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WESTERN AUSTRALIA

Temporary Traffic Management: Traffic Signal Approval Policy Network Operations

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Temporary Traffic Management: Traffic Signal Approval Policy – Network Operations

This document is owned and authorised by the Executive Director Network Operations. Please submit all comments and requests to the Manager Road Planned Interventions.

Authorisation

As Executive Director Network Operations, I authorise the issue and use of this Temporary Traffic Management Traffic Signal Approval Policy – Network Operations.

Approved by EXECUTIVE DIRECTOR NETWORK OPERATIONS

Date:

29th April 2020

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CONTENTS

DEFINITIONS	4
1 PURPOSE	5
2 SCOPE	5
3 ROLES & RESPONSIBILITIES	5
3.1 Main Roads Traffic Management for Works on Roads Code of Practice	5
4 TRAFFIC MODELLING REQUIREMENTS	6
4.1 Case examples:	8
5 TEMPORARY TRAFFIC MANAGEMENT AT SIGNALS – APPROVAL PROCESS	12
6 TEMPORARY MODIFICATIONS TO TRAFFIC SIGNALS – APPROVAL PROCESS	14
6.1 Technical Report	16
7 OTHER CONSIDERATIONS	16
7.1 Signalised Pedestrian Crossings	16
7.2 Long Term Signal Modifications	16
7.3 Covering Traffic Signal Aspects	16
7.4 Metered Roundabouts	17
7.5 Conducting Reversible Flow at Traffic Signals	17
7.6 Notification of Roadwork and Event Form	17
7.7 Reinstatement of traffic signal loops	17
7.8 Lateral Clearance	18
7.9 Pedestrian Considerations	18
8 REFERENCES AND RELATED DOCUMENTS	18
9 APPENDICES	18
Appendix 1: Temporary Metered Roundabout	19
Appendix 2:	21
LMA drawings – Temporary Traffic Signal modification for the purposes of roadworks	21
Appendix 3:	23
RPI approved LMA drawing example	23
Appendix 4	23
Example Traffic Guidance Scheme	23
Appendix 5	24
Technical report – Temporary modification to traffic signals	24

DEFINITIONS

The following definitions apply in this document:

Term	Definition
AGD	Above Ground Detector
FY	Flashing Yellow
LG	Local Government
LMA	Light Maintenance Traffic Signal Drawing
LOS	Level of Service
Main Roads	Main Roads Western Australia
NO	Network Operations
Portable Traffic Signals	Unfixed manually operated or automatic signals used in short term works
RA	Road Authority
RM	Regional Manager
RNOC	Road Network Operations Centre
Road Authority	National or state road agency, municipality, other body or individual responsible for the care, control and maintenance of road infrastructure
RPI	Road Planned Interventions
RTM	Roadworks Traffic Manager
RTTO	Real Time Traffic Operations
Temporary Traffic Signals	A fixed or unfixed set of traffic signals that may or may not be integrated with SCATS, accompanied by all required regulatory signs and pavement markings
Temporary Works	Less than 24 months in duration
TGS	Traffic Guidance Scheme
TMP	Traffic Management Plan
TMS	Traffic Management Services
Traffic Control Signal	As defined in Regulation 3 of the <i>Road Traffic Code 2000</i> means any light or lights (coloured or otherwise), however operated, for the control or regulation of traffic, by the use of an illuminated word or words, an illuminated symbol or symbols, a coloured light or coloured lights or any combination of those things
TSAP	Traffic Signal Approval Policy
Working Days	Monday – Friday, not including public holidays

1 PURPOSE

The purpose of this *Temporary Traffic Management Traffic Signal Approval Policy* document is to set out the circumstances and process under which Main Roads Network Operations will consider approving the temporary modification to traffic signals and/or the implementation of temporary traffic management within the vicinity of traffic signals for the purposes of carrying out works and events.

For the purposes of this document, temporary is defined as any work with a duration of less than 24 months.

Any proposals to modify signals for a duration greater than two years shall be subject to the requirements contained within the Main Roads Traffic Signal Approval Policy.

2 SCOPE

This policy and the related procedures apply to the temporary modification to all permanent traffic signals or any new temporary traffic signals.

3 ROLES & RESPONSIBILITIES

The Commissioner of Main Roads, under Regulation 297 of the *Road Traffic Code 2000*, has the sole authority to erect, establish or display, and alter or take down any traffic control signal in Western Australia. To this extent, all traffic control signal alterations or any arrangement that affects the normal operation of a traffic signal must be formally approved by Main Roads.

3.1 Main Roads Traffic Management for Works on Roads Code of Practice

Any TMP at permanent signals that requires any of the below traffic arrangements shall be endorsed by a Roadworks Traffic Manager (RTM) and submitted to Main Roads for approval:

1. Alteration to the function of the traffic signals or signal display (e.g. flashing yellow, masking displays, modifying movements or phasing, adjusting cycle times);
2. Closure of a traffic lane (including tapers or road closures):
 - a) within a signalised intersection,
 - b) within 30m of the stop line on the approach,
 - c) within 30m of the adjacent stop line on the departure,
3. Closure of any part of a signalised dedicated turning lane.

4 TRAFFIC MODELLING REQUIREMENTS

Depending on the location, complexity and duration of a project, Main Roads may request a traffic model demonstrating the anticipated impacts on traffic is provided so that various options of traffic management treatments can be explored. Producing a traffic model as part of a technical report can reduce multiple TMP revisions and the lengthy approval periods associated with those revisions.

Once a traffic model has been reviewed and accepted by Main Roads the applicant will then proceed to produce a TMP around the model and technical report, before submitting to Main Roads for authorisation to proceed.

Where a modelling report is necessary, the applicant should contact Main Roads to discuss the project in greater detail prior to submission. Applicants should note that for operational reasons to support implementation, the Network Operations Directorate within Main Roads have adopted LinSig as its preferred software for the assessment of signalled intersections. In some situations SIDRA maybe accepted dependant on the scenario.

To assist traffic management designers in ascertaining when traffic modelling maybe required, the following table should be used.

CONSEQUENCE CATEGORIES					
	INSIGNIFICANT	MINOR	MODERATE	MAJOR	CATASTROPHIC
Transport Services	<ul style="list-style-type: none"> Minimal impacts to customers (minimal drop in patronage or minimal-level of congestion, e.g 30 - 60 seconds travel time delay). 	<ul style="list-style-type: none"> Short-term impact to customers (short-term drop in patronage or isolated congestion, e.g 2 minutes travel time delay) 	<ul style="list-style-type: none"> Medium impact to customers (medium-term drop in patronage or medium level of congestion, e.g 5 minutes travel time delay). 	<ul style="list-style-type: none"> Non-critical service infrastructure is not operational and cannot be rectified. Substantial impact to customers (substantial drop in patronage or substantial level of congestion, e.g 5 -10 minutes). Queues extending to surrounding intersections 	<ul style="list-style-type: none"> Severe impact to customers (severe drop in patronage or severe level of congestion, e.g greater than 10 minutes travel time delay) Queues extending to surrounding intersections
Reputation and Trust	<ul style="list-style-type: none"> Isolated local community or individual's issue-based concerns. Low profile media attention. 	<ul style="list-style-type: none"> Local community impacts and concerns. Occasional once-off negative media attention. Trust issues raised. 	<ul style="list-style-type: none"> Sectional community impacts and concerns publicly expressed. Increased negative media attention. Loss of confidence and trust by community and stakeholders in agency processes and capability. Ministerial concern. 	<ul style="list-style-type: none"> Substantial and prolonged community impact and dissatisfaction publicly expressed. Consistent negative media attention. Criticism and loss of confidence/ trust by community and stakeholders in agency processes and capability. Ministerial intervention. 	<ul style="list-style-type: none"> Severe adverse community impacts and condemnation. Extreme negative media attention. Consistent ongoing community loss of confidence and trust in agency capabilities and intentions. Government intervention.
Business or Project Operations	<ul style="list-style-type: none"> Minimal delays to activities. Up to 5% variation in KPI or objective. 	<ul style="list-style-type: none"> Short-term delays to activities. 5% to 10% variation in KPI or objective. 	<ul style="list-style-type: none"> Medium delays to activities. 10% to 25% variation in KPI or objective. One or more projects is significantly impaired. 	<ul style="list-style-type: none"> Substantial delays to activities. 25% to 50% variation in KPI or objective. One or more critical programs or projects cannot be delivered. 	<ul style="list-style-type: none"> Activities ceased. More than 50% variation in KPI or objective. Multiple critical programs or projects cannot be delivered.

CONSEQUENCE CATEGORIES						
HEATMAP	DURATION	Insignificant	Minor	Moderate	Major	Catastrophic
	Permanent changes	TSAP required				
	Over two years	TSAP required				
	One to two years	4	9	10	11	12
	Six months to one year	3	6	10	11	12
	One month to six months	2	5	8	10	10
	One day to one month	1	3	5	7	9

Network Performance Oversight and Involvement	
Risk Rating	Network Performance Oversight
Low (1-5)	Low – Network Performance involvement not required
Medium (6-8)	Medium – Network Performance involvement required, Traffic analysis to be supplied if required
High (9-10)	High – Network Performance involvement required, Traffic analysis and Linsig modelling to be supplied if required
Very High (11-12)	Very High – Network Performance involvement required, Traffic analysis, Linsig modelling and microsimulation modelling to be supplied if required

4.1 Case examples:

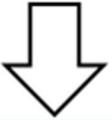
Example 1:

Council ABC has a requirement to close a local government road to facilitate major sewer works. The road carries 9,000 vehicles per day and the project will take 2 months to complete. Some businesses and bus services will be impacted, and the surrounding road network will be expected to manage the detoured traffic.



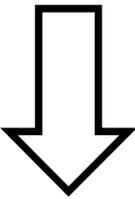
	CONSEQUENCE CATEGORIES				
	INSIGNIFICANT	MINOR	MODERATE	MAJOR	CATASTROPHIC
Transport Services	<ul style="list-style-type: none"> Minimal impacts to customers (minimal drop in patronage or minimal-level of congestion, e.g 30 - 60 seconds travel time delay). 	<ul style="list-style-type: none"> Short-term impact to customers (short-term drop in patronage or isolated congestion, e.g 2 minutes travel time delay) 	<ul style="list-style-type: none"> Medium impact to customers (medium-term drop in patronage or medium level of congestion, e.g 5 minutes travel time delay). 	<ul style="list-style-type: none"> Non-critical service infrastructure is not operational and cannot be rectified. Substantial impact to customers (substantial drop in patronage or substantial level of congestion, e.g 5 -10 minutes). 	<ul style="list-style-type: none"> Severe impact to customers (severe drop in patronage or severe level of congestion, e.g greater than 10 minutes travel time delay).
Reputation and Trust	<ul style="list-style-type: none"> Isolated local community or individual's issue-based concerns. Low profile media attention. 	<ul style="list-style-type: none"> Local community impacts and concerns. Occasional once-off negative media attention. Trust issues raised. 	<ul style="list-style-type: none"> Sectional community impacts and concerns publicly expressed. Increased negative media attention. Loss of confidence and trust by community and stakeholders in agency processes and capability. Ministerial concern. 	<ul style="list-style-type: none"> Substantial and prolonged community impact and dissatisfaction publicly expressed. Consistent negative media attention. Criticism and loss of confidence/ trust by community and stakeholders in agency processes and capability. Ministerial intervention. 	<ul style="list-style-type: none"> Severe adverse community impacts and condemnation. Extreme negative media attention. Consistent ongoing community loss of confidence and trust in agency capabilities and intentions. Government intervention.
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Project is forecast to have a moderate impact, equating to possible ministerial concern and approximately 5 minutes delay in travel times.



		CONSEQUENCE CATEGORIES				
HEATMAP	DURATION	Insignificant	Minor	Moderate	Major	Catastrophic
	Permanent changes			TSAP required		
	Over two years			TSAP required		
	One to two years	4	9	10	11	12
	Six months to one year	3	6	10	11	12
	One month to six months	2	5	8	10	10
One day to one month	1	3	5	7	9	

Project consequence and duration are combined, receiving a residual rating of 8.



Network Performance Oversight and Involvement	
Risk Rating	Network Performance Oversight
Low (1-5)	Low – Network Performance involvement not required
Medium (6-8)	Medium – Network Performance involvement required, Traffic analysis to be supplied if required
High (9-10)	High – Network Performance involvement required, Traffic analysis and <u>Linsig</u> modelling to be supplied if required
Very High (11-12)	Very High – Network Performance involvement required, Traffic analysis, <u>Linsig</u> modelling and microsimulation modelling to be supplied if required

*Project is categorised as **MEDIUM** meaning a traffic analysis maybe required if deemed necessary by Main Roads or the Local Government.*

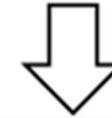
Example 2:

Main Roads contractor requires to close the westbound carriageway of a major highway to facilitate a significant excavation. Westbound traffic will be detoured on to the eastbound carriageway via a ‘contraflow’ arrangement, and various arterial routes will be impacted by detoured traffic. The road carries approximately 46,000 vehicles per day and the project will take approximately 6 weeks to complete.



CONSEQUENCE CATEGORIES					
	INSIGNIFICANT	MINOR	MODERATE	MAJOR	CATASTROPHIC
Transport Services	<ul style="list-style-type: none"> Minimal impacts to customers (minimal drop in patronage or minimal level of congestion, e.g. 30 - 60 seconds travel time delay). 	<ul style="list-style-type: none"> Short-term impact to customers (short-term drop in patronage or isolated congestion, e.g. 2 minutes travel time delay) 	<ul style="list-style-type: none"> Medium impact to customers (medium-term drop in patronage or medium level of congestion, e.g. 5 minutes travel time delay). 	<ul style="list-style-type: none"> Non-critical service infrastructure is not operational and cannot be rectified. Substantial impact to customers (substantial drop in patronage or substantial level of congestion, e.g. 5 -10 minutes). 	<ul style="list-style-type: none"> Severe impact to customers (severe drop in patronage or severe level of congestion, e.g. greater than 10 minutes travel time delay).
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Business or Project Operations	<ul style="list-style-type: none"> Minimal delays to activities. Up to 5% variation in KPI or objective. 	<ul style="list-style-type: none"> Short-term delays to activities. 5% to 10% variation in KPI or objective. 	<ul style="list-style-type: none"> Medium delays to activities. 10% to 25% variation in KPI or objective. One or more projects is significantly impaired. 	<ul style="list-style-type: none"> Substantial delays to activities. 25% to 50% variation in KPI or objective. One or more critical programs or projects cannot be delivered. 	<ul style="list-style-type: none"> Activities ceased. More than 50% variation in KPI or objective. Multiple critical programs or projects cannot be delivered.

Project is forecast to have a major impact, resulting in consistent negative media attention and approximately 5 to 10 minutes delay in travel times.



		CONSEQUENCE CATEGORIES				
		Insignificant	Minor	Moderate	Major	Catastrophic
HEA TMAP	DURATION					
	Permanent changes Over two years			TSAP required		
	One to two years	4	9	10	11	12
	Six months to one year	3	6	10	11	12
	One month to six months	2	5	8	10	10
	One day to one month	1	3	5	7	9

Project consequence and duration are combined, giving a residual rating of 10.

Network Performance Oversight and Involvement	
Risk Rating	Network Performance Oversight
Low (1-5)	Low – Network Performance involvement not required
Medium (6-8)	Medium – Network Performance involvement required, Traffic analysis to be supplied if required
High (9-10)	High – Network Performance involvement required, Traffic analysis and Linsig modelling to be supplied if required
Very High (11-12)	Very High – Network Performance involvement required, Traffic analysis, Linsig modelling and microsimulation modelling to be supplied if required

Project is categorised as **HIGH** meaning traffic analysis and Linsig modelling maybe required if deemed necessary by Main Roads

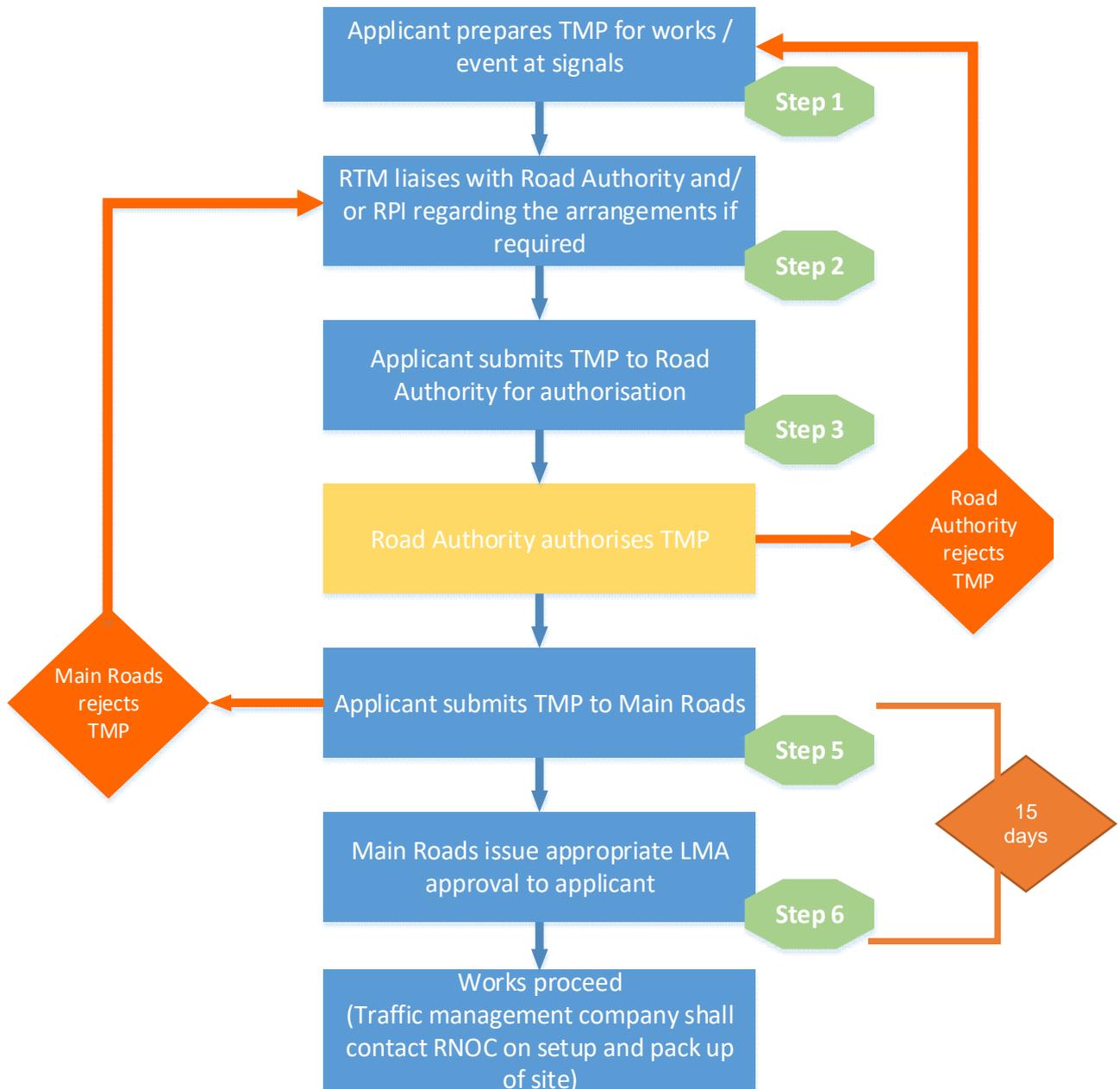
5 TEMPORARY TRAFFIC MANAGEMENT AT SIGNALS – APPROVAL PROCESS

Note:

The following outlines the general procedure for all temporary traffic management applications that do not involve a physical modification to traffic signals, or the associated signs and pavement markings. This section covers lane closures at signals, flashing yellow scenarios, extending green time phases, road closures at signals and any other works within 30 metres of traffic signals. For physical changes to traffic signal hardware or software, refer to section 6.

For applications in the Metropolitan area, please contact RPI and, for applications in regional areas, please contact the relevant Main Roads' Regional Office.

Works / Events not involving modifications – Approval Process



Works / Events at Traffic Signals – Approval and Implementation Process

- (1) The applicant shall prepare a compliant TMP, which caters for the safety of workers whilst maintaining compliance with the maximum allowable tolerances for lane capacity outlined within the AS1742.3 – 2009 and / or the Main Roads *Traffic Management for Works on Roads Code of Practice*. The RTM shall use the table within section 4 of this document to ascertain if traffic modelling is required.
- (2) The RTM may, on behalf of the applicant, contact RPI prior to the development of the TMP for technical advice in situations where they are unsure of an appropriate traffic management arrangement. In certain circumstances Main Roads may require the arrangements to be modelled, in which case the modelling requirements within the Traffic Signal Approval Policy shall be applicable.
- (3) Once the RTM endorses the TMP it shall be submitted to the RA for approval. The RA will return authorisation to the applicant. This authorisation should be affixed to the front cover of the TMP or included as an appendix to the plan.
- (4) RA will accept or reject the TMP.
- (5) The endorsed TMP and associated road authority consent shall be submitted to enquiries@mainroads.wa.gov.au a minimum of 15 working days prior to the proposed start date of works.¹
- (6) Main Roads will assess the proposed signal modifications and issue an approval with the specified times and dates for the specific TGS setups.
- (7) Works proceed onsite. The traffic management company installing the arrangements shall contact Main Roads on 138 111 at least 15 minutes prior to commencement and immediately upon removal of the traffic management. A copy of the approved LMA should be retained onsite at all times for producing on request by a road authority or Main Roads representative².

¹ Events are subject to differing timeframes subject to the requirements of the Road Traffic Act 1974, Part VA. Refer to section 6 of the *Traffic Management for Events Code of Practice* for further information.

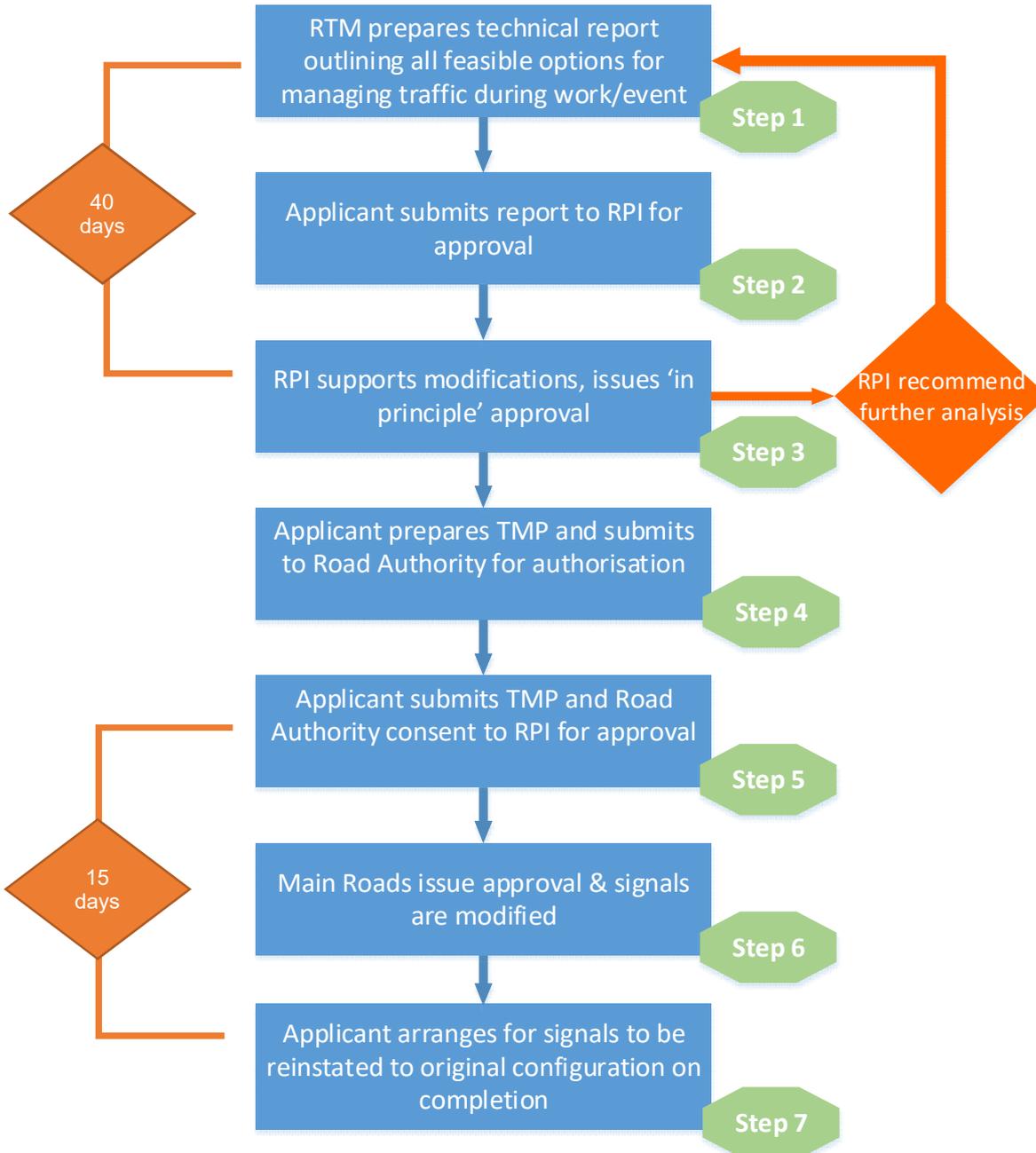
² Any date changes to works shall be submitted to Main Roads a minimum of five business days prior to commencement of the scheduled works. A maximum of three date changes per application are permitted, after which stage Main Roads may require a new application to be submitted.

6 TEMPORARY MODIFICATIONS TO TRAFFIC SIGNALS – APPROVAL PROCESS

Note:

The following outlines the process for any physical changes to traffic signals, such as adding / removing a signal aspect, installing a leading right turn, modifying line marking at signals, installing new loops or adding a new phase to the signal sequence. Physical changes to traffic signals for the purposes of temporary traffic management should be subject to a thorough analysis of all other traffic management treatments.

For applications in the metropolitan area, please contact RPI and for applications in regional areas, please contact the Main Roads Regional Office.



Temporary modifications to Traffic Signals – Approval Process

Traffic signal modification requires written authorisation from RPI and is subject to the presentation of satisfactory designs. The decision to temporarily modify an existing traffic signal and the associated regulatory signs and lines should be based on thorough evaluation and comparison of all possible alternative treatments for a particular site. For further information regarding the removal of traffic signals, refer to the TSAP.

In situations where significant volumes of traffic need to be redirected for the purposes of roadworks and/or events, there may be a requirement to make modifications to traffic signals to assist in managing the additional flows. Such temporary arrangements require significant research and feasibility investigations prior to proceeding with submitting the proposal to Main Roads. Any hardware modifications to traffic signals shall only be carried out by a company with previously demonstrated experience in operating with traffic signals.

The following steps elaborate upon the flowchart in section 6 of this document, identifying the steps to be taken when physical changes are being made to traffic signals.

- (1) The RTM endorsing the TMP shall explore the various options of carrying out works, recommending the most efficient and safe method for use. Where the RTM recommends physical modifications to traffic signals, they shall prepare a technical report outlining all feasible traffic management treatments for the works/event. The technical report (see Appendix 5) will detail these scenarios and provide a summary as to why the traffic signal modification is the most appropriate treatment.
- (2) The technical report shall be submitted in conjunction with TGS concept drawings and LMA mark-ups to RPI at least 40 business days prior to commencement of works. The RTM shall use the table within section 4 of this document to ascertain if traffic modelling is required.
- (3) Main Roads will provide comment on the technical report within 15 business days of receiving the report, making recommendations on the proposed modifications or improvements where required. Main Roads may either reject the findings of the report, in which case alternative measures should be explored, or support the proposals in principle, allowing the applicant to proceed with finalising the TMP.
- (4) The applicant should finalise the TMP based upon the technical report findings and submit to the road authority for authorisation.
- (5) On receipt of road authority consent, the finalised TMP and technical report shall be submitted to Main Roads a minimum of 15 business days prior to commencement of works.
- (6) Main Roads will issue approval to the applicant, allowing works to proceed. Signal modifications to signal hardware and software shall only be undertaken by a company with previously demonstrated experience. All costs to traffic signal modifications are the responsibility of the principal contractor carrying out the works.
- (7) When works conclude the applicant shall arrange restoration of the signals to their previous condition prior to the removal of temporary traffic management.

6.1 Technical Report

If it is deemed that a traffic model is necessary, it shall be accompanied by a technical report.

Any technical report provided shall be either prepared or reviewed by an RTM. An RTM is deemed as having the necessary skills and knowledge in assessing the most suitable traffic arrangement. For concepts requiring a technical report and the associated signal modifications, the RTM is encouraged to make contact with RPI to discuss the concept in detail prior to proceeding with development of the TMP. RAs (Main Roads or local councils) are key stakeholders and should be involved in any preliminary discussions.

Technical reports should outline all viable traffic management treatments, taking into account the most productive and cost effective construction methodology, whilst simultaneously providing the most efficient traffic management arrangements. To assist the applicant in preparing a technical report, an example has been provided in Appendix 4 of this policy.

The technical report shall contain the following as a minimum:

- A breakdown of various traffic management treatments explored as options for conducting the works, including the benefits and constraints of each treatment;
- A breakdown of the various construction methodologies;
- A comparison of timings (i.e. duration) of the project based upon the various traffic and construction methodologies;
- A consideration towards 24/7 works to expedite completion of works; and
- A TGS drawing depicting the traffic management arrangements³;
- A traffic model or microsimulation, as deemed necessary by Main Roads; and
- A marked up LMA drawing if physical changes are being proposed to traffic signals.

7 OTHER CONSIDERATIONS

There are multiple risks associated with working within the vicinity of signals, below are some common issues that are not appropriately considered within TMPs.

RTMs undertaking a review of a complex arrangement at signals are encouraged to contact RPI for any technical advice on the proposed traffic management arrangement.

7.1 Signalised Pedestrian Crossings

The approval process outlined in this document is applicable to all signalised pedestrian crossings.

7.2 Long Term Signal Modifications

Any proposal to modify signals that will be in place for a duration greater than 24 months shall be considered a permanent arrangement. The requirements of the Main Roads TSAP shall be applicable in those situations.

7.3 Covering Traffic Signal Aspects

Any plan to cover lanterns on existing signals or masking of signal aspects, must be approved by Main Roads through the submission of an RTM endorsed TMP and issuing of an approval as per section 5 of this document.

The covering of signal aspects shall only be undertaken by a company with previously demonstrated experience.

Main Roads shall be notified prior to the works and immediately upon removal of the traffic management on 138 111.

³ TGS should be conceptual and does not have to include all the required signs and devices

7.4 Metered Roundabouts

Innovative arrangements that effectively manage traffic movements whilst maintaining a safe working environment are encouraged.

Roundabout metering signals help to create gaps in traffic to assist with excessive queueing caused by unbalanced traffic flows. The use of temporary traffic signals at roundabouts for the purpose of managing traffic in roadwork arrangements shall be submitted to Main Roads for approval prior to installation.

For further information on the use of metering in permanent situations, refer to the *Main Roads Guidelines for the Analysis of Roundabout Metering Signals*.

7.5 Conducting Reversible Flow at Traffic Signals

There are situations where during events and roadworks traffic controllers must take control of a signalised intersection via reversible flow. Conducting reverse flow at signals shall only ever be undertaken when the signals either are in a Flashing Yellow state or alternatively blacked out (switched off) completely. Traffic Controllers shall never direct traffic contrary to that indicated by traffic signals.

Traffic Controllers using double-sided STOP/SLOW hand-held signs to control traffic at intersections, shall cover or remove the SLOW sign to ensure that vehicles on other approaches do not proceed into the intersection. If there is a risk of motorists departing a traffic controlled section and ignoring nearby traffic signals after reading the hand-held SLOW sign, an additional Traffic Controller shall be stationed at the approach to the signals (from the works or event), to display a hand-held STOP sign when the traffic signals display red.

In emergency situations, such as where a vehicle may have collided with traffic signals and traffic control is urgently required, emergency assistance can be arranged by contacting the Western Australia Police on 131 444.

7.6 Notification of Roadwork and Event Form

On receipt of LMA approval, a *Notification of Roadworks form* or a *Notification of Event form* shall be sent out to all affected stakeholders a minimum of seven days prior to commencement, or as soon as practicable.

In all cases when working at traffic signals, Main Roads shall be notified on 138 111 prior to setup and immediately after pack up of the site. The traffic management company shall reference the intersection and LMA drawing.

7.7 Reinstatement of traffic signal loops

When traffic signal vehicle detection loops are damaged during roadworks, the loops default to a permanent call for the designated traffic movement, as a consequence the approach will continually be demanded every cycle and the green signal time will go to maximum time even when no vehicles are present. This causes unnecessary delays to other traffic movements, especially during peak periods.

In advance of works that involve loops being cut, the principal contactor shall engage a suitably experienced traffic signal company to reinstate the damaged vehicle loops as soon as possible after the resurfacing has been completed. If the electrical contactor is unable to reinstate the loops within a 48 hour period, AGD's shall be installed prior to commencement of works to ensure there is temporary detection in place until the loops are reinstated. Detection systems used should also be capable of counting traffic so that assessments of traffic flow are possible during the use of these systems.

Traffic Management companies who do not notify detection services prior to works where loops are affected will be reprimanded and recorded in the Main Roads Traffic Management Company Registration Scheme.

7.8 Lateral Clearance

Closing right turning lanes whilst continuing to allow those movements from through lanes should be assessed for the risk of sideswipe type accidents. Austroads recommends a minimum of two metres lateral clearance is maintained, and any reduction of this clearance needs to be suitably risk assessed within the TMP.

Where a minimum distance cannot be achieved, turning bans or alternative means to avoid simultaneous turning movements should be considered.

7.9 Pedestrian Considerations

Closing turning lanes at signals and allowing those turns from centre lanes can often conflict with pedestrian phases, and designers are reminded to assess and mitigate this risk during the development of the TMP. Such mitigation measures can include banning the turning movement, implementing a pedestrian detour or positioning 'spotters' to assist path users across the intersection when safe to do so.

8 REFERENCES AND RELATED DOCUMENTS

Document Number	Description
AS1742.3-2009	Australian Standard 1742.3 – 2009
D10#12686	Main Roads Traffic Controllers' Handbook
D15#486558	Main Roads Policy for Traffic Management at Roadworks on State Roads.
D17#582749	Main Roads Traffic Signals Approval Policy
D18#808439	Main Roads Traffic Management for works on roads Code of Practice
D17#339636	Main Roads Traffic Management for events on roads Code of Practice
N/A	Main Roads Guidelines for the Analysis of Roundabout Metering Signals.

9 APPENDICES

Appendix	Title
Appendix 1	Temporary Metered Roundabout Example
Appendix 2	LMA drawings – Temporary Traffic Signal Modification
Appendix 3	RPI approved LMA example
Appendix 4	Technical Report Template

Appendix 1: Temporary Metered Roundabout

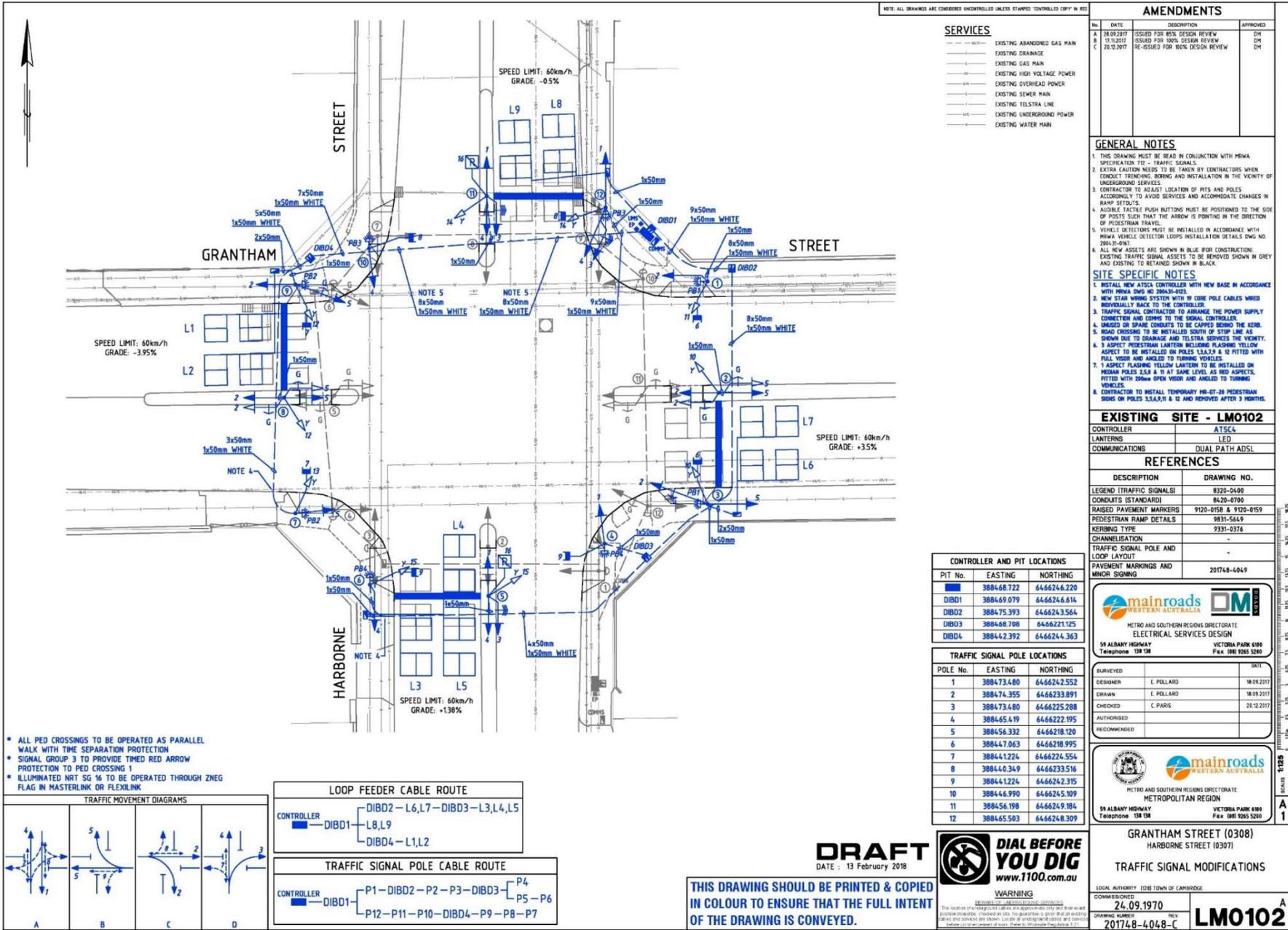
RPI encourages the exploration of innovative traffic management solutions that manage to maintain traffic efficiency as much as possible whilst not impeding adversely on site safety or the productivity of the works.

The following drawing is an example where temporary traffic signals were installed at a temporary roundabout to balance the flows of the traffic in peak periods. The temporary traffic signals are activated on the eastbound and westbound approaches during the morning peak period to create gaps for the heavy southbound traffic, thus enabling the roundabout to run at optimal efficiency.

Appendix 2:

LMA drawings – Temporary Traffic Signal modification for the purposes of roadworks

The following is an example of an LMA drawing issued showing physical changes to traffic signals, where a leading right turn and additional phases were added to the signal. The addition of a leading right turn increased the capacity of the intersection thus enabling the works to proceed whilst maintaining traffic efficiency.



NOTE: ALL DRAWINGS ARE CONSIDERED UNCONTROLLED UNLESS STAMPED 'CONTROLLED COPY' IN RED

SERVICES		
---	---	EXISTING ABANDONED GAS MAIN
---	---	EXISTING DRAINAGE
---	---	EXISTING GAS MAIN
---	---	EXISTING HIGH VOLTAGE POWER
---	---	EXISTING OVERHEAD POWER
---	---	EXISTING SEMAR MAIN
---	---	EXISTING TELSTRA LINE
---	---	EXISTING UNDERGROUND POWER
---	---	EXISTING WATER MAIN

AMENDMENTS			
No.	DATE	DESCRIPTION	APPROVED
A	28.09.2017	ISSUED FOR 85% DESIGN REVIEW	DM
B	17.11.2017	ISSUED FOR 100% DESIGN REVIEW	DM
C	20.12.2017	RE-ISSUED FOR 100% DESIGN REVIEW	DM

- GENERAL NOTES**
- THIS DRAWING MUST BE READ IN CONJUNCTION WITH MSHA SPECIFICATION 712 - TRAFFIC SIGNALS.
 - EXTRA CAUTION NEEDS TO BE TAKEN BY CONTRACTORS WHEN CONDUCT TRENCHING, BRIBING AND INSTALLATION IN THE VICINITY OF UNDERGROUND SERVICES.
 - CONTRACTOR TO ASSESS LOCATION OF PITS AND POLES ACCORDINGLY TO AVOID SERVICES AND ACCOMMODATE CHANGES IN RAMP SET-OUTS.
 - AUDIBLE TACTILE PUSH BUTTONS MUST BE POSITIONED TO THE SIDE OF POSTS SUCH THAT THE ARROW IS POINTING IN THE DIRECTION OF PEDESTRIAN TRAVEL.
 - VEHICLE DETECTORS MUST BE INSTALLED IN ACCORDANCE WITH MSHA VEHICLE DETECTOR LOOPS INSTALLATION DETAILS DWG NO. 2004-0047.
 - ALL NEW ASSETS ARE SHOWN IN BLUE (FOR CONSTRUCTION). EXISTING TRAFFIC SIGNAL ASSETS TO BE REMOVED SHOWN IN GREY AND EXISTING TO REMAIN SHOWN IN BLACK.

- SITE SPECIFIC NOTES**
- INSTALL NEW ATSC4 CONTROLLER WITH NEW BASE IN ACCORDANCE WITH MSHA DWG NO. 2004-005.
 - NEW STAR WIRING SYSTEM WITH 19 CORE POLE CABLES WIRED INDIVIDUALLY BACK TO THE CONTROLLER.
 - TRAFFIC SIGNAL CONTRACTOR TO ARRANGE THE POWER SUPPLY CONNECTOR AND COME TO THE SIGNAL CONTROLLER.
 - UNUSED OR SPARE CONDUITS TO BE CAPPED BEHIND THE KEYS.
 - ROAD CROSSING TO BE INSTALLED SOUTH OF STOP LINE AS SHOWN DUE TO DRAINAGE AND TELSTRA SERVICES THE VICINITY.
 - 3 ASPECT PEDESTRIAN LANTERN INCLUDING FLASHING YELLOW ASPECT TO BE INSTALLED ON POLES 3.5.5.7.9 & 10 FITTED WITH FULL VIGNER AND ANGLED TO TURNING VEHICLES.
 - 3 ASPECT FLASHING YELLOW LANTERN TO BE INSTALLED ON POLES 2.5.2.3 & 10 AT SAME LEVEL AS RED ASPECTS, FITTED WITH 200mm OPEN VIGNER AND ANGLED TO TURNING VEHICLES.
 - CONTRACTOR TO INSTALL TEMPORARY M8-02-20 PEDESTRIAN SIGNS ON POLES 3.5.5.7.9 & 10 AND REMOVED AFTER 3 MONTHS.

EXISTING SITE - LMO102

CONTROLLER	ATSC4
LANTERNS	LED
COMMUNICATIONS	DUAL PATH ADSL

REFERENCES

DESCRIPTION	DRAWING NO.
LEGEND (TRAFFIC SIGNALS)	8320-0400
CONDUITS (STANDARD)	8420-0700
RAISED PAVEMENT MARKERS	9120-0158 & 9120-0159
PEDESTRIAN RAMP DETAILS	9831-544.9
KEYBOARD TYPE	9331-0376
CHANNELISATION	-
TRAFFIC SIGNAL POLE AND LOOP LAYOUT	-
PAVEMENT MARKINGS AND MINOR SIGNING	201748-004.9

CONTROLLER AND PIT LOCATIONS

PIT No.	EASTING	NORTHING
DIBD1	3884.68.722	64.6624.6.220
DIBD2	3884.69.079	64.6624.6.614
DIBD3	3884.75.393	64.6624.3.564
DIBD4	3884.68.708	64.6622.1.125
DIBD4	3884.4.2.392	64.6624.4.363

TRAFFIC SIGNAL POLE LOCATIONS

POLE No.	EASTING	NORTHING
1	3884.73.480	64.6624.2.552
2	3884.74.355	64.6623.3.891
3	3884.73.480	64.6622.5.288
4	3884.65.419	64.6622.2.195
5	3884.56.332	64.6621.8.126
6	3884.47.063	64.6621.8.995
7	3884.41.224	64.6622.4.554
8	3884.40.349	64.6623.3.516
9	3884.41.224	64.6624.2.315
10	3884.46.990	64.6624.5.109
11	3884.56.198	64.6624.9.184
12	3884.65.503	64.6624.8.309

mainroads
WESTERN AUSTRALIA

METRO AND SOUTHERN REGIONS DIRECTORATE
ELECTRICAL SERVICES DESIGN

99 ALBANY HIGHWAY
Telephone 138 138

VICTORIA PARK 6100
Fax: 181 3265 3200

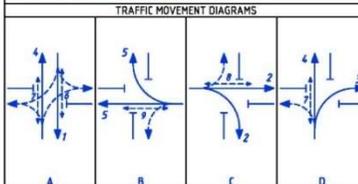
SURVEYED	DRAWN	CHECKED	DESIGNED	DATE
	E. POLLARD	C. PARIS	E. POLLARD	18.04.2017
	E. POLLARD			18.04.2017
				20.12.2017

METRO AND SOUTHERN REGIONS DIRECTORATE
METROPOLITAN REGION

99 ALBANY HIGHWAY
Telephone 138 138

VICTORIA PARK 6100
Fax: 181 3265 3200

- * ALL PED CROSSINGS TO BE OPERATED AS PARALLEL WALK WITH TIME SEPARATION PROTECTION
- * SIGNAL GROUP 3 TO PROVIDE TIMED RED ARROW PROTECTION TO PED CROSSINGS 1
- * ILLUMINATED NRT SG 16 TO BE OPERATED THROUGH ZNEG FLAG IN MASTERLINK OR FLEXILINK



LOOP FEEDER CABLE ROUTE

CONTROLLER DIBD1 - DIBD2 - L6, L7 - DIBD3 - L3, L4, L5
DIBD1 - L8, L9
DIBD4 - L1, L2

TRAFFIC SIGNAL POLE CABLE ROUTE

CONTROLLER DIBD1 - P1 - DIBD2 - P2 - P3 - DIBD3 - P4
DIBD1 - P12 - P11 - P10 - DIBD4 - P9 - P8 - P7

DRAFT
DATE: 13 February 2018

THIS DRAWING SHOULD BE PRINTED & COPIED IN COLOUR TO ENSURE THAT THE FULL INTENT OF THE DRAWING IS CONVEYED.



WARNING
The location of underground utilities are approximate only and their exact position should be checked on site. No guarantee is given that all existing utilities and services are shown. Users of underground utilities should contact the relevant utility companies before excavation.

GRANTHAM STREET (0308)
HARBORNE STREET (0307)

TRAFFIC SIGNAL MODIFICATIONS

LOCAL AUTHORITY (126) TOWN OF CARBISBEE

COMMISSIONER 24.09.1970

DRAWING NUMBER 201748-4048-C

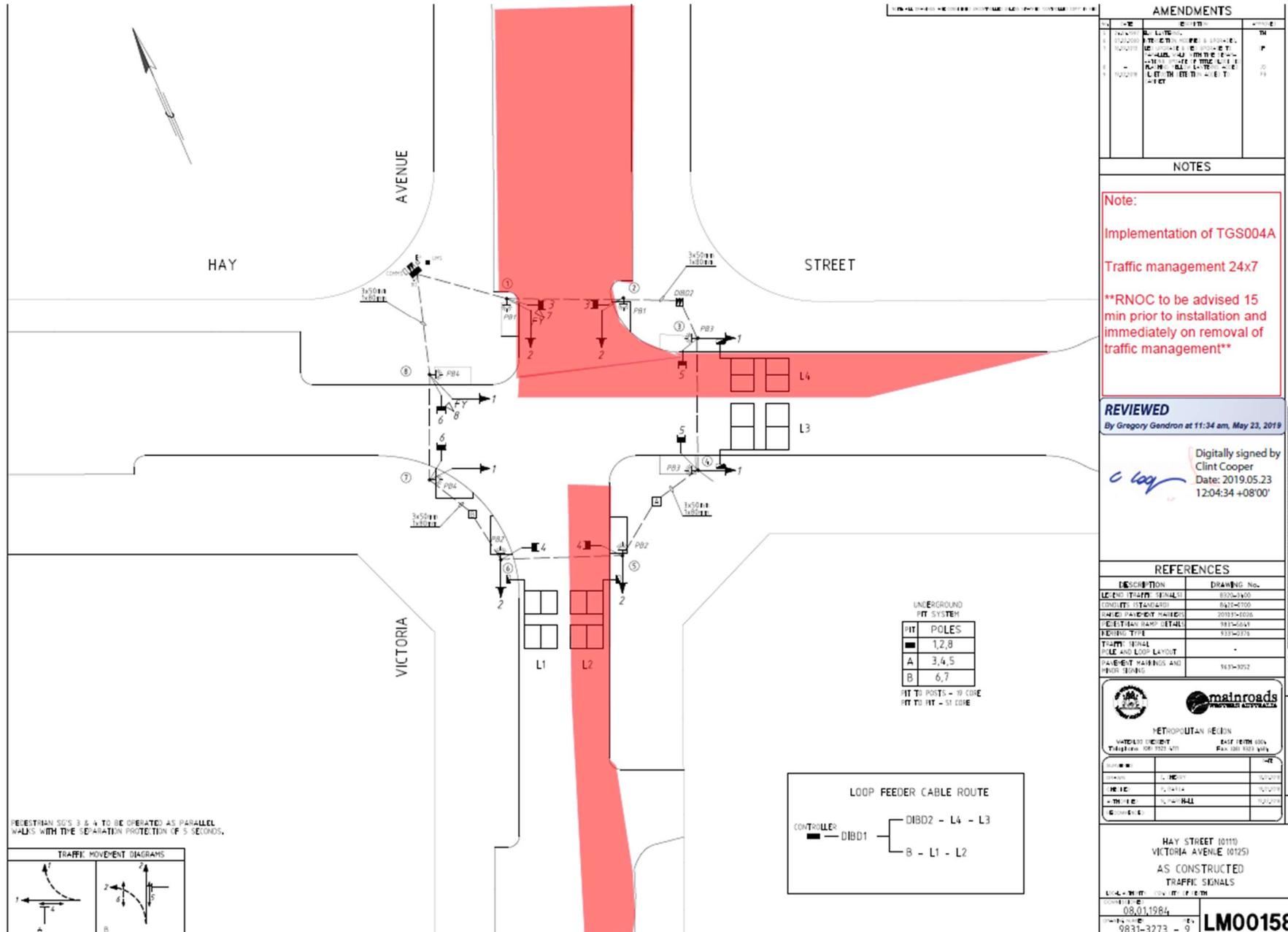
LMO102

Appendix 3:

RPI approved LMA drawing example

Below is an example demonstrating a closed lane at traffic signals for the purposes of roadworks. This LMA has been marked by Road Planned Interventions indicating the closed lane, and signed by the Manager Road Planned Interventions. LMA drawings that are not signed shall not be used onsite.

Traffic management companies are to not that a copy of the approved LMA shall be retained onsite at all times.



AMENDMENTS			
NO.	DATE	DESCRIPTION	BY
1	08/01/2000	ISSUED FOR CONSTRUCTION	JP
2	02/01/2019	IMPLEMENTATION OF TGS004A	JP
3	-	TRAFFIC SIGNALS TO BE OPERATED AS PARALLEL WALKS WITH THE SEPARATION PROTECTION OF 3 SECONDS.	JP
4	02/01/2019	IMPLEMENTATION OF TGS004A	JP

NOTES

Note:

Implementation of TGS004A

Traffic management 24x7

****RNOC to be advised 15 min prior to installation and immediately on removal of traffic management****

REVIEWED

By Gregory Gondron at 11:34 am, May 23, 2019

Digitally signed by
Clint Cooper
Date: 2019.05.23
12:04:34 +08'00'

REFERENCES	
DESCRIPTION	DRAWING No.
LEGEND TRAFFIC SIGNALS	8020-1400
CONDUIT SYSTEMS	8037-4100
PAVEMENT MARKINGS	20331-1000
PEDESTRIAN MARK DETAILS	9831-0649
POLE TYPE	9335-0219
TRAFFIC SIGNAL POLE AND LOOP LAYOUT	-
PAVEMENT MARKINGS AND UNDER SIGNING	9435-3052

mainroads
METROPOLITAN REGION

WATERLOO DISTRICT EAST BIRTH 0004
Telephone: 081 722 4471 Fax: 081 933 9474

NO.	DATE	BY
08/01/2000	08/01/2000	JP
02/01/2019	02/01/2019	JP
02/01/2019	02/01/2019	JP

HAY STREET (0111)
VICTORIA AVENUE (0125)
AS CONSTRUCTED
TRAFFIC SIGNALS

08,01,1984
9831-3273 - 9

LM00158

Appendix 4

Example Traffic Guidance Scheme

Below is a sample Traffic Guidance Scheme for the purposes of facilitating some roadworks.

NOTES

1. THIS SCENARIO IS CONSIDERED COMPLEX AND REQUIRES RTH SIGN OFF AND SITE SPECIFIC ANALYSIS OF TRAFFIC VOLUMES.
2. MAXIMUM LENGTH OF 40km/h IS 500m.
3. CONE SPACING AT 4m.
4. CONE SIZE IS 700mm.

LEGEND

- EXISTING PAVEMENT/ MARKING
- WORK SITE
- BOLLARDS/CONES
- CONTAINMENT FENCE

TABLE 2 CODE OF PRACTICE VALUE OF DIMENSION D

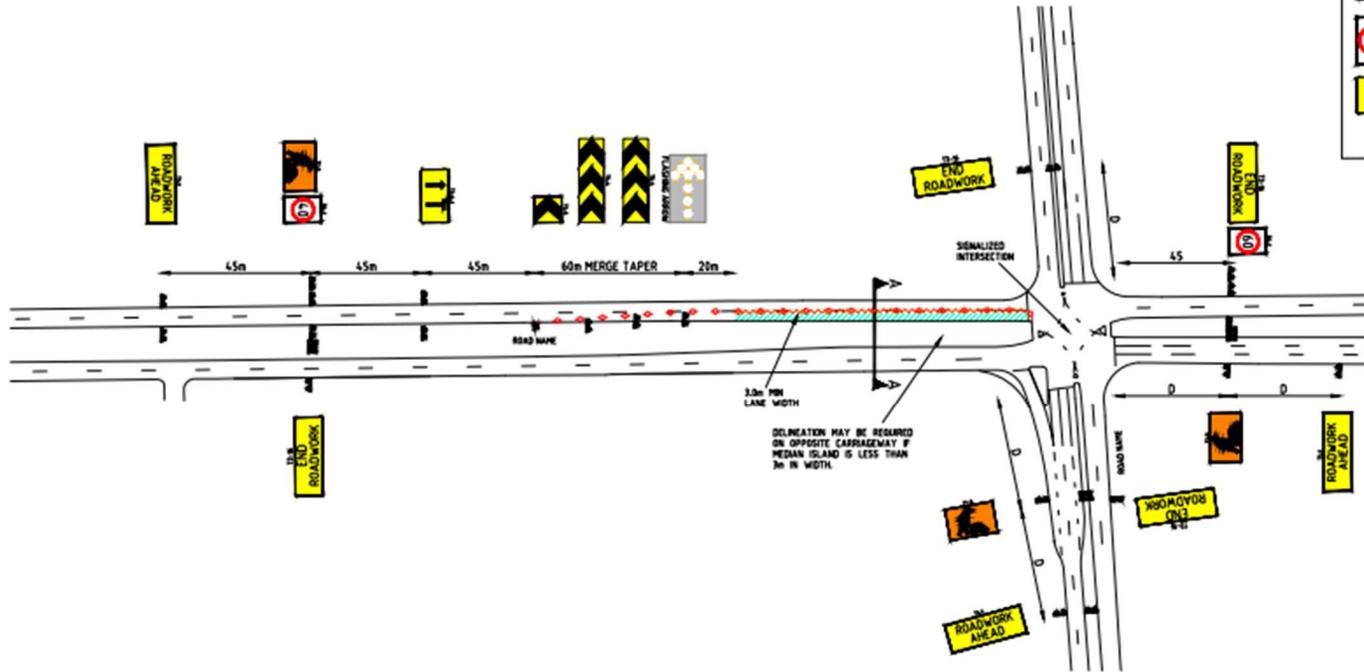
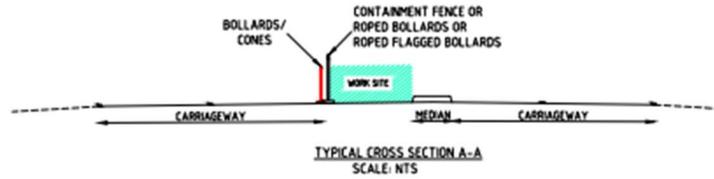
SPEED OF TRAFFIC km/h	DIEMENSION D m
55 OR LESS	15
56 TO 65	45
GREATER THAN 65	EQUAL TO SPEED OF TRAFFIC, IN km/h

SIGN LEGEND

SIGN	NO
	6
	6
	8
	1
	2
	1
	2
	2
	2

GENERAL NOTES

1. THIS TCD IS ONLY TO BE USED AS PART OF A TRAFFIC MANAGEMENT PLAN AND SIGNED OFF BY AN ACCREDITED AWTM.
2. ALL SIGN LOCATIONS ARE TO BE CHECKED PRIOR TO SETOUT AND POSITIONS ADJUSTED TO ALLOW FOR SPECIFIC SITE CONSTRAINTS SUCH AS VEGETATION, OTHER SIGNS, ROADSIDE FURNITURE AND SUFFICIENT SPACE ON SHOULDER/EMERGENCY LANES.
3. THE SYMBOLIC WORKER SIGNS SHALL BE INSTALLED ONLY DURING HOURS WHEN ON-FOOT PERSONNEL WILL BE VISIBLE TO PASSING TRAFFIC.
4. ALL EXISTING SPEED ZONE SIGNAGE WITHIN THE TEMPORARY SPEED ZONE SHALL BE COVERED WITH SUITABLE OPAQUE MATERIAL FOR THE DURATION OF THE STAGE AND COVERS TO BE REMOVED ON COMPLETION OF WORKS EACH DAY, UNLESS OTHERWISE NOTED.
5. MINIMUM TRAFFIC LANE WIDTH OF 3.0m IS TO BE MAINTAINED PAST THE WORKSITE AT ALL TIMES.
6. THE POSITIONING OF SIGNS, LENGTHS OF TAPERS OR MARKINGS SHALL BE:
 - A) MINIMUM, 10% LESS THAN THE DISTANCES OR LENGTHS GIVEN.
 - B) MAXIMUM, 25% MORE THAN THE DISTANCES OR LENGTHS GIVEN.
7. SPACING OF DELINEATION DEVICES:
 - A) NO MINIMUM.
 - B) MAXIMUM, 10% MORE THAN SPACING SHOWN.



DISCLAIMER

IT IS RESPONSIBILITY OF THE USER OF THIS TRAFFIC CONTROL DIAGRAM TO CONFIRM THE APPROPRIATENESS OR OTHERWISE FOR THE INTENDED WORK SITE BASED ON RIGOROUS RISK ASSESSMENT, REVIEW OF THE REQUIREMENTS OF ASTA2.3 AND MAIN ROADS WA TRAFFIC MANAGEMENT FOR WORKS ON ROADS CODE OF PRACTICE. ALL RESPONSIBILITY WILL REMAIN WITH THE USER TO ENSURE COMPLIANCE WITH RELEVANT STANDARDS AND THE PROVISION OF THE NECESSARY LEVEL OF PROTECTION FOR WORK PERSONNEL AND WORK SITE.

No.	DATE	DESCRIPTION	APPR.
D	3.04.14	MRWA AMENDMENTS	
C	19.02.14	SIGNAGE AMENDED	RG
B	13.02.14	TEXT AND SIGN AMENDMENTS	RG
A	31.01.14	FOR CLIENT REVIEW	RG
AMENDMENTS			



MAIN ROADS WA

Scale	NTS
Date	4/08/2014

Title
WORKS ON A HOLD LINE-MEDIAN LANE
 GENERIC SINGLE LANE CLOSURE
 WORKS WITHIN 200m OF SIGNALIZED INTERSECTION
 60km/h TO 40km/h SPEED RESTRICTION; WITHIN 12 m OF TRAFFIC

Dwg No.	MRWA-017
Rev.	D

Appendix 5

Technical report – Temporary modification to traffic signals

This template indicates what shall be used for the basis of a technical report that proposes temporary modifications to traffic signals. All section headings shall remain however the amount and type of details provided is project specific and therefore may be refined where applicable. Where sections do not apply to the project the heading shall remain and noted as not-applicable. Additional traffic analysis may be requested by Main Roads on review of the report.

Refer to section 6.1 for more information regarding technical reports for temporary modifications to traffic signals.



mainroads
WESTERN AUSTRALIA

TECHNICAL REPORT TEMPLATE – Temporary modifications to traffic signals for the purpose of roadworks and or events

INTERSECTION WORKS
STREET NAME - SUBURB
TRAFFIC MANAGEMENT PLAN DESIGNER
Contract XXXX
June 2019

	Name / Company	Accreditation Details	Date	Signed
Report prepared by	XXXXXXX	AWTM XXX	XX/XX/XX	
Reviewed by	XXXXXX	RTM XXXX	XX/XX/XX	

Document No XXX-XXXXX	Rev. No. X	Date XX/XX/XX
-----------------------	------------	---------------

Contents:

1 INTRODUCTION

- 1.1 Purpose and scope
- 1.2 Objectives
- 1.3 strategies

2 PROJECT OVERVIEW

- 2.1 Location
- 2.2 Project Details, Site Assessment and Site Constraint /Impacts
- 2.3 Overview of potential Temporary Traffic Management arrangements

3 TRAFFIC MANAGEMENT PLANNING AND ASSESSMENT

3.1 Traffic Assessment and Analysis

- 3.1.1 Traffic and Speed data
- 3.1.2 Traffic Flow Analysis
- 3.1.3 Current traffic signal phasing
- 3.1.4 Changes to traffic signal phasing
- 3.1.5 Changes to pavement marking
- 3.1.6 Software changes
- 3.1.7 Impact to adjoining network
- 3.1.8 End of queue treatment
- 3.1.9 Temporary Traffic Signals

3.2 Road Users

- 3.2.1 Pedestrians
- 3.2.2 Cyclists
- 3.2.3 Public Transport
- 3.2.4 Heavy and/or oversized vehicles
- 3.2.5 Existing Parking facilities
- 3.2.6 Access to adjoining properties / business
- 3.2.7 Rail Crossings
- 3.2.8 School crossings
- 3.2.9 Special events and other works
- 3.2.10 Emergency vehicle access

3.3 Night work provisions

3.4 Consultation and communication / notification

- 3.4.1 Other agencies
- 3.4.2 Public

3.5 TRAFFIC GUIDANCE SCHEMES

3.6 MODELLING RESULTS

3.7 MICROSIMULATION RESULTS

1 INTRODUCTION

1.1 Purpose and Scope

This technical report outlines the proposed temporary changes to traffic signals to be undertaken by the Project Manager to assist in effectively managing displaced traffic caused by the works/event.

1.1 Objective

The objective of the report is to ensure:

- The performance of the road network is not unduly impacted and the disruption and inconvenience to all road users are minimised for the duration of the works.
- Impacts on users of the road reserve and adjacent properties and facilities are minimised.
- The proposed temporary modifications to traffic signals are appropriate prior to commencement.
- Demonstrate that the TMP designer has conducted a thorough analysis of potential various temporary traffic management treatments.
- Demonstrate that various construction methodologies have been explored to expedite completion of the works.

•

1.2 Strategies

In an effort to meet these objectives this report will incorporate the following strategies:

<Amend if required based on the project>

- Providing a sufficient number of traffic lanes to accommodate vehicle volumes.
- Ensuring delays are minimised.
- Ensuring all road users are managed including motorists, pedestrians, cyclists, people with disabilities and people using public transport.
- Ensuring work activities are carried out sequentially to minimise adverse impacts.
- Provision will be made for works personnel to enter the work area in a safe manner in accordance with safety procedures.
- All entry and exit movements to and from traffic streams shall be in accordance with the requirements of safe working practices.

2 PROJECT OVERVIEW

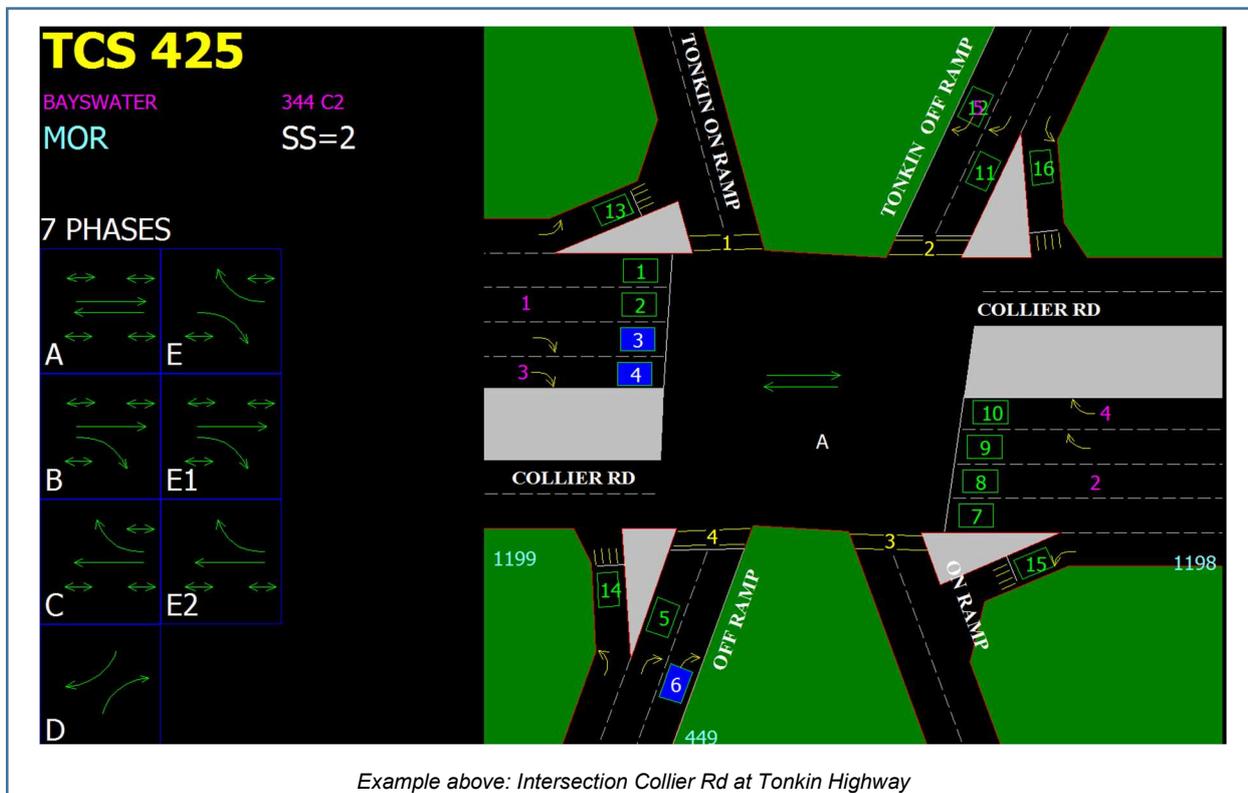
2.1 Location

Insert Sketch



Figure 1 Site Location

SCATS DRAWING



2.2 Project Details, Site Assessment and Site Constraint / Impacts

ITEM	DESCRIPTION
Project	
Location	
Road Classification, Existing Speed Limit	
Road Authority	
Local Government	
Client	
Prime Contractor	
Sub-Contractor	
Contractor undertaking signal modification	<i>(Include company name and contact details)</i>

2.3 Overview of Potential Temporary Traffic Management Arrangements

ITEM	DESCRIPTION
Temporary Traffic Management Descriptions	
Speed zone dates and times	
Lane Closures dates and times	
Road Closures dates and times	
Signal modifications description	
Proposed lane widths	
Road Safety Barrier	

3 TRAFFIC MANAGEMENT PLANNING AND ASSESSMENT

3.1 Traffic Assessment and Analysis

3.1.1 Traffic and Speed Data

A summary of recent traffic data is provided below:

Location	Vehicles per day (% heavy vehicles)	Date	Source
[ROAD NAME] (Site Number)	[NUMBER] (%)	[DATE]	[Traffic Map]

A summary of recent speed data is provided below:

Location	Posted Speed (km/h)	85 th Percentile Speed (km/h)	Date	Source
[ROAD NAME] (Site Number)	[NUMBER]	[NUMBER]	[DATE]	[Traffic Map]

3.1.2 Traffic Flow Analysis

Should include an analysis and commentary of the following:

- Traffic volume and composition against minimum lane requirements (should include traffic modelling data if requested by Main Roads).
- Traffic management selected - lane closures, road closures, speed reductions, detours, single lane reversible flow, side tracks etc.
- Dates, times and locations of proposed traffic management.
- Additional methods in place to minimise impacts to road users

3.1.3 Current Traffic Signal Phasing

<Amend as required>

TCS 123 currently operates as a split phase

3.1.4 Changes to Signal Phasing

<Provide analysis and commentary of any required lane closures and/or signal modifications required at permanent traffic signals>

3.1.5 Changes to Pavement Marking

3.1.6 Software Changes

3.1.7 Impact to Adjoining Network

<Provide analysis and commentary of expected impact on the adjoining road network. Include any consultation with other road agencies>

3.1.8 End of Queue Treatment

<If using traffic control provide analysis and commentary of predicted queue lengths and treatments (see Main Roads Fact Sheet Traffic Control - Avoiding End of Queue Collisions on High Speed Roads >

3.1.9 Temporary Traffic Signals

<Note as N/A if not using traffic signals>

In the event that portable or temporary traffic signal fail to operate correctly, Traffic Controllers shall be deployed immediately to control traffic movements.

3.2 Road Users

3.2.1 Pedestrians

<If pedestrians will be impacted provide details on how pedestrians, including pedestrians with disabilities, will be safely managed>

3.2.2 Cyclists

<If cyclists will be impacted provide details on how they will be safely managed>.

3.2.3 Public Transport

< If public transport facilities will be impacted provide details on how this will be managed, include any consultation and/or approval from the Public Transport Authority (PTA)>

3.2.4 Heavy and Oversized Vehicles

<If heavy and/or oversized vehicles will be impacted provide details on they will be catered for (consider lane widths and swept paths)>

3.2.5 Existing Parking Facilities

<If parking facilities are within the work site provide details on how this will be managed>

3.2.6 Access to Adjoining Properties / Business

<If properties or business will be impacted provide details on how this will be managed>

3.2.7 Rail Crossings

<If rail crossings will be impacted provide details on how this will be managed>

3.2.8 School Crossings

<If school crossings will be impacted provide details on how this will be managed>

3.2.9 Special Events and Other Works

<If there are any special events or concurrent works provide details on how this will be managed>

3.2.10 Emergency Vehicle Access

<For works involving traffic controllers or road closures provide details on allowing emergency vehicle access through or past the worksite>

3.3 Night Work Provisions

3.4 Consultation and Communication / Notification

3.4.1 Other Agencies

<Detail consultation/communication with relevant agencies as required, e.g. PTA, Emergency Services, Local Government Agencies, Main Roads Heavy Vehicle Services, etc>

3.4.2 Public

<Amend as required>

The public shall be notified of the works and traffic management arrangements which will affect journey times via:

- Notice to Motorists in the weekend West Australian newspaper placed two weeks in advance of the scheduled works;
- Letter drop to all residents and businesses within the traffic control zone one week ahead of the scheduled works; and,
- VMS boards during the works.

3.5 Traffic Guidance Schemes

The TGS outlined in Appendix 4 and listed below have been provided for the following stages to demonstrate the type of controls that will be implemented throughout the term of the contract. All sign and device requirements are shown on each TGS. Should the use of additional (not shown on the TGS or listing of devices) or reduced number of devices be required due to unforeseen needs, they will be recorded within the Daily Diary as a variation to the TMP, following prior approval.

Construction Stages	Traffic Management Stages	LMA Number and version	TGS Number and version	Details <Include work description, temporary traffic management arrangements, times of day in place, and any other required information>
Stage 1	1.1			Increasing the green time for phase C to maximise the clearing capacity for the right turn movement, in order to accommodate the existing right turn demand and the additional detoured traffic.
	1.2			Provide a leading right turn green arrow for motorists on XX Street so that general traffic can turn right into XX Street unopposed.
	1.3			Install a pedestrian detour at the intersection to prevent path users from crossing at an unprotected crossing. A Traffic Controller shall be onsite to assist path users as required.
Stage 2	2.1			Provide a leading right turn green arrow for motorists on XX Street heading westbound so that buses can turn right onto XX Street unopposed.
	2.2			Line mark the current shared through/right lane at the southern approach of the intersection to a 'right only' lane, with temporary delineation to direct all northbound traffic on XX Street to enter the kerb side lane on the approach to the XX Street intersection This modification will prevent motorists intending to travel straight ahead becoming trapped behind a right turning motorist at the intersection.

3.6 MODELLING RESULTS

<The following outputs should be included in the traffic model. Calculations should be based upon the current operation of the intersection (and/or surrounding intersections) versus the expected performance under temporary traffic management arrangements. Main Roads may request additional modelling outputs as required. >

LinSig Model Outputs

Item	Lane Description	Total Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: E.G Hay Street Bridge Modifications	-	-	-	-	-	%	-	-	-
E.G Mitchell Fwy Ramps / Hay Street	-	-	-	-	-	%	-	-	-
1/2+1/1	-	-	-	-	-	-	-	-	-
1/3+1/4	-	-	-	-	-	-	-	-	-
2/1	-	-	-	-	-	-	-	-	-
2/2	-	-	-	-	-	-	-	-	-
2/3+2/4	-	-	-	-	-	-	-	-	-
3/2+3/1	-	-	-	-	-	-	-	-	-
3/3	-	-	-	-	-	-	-	-	-
4/1	-	-	-	-	-	-	-	-	-
4/2	-	-	-	-	-	-	-	-	-

Comparison table

Criteria	Approach Name	Existing (2019)	Proposed TMP	Existing (2019)	Proposed TMP
		AM	AM	PM	PM
Cycle time (s)					
Phase Sequence					
Level of Service					
Av. Delay per PCU(s/pcu)					
Worst Deg. Of Sat (%) N					
Worst Deg. Of Sat (%) S					
Worst Deg. Of Sat (%) E					
Worst Deg. Of Sat (%) W					
Worst Deg Of Sat (%)					
Worst MMQ (pcu's)					
Worst Approach					

3.7 Microsimulation Results

Intersection Performance Output

Scenario (e.g existing AM Peak)						
Location	Approach	Direction	Volume (veh/hr)	Delay (sec)	LOS	Avg Queue length (m)
	North	Left-turn				
		Thru				
		Right-turn				
	East	Left-turn				
		Thru				
		Right-turn				
	South	Left-turn				
		Thru				
		Right-turn				
	West	Left-turn				
		Thru				
		Right-turn				

Network Performance Outputs

Scenario (e.g existing AM Peak)	
Number of vehicle served	
Average speed (km/h)	
Average delay per vehicle (s)	
Total latent traffic demand	

END OF DOCUMENT