Appendix 4
Road Safety Audit

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RoadNet

Road Safety Audit

Peats Ridge Road

New Access to Calga Sand Quarry

For

Transport and Urban Planning

5 June 2009

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Date of Issue	Amendment	Reviewed	Approved

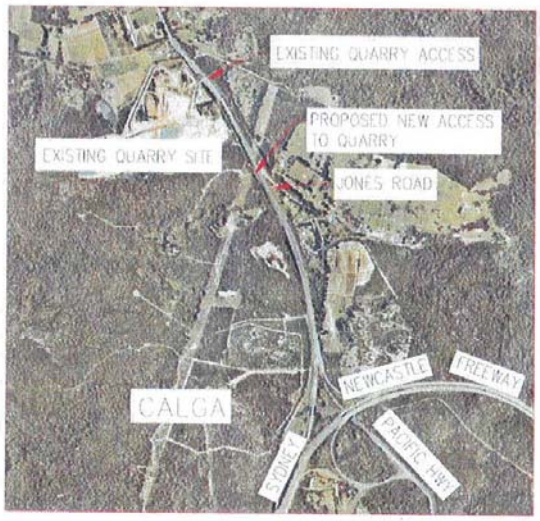
1. INTRODUCTION

1.1 Background

RoadNet Pty Ltd has been engaged by Transport and Urban Planning to undertake a road safety audit on a design for a new access on Peats Ridge Road, near Jones Road, Calga.

The road safety audit location is shown in Figure 1.1 below.

Figure 1.1: Road Safety Audit Location



Peats Ridge Road is a north-south regional road linking the central coast area to the Pacific Highway. The section of road past the proposed access is a four lane dived road with a 100kph speed limit. The alignment is generally level and straight with large radii horizontal curves to the north and south.

Peats Ridge Road was formerly a four lane road from the Pacific Highway interchange for several kilometres to the north of the existing access. The road was transformed to create turning lanes to form the painted seagull at the existing site access. Peats Ridge Road to the north of the existing access remains a four lane road and this provides good passing opportunities. The road reforms as a four lane road past the existing access for a distance of 1.5km. The proposed access point is located approximately 500m south of the existing access and about 60m north of Jones Road.

Traffic volumes on Peats Ridge Road during the am peak hour are low – 100vph southbound and 60vph northbound.

The existing access will be retained for a new land use.

The proposed access will be the prime access to the quarry development in Phase 3.

1.2 Scope of the Assessment

The audit involved undertaking a Detailed Design Audit Road Safety as per Austroads Road Safety Audit Checklist 3.

This safety assessment is based on the concept design of plans provided by consultants Transport and Urban Planning.

This audit is strictly a desktop exercise. Both auditors are familiar with this section of road hence no site inspections were undertaken or considered necessary. Aerial photographs and Streetview photographs available on the internet through Google Earth were sufficient to identify existing site conditions.

A copy of the concept design for Phase 3 is enclosed (Appendix C).

1.3 Limitations for Interpretation of Audit Results

The audit has been conducted on the concept design plans provided by Transport and Urban Planning. Comments and suggestions included in the audit are not intended to imply that they are the only way of addressing the issues raised.

2.0 Road Safety Audit Process

2.1 Definitions

The Austroads Road Safety Manual 2nd Edition (2002) guide defines a road safety audit as:

"a formal examination of an existing or future road or traffic project, or any project which interacts with road users, in which an independent, qualified examiner looks at the project's accident potential and safety performance."

The essential elements of this definition are that it is:

- a formal process and not an informal check;
- an independent process;
- carried out by someone with appropriate experience and training; and
- restricted to road safety issues.

The objectives of a road safety audit are:

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

The benefits of conducting road safety audits are that:

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

The aim of a road safety audit 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 users perception of local conditions assists safe behaviour."

Methodology

The audit has been carried out following the procedures set out in the Austroads Road Safety Audit guidelines (Second Edition) and the RTA's Accident Reduction Guide, Part 2: Road Safety Audits 2005. Reference is also made to the NSW RTA Road Design Guide.

The audit covers physical features of the proposal that may affect road user safety, and it has sought to identify potential safety hazards.

The audit team reviewed the plans checking critical elements of the design such a sight lines, length of turning bays, intersection layout, turning paths for large vehicles, relationship to nearby accesses and intersections, lighting and provision for other road users.

A completed copy of the Austroads Checklist 3 is attached in Appendix D.

Audit Team

The road safety audit was undertaken by:

- Brian Kerwick – Senior Road Safety Auditor
- Pat Vandermaal – Road Safety Auditor

Information Sources

Data sources for the road safety audit include:

- Concept Design Plans (Figure 9);
- Extracts from Traffic Study;
- Traffic Counts;
- Accident History;
- Austroads Road Safety Audit guidelines (Second Edition)
- RTA Accident Reduction Guide, Part 2: Road Safety Audits 2005.
- RTA Road Design Guide.
- Aerial Photographs using Google Earth
- Photographs of the route using Google Earth Streetview.

3.0 AUDIT RESULTS

This section summarises the safety issues identified during the audit. This section also offers suggestions to improve the design in terms of safety.

A ranking of each recommendation has been included to prioritise issues in order of importance in relation to road safety using the following ratings:

A - High Priority: Issues that require serious consideration.

B - Medium Priority: Issues where it would be desirable to reconsider the design.

C - Low Priority: General comments and issues with marginal safety benefits.

Table 3.1 details safety risks identified in the design. The table also includes road safety suggestions and an assessment of priority.

Table 3.1: Audit Results

Item	Issue	Priority	Suggestion	Client Response
1	Existing Site Access. The existing left turn lane is 140m long. The RTA Road Design Guide specifies 150m.	B	Consider extension of bay.	
2	Existing Site Access. The existing right turn lane is 135m long. The RTA Road Design Guide (Table 4.8.3) specifies 155m.	C	In practice the painted tail of the median may be used for deceleration. No action suggested.	
3	Existing Site Access. Safe Intersection Sight Distance (SISD) to the left is approximately 320m. To the right SISD is restricted to 225m by roadside vegetation. SISD for 100kph is 225m.	C	Sight Distance in both directions complies with 100kph. No action suggested.	
4	Proposed Site Access.	C	Complies.	

	The left turn lane is 150m long. The RTA Road Design Guide (Table 4.8.3) specifies 150m.		No action suggested.	
5	Proposed Site Access. The right turn lane is 150m long. The RTA Road Design Guide specifies 155m.	B	Suggest minor adjustment to the plan.	
6	Proposed Site Access. The left turn radii into and out of the proposed access appears to be tight for large vehicles.	B	Review turning paths. Refer to Figure 4.8.35 in the RTA Road Design Guide relating to splays and turning radii. (Copy is Appendix A of this report.)	
7	Proposed Site Access. The seagull acceleration lane is 450m long. The RTA Road Design Guide (Table 4.8.5) specifies 450m.	C	Complies. No action suggested.	
8	Proposed Site Access. Safe Intersection Sight Distance (SISD) to the left exceeds 350m. To the right SISD exceeds 350m. SISD for 100kph is 225m.	C	Sight Distance in both directions complies with 100kph. No action suggested.	
9	Jones Road The right turn lane is 150m long. The RTA Road Design Guide specifies 155m.	B	Suggest minor adjustment to the plan. There is currently no right turn bay at Jones Road. The design improves safety by providing a turning bay into Jones Road.	

10	Jones Road Safe Intersection Sight Distance (SISD) exceeds 350m in both directions SISD for 100kph is 225m.	C	Complies No action suggested.	
11	Jones Road Sight lines from the right turn bay into Jones Road to oncoming southbound vehicles in Peats Ridge Road may be obscured by trucks entering and using the Seagull acceleration lane.	C	This issue has been raised by the RTA in discussions with the client so the matter has been considered in detail. The audit team does not consider this to be a significant safety issue for the following reasons. Potential traffic conflicts are low with 15 trucks turning right from the quarry to the south being opposed by 4 vehicles turning right into Jones Road and 2 vehicles doing U Turns to the south. Combined with this are low traffic volumes on Peats Ridge Road – 100vph southbound and 60vph northbound. The low traffic volumes remove the temptation to take unacceptable risks to reduce delays. There is no imperative for vehicles to turn in front of a truck that only has to travel about 80 metres to clear the Jones Road intersection. It is possible that trucks entering Peats Ridge Road may obscure the view of southbound traffic while entering and using the seagull acceleration lane. However, this would not be any different from turning at a normal T junction onto a multi lane road. Trucks will continue moving in the seagull	

			acceleration lane so any sight line obstruction would be minimal. It would be different if the trucks stopped and stored in a seagull holding bay but this is not the case. Should this issue remain a concern to the RTA an intersection treatment similar to the existing access could be considered. The distances between intersections appear to be sufficient to allow both intersections to be controlled by seagulls. However as noted above, the audit team does not consider that a change of the design is warranted by any identified safety concerns.	
12	Pedestrians	C	There are no issues relating to pedestrians.	
13	Provision for Cyclists	A	The design should provide sealed shoulders on Peats Ridge Road of at least 1.2m to retain a continuous path for cyclists.	
14	No street lighting is provided	A	As no lighting is proposed reference is made to Figure 4.8.26 in the RTA Road Design Guide relating to offsets from the edge line to raised median islands. (Copy is Appendix A of this report.)	

4.0 CONCLUDING STATEMENT

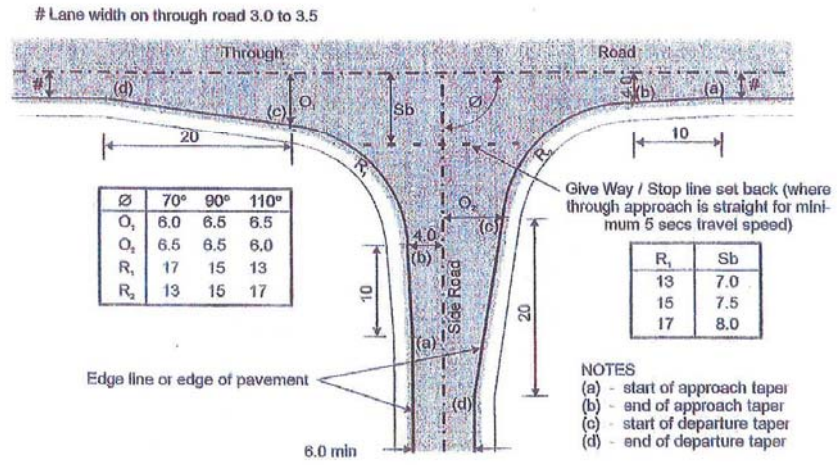
The audit has identified a number of minor safety issues that warrant a review of some design elements.

The audit concludes that the design is essentially sound and contains no serious safety issues.

Brian Kerwick - Senior Road Safety Auditor

Pat Vandermaal – Road Safety Auditor

APPENDIX A - Extract from RTA RDG for Rural BAL treatment



Ø	70°	90°	110°
O_1	6.0	6.5	6.5
O_2	6.5	6.5	6.0
R_1	17	15	13
R_2	13	15	17

R_1	Sb
13	7.0
15	7.5
17	8.0

Figure 4.8.35 - Details of Type "BAL" Layout for Rural Sites. where Side Road AADT ≥ 50 and / or specifically for articulated vehicles.

APPENDIX B - Extract from RTA RDG for offsets to raised medians at unlit rural junctions

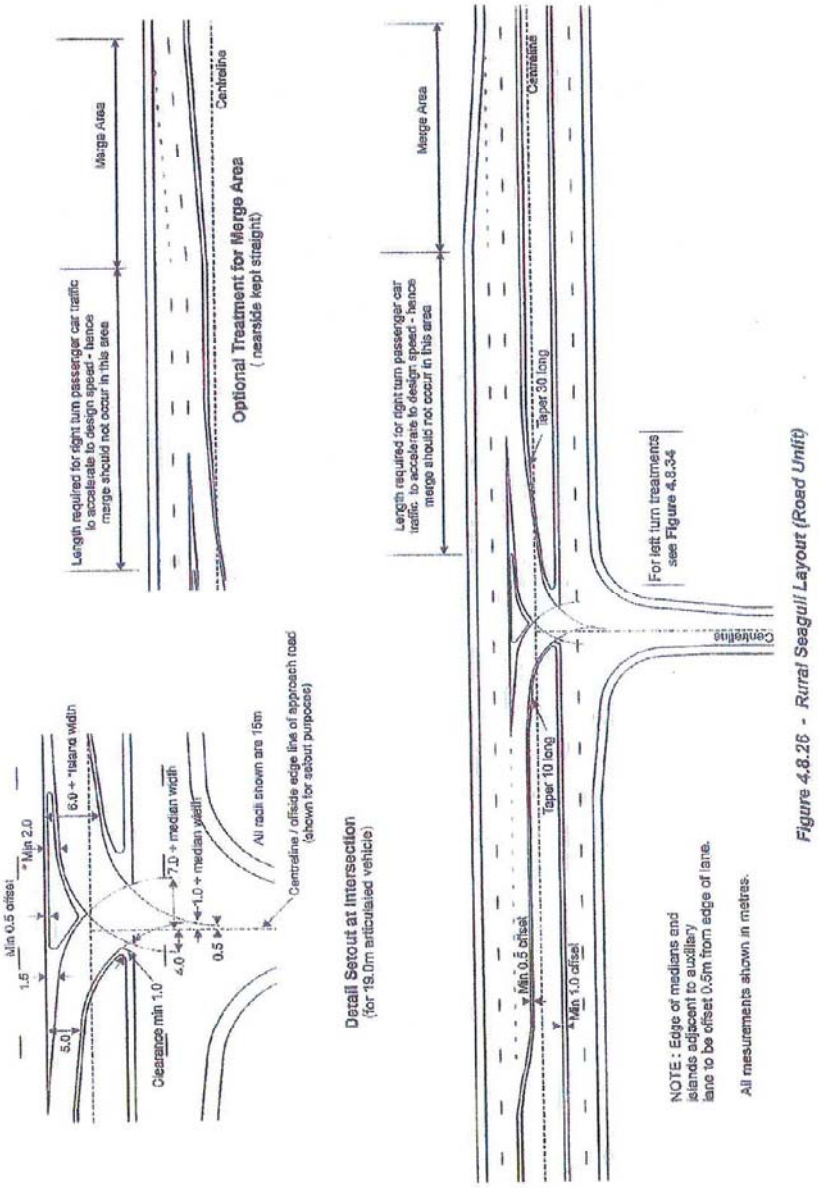
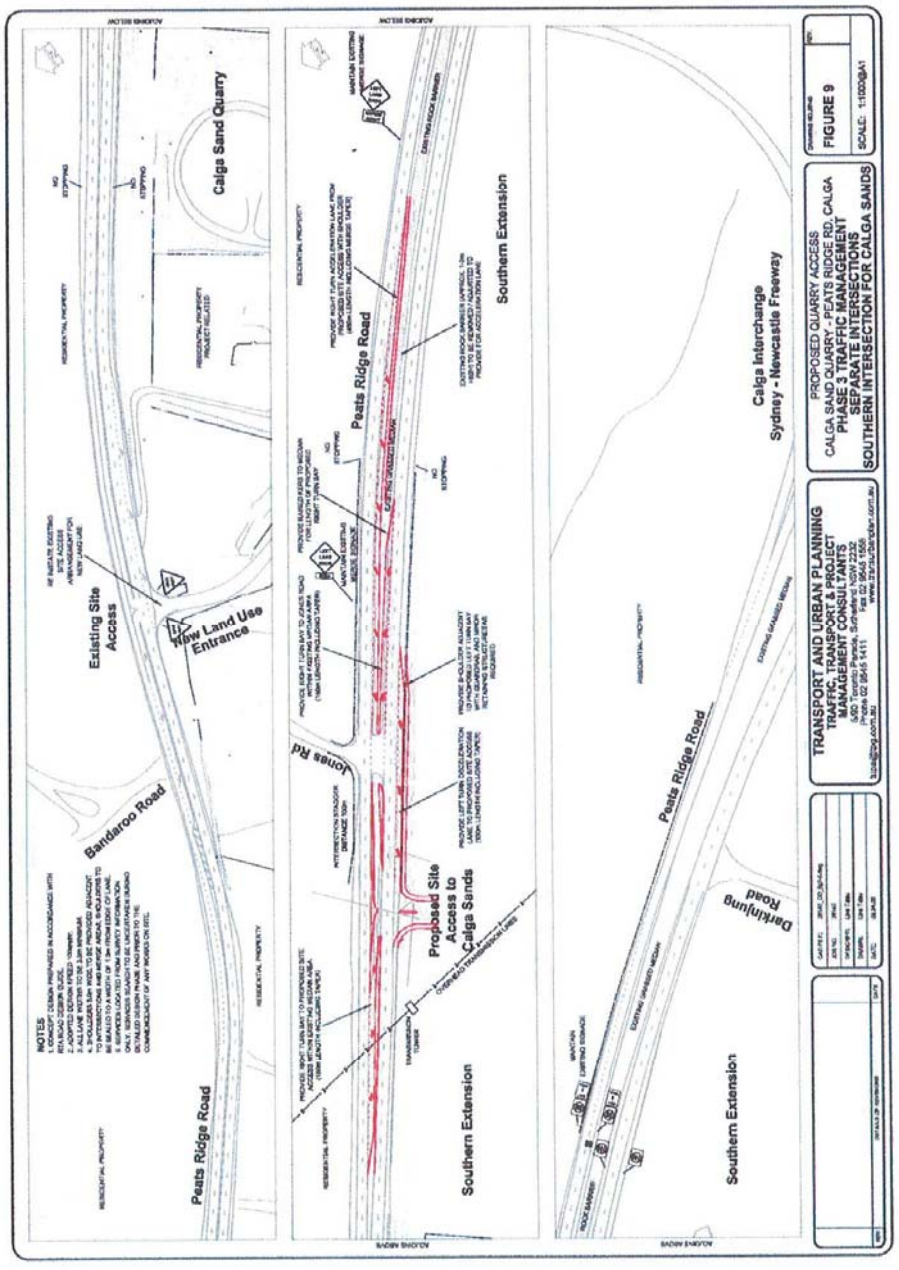


Figure 4.8.26 - Rural Seagull Layout (Road Unlit)

APPENDIX C - Concept Design for Phase 3.



APPENDIX D - RSA Checklist.

SEE FOLLOWING PAGES

Checklist 3: Detailed design stage audit			
Issue	Yes	No	Comment
3.1 General topics 1 Changes since previous audit Do the conditions for which the scheme was originally designed still apply? (i.e. no significant changes to the surrounding network or area to be served, or traffic mix.)			DETAILS OF ANY PREVIOUS AUDITS NOT KNOWN
Has the design of the project remained unchanged since previous audit (if any)?			—
2 Drainage Will the new road drain adequately?	✓		EXISTING CROSSFALLS – CHECK NEW LANES.
Are the road grades and crossfalls adequate for satisfactory drainage?			N|K
Are flat spots avoided or adequately dealt with at start/end of superelevation?			N|K
Has the possibility of surface flooding been adequately addressed, including overflow from surrounding or intersecting drains and water courses?			N|K
Is gully pit spacing adequate to limit flooding?			N/A
Is pit grate design safe for pedal cycles? (i.e. gaps not parallel with wheel tracks)			N/A.
Will footpaths drain adequately?			NO FOOTPATHS
3 Climatic condition Has the design taken into account weather records or local experience which may indicate a particular problem? (eg. snow, ice, wind, fog)			N|K.
4 Landscaping Will drivers be able to see pedestrians (and vice versa) past or over the landscaping?			NO LANDSCAPING PROPOSED
Will intersection sight lines be maintained past or over the landscaping?			N/A
Will safety be adequate with seasonal growth? (eg. no obscuring of signs, shading or light effects, slippery surface, etc.)			AS EXISTING.
Will roadside safety be adequate when trees or plantings mature? (no roadside hazard)			N/A.
Has 'frangible' vegetation been used in possible run-off-road areas?			N/A

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Checklist 3: Detailed design stage audit continued …			
Issue	Yes	No	Comment
5 Services Does the design adequately deal with buried and overhead services (especially in regard to overhead clearances, etc.)?			N\K
Has the location of fixed objects or furniture associated with services been checked? (including any loss of visibility, position of poles, and clearance to overhead wires.)		✓	
6 Access to property and developments Can all accesses be used safely?	✓		
Is the design free of any downstream or upstream effects from accesses, particularly near intersections?	✓		
Do rest areas and truck parking area have adequate sight distance at access points?			N/A
7 Emergencies, breakdowns, emergency and service vehicle access Has provision been made for safe access and movements by emergency vehicles?			N/A - RURAL ROAD - SEALED SHOULDERS
Does the design and positioning of medians and vehicle barriers allow emergency vehicles to stop & turn without unnecessarily disrupting traffic?	✓		
Have broken down vehicles or stopped emergency vehicles been adequately considered?	✓		SEALED SHOULDERS
Is provision for emergency telephones satisfactory?			N/A
Are median breaks on divided carriageways safely located? (i.e. frequency, visibility)			N/A.
8 Future widening and/or realignments If the scheme is only a stage towards a wider or dual carriageway is the design adequate to impart this message to drivers? (Is the reliance on signs minimal/appropriate, rather than excessive?)			N/A
Is the transition between single and dual carriageway (either way) handled safely?			N/A.
9 Staging of the scheme If the scheme is to be staged or constructed at different times: • Are the construction plans and program arranged to ensure maximum safety? • Do the construction plans and program include specific safety measures, signing; adequate transitional geometry; etc. for any temporary arrangements?			N/A .

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Checklist 3: Detailed design stage audit continued …			
Issue	Yes	No	Comment
10 Staging of the work If the construction is to be split into several sub-projects, is the order safe? (i.e. the stages are not constructed in an order that creates unsafe conditions.)			N/A.
11 Adjacent developments Does the design handle accesses to major adjacent generators of traffic and developments safely?			NO MAJOR ADJACENT DEVELOPMENTS.
Is the drivers' perception of the road ahead free of misleading effects of any lighting or traffic signals on an adjacent road?	✓		
Has the need for screening against glare from lighting of adjacent property been adequately considered?	✓		NOT REQUIRED
12 Stability of cut and fill Is the stability of batters satisfactory? (eg. no potential for loose material to affect road users.)	✓		MINIMAL BATTERS
13 Skid resistance Has the need for anti skid surfacing been considered where braking or good road adhesion is most essential? (eg. on gradients, curves, approaches to intersections and signals)	✓		
3.2 Design issues (general) 1 Geometry of horizontal and vertical alignment Does the horizontal and vertical design fit together correctly?	✓		AS EXISTING.
Is the vertical alignment consistent and appropriate throughout?	✓		
Is the horizontal alignment consistent throughout?	✓		
Is the alignment consistent with the function of the road?	✓		
Is the design free of misleading visual cues (eg. visual illusions, subliminal delineation like lines of poles)	✓		
2 Typical cross sections Are lane widths, shoulders, medians and other cross section features adequate for the function of the road?	✓		

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Checklist 3: Detailed design stage audit continued …			
Issue	Yes	No	Comment
Is the width of traffic lanes and carriageways suitable in relation to: • Alignment? • Traffic volume? • Vehicle dimensions? • The speed environment? • Combinations of speed and traffic volume?	✓		
Are the shoulder widths adequate for stationary vehicles and errant vehicles?	✓		
Are median widths adequate for road furniture?	✓		
Is superelevation consistent with the road environment?	✓		
Are the shoulder crossfalls safe for vehicles to traverse?	✓		
Are batter slopes drivable for cars, trucks?		✓	
Are side slopes under structures appropriate?			N/A.
Have adequate facilities been provided for pedestrians and cyclists?	✓		SEALED SHOULDERS – MINIMAL PEDS & CYCLISTS.
3 Effect of cross sectional variation Is the design free of undesirable variations in cross section design?	✓		
Are crossfalls safe? (particularly where sections of existing highway have been utilised, there have been compromises to accommodate accesses, at narrowings at bridges, etc.)	✓		
Are any curves with adverse crossfall within appropriate limits?			N/A.
Is superelevation provided and sufficient at all locations where required?			N/A
4 Roadway layout Are all traffic management features designed so as to avoid creating unsafe conditions?	✓		
Is the layout of road markings and reflective materials able to deal satisfactorily with changes in alignment? (particularly where the alignment may be substandard.)	✓		
Is there adequate provision for overtaking?	✓		
Are overtaking lanes provided where required and safely commenced and ended?	✓		
Are overtaking requirements satisfactory?	✓		
Is the design free of sunrise/sunset problems?	✓		GENERALLY NORTH/SOUTH

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Checklist 3: Detailed design stage audit continued …			
Issue	Yes	No	Comment
Have public transport requirements been adequately catered for?		✓	NOT REQ'D.
5 Shoulders and edge treatment Are the following safety aspects of shoulder provision satisfactory? • Provision of sealed or unsealed shoulders? • Width and treatment on embankments? • Crossfall of shoulders?	✓		
Are the shoulders likely to be safe if used by slow moving vehicles or cyclists?	✓		
6 Effect of departures from standards or guidelines Any approved departures from standards or guidelines: is safety maintained?	✓		
Any hitherto undetected departures from standards: is safety maintained?	✓		
7 Visibility and sight distance Are horizontal and vertical alignments consistent with visibility requirements?	✓		
Has an appropriate design speed been selected for visibility requirements?	✓		
8 Environmental treatments Has safety been considered in the location of environmental features (eg. noise fences)?			N/K
3.3 Alignment details 1 Visibility; sight distance Are horizontal and vertical alignments consistent with the visibility requirements?	✓		
Is the design free of sight line obstructions due to: • Safety fences or barriers? • Boundary fences? • Street furniture? • Parking facilities? • Signs? • Landscaping? • Bridge abutments? • Parked vehicles in laybys or at the kerb? • Queued traffic?	✓		"NO STOPPING" PROPOSED TO MAINTAIN SIGHT LINES NEAR JONES ROAD.
Are railway crossings, bridges and other hazards all conspicuous?			

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Checklist 3: Detailed design stage audit continued …			
Issue	Yes	No	Comment
Is the design free of any other local features which may affect visibility?	✓	✓	
Is the design free of overhead obstructions (eg. road or rail overpasses, sign gantries, overhanging trees) which may limit sight distance at sag curves?	✓		
Has clear headroom or a high vehicle detour been provided where necessary?			N/A
Is visibility adequate: • Any pedestrian, bicycle or cattle crossings? • Access roads, driveways, on and off ramps, etc.?	✓		
Has the minimum sight triangle been provided at: • Entry and exit ramps? • Gore areas? • Intersections? • Roundabouts? • Other conflict points?	✓		
2 New/existing road interface Have implications for safety at the interface been considered?	✓		
Is the transition from old road to the new scheme satisfactory?	✓		
If the existing road is of a lower standard than the new scheme, is there clear and unambiguous warning of the reduction in standard?			AS EXISTING.
Have the appropriate provisions for safety been made where sudden changes in speed are required?	✓		
Is access or side friction handled safely?	✓		
Does the interface occur well away from any hazard? (eg. a crest, a bend, a roadside hazard or where poor visibility/distractions may occur.)	✓		
If carriageway standards differ, is the change effected safely?			NO DIFFERENCE
Is the transition where the road environment changes? (eg. urban to rural; restricted to unrestricted; lit to unlit.) Is it done safely?			NO CHANGES.
Has the need for advance warning been considered?	✓		NOT REQUIRED
3 'Readability' of the alignment by drivers Will the general layout, function and broad features be recognised by drivers in sufficient time?	✓		

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Checklist 3: Detailed design stage audit continued …			
Issue	Yes	No	Comment
Will approach speeds be suitable and will drivers correctly track through the scheme?	✓		
4 Detail of geometric design Are the design standards appropriate for all the requirements of the scheme?	✓		
Is consistency of general standards and guidelines, such as lane widths and cross falls, maintained?	✓		
5 Treatment at bridges and culverts Is the geometric transition from the standard cross section to that on the bridge handled safely?			N/A
3.4 Intersections 1 Visibility to and visibility at intersections Are horizontal and vertical alignments at the intersection or on the approaches to the intersection consistent with the visibility requirements?	✓		
Is the standard adopted for provision of visibility appropriate for the speed of traffic and for any unusual traffic mix?	✓		
Will the design be free of sight line obstructions due to: • Safety fences or barriers? • Boundary fences? • Street furniture? • Parking facilities? • Signs? • Landscaping? • Bridge abutments? • Parked vehicles in laybys and at the kerb? • Queued traffic?	✓		"NO STOPPING" PROPOSED TO MAINTAIN SIGHT LINES.
Are railway crossings, bridges and other hazards all conspicuous?			N/A
Is the design free of any other local features which may affect visibility?	✓		
2 Layout Are intersections and accesses adequate for all vehicular movements?	✓		
Has the appropriate design vehicle and check vehicle been used for turning dimensions?	✓		19m SEMI.
Are swept paths accommodated for all likely vehicle types? (Has the appropriate design vehicle been used?)	✓		

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Checklist 3: Detailed design stage audit continued …			
Issue	Yes	No	Comment
Are intersections free of any unusual features which could affect road safety?	✓		
Are pedestrian fences provided where needed? (eg. to guide pedestrians or discourage parking).		✓	NONE REQ'D.
Has pavement anti-skid treatments been provided where needed?			NOT REQ'D
Have islands and signs been provided where required?	✓		
Vehicles which may park at or close to the intersection: can they do this safely or does this activity need to be relocated?			"NO STOPPING" PROPOSED
Are safety hazards due to parked vehicles avoided?	✓		
3 Readability by drivers Will the existence of the intersection and its general layout, function and broad features be perceived correctly and in adequate time?	✓		
Are the approach speeds and likely positions of vehicles tracking through the intersection safe?	✓		
Is the design free of misleading elements?	✓		
Is the design free of sunrise or sunset problems which may create a hazard for motorists?	✓		
4 Detailed geometric design Can the layout safely handle unusual traffic mixes or circumstances?	✓		
Does any median or any island safely account for: • Vehicle alignments and paths? • Future traffic signals? • Pedestrian storage space and surface? • Turning path clearance? • Stopping sight distance to the nose? • Mountability by errant vehicles?	✓		
Is adequate vertical clearance to structures provided (eg. powerlines, shop awnings)			N/A.
5 Traffic signals Is the signal phasing/sequence safe?			NIL
Is adequate time provided for traffic movements and pedestrian movements?			
Will the signal lanterns be visible? (eg. not obstructed by trees, poles, signs or large vehicles)			
Are lanterns for other approach directions adequately			

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Checklist 3: Detailed design stage audit continued …			
Issue	Yes	No	Comment
shielded from view?			
Are high intensity signals and/or target boards provided if likely to be affected by sunrise/sunset?			
Does the vertical alignment provide satisfactory stopping sight distance to the intersection or back of queue?			
Are pedestrian facilities provided where they are required?			
Will approaching drivers be able to see pedestrians?			
Are partially or fully controlled turning phases required and provided?			
Are signal posts located where they are not an undue hazard?			
Are road markings for turning traffic satisfactory?			
Have adequate pedestrian phases been provided?			
6 Roundabouts Is adequate deflection provided to reduce approach speeds?			NIL
If splitter islands are needed, are they adequate for sight distance, length, pedestrian storage, etc.?			
Is the central island prominent?			
Can the appropriate design vehicle and check vehicle be accommodated?			
Are the central island details satisfactory (delineation, mountability, conspicuity)?			
Can pedestrians be seen by drivers in sufficient time?			
Can pedestrians determine whether vehicles are turning (no obstructions to sight lines)?			
Are direction markings required in approach lanes?			
Is the lighting adequate?			
7 Other intersections Has the need for kerbed or painted islands and refuges been considered?	✓		
Do intersections have adequate queue length/storage for turning movements (including in the centre of a staggered intersection)?	✓		

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Checklist 3: Detailed design stage audit continued …			
Issue	Yes	No	Comment
3.5 Special road users 1 Adjacent land Are all accesses to and from adjacent land/properties safe?	✓		
Have the special needs of agriculture and stock movements been considered?	✓		AS EXISTING
2 Pedestrian Can pedestrians cross safely at: • Intersections? • Signalised and pedestrian crossings? • Refuges? • Kerb extensions? • Bridges and culverts? • Other locations?	✓		LOW VEHICLE & PEDESTRIAN VOLUMES.
Is each crossing point satisfactory for: • Visibility, for each direction? • Use by the disabled? • Use by the elderly? • Use by children/schools?			N/A.
Is pedestrian fencing on reservations and medians required and provided for each crossing?			NOT REQ'D
Is fencing adequate on freeways?			N/A
Are pedestrians deterred from crossing roads at unsafe locations?			NO UNSAFE LOCATIONS.
Are pedestrian related signs appropriate and adequate?			NIL
Is width and gradient of pedestrian paths, crossings, etc. satisfactory?			NO PATHS.
Is surfacing of pedestrian paths, crossings, etc. satisfactory?			N/A
Have dropped kerbs been provided for each crossing?			N/A
Have channels and gullies been avoided at each crossing?			N/A
Is lighting satisfactory for each crossing?			N/A
Are crossings sited to provide maximum use?			N/A.
Is avoidance of a crossing unlikely (eg. by more direct but less safe alternative)?		✓	N/A.

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Checklist 3: Detailed design stage audit continued …			
Issue	Yes	No	Comment
3 Cyclists Have the needs of cyclists been considered: • At intersections (particularly roundabouts)? • Especially on higher speed roads? • On cycle routes and crossings? • At freeway entry and exit ramps?	✓		SEALED SHOULDERS
Are shared cycleway/footway facilities (including subways and bridges) safe and adequately signed?			N/A.
4 Motorcyclists Has the location of devices or objects which might destabilise a motorcycle been avoided on the road surface?	✓		
Is the roadside clear of obstructions where motorcyclists may lean into curves?	✓		
Will warning or delineation be adequate for motorcyclists?		✓	
Has barrier kerb been avoided in high speed areas?	✓		
In areas more likely to have motorcycles run off the road is the roadside forgiving or safely shielded?		✓	AS EXISTING – ROADSIDE TREES IN RURAL AREA.
Are all poles, posts and devices necessary? (If so, is shielding an option?)	✓		
Are drainage pits and culverts traversable by motorcycle?	✓		
5 Equestrians and stock Have the needs of equestrians been considered, including the use of verges or shoulders and rules regarding the use of the carriageway?			NOT REQUIRED
Can underpass facilities be used by equestrians/stock?			N/A.
6 Freight Have the needs of truck drivers been considered, including turning radii and lane widths?	✓		
Have the needs of freight transport been considered, adequately signed and catered for?	✓		
7 Public transport Have the needs for public transport been considered, adequately signed and catered for?		✓	PUBLIC TRANSPORT NOT REQ'D.
Have the needs of public transport users been considered?	✓		
Have the manoeuvring needs of public transport vehicles been considered?	✓		

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Checklist 3: Detailed design stage audit continued …			
Issue	Yes	No	Comment
Are bus stops well positioned for safety?			
8 Road maintenance vehicles Have the needs of road maintenance vehicles been considered, adequately signed and catered for?	✓		AS EXISTING.
Can maintenance vehicles be safely located?	✓		SEALED SHOULDERS
3.6 Lighting, signs and delineation 1 Lighting Is lighting required and if so, has it been adequately provided?			LIGHTING NOT REQUIRED
Is the design free of features which interrupt illumination (eg. trees or overbridges)?			
Do any lighting poles present a fixed roadside hazard?			
Are frangible or slip-base poles to be 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?			
Does the lighting adequately illuminate crossings, nearby paths, refuges, etc.?			
Are all gore areas adequately illuminated?			
Are all merge areas adequately illuminated?			
Is the scheme free of any lighting black patches?			
If there are locations with accident problems which are known to be amenable to treatment with improved lighting, has this lighting been provided?			
2 Signs Are signs appropriate for their location?	✓		
Are signs located where they can be seen and read in adequate time?	✓		
Will signs be readily understood?	✓		
Are signs appropriate to the driver's needs (eg. direction signs, advisory speed signs, etc.)?	✓		
Are signs located so that drivers' sight distance is maintained?	✓		

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Checklist 3: Detailed design stage audit continued …			
Issue	Yes	No	Comment
Are signs located so that visibility is maintained to/from: • Accesses and intersecting roads? • Pedestrians and important features on the road?	✓		
Have the consequences of vehicles striking sign posts been considered?	✓		FRANGIBLE PIPE POSTS.
Are sign supports out of the clear zone?		✓	FRANGIBLE.
If not, are they: • Frangible? • Shielded by barriers (eg. guard fence, crash cushions)?	✓		
Has an over-reliance on signs (in lieu of adequate geometric design) been avoided?	✓		
Are signs on the new scheme consistent with those on the adjoining section of road (or will the previous signs need to be upgraded)?	✓		
3 Marking and delineation Are markings (lines, arrows, etc.) consistent with standard markings?	✓		
Have any locations where standard markings might be confusing or misread been identified and treated in a way which considers users' likely responses?	✓		
Are barrier lines (no overtaking) provided where required?	✓		
Are Raised Retroreflective Pavement Markers (RRPM's) provided where necessary?	✓		RRPM'S TO BE PROVIDED.
Are curve warning signs, advisory speed plates or chevron alignment markers provided where required?			N/A.
Are markings on the new scheme consistent with those on the adjoining section of road (or will the previous markings need to be upgraded)?	✓		
Are diagonal markings or chevrons painted where required?	✓		
Will markings and delineation be visible at night time?	✓		
Will markings and delineation be visible in wet weather?	✓		
Has the need for profiled (audible) line marking been considered?	✓		MATCH TO ANY EXISTING.
Have both high and low beam cases been considered?	✓		
Are guide posts of the frangible type?	✓		

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Checklist 3: Detailed design stage audit continued …			
Issue	Yes	No	Comment
3.7 Physical objects 1 Median barriers Have median barriers been considered and properly detailed?	✓		EXISTING LOW ROCK WALL.
Have all design features which require special attention (eg. end treatments) been considered?	✓		
2 Poles and other obstructions Are all poles located well away from moving traffic?			NIL
Have frangible or breakaway poles been included where required?			N/A
Are median widths adequate to accommodate lighting poles or trees?		✓	
Is the position of traffic signal controllers and other service apparatus satisfactory?			N/A
Is the roadside clear of any other obstructions which may create a safety hazard?		✓	ROADSIDE TREES ROCK WALLS AS EXISTING
Have all necessary measures been taken to remove, relocate or shield all hazards?	✓		GUARDRAIL AS EXISTING.
Can roadside drains and channels be safely traversed by any vehicle which runs off the road?	✓		
3 Crash barriers Are crash barriers provided where necessary and properly detailed? (eg. at embankments, structures, trees, poles, drainage channels, bridge piers, gore areas)?	✓		
Is the presence of - or details of - any crash barrier safe? (i.e. unlikely to create a danger for road users including pedestrians, cyclists, motorcyclists, etc.)	✓		
Are the end conditions of the crash barrier safe and satisfactory?	✓		
Is the guard fence designed according to standards for: • End treatments? • Anchorages? • Post spacing? • Block outs? • Post depth? • Rail overlap? • Stiffening at rigid obstacles?			EXISTING GUARDRAIL.

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Checklist 3: Detailed design stage audit continued …			
Issue	Yes	No	Comment
Is all guard fence necessary? (i.e. what it shields is a greater hazard than the fence)	✓		
Where pedestrians and cyclists travel behind guard fence, is the rear of the fence safe for them?			N/A.
4 Bridges, culverts and causeways/floodways Are bridge barriers and culvert end walls safe regarding: • Visibility? • Ease of recognition? • Proximity to moving traffic? • The possibility of causing injury or damage? • Collapsible or frangible ends? • Signs and markings? • Connection of crash barriers? • Roadside hazard shielding?			NIL
Is the bridge railing at the correct level and strong enough?			
Is the shoulder width on the bridge the same as on the adjacent road lengths?			
Is safe provision made for non-vehicular traffic over structures? (eg. pedestrians, pedal cycles, horses/stock, etc).			
Are all culvert end walls (including driveway culverts) drivable or outside the clear zone?			
Have causeways/floodways etc., been given correct signing and adequate sight distance?			
3.8 Additional questions to be considered for development proposals 1 Horizontal alignment Is visibility adequate for drivers and for pedestrians at proposed accesses?	✓		
Is adequate turning space provided for the volume and speed of traffic?	✓		
Are curve radii and forward visibility satisfactory?	✓		
Are sight and stopping distances adequate?	✓		
2 Vertical alignment Are gradients satisfactory?	✓		
Are sight and stopping distances adequate?	✓		

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Checklist 3: Detailed design stage audit continued …			
Issue	Yes	No	Comment
3 Parking provision Is on-site parking adequate to avoid on-street parking and associated risks?	✓		ON SITE STAFF & VISITOR PARKING. LOW VOLUMES
Are parking areas conveniently located?			N/K
Is adequate space provided in parking areas for circulation and intersection sight distance?			N/A
4 Servicing facilities Are off street loading/unloading areas adequate?	✓		
Are turning facilities for large vehicles provided in safe locations?	✓		
Is emergency vehicle access adequate?			N/K
5 Signs and markings Have necessary traffic signs and road markings been provided as part of a development?			N/A.
Is priority clearly defined at all the intersection points within the car park and access routes?			N/A.
Will the signs and markings be clear in all conditions, including day/night, rain, fog, etc.?			N/K.
6 Landscaping Does landscaping maintain visibility at intersections, bends, accesses and pedestrian locations?			NONE PROPOSED N/K
Has tree planting been avoided where vehicles are likely to run off the road?			" "
7 Traffic management Have any adverse area-wide effects been addressed?	✓		
Will the design keep travel speeds at a safe level?	✓		
Are the number and location of accesses appropriate?	✓		
Are the facilities for public transport services safely located?			NIL
Are any bicycle facilities safely located in respect to vehicular movements?			NIL
Are pedestrian facilities adequate and safely located?			NIL
8 Other Has appropriate street lighting been provided?			NO LIGHTING.
Are all roadside hazards appropriately dealt with?	✓		

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Checklist 3: Detailed design stage audit continued …			
Issue	Yes	No	Comment
Has safe pedestrian access to the development been provided?			NO PED ACCESS
3.9 Any other matter 1 Safety aspects not already covered Will there be special events? Have any consequent unusual or hazardous conditions been considered?		✓	
Is the road able to safely handle oversize vehicles, or large vehicles like trucks, buses, emergency vehicles, road maintenance vehicles?	✓		
If required, can the road be closed for special events in a safe manner?			N/A.
If applicable, are special requirements of scenic or tourist routes satisfied?			N/A.