Use Alternate Route</p>

14.2.7. Total closure event on EAC main carriageway

Total Closure Event on EAC Main Carriageway	Main Carriageway Guide Zone AVMS (Full Graphic)	
	<input type="checkbox"/> Use Alternate Route	<input checked="" type="checkbox"/> Use Alternate Route
RVMS		
CVMS		

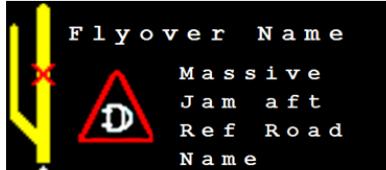
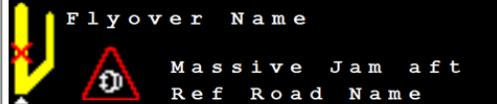
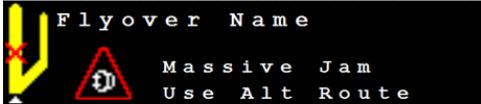
Total Closure Event on EAC Main Carriageway	Connecting / Leading Road / Adjoining EAC Guide Zone AVMS (Text)	
	<input type="checkbox"/> Use Alternate Route	<input checked="" type="checkbox"/> Use Alternate Route
RVMS	<p>XXX (DIR) Closed MASSIVE JAM Aft D</p> 	<p>XXX (DIR) Closed MASSIVE JAM Aft D Use Alt Route</p> 
CVMS	<p>XXX (DIR) Closed MASSIVE JAM aft D</p> 	<p>XXX (DIR) Closed MASSIVE JAM Use Alternate Route</p> 

14.2.8. Event on EAC slip road exit

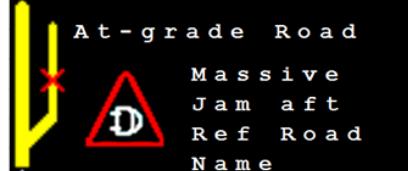
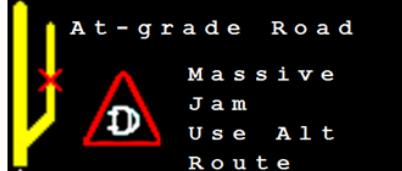
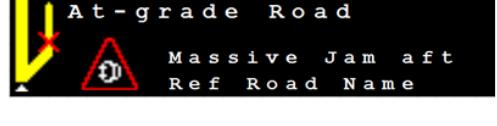
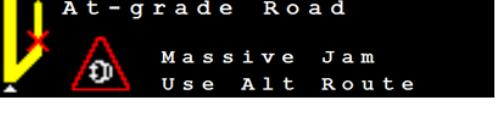
Non-total Closure Event on EAC Main Carriageway	EAC Main Carriageway Guide Zone AVMS (Text)	
	<input type="checkbox"/> Use Alternate Route	<input checked="" type="checkbox"/> Use Alternate Route
RVMS	Event At Slip Rd To YYY Massive Jam Aft D 	Event At Slip Rd To YYY Massive Jam Aft D Use Alt Route 
CVMS	Massive Jam Aft D 	Massive Jam Aft D Use Alternate Route 

Non-total Closure Event on EAC Main Carriageway	Connecting / Leading Road Guide Zone AVMS (Text)	
	<input type="checkbox"/> Use Alternate Route	<input checked="" type="checkbox"/> Use Alternate Route
RVMS	Massive Jam At XXX (D I R) 	Massive Jam At XXX (D I R)  Use Alt Route
CVMS	Massive Jam At XXX (D I R) 	Massive Jam At XXX (D I R)  Use Alternate Route

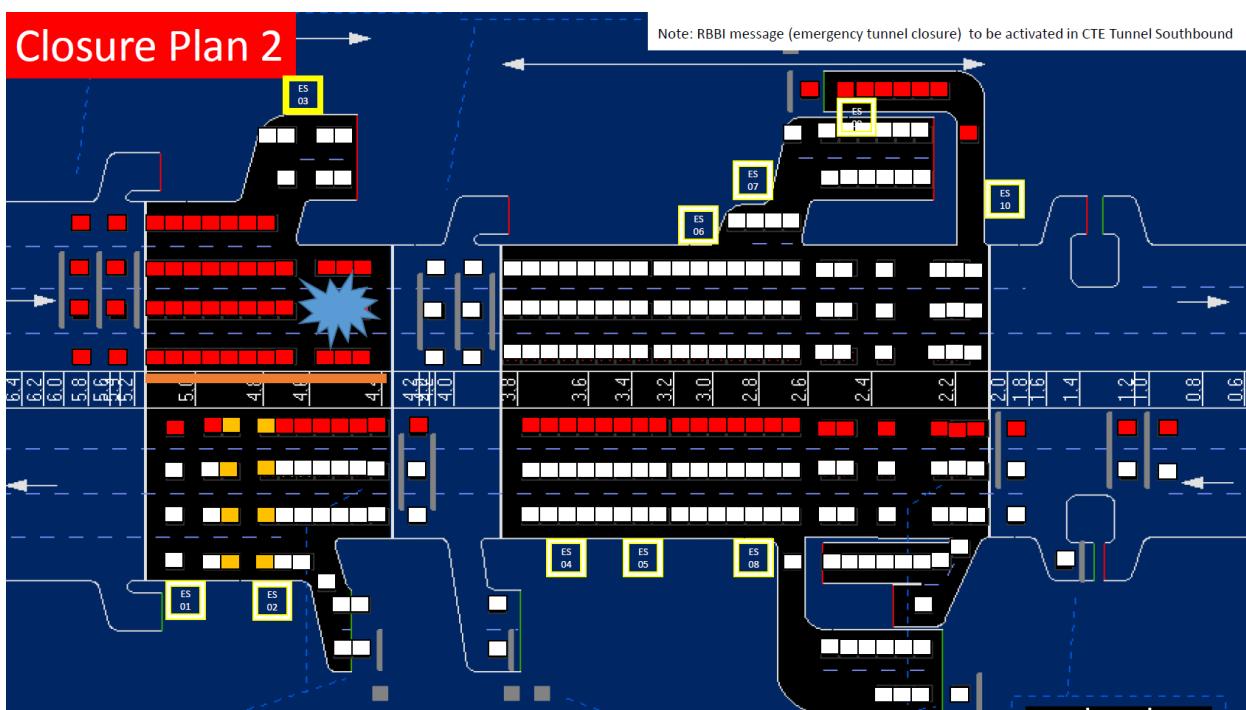
14.2.9. Event on flyover/underpass

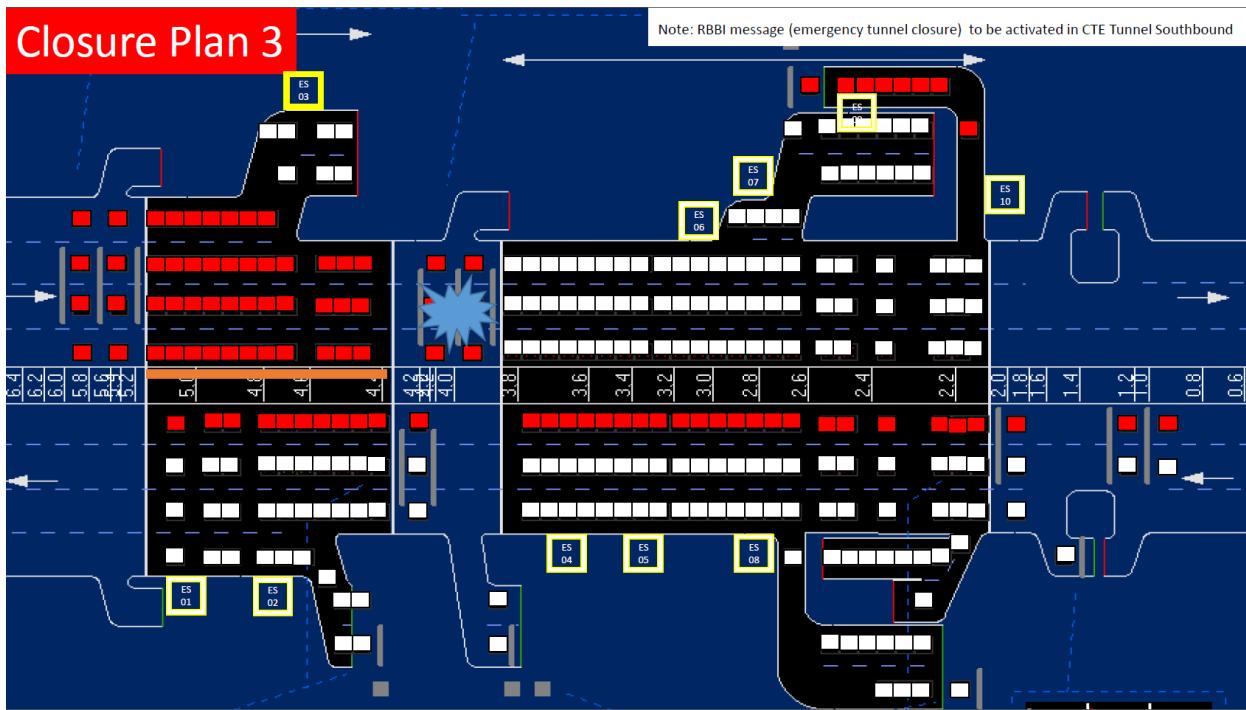
Event on Flyover / Underpass	Main Carriageway Guide Zone AVMS (Full Graphic)	
	<input type="checkbox"/> Use Alternate Route	<input checked="" type="checkbox"/> Use Alternate Route
RVMS		
CVMS		

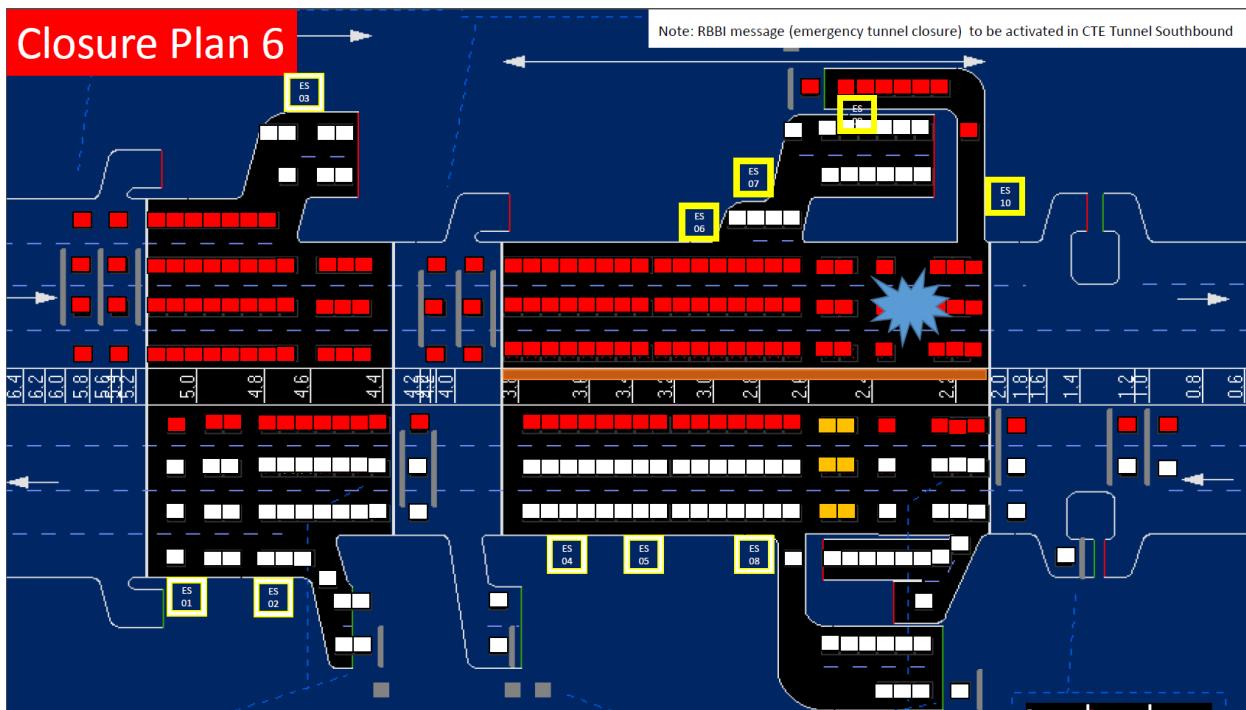
14.2.10. Event on at-grade road

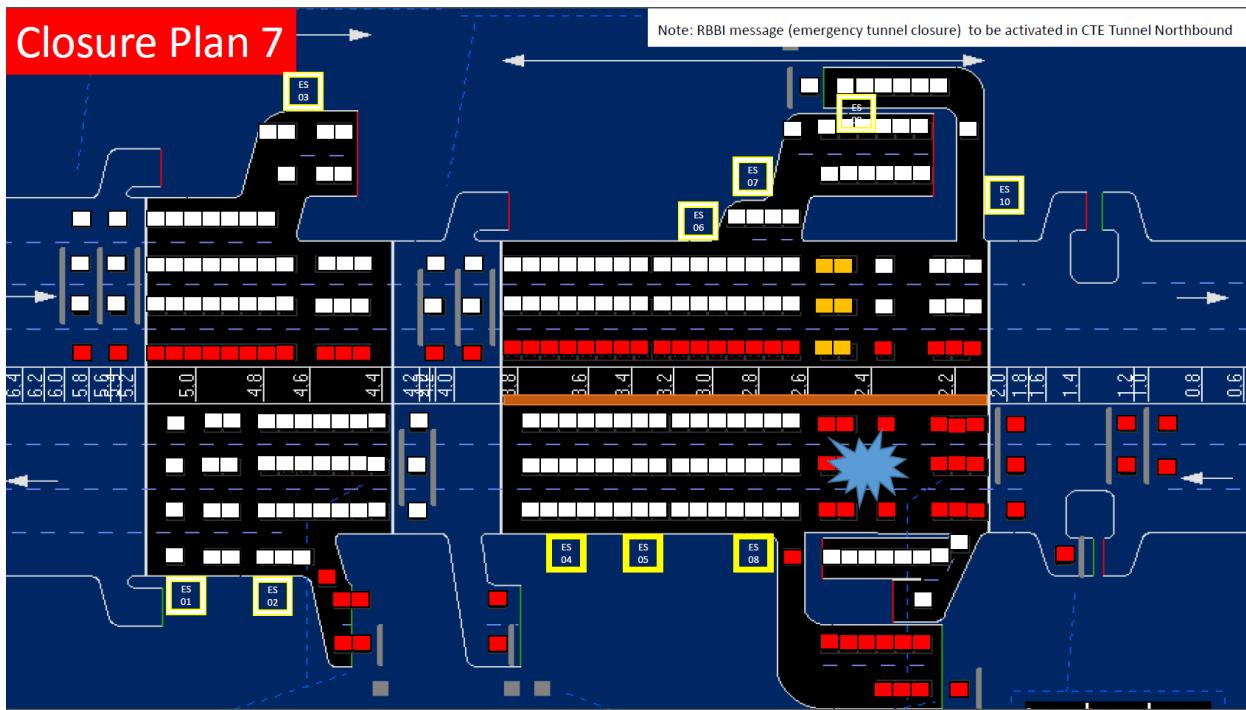
Event on Flyover / Underpass	EAC Main Carriageway Guide Zone AVMS (Full Graphic)	
	<input type="checkbox"/> Use Alternate Route	<input checked="" type="checkbox"/> Use Alternate Route
RVMS		
CVMS		

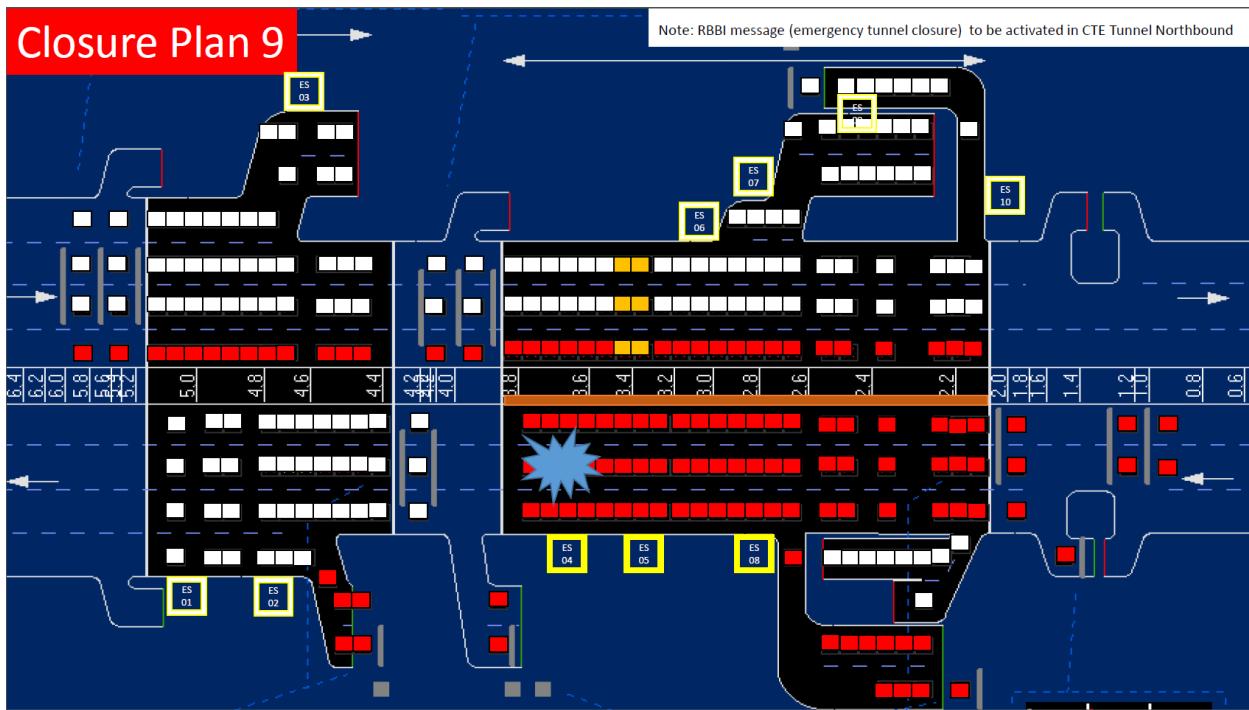
14.3. CTE fire case LUS Plan

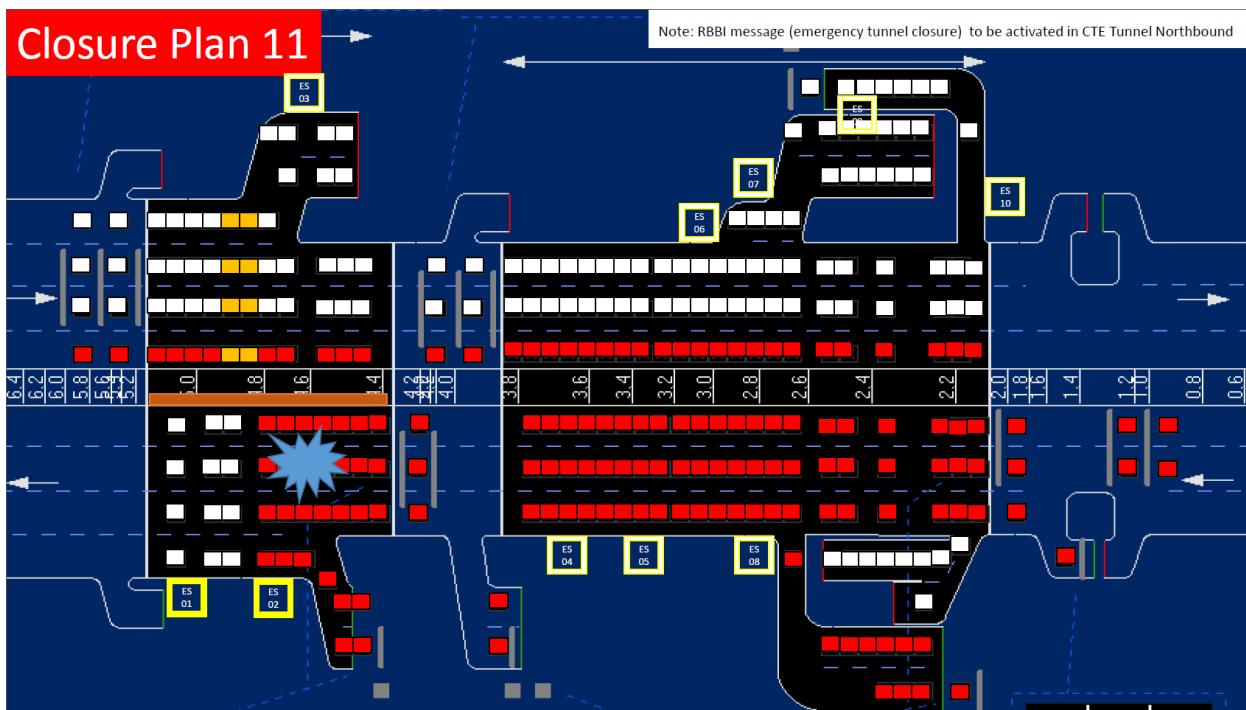


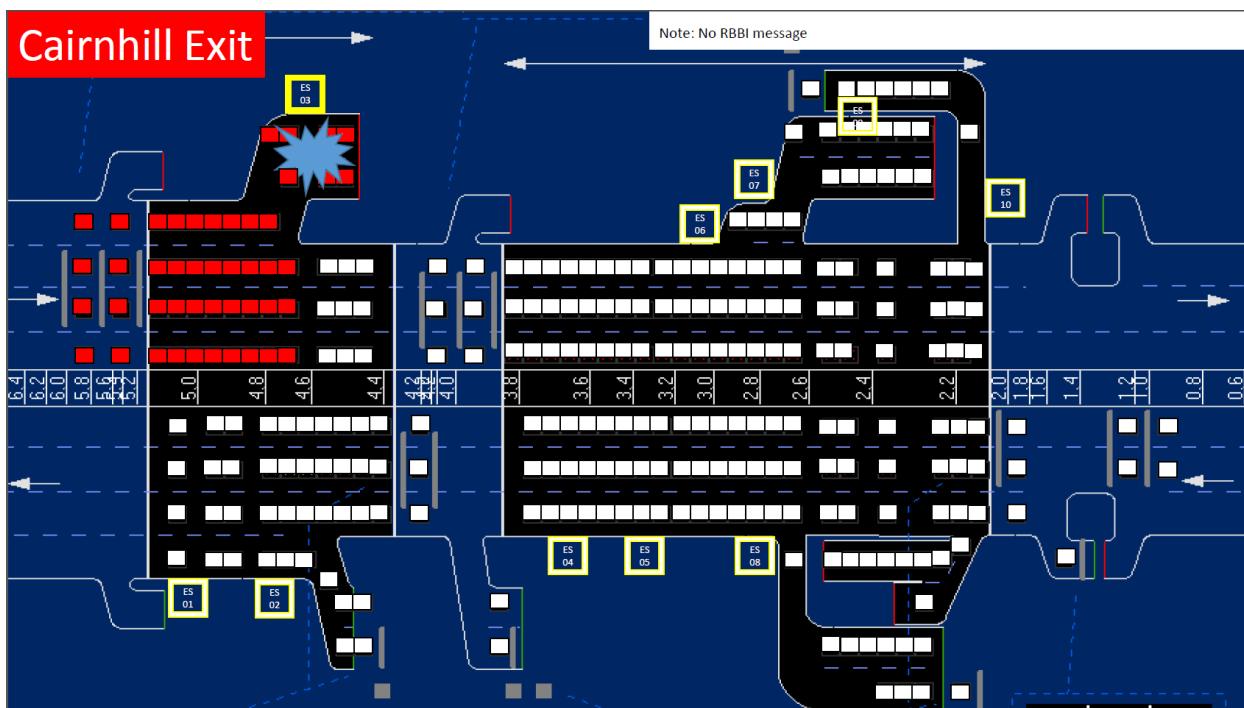
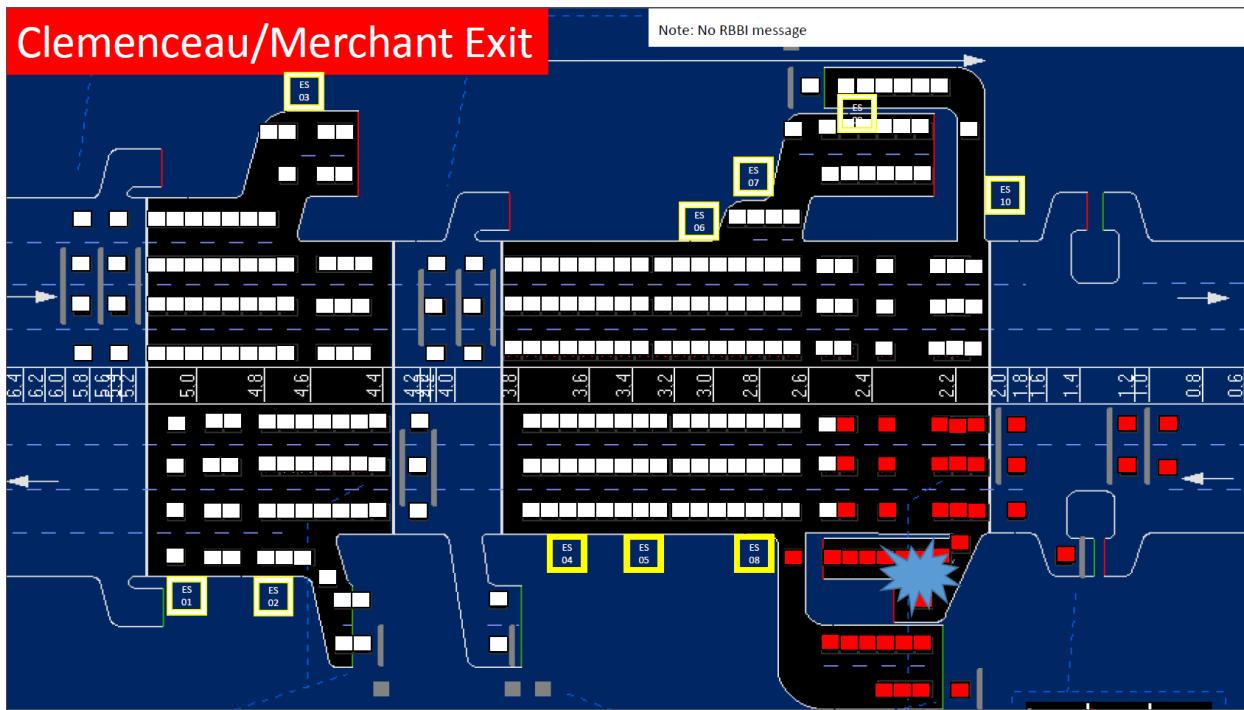


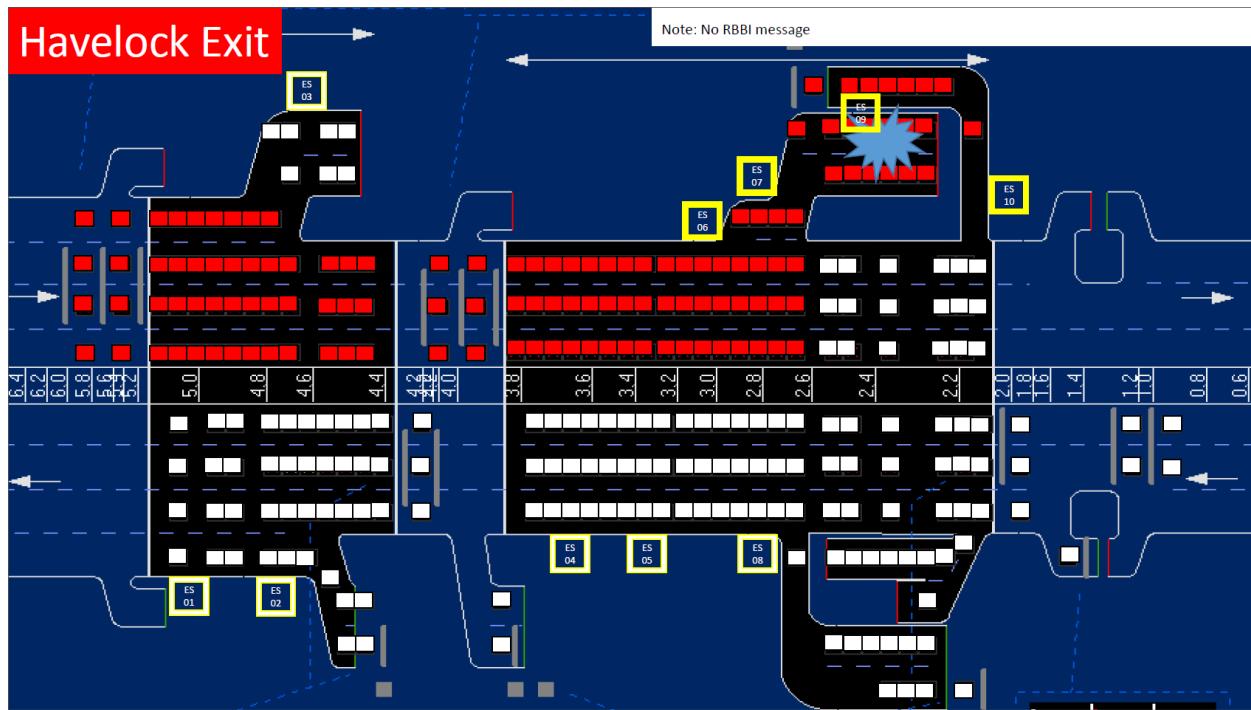








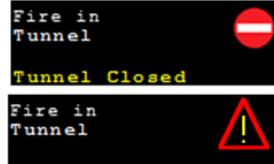
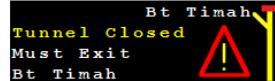
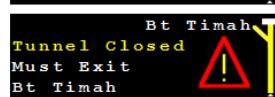
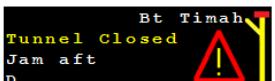
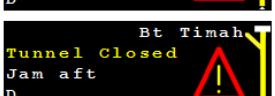




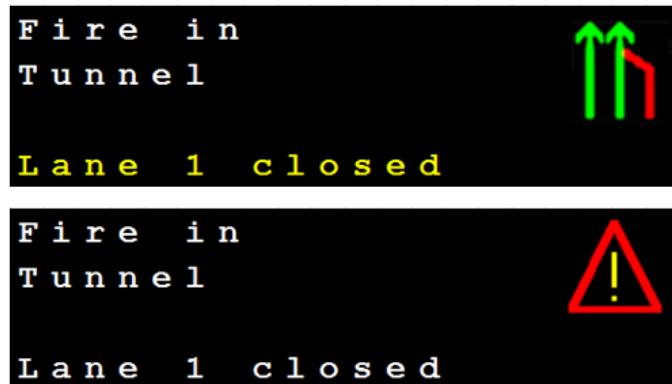
14.4. CTE fire case VMS plan

14.4.1. Fire case VMS plan, total closure in CTE tunnel (incident bound)

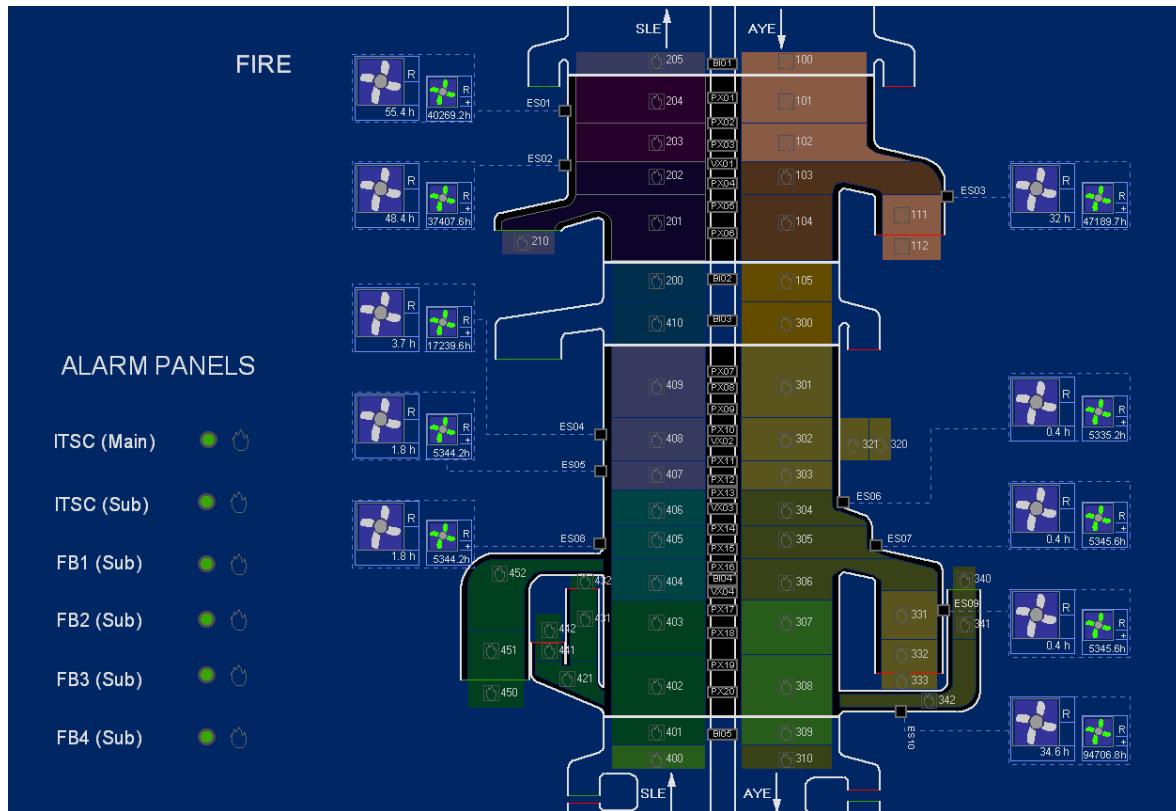
Total Closure Event in CTE Tunnel Main Carriageway - Fire Case	Main Carriageway TIP		
	Towards SLE		
	All TIPs between Outram Exit and Incident Location)	Jam Zone	Guide Zone
Single Incident (No Jam)	 	 <div style="border: 1px solid black; padding: 2px;">If Outram is the only exit</div>	
Single Incident (With Jam < MJL)		 	
Single Incident (With Jam > MJL)			

Total Closure Event in CTE Tunnel Main Carriageway - Fire Case	Main Carriageway TIP		
	Towards AYE		
	All TIPs between Bukit Timah Exit and Incident Location	Jam Zone	Guide Zone
Single Incident (No Jam)	 	  <p>If Bt Timah is the only exit</p>	 
Single Incident (With Jam < MJL)			 
Single Incident (With Jam > MJL)			

14.4.2. Fire case VMS Plan, total closure in CTE tunnel (non-incident bound)



14.5. CTE fire case pre-defined plan



Fire Zone	Plant PP Number	Traffic PP Number
100	439	2993
101	440	2993
102	441	2993
103	442	2994
104	443	2994
105	444	2995
111	445	2987
112	446	2987
200	447	3002
201	448	3003
202	449	3003
203	450	3004
204	451	3004
205	452	3004
210	453	2992
300	454	2995
301	455	2996
302	456	2996

Fire Zone	Plant PP Number	Traffic PP Number
303	457	2996
304	458	2997
305	459	2997
306	460	2997
307	461	2998
308	462	2998
309	463	2998
310	464	2998
320	465	2996
321	466	2996
331	467	2988
332	468	2988
333	469	2988
340	470	2990
341	471	2990
342	472	2990
400	473	2999
401	474	2999
402	475	2999
403	476	2999
404	477	3000
405	478	3000
406	479	3000
407	480	3001
408	481	3001
409	482	3001
410	483	3002
421	484	2989
431	485	2989
432	486	2989
441	487	2989
442	488	2989
450	489	2991
451	490	2991
452	491	2991

14.6. Tunnel fire case canning message

FIRE IR Canning Message examples						
	CTE	FCT	SGT	WVT	KPE	MCE
Main carriageway	Fire in CTE Tunnel (towards SLE) after Merchant Rd Exit. CTE Tunnel Closed.	Fire in Fort Canning Tunnel. Fort Canning Tunnel Closed.	Fire in Sentosa Gateway Tunnel. Sentosa Gateway Tunnel Closed.	Fire in Woodsville Tunnel(towards City). Woodsville Tunnel Closed	Fire on KPE(towards TPE) after ECP Entrance. KPE and MCE Tunnel Closed.	Fire on MCE(towards AYE) after ECP Entrance. MCE and KPE Tunnel Closed.
Entrance	Fire in CTE Tunnel (towards SLE) at Merchant Rd Entrance. Merchant Rd Entrance Closed.	N.A	N.A	Fire in Woodsville Tunnel(towards City) at Macpherson Entrance. Woodsville Tunnel Closed	Fire on KPE(towards TPE) at ECP Entrance. KPE and MCE Tunnel Closed.	Fire on MCE(towards AYE) at ECP Entrance. MCE and KPE Tunnel Closed.
Exit	Fire in CTE Tunnel (towards SLE) at Merchant Rd Exit. CTE Tunnel Closed.	N.A	Fire in Sentosa Gateway Tunnel at Lower Delta exit. Sentosa Gateway Tunnel Closed.	N.A	Fire on KPE(towards TPE) at Airport Rd Exit. KPE and MCE Tunnel Closed.	Fire on MCE(towards TPE) at Central Blvd Exit. MCE and KPE Tunnel Closed.

14.7. Train disruption radio broadcast template (pending LTA confirmation with Corp Comm)

14.7.1. Train Breakdown with Free Bus Service/Bridging

Due to _____ (e.g. signaling fault) on the _____ (e.g. North-South line), there is no train service between _____ (e.g. Tai Seng) and - _____ (Mountbatten) stations. Free travel on public bus services is available at designated bus stops along the affected stations

14.7.2. Train Breakdown Recovered with Free Bus Service/Bridging

Train service on the _____ (line) between _____ and _____ stations has resumed service. Free travel on public bus services is still available at designated bus stops along the affected stations

14.7.3. Train Breakdown Recovered

Train service on the _____ (line) between _____ and _____ stations has resumed regular service. Free travel on public bus services along the affected stations has ceased.

14.8. Event types (incident)

Event Type	Sub-type	VMS	OneMotoring/ MyTransport	Twitter
Accident*	Type of Accident		Accident	Accident



Event Type	Sub-type	VMS	OneMotoring/ MyTransport	Twitter
Vehicle Breakdown*	Chain Collision	Accident		
	Skidded			
	Overturned			
	Over Height			
	Rear-end			
	Side-swipe			
	Hit & Run			
	Others			
	Type of Danger			
	Vehicle on Fire	N.A.		
	Others			
Obstacles	Type of Breakdown			
	No Fuel	Veh Breakdown		
	Flat Tyre			
	Mechanical Fault			
	Unverified		Vehicle Breakdown	N.A.
	Others			
	Type of Danger			
	Vehicle on Fire	N.A.		
	Others			
	(Empty/Blank)	Obstacle		
	Fallen Tree	Fallen Tree	Obstacle	Obstacle
	Oil Spill	Oil Spill		
	Mud Spill	Mud Spill		
	Paint Spill	Paint Spill		
	Flash Flood	Flash Flood	Flash Flood	Flash Flood

Event Type	Sub-type	VMS	OneMotoring/ MyTransport	Twitter
	Water Ponding	Water Ponding		
	Debris	Debris		
	Object	Obstacle	Obstacle	Obstacle
	Uneven Road	Uneven Road		
	Others	Obstacle		
Heavy Traffic	Heavy Traffic	Heavy Traffic	Heavy Traffic	N.A.
Unattended Vehicles*	Unattended Vehicle	Veh Breakdown	Vehicle Breakdown	N.A.
Roadworks	Plant Pruning	Plant Pruning		
	<u>Plant Watering</u>	Plant Watering		
	<u>Road Sweeping</u>	Road Sweeping		
	<u>Litter Washing</u>	Litter Washing		
	<u>Tunnel Washing</u>	Tunnel Washing		
	Lane Marking			
	Maintenance Work		Roadworks	N.A.
	Repair Works			
	Others			
	Excavation	Roadworks		
	Milling & Patching			
	Road Projects			
	Loading / unloading			
	Cable / Pipe Laying			
Miscellaneous	Man Walking		Example: 'Avoid lane 3 & 4 on PIE towards Tuas after Eng Neo.'	
	Cyclists	Full Graphic		N.A.
	Emergency Vehicle			
	Police/SCDF Ops			

Event Type	Sub-type	VMS	OneMotoring/ MyTransport	Twitter
	PMD users			
	Bush Fire			
	Others			
Road Closure	Road Closure	XXX closed	XXX closed	XXX closed
Train Disruption	Train Disruption	Heavy traffic sub IR	Heavy traffic sub IR	N.A.
Fire	Fire	Fire	Fire	Fire
System / Plant Failure	System / Plant Failure	N.A.	N.A.	N.A.

15. End of document



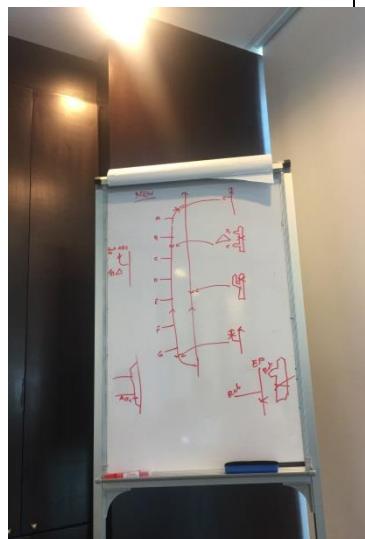
TT231 – Document Review

Document Ref	CTT231/SSA/D19.001.000/KAP/RPT	Doc Received date	18/10/2018
Document Title	TT231 – KAP Report (Unplanned Event) (Version A)		
Reviewer	TT231 Project Team	Date Commented	26/10/2018
Status	<input type="checkbox"/> Accepted (A)	<input checked="" type="checkbox"/> Accepted with Comments (AC)	<input type="checkbox"/> Not Accepted (NA)

No	Page	Section	Comments	Reply to Comments / Description of Changes
1.	General	Footer	<p>Use the standard footer for all TT231 documents:</p> <p>“This document is proprietary and restricted. No part of this document may be disclosed in any manner to a third party without the prior written consent of Land Transport Authority or Sopra Steria Asia Pte Ltd”</p>	Updated
2.	General	Attachments	Attachments within the pdf document are not readable. Submit in word format or provide a way to make the attachment available and readable.	Submit in word format.
3.	General	Appendix	Ensure all “Appendix (to be inserted)” are addressed.	Inserted.
4.	10	2.2	Specify that the sections provides the summary of the sessions for unplanned events management .	Updated.
5.	11	3.2.1	SLE-CTE super corridor, not SLT-CTE super corridor.	Updated.
6.	14	4.2	<p>1. Scenario 1: Need to mention that Ops need to create 2 separate IR on each bound, as messages need to be displayed on both bounds. There is no KB proposing message for both bounds because it is unknown if additional lanes will need to be closed on either or both bounds, which will complicate the KB handling subsequently.</p> <p>2. Specify what is KBRS Appendix E instead of referencing to the appendix (might not be Appendix E anymore in the new KBRS).</p>	Updated.

TT231 – Document Review

Document Ref	CTT231/SSA/D19.001.000/KAP/RPT	Doc Received date	18/10/2018
Document Title	TT231 – KAP Report (Unplanned Event) (Version A)		
Reviewer	TT231 Project Team	Date Commented	26/10/2018
Status	<input type="checkbox"/> Accepted (A)	<input checked="" type="checkbox"/> Accepted with Comments (AC)	<input type="checkbox"/> Not Accepted (NA)

No	Page	Section	Comments	Reply to Comments / Description of Changes
7.	15	4.2	<p>1. Table 3 messages are not comprehensive. Include messages for all scenarios.</p> <p>2. AER for Super Corridor, Expressway and EAC Main carriageway: put Alert Zone (AZ) instead of “2km upstream of the event location”. Add a note to provide the length of the AZ in current KB.</p> <p>3. Illustrate the AER for Connecting/Leading road</p>	<p>1. This table is only for scenario 1, event at CD not affecting lanes. If affect lane, standard KB rule for lane closure will reply. Not sure the not comprehensive means should also cover scenario 2&3 or there are more type of road has CD? Please advise if there are more road types have CD.</p> <p>2&3 updated</p>
8.	17	5.2	<p>1. The messages proposed on the LR/CR are not correct. LR/CR messages should be text if event happened on EAC main carriageway.</p> <p>The main carriageway can be defined from point A to point E at the at-grade road or flyover point A to point E.</p> <p>If the incident happened on the at-grade road and depending on the location of the incident, the main at-grade road VMS should be proposed with full graphic message and the LR/CR with text messages.</p> <p>Before side road</p> 	<p>1. The message is for main carriageway, to illustrate the stick usage. Not for CR/LR.</p> <p>The after side road example seems inconsistent with what we have discussed with Adrian.</p> 

TT231 – Document Review

Document Ref	CTT231/SSA/D19.001.000/KAP/RPT	Doc Received date	18/10/2018
Document Title	TT231 – KAP Report (Unplanned Event) (Version A)		
Reviewer	TT231 Project Team	Date Commented	26/10/2018
Status	<input type="checkbox"/> Accepted (A)	<input checked="" type="checkbox"/> Accepted with Comments (AC)	<input type="checkbox"/> Not Accepted (NA)

No	Page	Section	Comments	Reply to Comments / Description of Changes
			<p>After side road</p>  <p>Illustrate the full scenario in Figure 10 with messages displayed in the AZ, JZ and GZ.</p> <p>2. What are the messages in the AZ, JZ and GZ on VMS and OBU if there are simultaneous incidents on at-grade and the main road?</p>	<p>2. Existing rule, KBRS DDDD. Already updated in section 5.3.</p>
9.	18	6	<p>1. Check template. "aft" should be in the same row as "Massive jam", similar to Fig 18.</p> <p>2. Existing Guide Zone message is unable to fit "Massive Jam aft" due to icon size, and we asked to reduce icon size to accommodate words "Massive Jam aft". This enhancement and requirement is not explicitly captured anywhere in this KAP document. But based on the illustration here, it appears this will be done?</p>	<p>1. Updated</p> <p>2. 40x40 pictogram is available but the layout template is not defined. LTA need to liaise with EMAS and get back to SSA if the template can be added.</p>
10.	19	7.2.1	<p>1. Include fire location at "exit".</p> <p>2. Table 4 pending review. Depending on the review, we may consider to close whole tunnel for entrance fire incident.</p>	<p>1.Updated</p> <p>2. Noted</p>

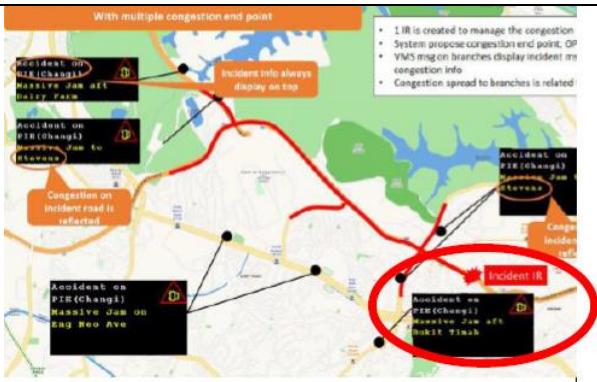
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No	Page	Section	Comments	Reply to Comments / Description of Changes
11.	19	7.2.2	1. Replace RP147 with i-transport 1.0. 2. To clarify in the document that the current traffic and plant predefined plans in i-transport 1.0 will be integrated into the KB of i-transport 2.0 and that they will be the default plan proposed by the KB for Fire IR.	Updated
12.	19	7.2.3	To clarify. Is this current or future?	Should be current, the information is from Adrian. Need to double check with Adrian.
13.	23	7.3	Guide zone message – Icon size to be reduced to accommodate “Massive jam aft” if needed.	Same as No9
14.	26	9.2.1	To specify that in phase 2, bus bridging route information might be obtained through the AIH interface. The affected bus bridging route will then be displayed instead of the full bridging route.	Updated
15.	26	9.2.2	<i>“The criterion to identify hotspot has not been discussed yet, details to be added.”</i> To state some proposals to identify hotspots (e.g. UCD) and that details shall be further discussed in design stage.	Updated
16.	26	9.2.3	Radio broadcast message shall be sent via email server in i-transport system or through the existing dissemination link to Mediacorp (to be confirmed during design stage).	Updated

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17.	28	10.1	 <p>The map illustrates several traffic incidents and their impact on traffic flow. Key annotations include:</p> <ul style="list-style-type: none"> With multiple congestion end point Incident on PIE(Bangkok) Massive Jam off Dairy Farm Incident on PIE(Bangkok) Massive Jam to Adam Congestion on incident road is reflected Incident on PIE(Echangi) Massive Jam on Eng Neo Ave Incident on PIE(Echangi) Massive Jam aft Bukit Timah Incident IR Incident info always display on trip 1 IR is created to manage the congestion System propose congestion end point, OP VMS msg on branches display incident in congestion info Congestion spread to branches is related <p>Should Red circle VMS say "Massive jam aft Bukit Timah Rd" instead of "Bukit Timah"? As it may appear that "Bukit Timah" is a reference point along PIE instead of up ahead along Adam Rd. We may need to think about how to differentiate this.</p>	Have checked the reference point from DB table, it should be Bk Timah Rd as a reference exit of Farrer Road. Updated in Figure 27.
18.	30	10.2	For Figure 26, if it is a direct link from E'way/EA to arterial roads, the system should propose the congestion end point. Removed the portion whereby it states 'no camera on arterial road to verify traffic situation'.	Updated
19.	30	10.3	<ol style="list-style-type: none"> 1. Typo: should be 250m for EMAS arterial 2. Specify the distance threshold for super corridor 	<ol style="list-style-type: none"> 1. Updated 2. Depends on the incident location. For incident happen on arterial road and EA, will use 250m as threshold, incident on expressway will use 500m threshold. Updated in document.

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20.	35	Fig 33	<p>VMS messages do not seem correct.</p> <p>VMS 3 & 4 – there should be differentiation between with and without alt exit C</p> <p>VMS 5 & 6 – there should be differentiation between with or without alt exit D</p>	Updated. Please see figure 35.
21.	35 36	11.3	Ensure the graphic shown are comprehensive. There may be more than what is shown, especially for Figure 34 RVMS/CMVS	Updated
22.	37	12.1	Noted that it is configurable. AER pending confirmation.	Updated
23.	37	12.2	Please refer to incident type PDF sent on 23/10/2018 on the types of mobile roadworks and include in the document.	Updated
24.	39	13.1.3	TPE, PIE and ECP are not super corridor or KPE/MCE, but congestion extended from KPE/MCE to these roads should be handled using multiple congestion endpoint rules as per section 10. So OE should not need to create separate heavy traffic IRs, which is incorrectly mentioned here.	Updated

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1.	15	4.2	<p>[Reviewer's comment]</p> <p>1. Table 3 messages are not comprehensive. Include messages for all scenarios.</p> <p>[SSA's reply]</p> <p>1. This table is only for scenario 1, event at CD not affecting lanes. If affect lane, standard KB rule for lane closure will apply. Not sure the not comprehensive means should also cover scenario 2&3 or there are more type of road has CD? Please advise if there are more road types have CD.</p> <p>[Reviewer's reply]</p> <p>Add a statement to clarify that Centre Median IR can also involve Plant Pruning or Works which OCC Ops may use.</p>	<p>SSA has clarified with Adrian that sub-types of miscellaneous and road works are applicable to CD, plant pruning is one of the subtypes of roadworks. Document is updated accordingly with reference to Appendix.</p>

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2.	17	5.2 Figure 12	<p>[Reviewer's comment]</p> <p>The messages proposed on the LR/CR are not correct. LR/CR messages should be text if event happened on EAC main carriageway.</p> <p>The main carriageway can be defined from point A to point E at the at-grade road or flyover point A to point E.</p> <p>If the incident happened on the at-grade road and depending on the location of the incident, the main at-grade road VMS should be proposed with full graphic message and the LR/CR with text messages.</p> <p>Before side road</p> 	<p>Figure 12 is updated.</p> <p>Adrian has suggested SSA to clarify with i-transport 1 team internally regarding the latest update of event on at-grade road. According to Tian He, the latest update they have done is: when event happens on at-grade road, system will automatically search the nearest exit, VMS will display Aft/Bef exit accordingly and at grade road picto (Y shape), which will be replaced with the stick usage we have discussed during i-transport 2 I think?</p>

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			<p>After side road</p>  <p>Illustrate the full scenario in Figure 10 with messages displayed in the AZ, JZ and GZ.</p> <p>[SSA's reply]</p> <p>1. The message is for main carriageway, to illustrate the stick usage. Not for CR/LR.</p> <p>[Reviewer's reply]</p> <p>The representation of the IR is wrong in figure 12. The after side/before side road is only applicable to incident at the immediate exit of the flyover/underpass. On IR5 row, the road name to display should be the side road, not the at-grade road name. For IR1, depending on the AER, the LR/CR may be proposed with messages.</p>	
3.	19	7.2.3	<p>[Reviewer's comment]</p> <p>To clarify. Is this current or future?</p> <p>[SSA's reply]</p> <p>Should be current, the information is from Adrian. Need to double check with Adrian.</p> <p>[Reviewer's reply]</p> <p>Yes, it is the current fire zones.</p>	No action from SSA needed

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4.	General	-	Add a section to introduce the users, what they do and the types of events they manage. Introduce and standardize the way the users are named in the document e.g. Ops for OCC Operators (not OPS).	Added user group in Section 1.4. Updated OPS to Ops
5.	18 21 23	5 5.3 7.2	Correct the formatting to be the same as the rest of the document.	Done
6.	23	7.2.3	Correct section title.	Done

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No	Page	Section	Comments	Reply to Comments / Description of Changes
1.	17	-	Centre Divider - if only centre divider selected for an IR, propose both bound alert zone messages. Once lane is selected, it will be reverted to incident bound according to the AER.	Updated in Section 4.2
2.	22	Figure 5.2	IR 4 examples is still wrong. See illustration in Appendix A.	Updated in Figure 5.2
3.	25	Table 7.1	For fire at exit, it is also a total closure. Only entrance is close affected entrance subjected to review.	Updated in Table 7.1
4.	32	-	Radio Broadcast template to be editable and can be saved.	Updated in Section 9.2.3
5.	57	14.2.1	Wrong template used. The main carriageway guide zone TIP should use guide zone message and not jam zone message.	Updated in Section 14.2.1
6.	69 71	-	For entrance closure, use LUS and traffic plan currently tagged in the i-transport PP plan. (* LUS plan and canning messages indicated full incident bound closure in the document, refer to page 63, 14.3 LUS plan).	LUS plan for entrance fire IR: follow existing PP plan. As requested by LTA, the mapping between CTE funnel fire zone and pp plan has been added in Section 14.5.
7.	73	-	Canning messages for CTE fire entrance closure should be just the entrance closure messages. (Refer to the current i-transport canning message for fire at the entrance).	Updated in Section 14.6



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Appendix A

Illustration of message for event at at-grade road

