Road Safety Audit Report

Mossman – Mt Molloy Road

Prepared by

RECS Consulting Engineers

& Building Design

PO Box 894

PORT DOUGLAS QLD 4877

Phone:(07) 4099 6010

Fax: (07) 4099 6020

Email:admin@recs.net.au

ABN: 95 081 197 006

Prepared for

JAMARR

Julatten & Mt Molloy Association of

Residents & Ratepayers Inc.

P O Box 30

Mt Molloy QLD 4871

Project No: 29-2014

Project Name / Location

Stage 5 - Road Safety Audit

Mossman – Mt Molloy Road

Date: July, 2014

Contents

.

INTRODUCTION

This report presents the findings of a road safety audit (Stage 5 – Existing Road Phase) based on Austroads AGRS06-09) conducted on the Mossman – Mt Molloy Road in June & July, 2014.

The audit was undertaken by:

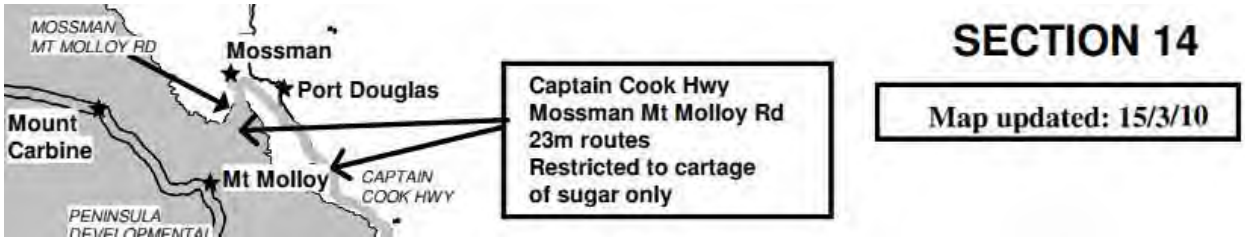
Peter Dutaillis	Registered Senior Road Safety Auditor – (Level 2)

In consultation with Queensland Police Service officers

Mt Molloy	OIC Snr Const Greg Matthews
Mossman	OIC Sgt Matt Smith
Port Douglas	OIC Sgt Damien Meadows

BACKGROUND

The Captain Cook Highway Mossman – Mt Molloy Road in North Queensland is a designated multi-combination (MC) route restricted to 23m and to cartage of sugar (ref. TMR map 15 March, 2010.



The Captain Cook Highway and Mossman – Mt Molloy Road is a State Controlled Road (SCR) under the jurisdiction of the Department of Transport and Main Roads. Routine maintenance of the road is undertaken by Douglas and Mareeba Shire Councils under local government road maintenance arrangements and periodic capital works funding programs.

In April, 2013 Mackay Sugar Limited announced that Cane Supply Agreements with cane growers on the Atherton Tablelands will result in approximately 700,000 tonnes of cane being supplied from the Atherton Tablelands to Mackay Sugar's Mossman Mill from 2014.

In October, 2013 Mackay Sugar announced the transport of sugar cane from Mackay Sugar's Tablelands cane supply network to Mossman Mill would be by road trailer.

The most direct route from the Atherton Tablelands to the Mossman Mill is via the Mount Molloy - Mossman Road. Road Trains and B double are prohibited on the Mareeba to Cairns section of the Kennedy Highway. The Giles Highway is not a designated MC route. An alternate route is available along the Palmerston Highway south of Cairns.

Road Transport of the sugar cane commenced along the Mossman - Mount Molloy route in May, 2014.

RECS Consulting Engineers & Building Design (RECS) was commissioned by Julatten & Mt Molloy Association of Residents & Ratepayers Inc. (JAMARR) to undertake a Road Safety Audit of the Mt Molloy – Mossman Road amid concerns to the general community, road users and local residents.

A senior engineer from RECS undertook opening meetings with Queensland Police Service Officers at Mt Molloy, Mossman and Port Douglas Stations to outline the scope of the audit and to record known concerns and reports of incidents known to the Officers.

The route is a popular tourist road frequented by travellers to the Atherton Tablelands as well as Cooktown and Cape York. The route is a popular training circuit for bicyclists and recreational motor cyclists on weekends.

Road accident data indicates no serious incidents but are likely to be associated with a change in the road environment from adjoining sections as well as the adjacent intersection each side of the structure.

TRAFFIC DATA

Traffic volumes recorded along the route are:

AADT – Mossman – Mt Molloy (2013) 916 - 1895 10 - 13% HV.

Traffic Analysis and Reporting System

AADT Segment Report

Road Section 653 - Mossman - Mt Molloy Road

Traffic Year 2013

Road Segments Summary - All Vehicles

Region	Segment Start TDist	Segment End TDist	Site	Site TDist	Description	AADT G	AADT A	AADT B	VKT (Millions) G	VKT (Millions) A	VKT (Millions) B	Data Year	Page
203	0.000 km	10.622 km	111613	1.160 km	WiM Site Ponzo Road	951	944	1,895	3.68706	3.65992	7.34697	2013	2
203	10.622 km	19.210 km	110416	8.900 km	West of 9 Mile Rd	717	687	1,404	2.24752	2.15348	4.40101	2013	3
203	19.210 km	28.494 km	110043	28.394 km	Mt.Molloy-100m East of Peninsula Dev.Rd.	478	438	916	1.61978	1.48423	3.10401	2013	4
								Totals	7.55436	7.29763	14.85199		

Road Segments Summary - Heavy Vehicles only

VKT totals are calculated only if traffic class data is available for all sites.

Region	Segment Start TDist	Segment End TDist	Site	Site TDist	Description	HV AADT G AADT	HV AADT G HV %	HV AADT A AADT	HV AADT A HV %	HV AADT B AADT	HV AADT B HV %	HV VKT (Millions) G	HV VKT (Millions) A	HV VKT (Millions) B	Data Year	Page
203	0.000 km	10.622 km	111613	1.160 km	WiM Site Ponzo Road	113	11.88%	139	14.72%	252	13.30%	0.43610	0.53891	0.97701	2013	2
203	10.622 km	19.210 km	110416	8.900 km	West of 9 Mile Rd	73	10.18%	78	11.35%	151	10.75%	0.22683	0.24450	0.47333	2013	3
203	19.210 km	28.494 km	110043	28.394 km	Mt.Molloy-100m East of Peninsula Dev.Rd.										2013	4
											Totals					

AADT – Average Annual Daily Traffic

HV – Heavy vehicles

A further breakdown of the heavy vehicle traffic data to vehicle type shows:

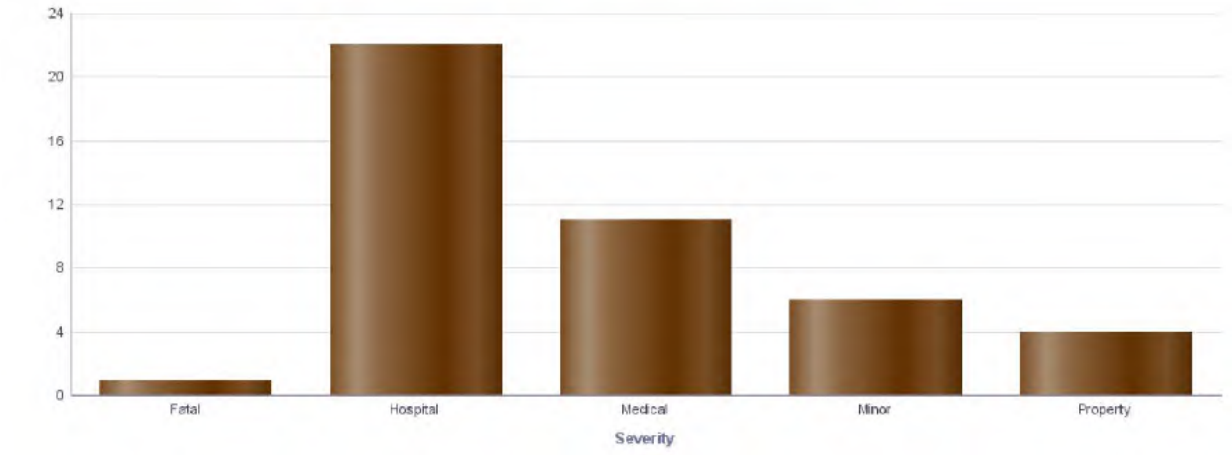
Truck & Bus	90 – 153vpd	6.4% – 8.1%
Articulated vehicle	43 – 83vpd	3.1% – 4.5%
Road Train (B Double)	13 - 18vpd	1.3% – 0.7%

It is estimated that the proposal to transport sugar cane by road will increase Road Train vehicle traffic by an additional 90 vehicles per day one way.

ROAD INJURY AND ACCIDENT DATA

Period: June, 2004 – June, 2014

	Fatal	Hospital	Medical	Minor	Property
Crashes	1	22	11	6	4



IDENTIFIED ROAD USERS

- General public
- Commercial transport operators
- Tourism operators
- School bus operators
- Commercial bus operators
- Pedestrians
- Bicyclists
- Motorcyclists
- Agricultural machinery
- Emergency services
- Road maintenance vehicles
- Heavy machinery operators

ADJOINING LAND USES

- Agricultural farms
- Commercial shops and premises
- Hotels
- Petrol station
- Residential dwellings
- Rural residential development
- Schools
- Julatten and Mt Molloy townships
- Heavy vehicle operators
- Farm stays & B&Bs
- Retirement and aged care facility
- Roadside stalls
- Sugarcane bin loading facilities
- Camping and picnic areas
- School bus stops
- Community hall
- Community recreation areas
- National Park

AUDIT PROCESS

The Road Safety Audit

The *Austroads Guide to Road Safety Part 6: Road Safety Audit (2009)* defines an RSA as:

"a formal evaluation of an existing or 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."

An audit is not a check against standards. Compliance with standards, which may represent the minimum requirements, does not guarantee safety.

The essential elements of this definition are that the audit is:

- A formal process and not an informal check
- An independent process
- Carried out by someone with appropriate experience and training
- Restricted to road safety issues.

The objectives of an RSA are:

- To identify potential safety problems for road users and others affected by a road project
- To ensure that measures to eliminate or reduce the problems are considered in full.

The benefits of conducting RSAs include:

- The likelihood of accidents on the road network can be reduced
- The severity of accidents can be reduced.

The aim of an RSA is:

"To identify any existing safety deficiencies of design, layout and road furniture, which are not consistent with the road's function and use. There should be a consistency of standards such that the road user's perception of local conditions assists safe behaviour."

AUDIT METHODOLOGY

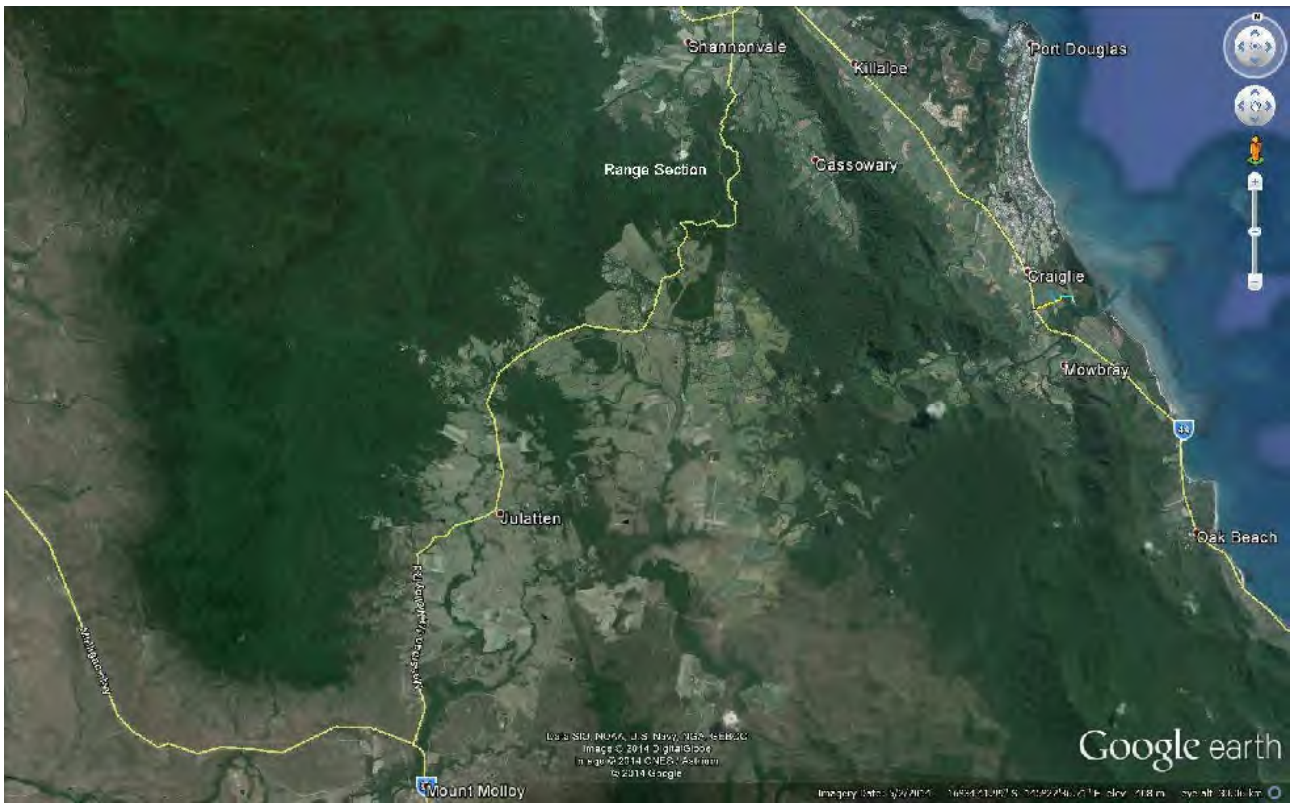
The following criteria were considered for the audit approach:

a) General Topics
b) Design Issues
c) Alignment
d) Accesses
e) Special Road Users
f) Signs
g) Physical Objects
h) Construction and Operation Use
i) Accident and injury data

AUDIT REFERENCE DOCUMENTS

The auditors were provided with the following information:

- Accident data
- Traffic data
- Accident and injury data



Route Photo

CHECKLISTS

The audit utilised checklists provided by Austroads Road Safety Audit Manual - 2009. The completed checklists for Stage 5 – Existing Road are included in Appendix A.

STAGE 5 AUDIT FINDINGS AND RECOMMENDATIONS

A suggested priority for remedial work has been shown for each of the issues using the following ratings:

- Priority A: Those issues that have a high priority for action from a road safety viewpoint
- Priority B: Those issues for which action needs to be taken from a road safety viewpoint
- Priority C: Those issues for which action is desirable from a road safety viewpoint.

No.	Location	Deficiency	Ranking	Recommendation
1	*Various locations along route*	Restricted sight distances at private accesses and intersections	B	Provide sight distances and delineation to lookouts, driveways and property entrances in accordance with TMR Road Planning and Design Manual requirements. Provide and maintain advanced warning signs.
2	*Various locations along route*	Narrow lane widths	A	Increase lane widths including curve widening to prevent road train vehicle encroachment into adjoining lanes and verges along entire route in accordance with TMR Road Planning and Design Manual requirements.
3	*Various locations along route*	Absent or narrow road shoulder	B	Increase shoulder widths along entire route in accordance with TMR Road Planning and Design Manual requirements and improved provision for pedestrian and cyclist road safety.
4	*Spear, Rifle and Pashens bridge barrier and safety rail*	Bridge barrier and connections to approach safety barrier is not likely to meet current standards.	B	Ensure that the barriers and connections meets structural and collision requirements and does not adversely affect motorist safety and operation. Install and maintain barrier end and safety railing delineation.

No.	Location	Deficiency	Ranking	Recommendation
5	*Route intersections*	Taper lengths and HV turning at intersection Layout	B	Review existing intersection layouts to ensure adequate for road train vehicles in accordance with TMR Road Planning and Design Manual requirements
6	*Entire route*	Loss of sign and pavement marking reflectivity and condition	B	Remove and prevent dirt and mud from depositing on carriageway. Inspect and maintain sign position and reflectivity class. Schedule to re-apply pavement markings and schedule periodic maintenance.
7	*Entire route*	Loss of centerline delineation.	B	Install and maintain damaged / missing RRPMs
8	*Various locations along route*	Deposition of loose material, pavement failures and accelerated pavement fatigue	A	Sealed adjoining gravel areas. Ensure that scheduled road maintenance activities are undertaken in a timely manner and preserve pavement conditions to minimise rough or unsafe road surface conditions.
9	*Various locations along route*	Unprotected culverts and drainage structures inside the roadway recovery area	B	Delineate, shield and protect structures
10	*Range Section of Route*	Lack of provision for emergency and vehicle breakdown areas	C	Provide for emergency breakdown areas
11	*Range Section of Route*	Lack of provision for runaway heavy vehicles	C	Provide treatment for control of runaway heavy vehicles.
12	*Range Section of Route*	Limited overtaking opportunity increasing travel time, driver frustration and erratic driver behavior	B	Provide for slow vehicle lanes and increased overtaking opportunities

No.	Location	Deficiency	Ranking	Recommendation
13	*Various locations along route*	Cutting and embankment instability	B	Undertake slope risk assessment for embankments and cuttings along the route. Install protective measures as recommended to prevent slip debris from road encroachment
14	*Mt Molloy & Cassowary Siding*	Lack of road train route advisory signs	B	Installation of road train route advisory signs
15	*Various locations along route*	Concentrated discharge from adjoining properties to roadway.	B	Installation of diversions drains to intercept concentrated discharge from adjoining accesses

AUDIT TEAM STATEMENT

The road safety audit was carried out by the audit team using all the available material as referenced. Every effort was made to ensure that all safety issues were considered. The above safety audit findings and recommendations are the opinion and judgement of the audit team.

……

Peter Dutaillis
Senior Road Safety Auditor
Consulting Engineer

SITE PHOTOGRAPHS

Restricted Sight Distances

Restricted Sight Distances

Restricted Sight Distance for RH Turning HV

Roadside Stall Access

Pavement Fatigue

Pavement Fatigue

Road Verge Damage

Road Verge Damage

Road Verge Damage

Road Verge Damage

Road Verge Damage

Delineation – Terminal End Treatments Missing

Restricted width

Delineation – Terminal End Delineation Missing

Delineation – Terminal End Delineation Missing

Delineation – Terminal End Delineation Missing

Mud & Dirt Obscuring Road Pavement Markings

Loose material on roadway

Pavement marking obscured

Reflectivity at night - poor

Entrance to Cassowary Siding for HV – Minimal Intersection Treatments for turning Vehicles

Review taper lengths for Road Trains

Loose material on roadway

Concealed Private Access

Access to Stockpile Area

Concealed Private Access

Concealed Private Accesses with Limited Sight Distance

Access to Picnic Area - Untreated

Access to Cane Bin - Loose material on roadway

Uncontrolled turning movements at Intersection and Access to Camp Area

Loose material on roadway

Rural Residential Private Accesses – Untreated

SHOULDER WIDTHS


NO
OVERTAKING
ON
BRIDGE

SLOPE STABILITY

Shallow slip

Recent Cutting Instability and Old Linemarking Evident

Unstable Cuttings

Traffic Incidents

Material Spill Residue

Cane Debris from Traffic Incident

Angled Parking in Mt Molloy Township – reversing into travel lane

Loss of median delineation and linemarking reflectivity

Adjoining impervious areas and discharge of concentrated sheet flow to carriageway on curve

APPENDIX A

ROAD SAFETY AUDIT

STAGE 5 – Existing Road

CHECKLIST

11 CHECKLISTS

CHECKLIST 6 – EXISTING ROADS: ROAD SAFETY AUDIT

6.1 Road alignment and cross-section

1. Visibility; sight distance
2. Design speed
3. Speed limit/speed zoning
4. Overtaking
5. Readability by drivers
6. Widths
7. Shoulders
8. Crossfalls
9. Batter slopes
10. Drains

6.2 Auxiliary lanes

1. Tapers
2. Shoulders
3. Signs and markings
4. Turning traffic

6.3 Intersections

1. Location
2. Visibility; sight distance
3. Controls and delineation
4. Layout
5. Miscellaneous

6.4 Signs and lighting

1. Lighting
2. General sign issues
3. Sign legibility
4. Sign supports

6.5 Markings and delineation

1. General issues
2. Centrelines, edgelines, lane lines
3. Guideposts and reflectors
4. Curve warning and delineation

6.6 Crash barriers and clear zones

1. Clear zones
2. Crash barriers
3. End treatments
4. Fences
5. Visibility of barriers and fences

6.7 Traffic signals

1. Operations
2. Visibility

6.8 Pedestrians and cyclists

1. General issues
2. Pedestrians
3. Cyclists
4. Public transport

6.9 Bridges and culverts

1. Design features
2. Crash barriers
3. Miscellaneous

6.10 Pavement

1. Pavement defects
2. Skid resistance
3. Ponding
4. Loose stones/material

6.11 Parking

1. General issues

6.12 Provision for heavy vehicles

1. Design issues
2. Pavements/shoulder quality

6.13 Floodways and causeways

1. Ponding, flooding
2. Safety of devices

6.14 Miscellaneous

1. Landscaping
2. Temporary works
3. Headlight glare
4. Roadside activities
5. Errant vehicles
6. Other safety issues
7. Rest areas
8. Animals

11.2 Detailed Checklists

CHECKLIST 6: EXISTING ROADS: ROAD SAFETY AUDIT

Issue	Yes	No	Comment
6.1 Road alignment and cross-section **6.1.1 Visibility; sight distance**			
Is sight distance adequate for the speed of traffic using the route?	☐	✔ ☐	Sections climbing the range have restricted sight distances. Some private accesses have concealed entrances.
Is adequate sight distance provided for intersections and crossings? (for example, pedestrian, cyclist, cattle, railway)	☐	✔ ☐	Wessel Rd intersection has restricted sight distance for RH turning vehicles. Sight distance for pedestrian, animals and cyclists is restricted along sections of the route.
Is adequate sight distance provided at all private driveways and property entrances?	☐	✔ ☐	Several properties have limited sight distance and / or concealed driveways / entrances.
6.1.2 Design speed	☐	☐	
Is the horizontal and vertical alignment suitable for the (85th percentile) traffic speed?	☐	✔ ☐	Horizontal curves on the range section have tight narrow curves with adverse crossfalls
If not: • are warning signs installed? • are advisory speed signs installed?	✔ ☐	☐	
Are the posted advisory speeds for curves appropriate?	✔ ☐	☐	
6.1.3 Speed limit/speed zoning	☐	☐	
Is the speed limit compatible with the function, road geometry, land use and sight distance?	✔ ☐	☐	Sight distances are limited in sections
6.1.4 Overtaking	☐	☐	
Are safe overtaking opportunities provided?	✔ ☐	☐	Increased road train volume and increased travel times may lead to queueing traffic behind road trains and limited relief at overtaking opportunities.
6.1.5 Readability by drivers	☐	☐	

Issue	Yes	No	Comment
Is the road free of elements that may cause confusion? For example: • is alignment of the roadway clearly defined? • has disused pavement (if any) been removed or treated? • have old pavement markings been removed properly? • do tree lines follow the road alignment? • does the line of street lights or the poles follow the road alignment?	☐ ☐ ✔ ☐ ☐ ☐ ✔ ✔ ☐	☐ ☐ ☐ ☐ ☐ ✔ ☐ ☐ ☐	Old linemarking evident at slip repair
Is the road free of misleading curves or combinations of curves?	✔	☐	
6.1.6 Widths	☐	☐	
Are medians and islands of adequate width for the likely users?	✔	☐	Islands used to delineate lookout areas
Are traffic lane and carriageway widths adequate for the traffic volume and mix?	☐	✔	Road verge damage is evident along several sections
Are bridge widths adequate?	☐	✔	Narrow bridges at Spear and Rifle Creeks
6.1.7 Shoulders	☐	☐	
Are shoulders wide enough to allow drivers to regain control of errant vehicles?	☐	✔	Limited provision for road shoulders along entire route
Are shoulders wide enough for broken-down or emergency vehicles to stop safely?	☐	✔	Limited provision for road shoulders along entire route
Are shoulders sealed?	☐	✔	Limited provision for road shoulders along entire route
Are shoulders traffickable for all vehicles and road users? (i.e. are shoulders in good condition)	☐	✔	Limited provision for road shoulders along entire route
Is the transition from road to shoulder safe? (no drop-offs)	☐	✔	Limited provision for road shoulders along entire route
6.1.8 Crossfalls	☐	☐	
Is appropriate superelevation provided on curves?	☐	✔	Review is required to meet current standards
Is any adverse crossfall safely managed (for cars, trucks, etc.)?	✔	☐	
Do crossfalls (carriageway and shoulder) provide adequate drainage?	✔	☐	Concentrated flow would occur during high rainfall events
6.1.9 Batter slopes	☐	☐	

Issue	Yes	No	Comment
Are batter slopes traversable by cars and trucks that run off the road?	☐	✔ ☐	Batter slopes not traverable in sections
6.1.10 Drains	☐	☐	
Are roadside drains and culvert end walls traversable?	☐	✔ ☐	Roadside drains and batter slopes are generally not traversable.
6.2 Auxiliary lanes **6.2.1 Tapers**	☐	☐	
Are starting and finishing tapers located and aligned correctly?	☐	✔ ☐	A design review should be undertaken for compliance of Road Train requirements along route.
Is there sufficient sight distance to the end of the auxiliary lane?	✔ ☐	☐	
6.2.2 Shoulders	☐	☐	
Are appropriate shoulder widths provided at merges?	☐	✔ ☐	Limited provision for road shoulders along entire route
Have shoulder widths been maintained beside the auxiliary lane?	☐	✔ ☐	Limited provision for road shoulders along entire route
6.2.3 Signs and markings	☐	☐	
Have all signs been installed in accordance with the appropriate guidelines?	✔ ☐	☐	
Are all signs conspicuous and clear?	✔ ☐	☐	
Does all linemarking conform with these guidelines?	☐	✔ ☐	A design review should be undertaken for compliance of Road Train requirements along route.
Is there advance warning of approaching auxiliary lanes?	✔ ☐	☐	
6.2.4 Turning traffic	☐	☐	
Have right turns from the through lane been avoided?	✔ ☐	☐	
Is there advance warning of turn lanes?	✔ ☐	☐	
6.3 Intersections **6.3.1 Location**	☐	☐	
Are all intersections located safely with respect to the horizontal and vertical alignment?	☐	✔ ☐	Wessel Rd Intersection is located in a high speed environment on a crest with limited sight distancet
Where intersections occur at the end of high-speed environments (for example, at approaches to towns), are there traffic control devices to alert drivers?	✔ ☐	☐	
6.3.2 Visibility; sight distance	☐	☐	

Issue	Yes	No	Comment
Is the presence of each intersection obvious to all road users?	✔		
Is the sight distance appropriate for all movements and all road users?		✔	A design review should be undertaken for compliance of Road Train requirements at all intersections including Mulligan Highway intersection.
Is there stopping sight distance to the rear of any queue or slow-moving turning vehicles?	✔		
Has the appropriate sight distance been provided for entering and leaving vehicles?		✔	A design review should be undertaken for compliance of Road Train requirements at Mulligan Highway intersection.
6.3.3 Controls and delineation			
Are pavement markings and intersection control signs satisfactory?		✔	Condition and reflectivity of pavement markings at Cassowary Siding is fair to poor
Are vehicle paths through intersections delineated satisfactorily?	✔		
Are all lanes properly marked (including any arrows)?	✔		
6.3.4 Layout			
Are all conflict points between vehicles safely managed?		✔	Provision for Road Train should be reviewed
Is the intersection layout obvious to all road users?	✔		
Is the alignment of kerbs obvious and appropriate?	✔		
Is the alignment of traffic islands obvious and appropriate?	✔		
Is the alignment of medians obvious and appropriate?	✔		
Can all likely vehicle types be accommodated?		✔	Provision for Road Train should be reviewed
Are merge tapers long enough?		✔	Provision for Road Train should be reviewed
Is the intersection free of capacity problems that may produce safety problems?		✔	Provision for Road Train should be reviewed at Cassowary Siding.
6.3.5 Miscellaneous			
Particularly at rural sites, are all intersections free of loose gravel?		✔	Loose material evident at several locations
6.4 Signs and lighting **6.4.1 Lighting**			
Has lighting been adequately provided where required?	✔		

Issue	Yes	No	Comment
Is the road free of features that interrupt illumination? (for example, trees or overbridges)	✔		
Is the road free of lighting poles that are a fixed roadside hazard?	✔		
Are frangible or slip-base poles provided?	✔		
Ambient lighting: if it creates special lighting needs, have these been satisfied?	✔		
Is the lighting scheme free of confusing or misleading effects on signals or signs?	✔		
Is the scheme free of any lighting black patches?	✔		
6.4.2 General signs issues			
Are all necessary regulatory, warning and direction signs in place? Are they conspicuous and clear?	✔		
Are the correct signs used for each situation, and is each sign necessary?	✔		
Are all signs effective for all likely conditions? (for example, day, night, rain, fog, rising or setting sun, oncoming headlights, poor lighting)		✔	Sign should be checked for reflectivity and general condition
If restrictions apply for any class of vehicle, are drivers adequately advised?	✔		
If restrictions apply for any class of vehicle, are drivers advised of alternative routes?	✔		
6.4.3 Sign legibility			
In daylight and darkness, are signs satisfactory regarding visibility and: • clarity of message? • readability/legibility at the required distance?		✔	
Is sign retroreflectivity or illumination satisfactory?		✔	Maintenance is required
Are signs able to be seen without being hidden by their background or adjacent distractions?	✔		
Is driver confusion due to too many signs avoided?	✔		
6.4.4 Sign supports			
Are sign supports out of the clear zone?		✔	
If not, are they: • frangible? • shielded by barriers (for example, guard fence, crash cushions)?	✔		

Issue	Yes	No	Comment
6.5 Markings and delineation **6.5.1 General issues**	☐	☐	
Is the line marking and delineation: • appropriate for the function of the road? • consistent along the route? • likely to be effective under all expected conditions? (day, night, wet, dry, fog, rising and setting sun position, oncoming headlights, etc.)	☐	✔ ☐	RRPMs along centre line are missing and damaged in sections along the route. Reflectivity of pavement markings is fair to poor
Is the pavement free of excessive markings? (for example, unnecessary turn arrows, unnecessary barrier lines, etc.)	✔ ☐	☐	
6.5.2 Centrelines, edgelines, lane lines	☐	☐	
Are centrelines, edgelines, lane lines provided? If not, do drivers have adequate guidance?	✔ ☐	☐	
Have RRPMs been installed where required?	☐	✔ ☐	RRPMs are inconsistently located along centerline. No RRPM are located on edgelines
If RRPMs are installed, are they correctly placed, correct colours, in good condition?	☐	✔ ☐	Sections of centerlines are missing and other areas damaged
Are profiled (audible) edgelines provided where required?	☐	✔ ☐	No audible linemarking is provided
Is the linemarking in good condition?	☐	✔ ☐	Reflectivity of pavement markings is fair to poor. Redundant linemarking is evident at recent repair work.
Is there sufficient contrast between linemarking and pavement colour?	✔ ☐	☐	Previous comments refer to night time condition
6.5.3 Guideposts and reflectors	☐	☐	
Are guideposts appropriately installed?	✔ ☐	☐	Maintenance is required in secctions
Are delineators clearly visible?	☐	☐	
Are the correct colours used for the delineators?	✔ ☐	☐	
Are the delineators on guard fences, crash barriers and bridge railings consistent with those on guideposts?	☐	✔ ☐	A mix of delineators are in place along the route. Reflectivity of some delineators is poor
6.5.4 Curve warning and delineation	☐	☐	
Are curve warning signs and advisory speed signs installed where required?	✔ ☐	☐	
Are advisory speed signs consistent along the route?	✔ ☐	☐	
Are the signs correctly located in relation to the curve? (i.e. not too far in advance)	✔ ☐	☐	Sign maintenance is required to reposition alignment of individual signs and reflectivity class
Are the signs large enough?	✔ ☐	☐	

Issue	Yes	No	Comment
Are chevron alignment markers (CAMs) installed where required?	✔	☐	Sign maintenance is required to reposition alignment of individual signs and reflectivity class
Is the positioning of CAMs satisfactory to provide guidance around the curve?	✔	☐	
Are the CAMs the correct size?	✔	☐	
Are CAMs confined to curves? (not used to delineate islands, etc)	✔	☐	
6.6 Crash barriers and clear zones **6.6.1 Clear zones**	☐	☐	
Is the clear zone width traversable? (i.e. drivable)	☐	✔	Generally No
Is the clear zone width free of rigid fixtures? (if not, can all of these rigid fixtures be removed or shielded?)	☐	✔	Locations of fixed rigid objects should be individually identified and removal or shielding options considered in each case.
Are all power poles, trees, etc., at a safe distance from the traffic paths?	✔	☐	
Is the appropriate treatment or protection provided for any objects within the clear zone?	☐	✔	
6.6.2 Crash barriers	☐	☐	
Are crash barriers installed where necessary?	✔	☐	Generally
Are crash barriers installed at all necessary locations in accordance with the relevant guidelines?	-	-	Guidelines not reviewed
Are the barrier systems suitable for the purpose?	☐	✔	Systems do not meet current design standards.
Are the crash barriers correctly installed?	☐	✔	Systems do not meet current design standards.
Is the length of crash barrier at each installation adequate?	☐	✔	Systems do not meet current design standards
Is the guard fence attached correctly to bridge railings?	☐	✔	Systems do not meet current design standards
Is there sufficient width between the barrier and the edge line to contain a broken-down vehicle?	☐	✔	Systems do not meet current design standards
6.6.3 End treatments	☐	☐	
Are end treatments constructed correctly?	☐	✔	Systems do not meet current design standards
Is there a safe run-off area behind breakaway terminals?	☐	✔	Systems do not meet current design standards
6.6.4 Fences	☐	☐	
Are pedestrian fences frangible?	☐	☐	Limited provision for pedestrian

Issue	Yes	No	Comment
Are vehicles safe from being speared by horizontal fence railings located within the clear zone?	✔		
6.6.5 Visibility of barriers and fences			
Is there adequate delineation and visibility of crash barriers and fences at night?	✔		Generally
6.7 Traffic signals **6.7.1 Operations**			Not Applicable
Are traffic signals operating correctly?			Not Applicable
Are the number, location and type of signal displays appropriate for the traffic mix and traffic environment?			Not Applicable
Where necessary, are there provisions for visually impaired pedestrians? (for example, audio-tactile push buttons, tactile markings)			Not Applicable
Where necessary, are there provisions for elderly or disabled pedestrians? (for example, extended green or clearance phase)			Not Applicable
Is the controller located in a safe position? (i.e. where it is unlikely to be hit, but maintenance access is safe)			Not Applicable
Is the condition (especially skid resistance) of the road surface on the approaches satisfactory?			Not Applicable
6.7.2 Visibility			
Are traffic signals clearly visible to approaching motorists?	–	–	Not Applicable
Is there adequate stopping sight distance to the ends of possible vehicle queues?	✔		
Have any visibility problems that could be caused by the rising or setting sun been addressed?	–	–	Not Applicable
Are signal displays shielded so that they can be seen only by the motorists for whom they are intended?	–	–	Not Applicable
Where signal displays are not visible from an adequate distance, are signal warning signs and/or flashing lights installed?	–	–	Not Applicable
Where signals are mounted high for visibility over crests, is there adequate stopping sight distance to the ends of traffic queues?	–	–	Not Applicable
Is the primary signal free from obstructions on the nearside footway to approaching drivers? (trees, light poles, signs, bus stops, etc.)	–	–	Not Applicable

Issue	Yes	No	Comment
6.8 Pedestrians and cyclists **6.8.1 General issues**	☐	☐	
Are there appropriate travel paths and crossing points for pedestrians and cyclists?	☐	✔ ☐	Limited provision for pedestrians and cyclists along route
Is a safety fence installed where necessary to guide pedestrians and cyclists to crossings or overpasses?	☐	✔ ☐	Limited provision for pedestrians and cyclists along route
Is a safety barrier installed where necessary to separate vehicle, pedestrian and cyclist flows?	☐	✔ ☐	Limited provision for pedestrians and cyclists along route
Are pedestrian and bicycle facilities suitable for night use?	☐	✔ ☐	Limited provision for pedestrians and cyclists along route
6.8.2 Pedestrians	☐	☐	
Is there adequate separation distance between vehicular traffic and pedestrians on footways?	– ☐	– ☐	Limited provision of footways along route
Is there an adequate number of pedestrian crossings along the route?	☐	✔ ☐	No formal pedestrian areas along route
At crossing points is fencing oriented so pedestrians face oncoming traffic?	– ☐	– ☐	As above
Is there adequate provision for the elderly, the disabled, children, wheelchairs and baby carriages? (for example, holding rails, kerb and median crossings, ramps)	– ☐	– ☐	As above
Are adequate hand rails provided where necessary? (for example, on bridges, ramps)	– ☐	– ☐	As above
Is signing about pedestrians near schools adequate and effective?	✔ ☐	☐	Advisory signs installed
Is signing about pedestrians near any hospital adequate and effective?	– ☐	– ☐	Not Applicable
Is the distance from the stop line to a cross walk sufficient for truck drivers to see pedestrians?	– ☐	– ☐	As above
6.8.3 Cyclists	☐	☐	
Is the pavement width adequate for the number of cyclists using the route?	☐	✔ ☐	Lane width vary from 3.05 to 3.1m with narrow (0.5m) if any, shoulder width
Is the bicycle route continuous? (i.e. free of squeeze points or gaps)	☐	✔ ☐	Mossman – Mt Molloy Range is a popular road bicycle training route from Captain Cook Highway
Are drainage pit grates bicycle safe?	☐	✔ ☐	Older style covers used
6.8.4 Public transport	☐	☐	
Are bus stops safely located with adequate visibility and clearance to the traffic lane?	☐	☐	Roadside school bus stops in road verge. Minimal formal provision for clearance and shelter at most locations.

Issue	Yes	No	Comment
Are bus stops in rural areas signposted in advance?	✔		
Are shelters and seats located safely to ensure that sight lines are not impeded? Is clearance to the road adequate?			N/A
Is the height and shape of the kerb at bus stops suitable for pedestrians and bus drivers?			No kerbing at bus stops
6.9 Bridges and culverts **6.9.1 Design features**			
Are bridges and culverts the full formation width?		✔	Rifle Ck is single lane with give way installed. Spear Ck bridge and Bushy Ck causeway has restricted width with rough surface. All causeways should be reviewed for RPDM width compliance.
Are bridge and culvert carriageway widths consistent with approach conditions?		✔	Comments above
Is the approach alignment compatible with the 85th percentile travel speed?		✔	Approaches to Rifle Creek are inconsistent with adjoining alignment.
Have warning signs been erected if either of the above two conditions (i.e. width and speed) are not met?	✔		
6.9.2 Crash barriers			
Are there suitable traffic barriers on bridges and culverts and their approaches to protect errant vehicles?		✔	Bridge traffic barrier at Spear and Rifle creek not to current standard. Delineation of crash barriers ends missing
Is the connection between barrier and bridge safe?		✔	Connections would not comply with current standards
Is the bridge free of kerbing that would reduce the effectiveness of barriers or rails?	✔		Barrier kerb present
6.9.3 Miscellaneous			
Are pedestrian facilities on the bridge appropriate and safe?		✔	No pedestrian facilities on bridges
Is fishing from the bridge prohibited? If not, has provision been made for safe fishing?		✔	No provision for fishing
Does delineation continue over the bridge?	✔		Delineation damaged or missing in places
6.10 Pavement **6.10.1 Pavement defects**			
Is the condition of the pavement edges satisfactory?		✔	Pavement defects evident in sections
Is the transition from pavement to shoulder free of dangerous edge drop offs?		✔	Generally narrow or limited shoulder width provided along route.

Issue	Yes	No	Comment
Is the pavement free of defects (for example, excessive roughness or rutting, potholes, loose material, etc.) that could result in safety problems (for example, loss of steering control)?	☐	✔ ☐	Pavement fatigue and defects evident along route resulting in rough surfaces in sections.
6.10.2 Skid resistance	☐	☐	
Does the pavement appear to have adequate skid resistance, particularly on curves, steep grades and approaches to intersections?	☐	✔ ☐	Unlikely to comply in sections
Has skid resistance testing been carried out where necessary?	– ☐	– ☐	Unknown
6.10.3 Ponding	☐	☐	
Is the pavement free of areas where pond ing or sheet flow of water could contribute to safety problems?	☐	✔ ☐	Sheet flow is experienced where adjoining impervious surfaces discharge directly to roadway e.g driveway and accesses. Concentrated sheet flow would occur at locations on the Range section during high rainfall events. Diversion drains should be considered.
6.10.4 Loose stones/material	☐	☐	
Is the pavement free of loose stones and other material?	☐	✔ ☐	Loose material evident at some intersections and vehicle crossings
6.11 Parking **6.11.1 General issues**	☐	☐	
Are the provisions for, or restrictions on, parking satisfactory in relation to traffic safety?	☐	✔ ☐	Consider restrictions along range section.
Is the frequency of parking turnover compatible with the safety of the route?	✔ ☐	☐	
Is there sufficient parking for delivery vehicles so that safety problems due to double parking do not occur?	✔ ☐	☐	
Are parking manoeuvres along the route possible without causing safety problems? (for example, angle parking)	☐	✔ ☐	Angle parking in Mt Molloy would reverse into travel lane
Is the sight distance at intersections and along the route, unaffected by parked vehicles?	✔ ☐	☐	
6.12 Provision for heavy vehicles **6.12.1 Design issues**	☐	☐	
Are overtaking opportunities available for heavy vehicles where volumes are high?	✔ ☐	☐	

Issue	Yes	No	Comment
Does the route generally cater for the size of vehicle likely to use it?	☐	✔	Lane widths and curve widening on range section inadequate to contain road trains within current lanes widths at some locations.
Is there adequate manoeuvring room for large vehicles along the route, at intersections, roundabouts, etc.?	☐	✔	Manoeuvring room is restricted along sections with tight curves. Two heavy vehicle co-inciding at these locations would require one to yield and would not be obvious to vehicles following.
Is access to rest areas and truck parking areas adequate for the size of vehicle expected? (consider acceleration, deceleration, shoulder widths, etc.)	☐	☐	Access to rest area and lookouts is restricted with minimal pavement widening for acceleration, deceleration and shoulder width.
6.12.2 Pavement/shoulder quality	☐	☐	
Are shoulders sealed at bends to provide additional pavement for long vehicles?	☐	✔	Sealed shoulder width varies from < 0.1m to 1.0m
Is the pavement width adequate for heavy vehicles?	☐	✔	Pavement width varies. Damage to road verge is evident
In general, is the pavement quality sufficient for the safe travel of heavy and oversized vehicles?	✔	☐	Road is surfaced with a flexible sealed pavement. Pavement fatigue is evident along the route.
On truck routes, are reflective devices appropriate for truck drivers' eye heights?	☐	☐	No known issues
6.13 Floodways and causeways **6.13.1 Ponding, flooding**	☐	☐	
Are all sections of the route free from ponding or flow across the road during wet weather?	☐	✔	Bushy Creek and adjoin floodways regularly cause road closure during the wet season.
If there is ponding or flow across the road during wet weather, is there appropriate signposting?	✔	☐	
Are floodways and causeways correctly signposted?	✔	☐	
6.13.2 Safety of devices	☐	☐	
Are all culverts or drainage structures located outside the clear roadside recovery area?	☐	✔	Road formation width is restricted
If not, are they shielded from the possibility of vehicle collision?	☐	✔	Road formation width is restricted
6.14 Miscellaneous **6.14.1 Landscaping**	☐	☐	No formal landscaping is located along the route
Is landscaping in accordance with guidelines? (for example, clearances, sight distance)	–	–	Not applicable

Issue	Yes	No	Comment
Will existing clearances and sight distances be maintained following future plant growth?	–	–	Not applicable
Does the landscaping at roundabouts avoid visibility problems?	–	–	Not applicable
6.14.2 Temporary works			
Are all locations free of construction or maintenance equipment that is no longer required?	✔		
Are all locations free of signs or temporary traffic control devices that are no longer required?	✔		
6.14.3 Headlight glare			
Have any problems that could be caused by headlight glare been addressed? (for example, a two-way service road close to main traffic lanes, the use of glare fencing or screening)	✔		No known problem along the route
6.14.4 Roadside activities			
Are the road boundaries free of any activities that are likely to distract drivers?	✔		Road stall accesses
Are all advertising signs installed so that they do not constitute a hazard?	✔		
6.14.5 Errant vehicles			
Is the roadside furniture on the verges and footways free of damage from errant vehicles that could indicate a possible problem, hazard or conflict at the site?		✔	Damage to road verges is evident
6.14.6 Other safety issues			
Is the embankment stability safe?		✔	Cutting and embankment instability is evident
Is the route free of unsafe overhanging branches?		✔	Overhanging branches are evident along the route
Is the route free of visibility obstructions caused by long grass?	✔		Grass is maintained by road maintenance activity
Are any high-wind areas safely dealt with?	✔		No known Issues other than cyclone events.
If back-to-back median kerbing is used is it: - adequately delineated? - obvious where it starts? - obvious at intersections? - unlikely to be a hazard to pedestrians?			Kerbing is used to delineate parking and pedestrian areas at lookout locations. Delineation should be considered.
6.14.7 Rest areas			

Issue	Yes	No	Comment
Is the location of rest areas and truck parking areas along the route appropriate?	✔		Rest areas are located at popular tourist look points, picnic areas and environmental attractions
Is there adequate sight distance to the exit and entry points from rest areas and truck parking areas at all times of the day?		✔	Sight distance is restricted at entry and exit points Delineation of kerb medians should be improved / maintained.
6.14.8 Animals			
Is the route free from large numbers of animals? (for example, cattle, sheep, kangaroos, koalas, wombats, etc.)		✔	Route transects Mowbray National Park a World Heritage listed area. Road kills are evident.
If not, is it protected by animal-proof fencing?		✔	
6.14.9 Safety aspects for heavy vehicles not already covered			
Have all other matters which may have a bearing on safety for heavy vehicles been addressed?		✔	Substantial increase in road train vehicle traffic volume, increases in travel time, limited overtaking opportunity, restricted flow and decrease in level of service. Increase in adverse driver behavior e.g. driver frustration. No provision for run away heavy vehicles.

12 REFERENCES

ARRB in press, *Unsealed roads manual — guidelines to good practice,* revised edition, ARRB Group, Vermont South, Vic.

ARRB 2008, ARRB Group Ltd homepage, ARRB Group, Vermont South, Vic, viewed August 26 2008, http://www.arrb.com.au .

ARRB Group 2008, *Road safety audit toolkit homepage,* ARRB Group & Austroads, viewed August 2008, http://www.rsatoolkit.com.au.

Austroads 1996, *Benefit cost analysis manual,* AP-42/96, Austroads, Sydney, Australia. Austroads 2002,

Road safety audit, 2nd edn., AP-G30/02, Austroads, Sydney, Australia.

Austroads 2006, *Guide to road safety: part 7: road network crash risk assessment and management,* AGRS07/06, Austroads, Sydney, Australia.

Austroads 2008a, *Guide to traffic management: part 5: road management,* AGTM05/08 Austroads, Sydney, Australia.

Austroads 2008b, *Guide to road safety: part 3: speed limits and speed management,* AGRS03/08, Austroads, Sydney, Australia.

Austroads 2008c, *Guide to road safety: part 8: treatment of crash locations,* Austroads, Sydney Australia.

Australian Transport Council 2006, *National road safety action plan 2007 and 2008.* Australian Transport Council, Canberra, ACT.

Australian Transport Safety Bureau (ATSB) 2008, *Road deaths Australia: monthly bulletin, June 2008,* Infrastructure and Surface Transport Policy Division, Canberra, ACT.

Brindle, R 1998, *Relationship between accidents and access control,* ARR 320, ARRB Transport Research, Vermont South, Vic.

Bowman, BL Fruin, JJ & Zeger, CV 1989, P*lanning design and maintenance of pedestrian facilities,* US Department of Transport, Federal Highway Administration, Virginia.

Institute of Highways and Transportation 1996, *Guidelines for the safety audit of highways,* Institute of Highways and Transportation , London, UK.

Macauley, J & McInerney, R 2002 *Evaluation of the proposed actions emanating from road safety audits,* AP-R209/02, Austroads, Sydney, NSW.

McLennan, W 1988, *Disability and handicap Australia,* 4120.0, Australian Bureau of Statistics, Canberra, ACT.

Ministry of Transport New Zealand 2006, *Motor vehicle crashes in New Zealand, 2005,* Land Transport New Zealand, Wellington, NZ.

OECD/ECMT Joint Transport Research Committee 2006, *Speed management,* Organisation for Economic Co-operation and Development & European Conference of Ministers of Transport (OECD/ECMT), Paris.

Ogden, KW 1994, *Traffic engineering road safety: a practitioner's guide,* CR 145, Federal Office of Road Safety, Canberra.

Ogden, KW 1996, *Safer roads: a guide to road safety engineering,* Avebury, London.

Roberts, K 1998, 'Safety conscious planning', Proceedings of the Austroads International Road Safety Audit Forum, Melbourne, May 11–12, Austroads, Sydney, NSW.

Standards Australia 1994, Manual of uniform traffic control devices, part 2: traffic control devices for general use, AS 1742.2-1994, SA, North Sydney.