



Moorebank Avenue: MAAI Stage 1A

Post-Opening Road Safety Audit Report

May 2023

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Site Photos of Selected Safety Issues

1. Introduction

1.1 Background

BMD Constructions Pty Ltd (BMD) is the successful tenderer for the Design and Construction of the Moorebank Avenue Upgrade Works, which will involve two separate packages of work as follows:

1. Moorebank Avenue Upgrade Works (MAUW); and
2. Moorebank Avenue and Anzac Road Intersection Works (MAAI).

The scope of works involves the widening and upgrade of the existing Moorebank Avenue and Anzac Road signalised intersection and the raising and widening of the existing Moorebank Avenue for approximately 1.5 km adjacent to the Moorebank Precinct East (MPE) intermodal facility.

Moorebank Avenue is a privately owned, publicly accessible road currently used by commuters with larger traffic volumes in the morning and afternoon peak, and by warehousing tenants using Moorebank Avenue to access their respective warehouses in the precinct.

Moorebank Avenue / Anzac Road intersection (MAAI) and the Moorebank Avenue Upgrade Works (MAUW) include traffic and capacity improvements, changes in alignment to accommodate adjacent development levels, and works to drainage and services requirements. These works are required to ensure that Moorebank Avenue has the capacity, integrity and ability to maintain its use as a publicly accessible major arterial road, and to facilitate operational access to the surrounding area.

During construction, access to Moorebank Avenue will be retained for use by the public as a sub-arterial road, and as the primary means of road access to the area. Moorebank Avenue provides the main construction access points for other contractors working within the overall intermodal precinct including Moorebank Precinct West (MPW).

At this stage of construction, Chatham Avenue is to be closed permanently and an alternative route has been provided for access from Moorebank Avenue into MPW. This alternative route will be via Bapaume Road and Western Ring Road. Stage 1A involves the upgrade of the Bapaume Road / Moorebank Avenue intersection as well as the upgrade of Bapaume Road through to Western Ring Road including a roundabout.

This report details an independently undertaken post-opening road safety audit for Stage 1A of the Moorebank Avenue / Anzac Road intersection area – refer to *Figure 1* below for the audit area. The audit was undertaken by *Samsa Consulting Pty Ltd*, Transport Planning & Traffic Engineering Consultants. The report has been prepared for BMD as part of its Project obligations.

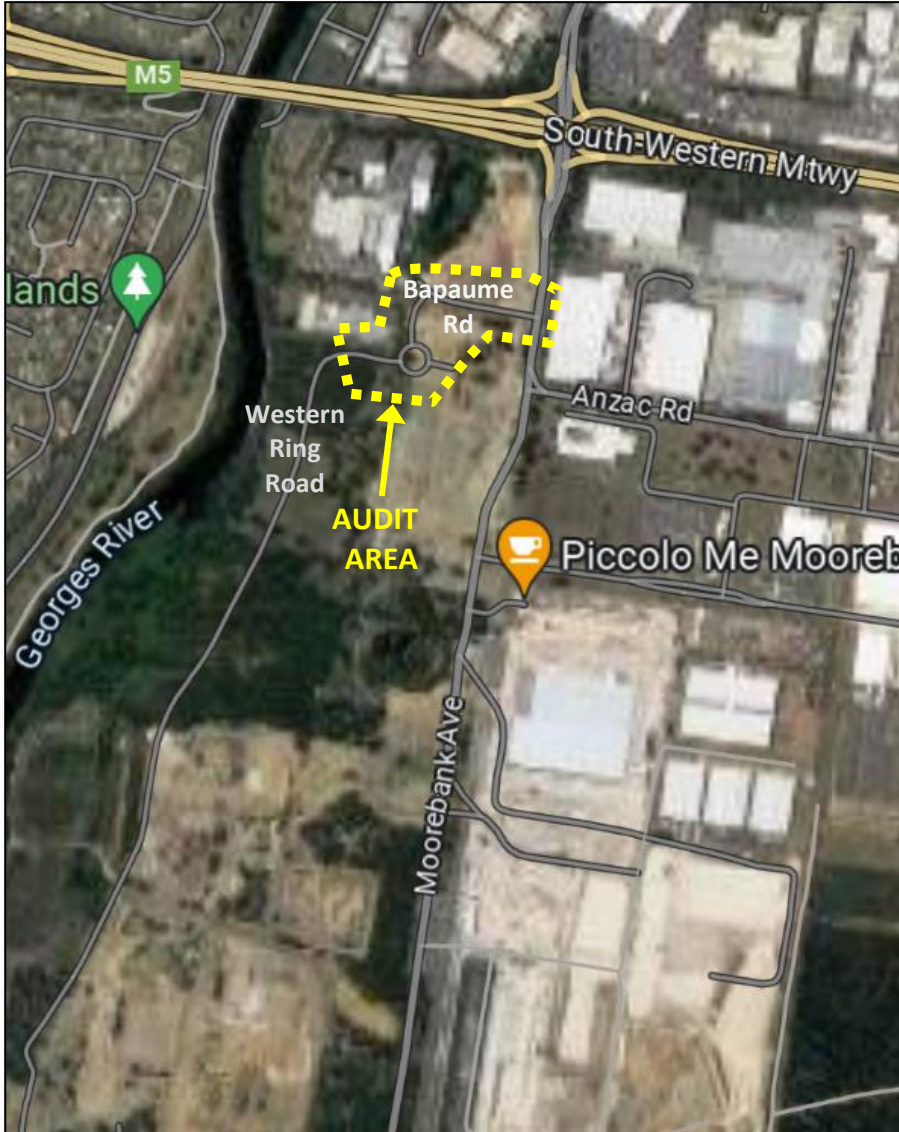


Figure 1: Audit Area and Location

1.2 Report Structure

The remainder of this report is presented as follows:

Chapter 2 describes details of the road safety audit undertaken including the methodology, administration and documentation audited.

Chapter 3 details the road safety issues identified and audit findings.

Chapter 4 provides a formal audit statement.

2. Audit Details

2.1 Audit Methodology

A road safety audit is “... a formal examination of a future road or traffic project or an existing road, in which an independent, qualified team reports on the project’s crash potential and safety performance” (Austroads 2009).

This post-opening audit followed a standard practice in identifying safety related issues of the recently opened road section during the site inspections. It involved a desktop assessment of relevant design documentation and other related project material, as well as identification of issues on site during day and night inspections.

Standard issues such as road network approach conditions, intersection layout, road user assessment, sight distance, speed zones, road alignment, linemarking and signage (amongst others) were assessed with respect to road safety.

The scope of the audit is in accordance with the requirements in Austroads’ “*Guide to Road Safety, Part 6*” and is structured around prompt lists provided in that manual as well as RTA’s “*Accident Reduction Guide – Part 2: Road Safety Audits*”.

An audit commencement meeting was held with the BMD Senior Project Engineer where background information on the subject road section was discussed.

The post-opening site audit was undertaken on Friday 5 May 2023. An audit exit meeting was held at the completion of the road safety audit report.

2.2 Audit Administration

BMD Traffic Manager: [REDACTED]

BMD Senior Project Engineer: [REDACTED]

Road Safety Auditors: [REDACTED]
[REDACTED]
[REDACTED]

2.3 References & Documentation Audited

- Austroads “*Guide to Road Design Part 3: Geometric Design (Edition 3.4)*”, February 2021
- Austroads “*Guide to Road Design Part 4: Intersections and Crossings – General (Edition 2.1)*”, February 2021
- Austroads “*Guide to Road Design Part 4A: Unsignalised and Signalised Intersections (Edition 3.1)*”, February 2021
- Austroads “*Guide to Road Design Part 6: Roadside Design, Safety and Barriers (Edition 4.0)*”, June 2022
- Austroads “*Guide to Road Safety, Part 6: Road Safety Audit (Edition 6.0)*”, January 2022
- Austroads “*Guide to Traffic Engineering Practice: Part 13 – Pedestrians*”, 1995
- Austroads “*Urban Road Design: A Guide to the Geometric Design of Major Urban Roads*”, February 2003
- Northrop “*Moorebank Precinct West: Temporary Wayfinding & Internal Configuration Entrance Via Bapaume Road (Sheet PIWW-NTP-TP-SKC-1001 [F])*”, 17/03/2023
- Northrop “*Moorebank Precinct West (MPW): Loop Road (Sheet PIWW-NRP-CV-DWG-3021 [D])*”, 12/02/2023
- Northrop “*Phase (1A-SRM) Linemarking, Signposting and Barrier Plan (Drawing no. MAAI-NRP-CP-DWG-4112)*”, 21/04/2023
- Northrop “*Phase (1A-SRM) Turning Paths (Drawing no’s MAAI-NRP-CP-DWG-8111 to 8112)*”, 20/04/2023
- Northrop “*Phase (1A-SRM) Turning Paths (Drawing no’s MAAI-NRP-CP-DWG-8111 to 8112)*”, 20/04/2023
- RTA “*Accident Reduction Guide – Part 2: Road Safety Audits*”, 2005
- RTA “*Road Safety Audit Technical Direction TD2003/RS03, Version 2*”, August 2005
- RTA “*Delineation Guidelines: Parts 1 to 19 & Appendices A & B*”, assorted dates
- RTA “*Guidelines for Road Safety Audit Practices – Part 1: Road Safety Audit*”, July 2011
- Standards Australia “*AS 1742.1 – 2003: Manual of uniform traffic control devices, Part 1: General introduction and index of signs*”, 2003
- Standards Australia “*AS 1742.3 – 2009: Manual of uniform traffic control devices, Part 3: Traffic control for works on roads*”, 2009
- Transport for NSW “*Traffic Control at Work Sites, Technical Manual – Issue 6.0*”, 14 September 2020

3. Identified Road Safety Issues

The audit of the relevant road section focussed on providing an independent identification of potential road safety hazards, regardless of current practices, standards and operations, to allow BMD to identify remedial measures as part of its works finalisation process.

In categorising and prioritising identified safety issues, a risk assessment process was adopted. Risk assessment is the overall process of risk identification, analysis and evaluation. Preliminary risk ratings for each identified issue are assessed based on subjective professional judgement by the Road Safety Audit team with guidance from *Section 10.5* of Austroads "Guide to Road Safety, Part 6: Road Safety Audit". The Austroads' document provides an indication of the level of risk and what response may be appropriate. The identified road safety issue is first categorised based on its likely frequency of occurrence and severity ('likelihood' and 'consequence' of crash potential) – refer to *Figures 3.1* and *3.2* below (extracted from the Austroads' document).

Crash frequency	Description
Frequent (F)	Once or more per week
Probable (P)	Once or more per year but less than once per week
Occasional (O)	Once every five to ten years
Improbable (I)	Less than once every ten years

Figure 3.1: Likely Frequency of Issue

Severity	Description	Examples
Catastrophic (C)	Likely multiple deaths	<ul style="list-style-type: none"> High-speed, multi-vehicle crash on a freeway Car runs into crowded bus stop Bus and petrol tanker collide Collapse of a bridge or tunnel
Serious (S)	Likely death or serious injury	<ul style="list-style-type: none"> High or medium-speed vehicle / vehicle collision High or medium-speed collision with a fixed roadside object Pedestrian struck at high speed Cyclist is hit by a car
Minor (M)	Likely minor injury	<ul style="list-style-type: none"> Some low-speed vehicle collisions Cyclist falls from bicycle at low speed Left-turn rear-end crash in a slip lane
Limited (L)	Likely trivial injury or property damage only	<ul style="list-style-type: none"> Some low speed collisions Pedestrian walks into object (no head injury) Car reverses into post

Figure 3.2: Likely Severity of Issue

An appropriate risk rating is then selected from the risk categories in the risk matrix with a preferred treatment approach for each risk rating (refer to *Figures 3.3 and 3.4* below, both extracted from Austroads).

	Frequent (F)	Probable (P)	Occasional (O)	Improbable (I)
Catastrophic (C)	Intolerable (I)	Intolerable (I)	Intolerable (I)	High (H)
Serious (S)	Intolerable (I)	Intolerable (I)	High (H)	Medium (M)
Minor (M)	Intolerable (I)	High (H)	Medium (M)	Low (L)
Limited (L)	High (H)	Medium (M)	Low (L)	Low (L)

Figure 3.3: Risk Matrix

Risk	Suggested treatment approach
Intolerable (I)	Must be corrected
High (H)	Should be corrected or the risk significantly reduced, even if the treatment cost is high
Medium (M)	Should be corrected or the risk significantly reduced, if the treatment cost is moderate, but not high
Low (L)	Should be corrected or the risk reduced, if the treatment cost is low

Figure 3.4: Treatment Approach

This report may provide recommendations about possible remedial measures in response to identified road safety deficiencies. Any remedial actions recommended are based on current standards and practices. However, it should be noted that it is ultimately the responsibility of BMD and the relevant road authority to determine how to respond to each identified road safety deficiency.

Due to the nature of temporary traffic management schemes, the layout and arrangement is often frequently changing and therefore, not all road safety issues may be identified during specific audit periods. While this audit of overall road safety has been undertaken, it is not meant to replace regular inspections of traffic management schemes and devices at work sites according to TfNSW's "Traffic Control At Work Sites" manual and AS 1742.3.

The audit of the relevant road section identified a number of potential road safety issues. The road safety audit process requires that the road safety issues identified during an audit be acknowledged by the Audit Team and accordingly responded to by BMD. The road safety issues are characterised according to their risk and detailed in *Table 3.1* following.

It should be noted that not all road safety issues identified may necessarily be within the scope of the project area. This is because while the scope of the audit is generally within the project area described earlier, to complete a full audit of the project, the approaches and transitions to the project area were also audited to identify potential issues that may affect road safety within the project road sections. Therefore, some road safety issues that are outside the project design area may be the responsibility of the relevant controlling road authority.

Also, note that while this audit focussed on identifying road safety issues related to the subject road section and not the background existing conditions, some existing road conditions may

have been recorded where they were deemed notable.

Table 3.1: Identified Road Safety Issues

No.	Description of Road Safety Issue	Risk Rating	Road Safety Category	For completion by BMD	
				Action by	Response
1.	For the Western Ring Road approach to the roundabout near the BMD site office, there are two lanes on the northbound approach with only single lane exit lanes from the roundabout. Moreover, pavement markings show a through / right-turn in the median lane when there is no right-turn available – refer to <i>Photo 1 in Appendix A</i> . Consideration should be given to restricting travel to a single lane (similar to the rest of the Western Ring Road) in the kerbside lane to accommodate the large left-turn movement (Moorebank Precinct West (MPW) exiting to Moorebank Avenue). Similarly, for the BMD site office (eastern) leg approach to the roundabout, consideration should be given to restricting travel to a single lane.	Medium	Traffic management & operations / Intersections	LOGOS	<p>Noted; Required lane closure is outside BMD's LoW and forwarded to LOGOS for review and action.</p> <p>Logos – we will ask Knight Frank (who is responsible for this area) to adjust.</p> <p><u>Previously the western approach to the roundabout has had the left and through lane blocked to access through the use of cones. We would suggest this would limit the potential issue. As speeds are currently limited to 40 km/h this will help mitigate any risk. For right turns there is still the opportunity to do a u-turn and we do not believe this is a significant safety issue</u></p>
2.	There is no pedestrian facility across Bapaume Road between Gate 1A and the BMD site office nor any warning to traffic that pedestrians may be crossing at this location, which will become more necessary / critical once Chatham Avenue is closed and all MPW traffic enters via Bapaume Road.	Medium	Pedestrian infrastructure	NORTHROP	<p>Noted; Signs installed as per design and council approved the drawings. BMD will notify Designer Northrop for review.</p> <p>Logos – no comment.</p> <p><u>No pedestrian access is to occur on Bapaume road and all pedestrians are directed from Anzac avenue to the island of the Northern leg of the roundabout. This has been intentionally done due to the presence of large vehicles. BMD site Gate has been closed at Bapume Road.</u></p>

Commented [JT1]: (SMEC DS/JT): Agree with LOGOS/Northrop response

Commented [JT2]: (SMEC DS/JT): Agree with comments

No.	Description of Road Safety Issue	Risk Rating	Road Safety Category	For completion by BMD	
				Action by	Response
3.	The issue of sun-glare during certain periods of the year at sunset (for westbound travel) and sunrise (for eastbound travel) is applicable to the general east-west alignment of Bapaume Road including the Western Ring Road. Consequently, advisory / information signage and traffic control devices, including traffic signal lanterns, may be difficult to sight due to sun glare.	Low - Medium	Delineation	NOR THR OP	<p>Noted; Approved design implemented.</p> <p>Logos – no comment.</p>
4.	For the southbound approach from Bapaume Road to the BMD site office / Western Ring Road roundabout, the 'roundabout control' signage is difficult to sight because it is located on the far left of the intersection entry leg – refer to <i>Photo 2</i> in <i>Appendix A</i> . Consideration should be given to providing an additional 'roundabout control' sign on the right side of the intersection approach within the median area (as per the other intersection leg treatments).	Low - Medium	Traffic signs	NOR THR OP	<p>Noted; Signs installed as per approved design. BMD will notify Designer Northrop for review.</p> <p>Logos – see Figure 11.2 of RTA Delineation Section 11 – Pavements markings at roundabouts. This shows signage to the right of approach.</p> <p>Delineation - Section 11 Pavement markings at roundabouts (nsw.gov.au)</p> <p>AS1742.2 Allows for the sign to be placed on either side of the roundabout, and additional signage placed as optional. We agree that due to the large size of the roundabout additional central island signage would be beneficial.</p>

Commented [JT3]: (SMEC DS/JT): PV has no comments

Commented [JT4]: (SMEC DS/JT): Non-WAD/no issues with response

No.	Description of Road Safety Issue	Risk Rating	Road Safety Category	For completion by BMD	
				Action by	Response
5.	For travel along the Western Ring Road, the street lighting was not operational resulting in a darker section of road network in comparison with adjacent road sections – refer to <i>Photo 3</i> in <i>Appendix A</i> .	Low - Medium	Lighting	LOGOS	<p>Noted; It is outside BMD's LoW. BMD will notify LOGOS for review and action.</p> <p>Logos – This location is outside the extent of this RSA however we will advise maintenance and rectify.</p> <p>BMD to confirm lighting has been installed as per approved plans. Western ring road lighting should be provided once road is opened to public.</p>
6.	For the entry into Bapaume Road from Moorebank Avenue, there is no indication provided of the speed limit along Bapaume Road leading into Western Ring Road.	Low - Medium	Speed zoning	NORTHROP	<p>Signs and Line marking installed as per approved design. BMD will notify Designer Northrop for review.</p> <p>Logos – no comment.</p> <p>Noted, as Bapaume is a local street speed limits are not indicated or required by council, discussion to be had with LOGOS if speed signs are supported as they may provide some benefit.</p>
7.	For eastbound travel along Bapaume Road approaching Moorebank Avenue, the advisory right-turn restriction sign is located too far left of a driver's sightline, which focusses on the intersection ahead, and is difficult to fully read because of its relatively small size and its location beyond roadside power / street light poles – refer to <i>Photo 4</i> in <i>Appendix A</i> .	Low	Traffic signs	BMD	<p>Agreed; The sign has been relocated closer to travel path. Closed out: 07/05/2023</p> <p>Logos – no comment.</p>

Commented [JT5]: (SMEC DS/JT): Non-WAD/agree with response

Commented [JT6]: (SMEC DS/JT): Given the risk rating of low-medium PV have no objections, however ideally additional signage will assist

Commented [JT7]: (SMEC DS/JT): Comment addressed

No.	Description of Road Safety Issue	Risk Rating	Road Safety Category	For completion by BMD	
				Action by	Response
8.	For the Bapaume Road approach to Moorebank Avenue, the 'Stop' control sign is located on the right side of the approach only, which is non-standard and undesirable, especially for the majority left-turning traffic – refer to <i>Photo 5</i> in <i>Appendix A</i> .	Low	Traffic signs	Northrop	<p>Noted; BMD will notify Designer Northrop for review.</p> <p>Logos – consider secondary sign on left.</p> <p>This has been rectified with the Stop sign being adjusted to provide additional offset to medians. An additional stop sign has been provided on the updated designs and advanced warnign sign provided on the left (MAAI-NRP-CP-DWG-4111_rev 11 drawing).</p>
9.	For the southbound approach from Bapaume Road to the BMD site office / Western Ring Road roundabout, the advance direction signage is difficult to sight because it is on the inside of a left curved alignment – refer to <i>Photo 6</i> in <i>Appendix A</i> .	Low	Traffic signs	LOGOS	<p>Noted; The sign installed as per approved design provided by LOGOS. BMD will notify LOGOS for review.</p> <p>Logos – no comment.</p> <p>due to the large radius of the corner this was considered the most suitable location.</p>

Commented [JT8]: (SMEC DS/JT): Issue has been satisfactorily addressed

Commented [JT9]: (SMEC DS/JT): Non-WAD/no issues with response

				For completion by BMD	
No.	Description of Road Safety Issue	Risk Rating	Road Safety Category	Action by	Response
10.	For travel along Moorebank Avenue at the Bapaume Road intersection, there are sections of poor pavement resulting in sub-standard ride quality and delineation – refer to <i>Photo 7</i> in <i>Appendix A</i> .	Low	Road pavement	BMD	<p>Noted; It is existing road condition. BMD will notify LOGOS for review and required action.</p> <p>Logos – monitor, pavement will be redundant in a few months.</p> <p>We assume this comment relates to the existing condition of Moorebank Avenue and rectification of this will be undertaken in subsequent stages, this is outside the scope of upgraded works.</p>
11.	For the ABB exit movement onto Bapaume Road, there may be some potential confusion because the intersection movement is controlled by a 'Give Way' control and the conflicting northbound movement from Western Ring Road is controlled by a 'Stop' control.	Low	Traffic signs / Intersections	LOGOS	<p>Noted; Signs and Line marking installed as per approved design. BMD will notify LOGOS for review and action.</p> <p>Logos – no comment.</p> <p>Noted, this was considered the best solution to ensure ABB traffic had priority. This was a Logos request to ensure no detrimental impacts to the existing ABB users.</p>

Commented [JT10]: (SMEC DS/JT): Agree with response

Commented [JT11]: (SMEC DS/JT): No issues/non-WAD

4. Formal Audit Statement

This road safety audit has been undertaken by *Samsa Consulting Pty Ltd*, using the references and documentation detailed previously and site inspections of the subject project area during both daylight and night conditions.

While the road safety audit may provide recommendations about possible remedial measures in response to identified road safety issues, it is ultimately the responsibility of BMD and the relevant road authority to determine how best to respond to each identified road safety issue.

The audit has been undertaken for the sole purpose of identifying any road safety-deficient features and road safety risks of the recently opened road section. Every effort was made to ensure that all relevant road safety issues were considered and the findings are the opinion and judgement of the audit team.

Due to the nature of temporary traffic management schemes, the layout and arrangement is often frequently changing and therefore, not all road safety issues may be identified during specific audit periods. While this audit of overall road safety has been undertaken, it is not meant to replace regular inspections of roadwork traffic management schemes and devices at work sites according to TfNSW's "*Traffic Control at Work Sites*" manual and AS 1742.3.

6 May 2023

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6 May 2023

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Appendix A
Site Photos of Selected Safety Issues



PHOTO 1: For the Western Ring Road approach to the roundabout near the BMD site office, there are two lanes on the northbound approach with only single lane exit lanes from the roundabout. Moreover, pavement markings show a through / right-turn in the median lane when there is no right-turn available.

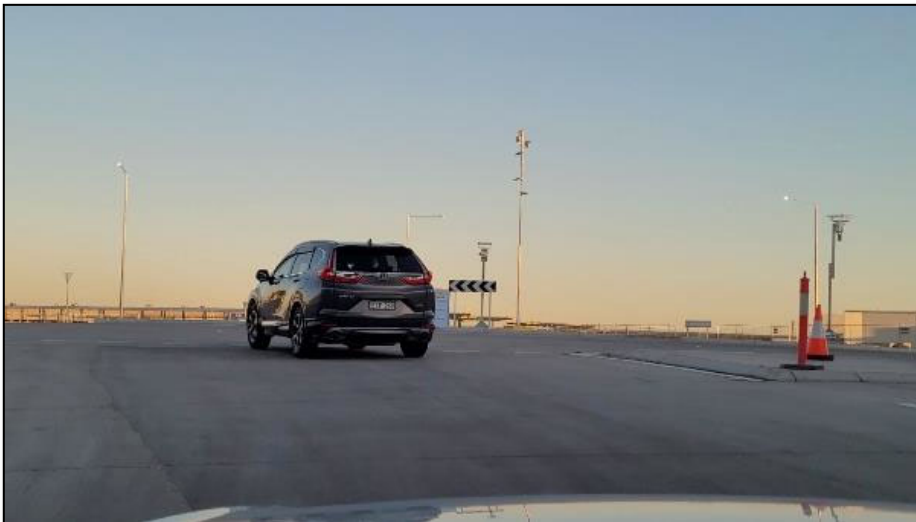


PHOTO 2: For the southbound approach from Bapaume Road to the BMD site office / Western Ring Road roundabout, the 'roundabout control' signage is difficult to sight because it is located on the far left of the intersection entry leg.



PHOTO 3: For travel along the Western Ring Road, the street lighting was not operational resulting in a darker section of road network in comparison with adjacent road sections.

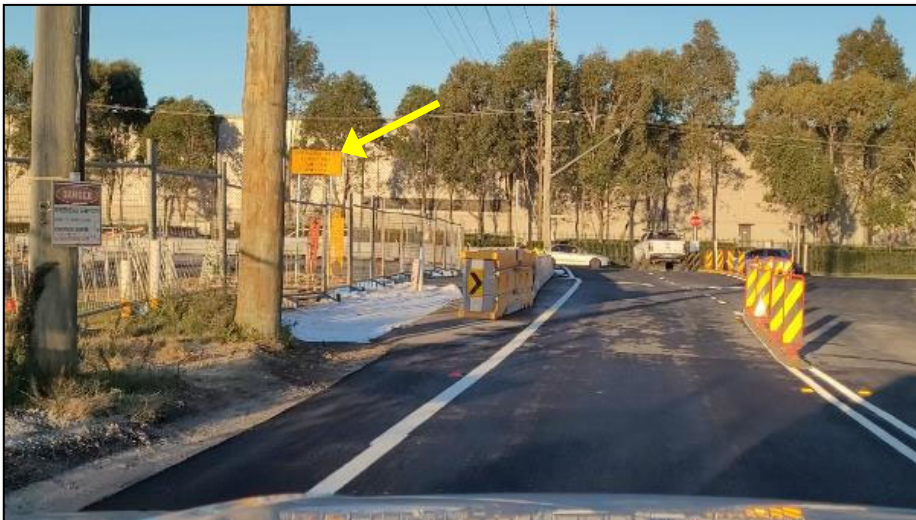


PHOTO 4: For eastbound travel along Bapaume Road approaching Moorebank Avenue, the advisory right-turn restriction sign is located too far left of a driver's sightline and is difficult to fully read because of its relatively small size and its location beyond roadside power / street light poles.



PHOTO 5: For the Bapaume Road approach to Moorebank Avenue, the 'Stop' control sign is located on the right side of the approach only, which is non-standard and undesirable, especially for the majority left-turning traffic.

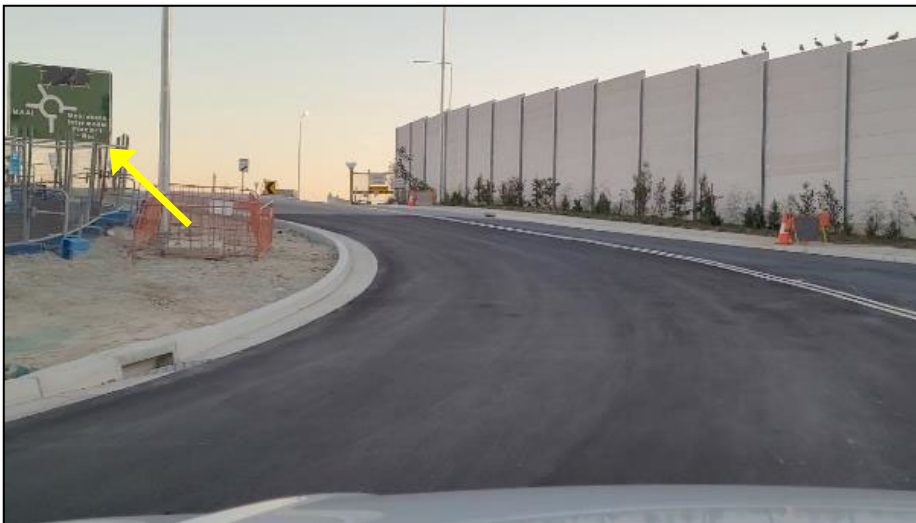


PHOTO 6: For the southbound approach from Bapaume Road to the BMD site office / Western Ring Road roundabout, the advance direction signage is difficult to sight because it is on the inside of a left curved alignment.



PHOTO 7: For travel along Moorebank Avenue at the Bapaume Road intersection, there are sections of poor pavement resulting in sub-standard ride quality and delineation.