AUSTRALIAN ZIRCONIA LTD

(A wholly owned subsidiary of Alkane Resources Ltd)

Dubbo Zirconia Project

Traffic Impact Assessment

Prepared by

Constructive Solutions Pty Ltd

September 2013

Specialist Consultant Studies Compendium
Volume 3, Part 11

This page has intentionally been left blank

AUSTRALIAN ZIRCONIA LTD

(A wholly owned subsidiary of Alkane Resources Ltd)

Traffic Impact Assessment

Prepared for:

R.W. Corkery & Co. Pty Limited
62 Hill Street
ORANGE NSW 2800

Tel: (02) 6362 5411
Fax: (02) 6361 3622
Email: orange@rwcorkery.com

On behalf of:

Australian Zirconia Ltd
65 Burswood Road
BURSWOOD WA 6100

Tel: (08) 9227 5677
Fax: (08) 9227 8178
Email: mail@alkane.com.au

Prepared by:

Constructive Solutions Pty Ltd
PO Box 1498
TAMWORTH NSW 2340

Tel: (02) 6762 1969
Fax: (02) 6762 1969
Email: ben@constructivesolutions.com.au

September 2013

Constructive Solutions

This Copyright is included for the protection of this document

CONTENTS

Page

CONTENTS

Page

CONTENTS

Page

APPENDICES

TABLES

CONTENTS

Page

FIGURES

PLATES

CONTENTS

Page

COMMONLY USED ACRONYMS

AADT	Average Annual Daily Traffic
AUR	Auxiliary right turn lane
AUL	Auxiliary left turn lane
AZL	Australian Zirconia Ltd
BAR	Basic right turn lane
CHR	Channelised right turn lane
DCC	Dubbo City Council
DoS	Degree of Saturation
DZP	Dubbo Zirconia Project
EIS	Environmental Impact Statement
LoS	Level of Service
LR	Local Road
MR	Main Road
RMS	Roads and Maritime Services
RWC	R.W. Corkery & Co. Pty Limited
SH	State Highway
SIDRA	Signalised and Unsignalised Intersection Design and Research Aid
TB	Transverse bar linemarking
TIA	Traffic Impact Assessment
TMP	Traffic Management Plan

EXECUTIVE SUMMARY

This traffic assessment has been prepared for R.W. Corkery & Co. Pty. Limited (RWC) who are preparing an Environmental Impact Statement (EIS) on behalf of Australian Zirconia Limited (AZL) who are developing the Dubbo Zirconia Project (DZP).

The Dubbo Zirconia Project involves construction of an open cut mine to extract zirconium and other minerals, an on-site product processing plant and waste treatment facilities at Toongi, approximately 25 kilometres south of Dubbo. Reagents required for mineral processing would need to be transported to the DZP Site, and processed product transported away, by either road or a road/rail combination.

The purpose of this report is to assess the existing road network, traffic related constraints, and traffic associated with the DZP on the surrounding road network for mine construction and operations, including the haulage of reagents and mine product.

The assessment has been prepared in accordance with the Transport NSW Roads and Maritime Services *Guide to Traffic Generating Developments* (2002), Austroads *Road Design Guide* and addresses the Director-General's Requirements issued by the Department of Planning and Infrastructure and requirements nominated by the Roads and Maritime Services of NSW and Dubbo City Council.

An appreciation of the existing traffic situation around the DZP Site was gained by examining the existing road network, collecting traffic volume data, forecasting growth and assessing relevant safety aspects of the road system. These aspects are discussed in this report.

The Applicant's preferred method of transporting materials including reagents to and processed products from the DZP involves both rail and road operations. The technically 'open', yet long disused Dubbo-Molong Rail Line would require considerable engineering works to serve the DZP and consideration of this and various other logistical, operational and economic factors indicates that it would be at least five years (approximately 2020) before this would be feasible. In recognition of this, three transport options are identified as feasible for implementation. The preferred Option A involves the delivery of bulk reagents to the DZP Site by rail (and requires the upgrade of the Toongi-Dubbo Rail Line), with those of lesser quantities being delivered by road. Option B involves transport of the bulk reagents by rail to a terminal in Dubbo before being transferred to truck for transport to the DZP Site. Option C involves no or delayed construction of the rail line, with all materials being transported to and from the DZP Site by truck.

The proposed route for access to the DZP from Dubbo incorporates the Newell Highway, Obley Road, and Toongi Road. These roads were inspected and their condition and suitability for use for the DZP reviewed. The current condition of the level crossings with public roads associated with the disused Dubbo to Toongi section of the Dubbo-Molong Rail Line were also reviewed.

Reagent haulage for the road/rail option would require the use of Yarrandale and Boothenba Roads from the Fletcher International Exports rail terminal to the Newell Highway. The relevant sections of the latter roads were also assessed for their suitability for heavy haulage.

To assist in the assessment a preliminary alignment and pavement investigation were undertaken to determine the suitability of Obley Road for the proposed increase in traffic related to the Proposal. The findings of these reviews have been incorporated into the assessment and subsequently the recommendations.

Four railway level crossings would be re-activated within the Dubbo urban area if the option is taken to reopen the railway line from Dubbo to Toongi. One train movement is expected each day. Each movement is likely to result in a 5 minute delay to traffic at the level crossings. Queue lengths could be minimised by avoiding train movements during morning and afternoon peak traffic flows.

To accommodate the increased traffic generated by the DZP, including over size/weight vehicles, several upgrades to the public roads of the route are recommended. The primary upgrades include:

- upgrading Obley Road to improve the alignment and pavement in accordance with Council standards generally in accordance with the conceptual design in **Appendix D(i)**;
- upgrading Toongi Road between Obley Road and the DZP site; and
- upgrading the existing stormwater drainage structures over Hyandra Creek, Five Mile Creek and Wambangalang Creek.

Careful consideration of the construction phase would be required to ensure that the impacts of the introduction of construction traffic potentially whilst roadworks are being undertaken is managed and adequately mitigated.

Traffic generated throughout the life of the Proposal would have an impact on the capacity, safety and structural integrity of various roads and intersections within the vicinity of the DZP Site, however, the proposed roadworks shall in part address these issues. If the disused Dubbo-Molong rail line is reinstated the need for road haulage would reduce significantly, however, delays to traffic at the reactivated rail crossings would result.

If the recommendations of this report are implemented, it is anticipated that the impacts to traffic and other road users would be successfully mitigated.

1. INTRODUCTION

1.1 PROJECT BACKGROUND

The Dubbo Zirconia Project (DZP) comprises the development, mining and processing of an intrusive trachyte containing rare metal (zirconium and niobium) and rare earth element (REE) resources located near Toongi, approximately 25km south of the city of Dubbo (see **Figure 1**).

The DZP would incorporate a conventional open cut mine, small waste rock emplacement (WRE), processing plant and associated rail loading/unloading infrastructure, a Solid Residue Storage Facility (SRSF), a Liquid Residue Storage Facility (LRSF) (for the evaporation of waste water and crystallisation of salts), and a series of salt encapsulation cells for the disposal of the crystallised salts at Toongi (see **Figure 2**)

The DZP would require the use of both road and rail infrastructure for the delivery of processing reagents and other raw materials and despatch of the rare metal and REE products. R.W. Corkery and Co. Pty Limited (RWC) have commissioned a Traffic Impact Assessment (TIA) on behalf of the Applicant, Australian Zirconia Ltd (AZL). The TIA accompanies an Environmental Impact Statement (EIS) for a development application to develop and operate the DZP.

The “Study Area” for the TIA includes the road and rail infrastructure to be used by DZP related traffic, as well as the road and rail infrastructure impacted indirectly by changes to local traffic conditions.

The processing plant, which would be the hub for most traffic movements to and from the DZP, would be located adjacent to the disused Dubbo-Molong Rail Line (which was last operated in 1988). This has the potential to be upgraded and re-opened between Dubbo and Toongi.

It is the preferred option of the Applicant to upgrade and reopen the Toongi to Dubbo section of the Dubbo-Molong Rail Line and under this option approximately two-thirds of the reagents required for the DZP, and all processed products from the DZP, would be transported by rail. The remaining one-third of reagents would be delivered to the DZP via the existing road network. In addition to the delivery by road of at least some reagents to the processing plant under all transport options, there would be a reasonable amount of road traffic generated by the DZP. This shall include the delivery of plant, infrastructure and equipment during the construction phase and service trucks and employee vehicles connected with the operational phase.

While technically still ‘open’, the long disused Dubbo-Molong Rail Line requires considerable engineering works before it can be reopened. In consideration of this, and various other logistical, operational and economic factors, it is considered likely to be at least five years (approximately 2020) before this would be feasible. In recognition of this, two alternative transport options have been identified and are assessed. Section 1.3.4 provides further detail on the preferred and contingency transport options.

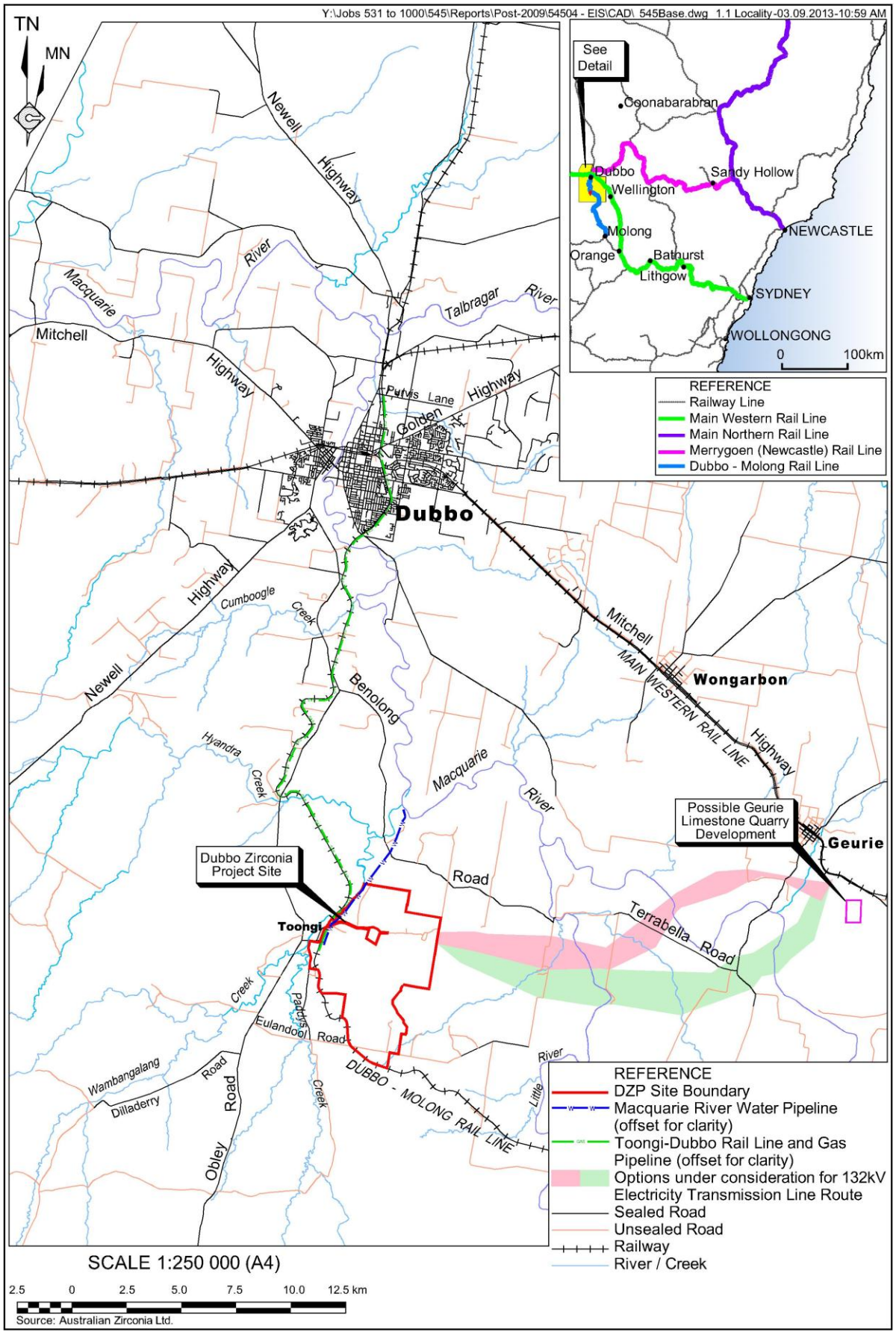

Figure 1 – Locality Plan

1.2 SCOPE OF REPORT

This report has been prepared to accompany an Environmental Impact Statement (EIS) for the DZP, prepared by RWC to satisfy the Director-General's Requirements (DGRs) prepared for the DZP by the Department of Planning and Infrastructure (DP&I) under Part 4, Division 4.1 of the *Environmental Planning & Assessment Act 1979* (EP&A Act). This report assesses the existing road network and the potential direct traffic-related impacts in accordance with the RMS's *Guide to Traffic Generating Developments*, the DP&I's *EIS Guidelines Roads and Related Facilities* and the specific requirements nominated by the RMS and Dubbo City Council (and accompanying the DGRs). It also assesses indirect impacts associated with the proposed rail movements and reopening of rail level crossings within the Dubbo City local government area (LGA).

Any potential constraints/deficiencies on the existing road network are identified and have been reviewed in accordance with the Austroads Design Standards and Guide Notes where applicable.

Broader regional impacts associated with transport (both road and rail) are discussed in general, however, are considered outside the scope of this report. Other aspects that are considered outside the scope of the report include:

- assessment of existing or proposed new rail level crossings of private accesses; and
- noise generated by traffic associated with the DZP.

1.3 OVERVIEW OF THE DZP

1.3.1 Component Activities of the DZP

The DZP would comprise a small scale open cut mine supplying approximately 1Mt of ore containing rare metals (zirconium and niobium) and rare earth elements (REE's) to a processing plant annually (19.5 million tonnes of ore over a period of up to 20 years). The land on which the open cut, processing plant and associated facilities for the management of waste generated by these activities is collectively referred to as the DZP Site.

The Proposal also incorporates the following component areas.

- Upgrade and reactivation of the Toongi to Dubbo Section of the Dubbo-Molong Rail Line. AZL also proposes to construct a pipeline to deliver natural gas from the Central West Pipeline operated by APA Group within the Toongi-Dubbo Rail Line and Natural Gas Pipeline Corridor.
- Construction of a water pipeline to deliver up to 4.05GL of water from the Macquarie River to the processing plant (referred to hereafter as the Macquarie River Water Pipeline).
- Upgrades, including minor realignment, creek crossing upgrades and pavement strengthening, of the public road network (Toongi Road and Obley Road).

1.3.2 Objectives of the DZP

The principal objectives of the DZP are to:

- maximise the recovery of the rare metals and REE's contained within the Toongi ore body through efficient of mining and processing operations;
- minimise the consumption of water, power and chemical reagents required by the processing operations;
- minimise the disturbance footprint associated with the proposed activities;
- ensure that all waste by-products are managed to minimise the risk of pollution (short-term impact) or contamination (long-term impact);
- establish, re-establish and/or upgrade local/regional infrastructure for the purposes of the Proposal but which could also have beneficial uses for other industry/activities;
- undertake all activities in an environmentally responsible manner to ensure compliance with relevant criteria/goals or reasonable community expectations; and
- work cooperatively with the surrounding community to build socio-economic capacity within communities affected by the Proposal.

1.3.3 Description of the Proposed Activities

As noted in Section 1.3.1, the DZP includes activities within four distinct areas, namely:

- the DZP Site;
- Toongi-Dubbo Rail Line and Natural Gas Pipeline Corridor;
- Macquarie River Water Pipeline; and
- public road network.

The following provides an overview of the activities to be undertaken within each of these areas.

DZP Site Operations

The principal activities to be undertaken on the DZP Site are as follows (see **Figure 2**).

- Extraction of approximately 19.5Mt of ore at a maximum rate of 1.1Mt per year from a shallow open cut developed to a maximum depth of 32m (355m AHD) (remaining above the groundwater table). At the proposed rate of mining, the open cut design proposed would provide for a mine life of 20 to 22 years.
- Extraction and placement of approximately 3.5Mt of waste rock (weathered material or rock containing insufficient grades of rare metals or REEs for processing) within a small waste rock emplacement (WRE) to the southwest of the open cut.
- Haulage of ore to a Run-of-Mine (ROM) Pad for crushing and grinding.

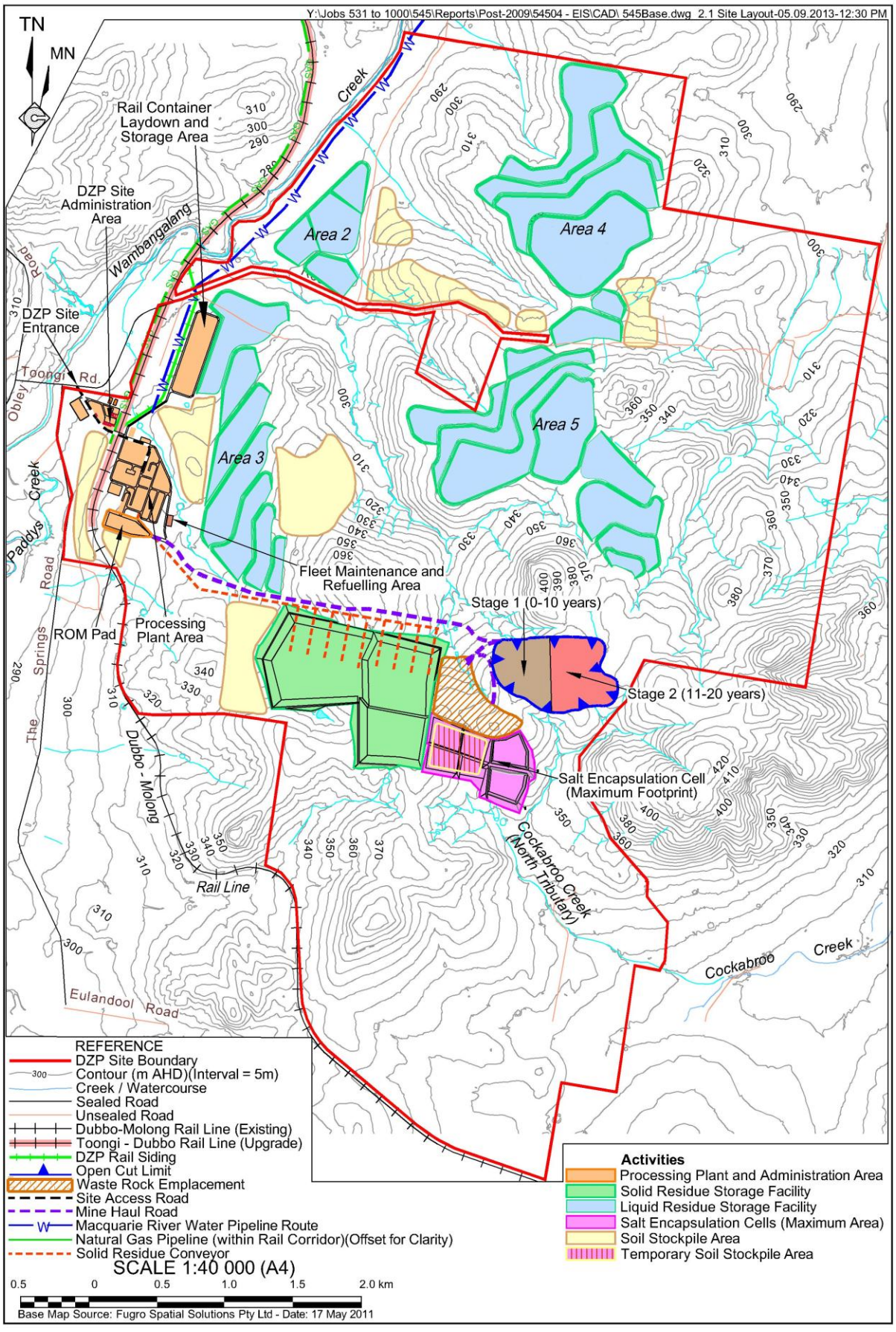

Figure 2 – Dubbo Zirconia Project Site Layout

- Processing of the crushed and ground ore by:
  - Sulphation roast of ore and leaching to dissolve sulphated metals.
  - Solvent extraction, precipitation, thickening, washing and drying of the various rare metal and REE products.

  The sulphuric acid required as part of the sulphation process would be manufactured within the DZP processing plant from imported raw sulphur.
- Construction and operation of a rail siding from the Toongi-Dubbo Rail Line and a Rail Container Laydown and Storage Area for the unloading and temporary storage of reagents and loading of products for despatch.

  Other reagents would be transported to the DZP Site via the public road network, with sections of Obley Road and Toongi Road to be upgraded to accommodate the proposed increase in heavy vehicle traffic.
- Mixing of solid residues produced by the processing of the ore with crushed and washed limestone and transportation via conveyor to a Solid Residue Storage Facility (SRSF).
- Pumping of water used in the processing operations, which cannot be recycled, to a Liquid Residue Storage Facility (LRSF), comprising a series of terraced and lined crystallisation cells.
- Recovery and disposal of an estimated 6.7Mt of salt which would accumulate within the LSRF within a series of Salt Encapsulation Cells adjoining the WRE and SRSF.
- Other ancillary activities including equipment maintenance, clearing and stripping of the areas to be disturbed and rehabilitation activities.

Macquarie River Water Pipeline

Processing operations would require up to 4.05GL of water annually which would be sourced (partially or completely) from the Macquarie River (under licence) and transferred to the DZP Site by water pipeline.

Figure 3 provides the proposed alignment of the Macquarie River Water Pipeline

Toongi-Dubbo Rail Line and Natural Gas Pipeline Corridor

The Applicant has identified the upgrade and use of the Toongi to Dubbo section of the currently disused Dubbo-Molong Rail Line as an opportunity to reduce the volume of traffic on the public road network.

Figure 4 provides the proposed alignment of the Toongi-Dubbo Rail Line, the key features of which are as follows.

- Upgrade of the Toongi to Dubbo section of the Dubbo-Molong Rail Line to a Class 1 track (92t gross/67t pay load capacity).
- Replacement or upgrade of steel bridges, culvert structures, and timber bridges.
- Reinstatement, civil works and installation back to the required standard at each of the 26 level crossings. Of these, seven are major crossings (of local roads), four of which occur in Dubbo (Wingewarra Street, Cobra Street, Boundary Road and Macquarie Street) and three (Cumboogle, Glengerra and Toongi) between the Macquarie River and the proposed DZP Rail Siding.

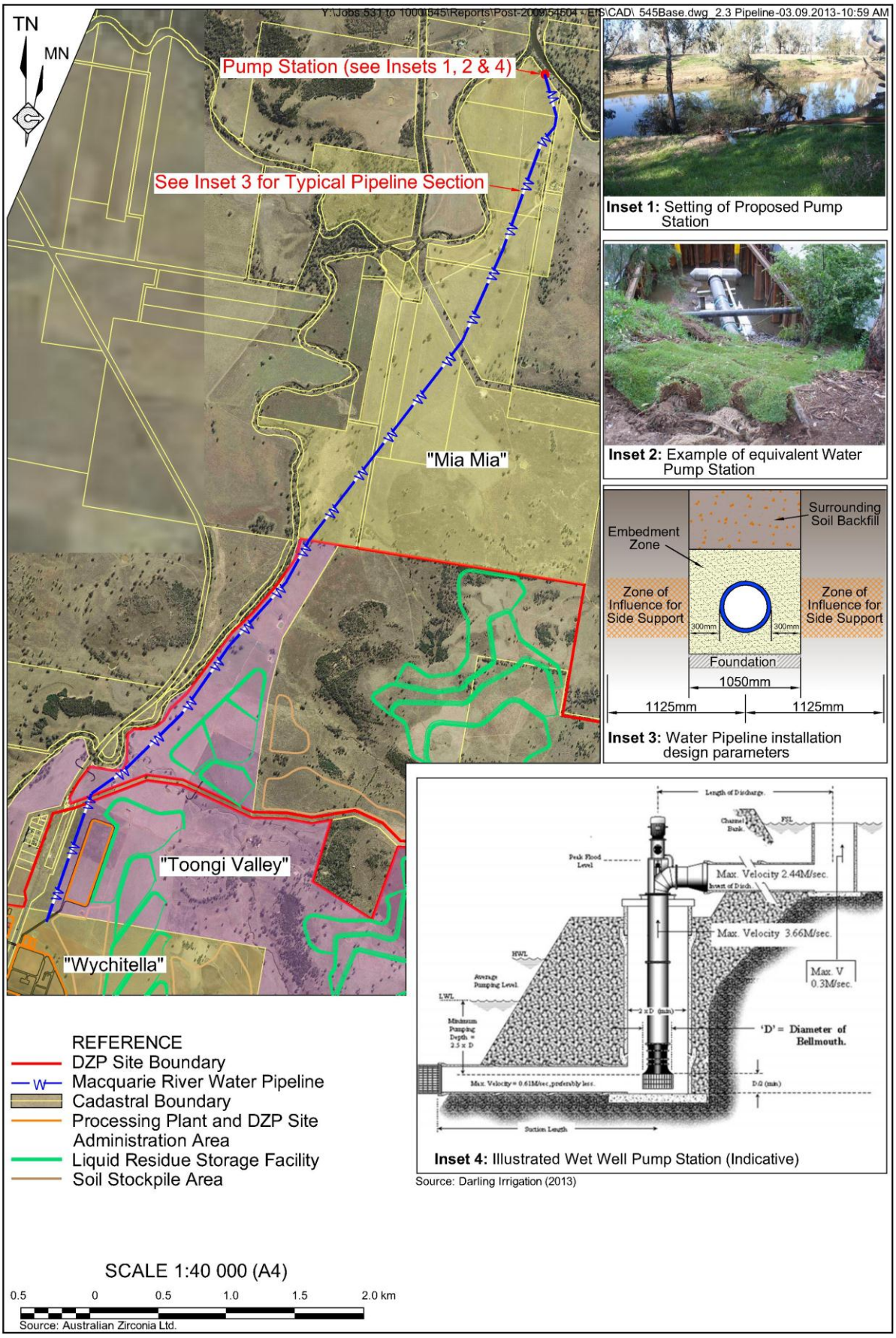

Figure 3 – Macquarie River Water Pipeline

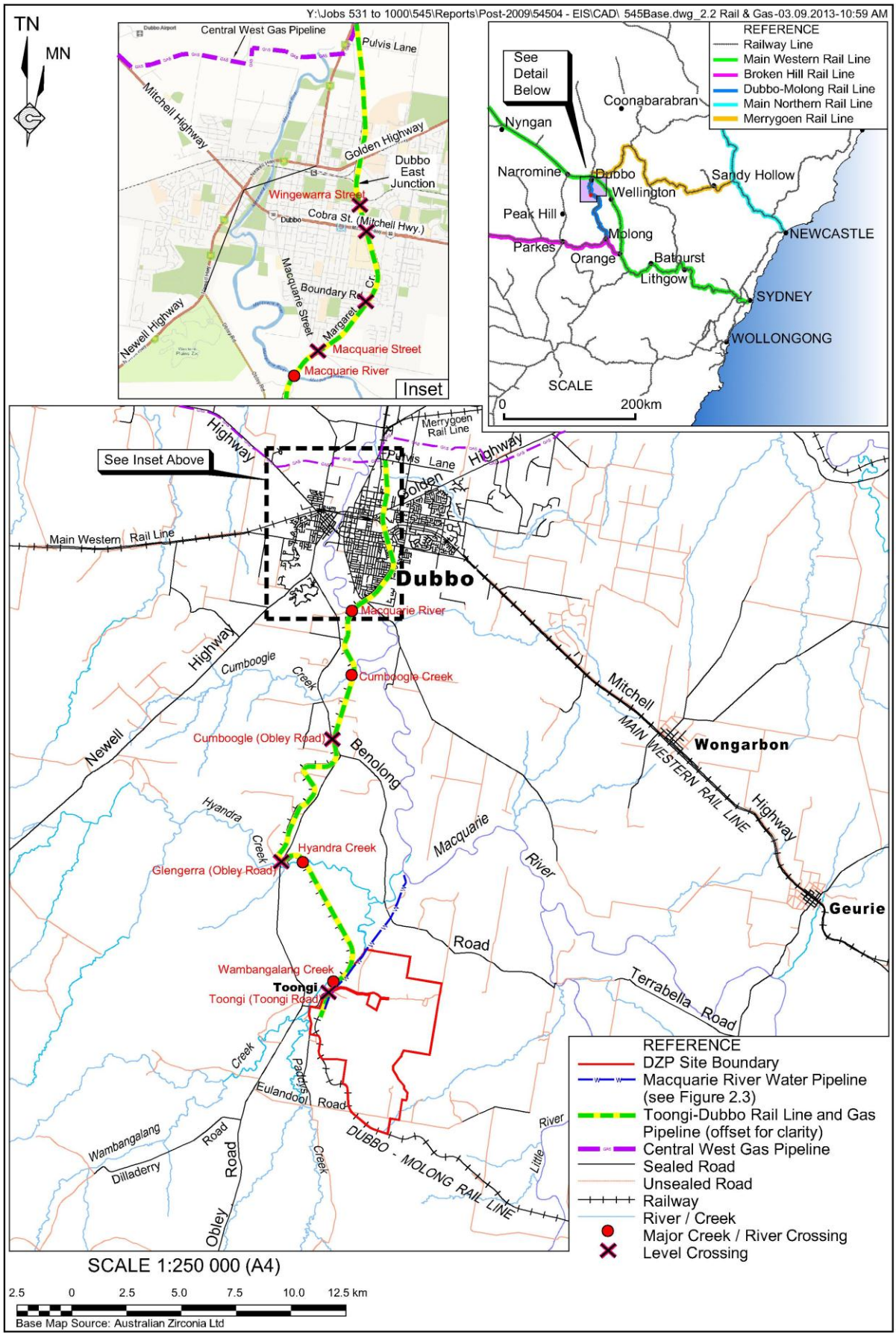

Figure 4 – Toongi-Dubbo Rail Line, Gas Pipeline and Macquarie River Water Pipeline

Figure 4 also identifies the proposed natural gas pipeline between the Central West Pipeline (of APA Group) at Purvis Lane, Dubbo, and the DZP Site which would deliver up to 970TJ/year of natural gas for the heating of various circuits within the processing plant.

Public Road Network

Significant quantities of the processing reagents and other raw materials would be delivered by road, via the Newell Highway, Obley Road and Toongi Road. To accommodate the proposed heavy vehicle traffic associated with this transport, the alignment and pavement depth of the two roads would be improved in several locations, with a number of creek crossings, rail level crossings and intersections to be upgraded (see **Figure 5**).

A more detailed description of the Proposal is provided by Section 2 of the EIS, of which this assessment forms Part 11 of the accompanying *Specialist Consultant Studies Compendium*.

1.3.4 Description of the Proposed Transport Operations

Processing operations would require several different reagents to be transported to the DZP. These include sulphur, limestone, quick lime, caustic soda, soda ash, salt, anhydrous ammonia, aluminium powder and several other reagents used in minor quantities. These would need to be transported to the DZP from several locations including Newcastle, Sydney, Charbon (NSW), and Cheetham (Victoria).

The Applicant's preferred method of transporting reagents is combined road and rail operations. As noted in Section 1.1, the Applicant has identified two contingency transport options that may be implemented. Under all options certain reagents will need to be transported all the way from where they are sourced to the DZP using the public road network.

Preferred Transport Option (A) – Rail to Toongi / Supplementary Road

For this option the bulk reagents of sulphur, caustic soda and hydrochloric acid would be transported by rail directly to the DZP Site along the reinstated Toongi-Dubbo Rail line. Three trains per week would be operated between Newcastle (from where the bulk reagents would be sourced) and the DZP Site. The timing of these movements would be beyond the control of the Applicant, as they would have to be integrated with overall operations of the broader rail network, however it is anticipated that there would be only one movement of the rail line per day (either to or from the DZP Site).

During a typical week, it is probable there would be one in-bound train movement to the DZP Site one day, with its out-bound movement the following day (and one day per week with no train movements).

Some smaller quantity reagents would be transported by rail from Sydney via the Main Western Rail Line before being unloaded and transferred to trucks for delivery to the DZP Site. These rail movements would be combined with current freight rail movements between Sydney and Dubbo. All other reagents, and other materials such as diesel fuel, would be transported to the DZP Site by road. Overall, however, this option would minimise the volume of heavy vehicle traffic on local roads generated by the DZP.

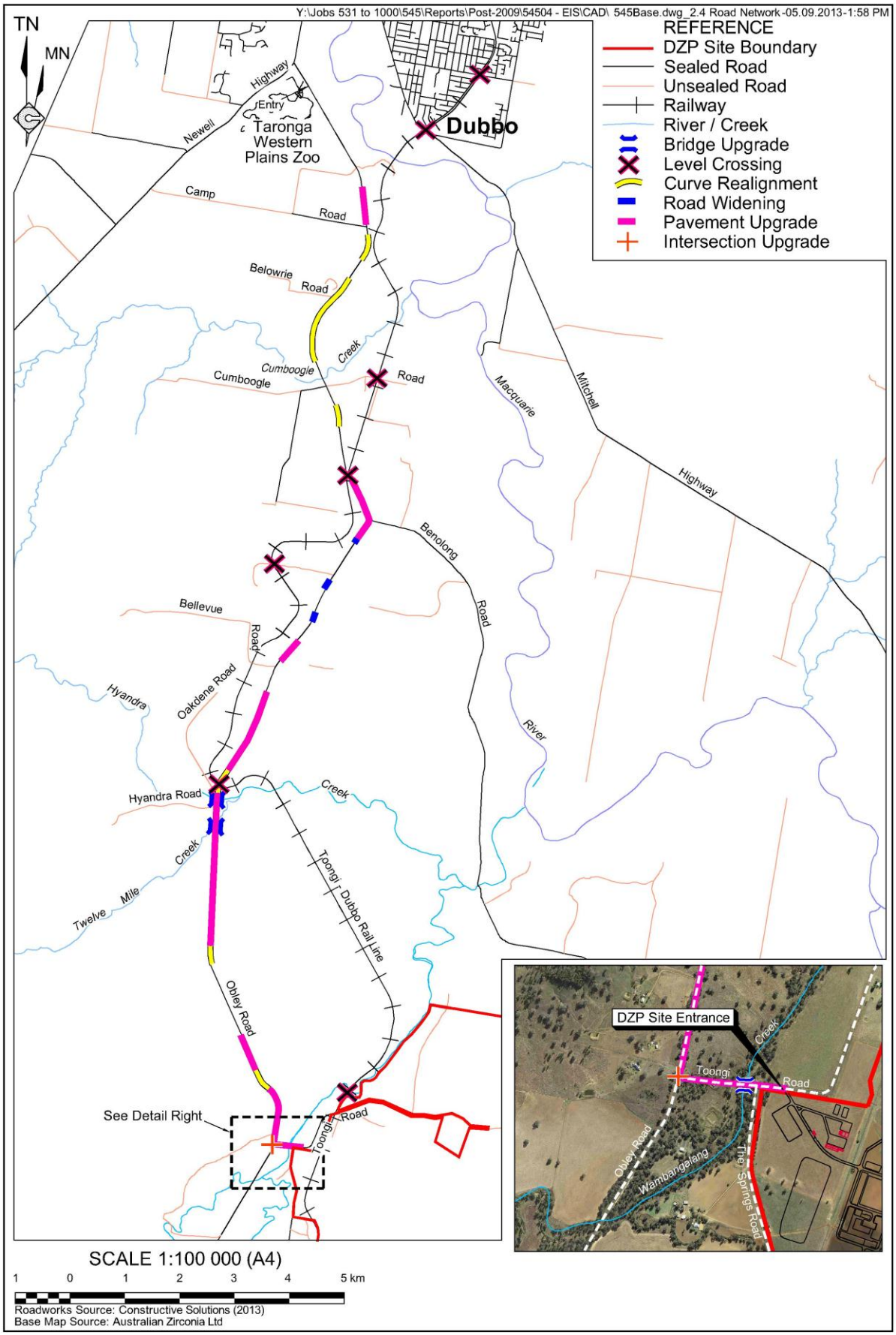

Figure 5 – Proposed Upgrades to Obley Road and Toongi Road

Transport Option (B) – Rail to Dubbo / Road to Toongi

Should Preferred Option A be delayed as suggested above, the Applicant proposes that the bulk reagents of sulphur, caustic soda and hydrochloric acid would be transported from Newcastle to a rail terminal operated by Fletcher International Exports Pty Ltd on the Merrygoen Rail Line north of Dubbo. The reagents would be unloaded at this rail terminal and transferred to trucks for delivery to Toongi by road utilising an approved heavy haulage route between the rail terminal and the Newell Highway and turning:

- right onto Yarrandale Road; then
- left on Boothenba Road before crossing the Merrygoen Rail Line at a signalled level crossing; then
- left onto the Newell Highway.

The trucks would then make a left hand turn onto Obley Road, followed by a left hand turn onto Toongi Road for delivery to the DZP Site.

Figure 6 identifies the location of the Fletcher International Exports Rail Terminal and the route that would be taken by trucks between the rail terminal and the DZP Site. It is noted that B-doubles would not be able to be utilised for transport between the Fletcher International Exports Rail Terminal and DZP Site. As a result, the total number of truck movements for these reagents would be greater than that which would be required if these reagents were transported to the DZP Site solely by road (Option C).

Transport Option (C) – Road Only

In the event that the use of the rail terminal of Fletcher International Exports Pty Ltd becomes unavailable or impractical for unforeseen reasons, the Applicant would transport the majority of processing reagents and other materials (excluding those transported to Dubbo from Sydney by general freight rail) to the DZP Site by road. This contingency option would also be implemented in the event that access to the rail network is delayed for significant periods.

Reagents required in bulk quantities such as sulphur, limestone and hydrochloric acid would be transported to the DZP Site primarily by B-double trucks. Reagents required in lower quantities or requiring specialised vehicles (such as quick lime) would be transported by various heavy vehicles appropriate for their particular safe transportation requirements. This option involves more B-double movements than either of the others, yet has a lower overall volume of heavy vehicles than Option (B).

Table 1 summarises the likely average daily heavy vehicle movements under each of the three options described above. These totals include movements of processed product by B-double trucks on public roads from the DZP Site. It is estimated there will be 4,230 of these movements (one-way outbound from the DZP Site) each year.

Table 1 shows the ‘worst case scenario’ of 158 daily heavy vehicle movements associated with Contingency Option (B). Subsequent traffic forecasts in this report are based on this worst case scenario of 158 reagent heavy vehicle movements per day when the DZP is in full operation.

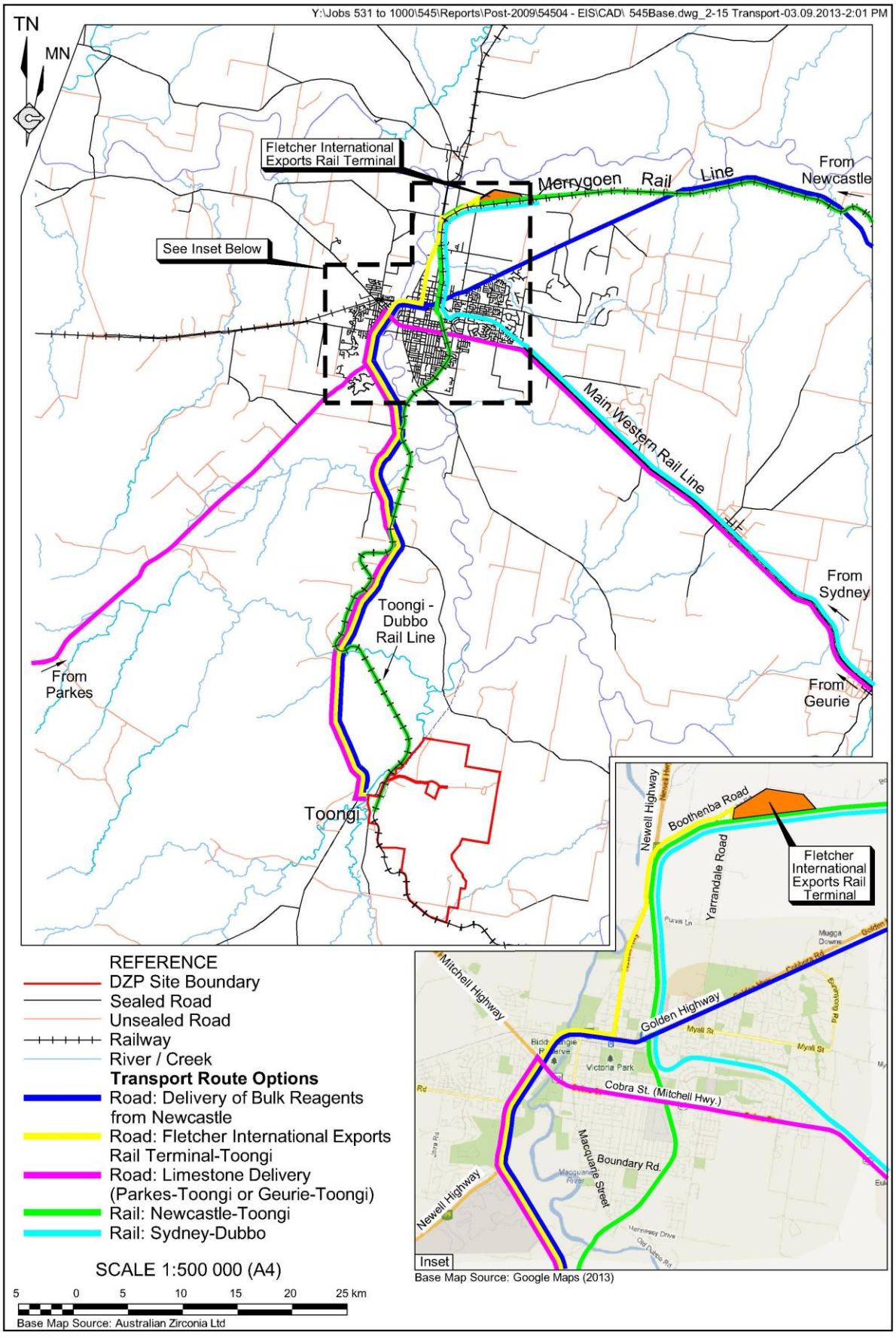

Figure 6 – Transport Routes

Table 1 - Daily Truck Movements

Option	Truck Type	Loaded	Empty / Return	Total
Preferred Option (A) – Rail to Toongi / Supplementary Road	B Double	30	30	60
	Single	14	14	28
	Total	**44**	**44**	**88**
Contingency Option (B) – Rail to Dubbo / Road to Toongi	B Double	30	30	60
	Single	49	49	98
	Total	**79**	**79**	**158**
Contingency Option (C) – Road Only	B Double	42	42	84
	Single	27	27	54
	Total	**69**	**69**	**138**

1.4 CONSULTATION

Consultation with Dubbo City Council (Council) and Roads and Maritime Services (RMS) occurred after the issue of DGRs to discuss the Proposal and relevant concerns raised by the respective authorities.

Dubbo City Council

Meetings were held with Council on the following dates:

- 7th August 2012; and
- 19th March 2013.

A summary of the questions posed/information sought and associated responses from the second meeting are included in **Table 2**.

Table 2 - Summary of DCC Meeting 19th March 2013

Page 1 of 2

Question / Items	Response / Comments
Reagent transport options and proposed assessment methodology involving worst case scenario approach explained.	General consensus obtained for assessment methodology.
Indicated that State Road impacts will not necessarily be assessed with the exception of the intersections with local roads where traffic will turn.	Agreed.
Propose to analyse key intersections utilising SIDRA however 24 hour counts not available. Does DCC have any counts that may assist?	DCC advised that there were no suitable counts available however requested manual counts be undertaken.
Guidance for the assessment of the rail crossings was sought noting that the time of day for rail movements was not known.	DCC indicated that provided delays were kept to a minimum and rail signalling was appropriate delays should not have a significant impact.

Table 2 (cont'd) - Summary of DCC Meeting 19th March 2013

Question / Items	Response / Comments
Obley Road conceptual alignment and pavement design was tabled noting that it was only based on imagery therefore may change.	General consensus was obtained for the proposed alignment and pavement upgrades however would be subject to further investigations, survey and design prior to approval. Details such as the approaches to the rail crossings and school bus stops were discussed and will require further detail.
Proposed bridge arrangements were discussed and design ARI's / flood immunity. Advice was sought as to the suitability of the proposed deck levels and ARI's proposed.	DCC took the bridge design requirements on notice and would advise on bridge design parameters.
DCC were asked what the process for the approval of B-double routes and whether it would be approved if DZP continue with the reconstruction of Obley Road to a suitable standard.	DCC advised that the proposal would need to be approved by the traffic committee and the Council however couldn't see that the approval would be an issue provided the road was designed and constructed to a suitable standard.

Roads and Maritime Services (RMS)

A letter dated 24 April 2012 from Mr Tony Hendry, who is the Road Safety and Traffic Manager for Western Region, RMS, outlined the following requirements for the traffic assessment. **Table 3** identifies the requirements contained within Mr Hendry's letter, a brief response and identification as to the section of this TIA where it has been addressed.

Table 3 - Summary of RMS Response

Requirements	Response	Report Section
Identify origin and destinations of vehicles by: • Type; • Volume; and • peak periods; along with existing and forecast background traffic	All currently available data has been utilised to fulfil this require to greatest extent possible	1.3.4 Description of the Proposed Transport Operations
Address key intersections with the Newell Highway including Obley Road and Boothenba Road	Assessed impact of proposal does not warrant upgrades to these intersections	2.5 Current and Forecast Traffic Volumes 2.6 Traffic Generated by the Project
Intersection treatments to cater for predicted traffic impacts	Several intersection upgrades proposed for Obley Road	4.2 Road Upgrades 4.4 Mitigation Summary
Other treatments to cater for predicted traffic impacts	Major pavement upgrade of Obley Road and Toongi Road; upgrade of waterway crossings on Obley and Toongi Roads	4.2 Road Upgrades 4.4 Mitigation Summary
Consider cumulative impacts	Cumulative impacts are not considered in this report as there are no other major projects proposed for the affected public road network	N/A

Table 3 (Cont'd) - Summary of RMS Response

Requirements	Response	Report Section
Detail reinstated rail level crossings	One proposed transport operation option involves reinstatement of seven public road rail level crossings	2.4 Rail Level Crossing Descriptions 3.7 Rail Level Crossings (Assessment of Operational Traffic and Rail Impacts)
Detail associated crossings of classified roads by water, gas or electricity	No water, gas or electricity infrastructure for the proposal crosses any classified roads	N/A
N/A = Not Applicable		

Issues identified by RMS have been addressed where possible with the information currently available, however, some of the aspects raised by RMS will be subject to separate approvals therefore will need to be addressed outside of the development consent process of the EP&A Act.

2. EXISTING ROAD NETWORK

2.1 INTRODUCTION

The existing road network to be incorporated into the road transport route for the DZP shown in **Figure 6** and is described in the following sections. The proposed major route for all inbound heavy vehicles to the DZP Site begins on the Newell Highway followed by Obley Road and finally Toongi Road before entering the DZP Site from a new intersection with Toongi Road. These heavy vehicle movements will originate from several locations (see Section 1.3.4), with the majority utilising the State Highway network to reach Dubbo, before travelling south along the Newell Highway to the Obley Road intersection. Others will originate south of Dubbo and travel north along the Newell Highway to reach Obley Road.

It is anticipated the majority of delivery and employee vehicles will originate from Dubbo and use the route described above. However, there may be a limited number of light vehicle movements from the south using Obley Road.

As outlined in Section 1.3.4, Transport Option B involves the transportation of reagents from the rail terminal at Fletcher International Exports along an approved heavy haulage incorporating Yarrandale and Boothenba Roads to access the Obley Road intersection via the Newell Highway.

2.2 ROAD CONDITION REPORT

2.2.1 Introduction

The road network information provided in this section was collected in February 2012 and March 2013 through inspections by Mr Doug Seymour and Mr Ben Rossiter. The information was compiled to provide a summary of existing roads standards and their respective condition. A copy of this report is provided as **Appendix A**. Traffic count data was obtained from Roads and Maritime Services for the State Highways and Dubbo City Council and Narromine Shire Council for all relevant local roads. The most recent counts available were utilised. They were undertaken between July 2007 and May 2012.

Provided in the following sections is a description of the roads proposed for use by Proposal generated traffic. These roads include Obley Road and Toongi Road between the Newell Highway and the DZP Site, and Boothenba Road and Yarrandale Road, between the Fletcher International Exports rail terminal and the Newell Highway. A description of the relevant intersections with these roads is provided in Section 2.3.

2.2.2 Obley Road

Obley Road is a local road which primarily services the existing properties along its length. It is also used as alternative route to Dubbo from the south for vehicles choosing to avoid using the Mitchell Highway. The road begins at the Newell Highway south of Dubbo and continues south until terminating at the Mitchell Highway at the town of Molong. Traffic volumes increase significantly travelling north towards Dubbo. They range from 388 AADT immediately north of Toongi Road to 2,330 AADT between the Newell Highway and Taronga Western Plains Zoo entrance. **Plate 1** shows the typical alignment and condition of Obley Road.

Plate 1 - Obley Road Typical Alignment and Condition

The first 9.5km of Obley Road between the Newell Highway and Toongi Road is relatively flat with good horizontal and vertical alignment and formation width. The seal width is approximately 9m and is in good condition but general pavement deformation is evident. From chainage 9.5 to 19.9 no centre lines are marked and the seal narrows to 7m to 7.5m with pavement in average condition. The alignment is sub-standard for the sign posted speed of 100km/hr. From chainage 19.9 to Toongi Road (chainage 21.8) line-marking returns and the seal widens. For more detailed information see **Appendix A**.

The disused Dubbo-Molong Rail Line crosses Obley Road twice and these level crossings are detailed in Sections 2.4.6 and 2.4.7.

Obley Road forms part of a school bus route with bus pull off areas and shelters observed at several intersections. Two services are known to currently operate south from the Newell Highway to Toongi Road during both mornings and afternoons. One continues south along Obley Road until turning at Strathgled Road, approximately 7km south of Toongi Road. The other service exits Obley Road at Toongi Road on the outbound journey.

There are known school bus stops adjacent to the intersections with Camp Road and Oakdene Road and two at properties between them. At least another two stops are located between Oakdene and Strathgled Roads (one or more of which may be south of Toongi Road). As is common on rural school bus routes, stop locations are likely to change over time as younger children begin school and older children finish.

The first 3.3km of Obley Road forms a sign posted 'Western Plains Tourist Circuit', with Camp Road and the Newell Highway (see **Plate 2**). Tourist attractions accessible from Obley Road include Taronga Western Plains Zoo and the Dundullimal Homestead.

Plate 2 - Western Plains Tourist Circuit

No pedestrians or cyclists were observed adjacent to the road during the initial inspection. It was anticipated that on-road cyclist volumes on the northern section of Obley Road, adjacent to Taronga Western Plains Zoo, would be low because an off-road shared pedestrian path is located nearby. The Tracker Riley Cycleway is located within the road reserve on the northern side of Obley Road, in the vicinity of the Zoo. The presence of this shared path means pedestrians are far more likely to walk along it than the Obley Road carriageway. Less experienced or confident cyclists are also more likely to ride along here than the adjacent road.

Consultation with local cycling groups has revealed Obley Road is a popular cycling route. Although there is never racing on Obley Road, sports cyclists regularly use it for training to south of the Toongi Road intersection. The Dubbo Cycling Club has organised rides with groups (‘bunches’) of 5 to 20 riders at least 1 to 2 weekends per month between October and March. These occur on both Saturdays and Sundays. Obley Road is also used all days of the week for personal training of individuals, pairs and groups of up to five persons on weekends.

Every second Sunday during warmer months the Orana Veterans Cycling Club and Dubbo Bicycle Users Group jointly hold a group ride along Obley Road that typically has 25 to 30 participants. This ride sometimes continues to Toongi Road, then to The Springs Road before returning. At other times the ride turns off Obley Road at Benolong Road.

Each year there are also two major group rides called ‘Zoo to Zoo’ that both proceed north along Obley Road from Yeoval to the entrance to Taronga Western Plains Zoo. One, from Sydney Taronga Zoo, is limited to 200 riders (for which there is excess demand) and occurs every October. The other, from Canberra Zoo, has 80-100 riders and takes place during March. It is presumed both rides are planned and operated in accordance with RMS *Guide to Traffic and Transport Management for Special Events* to maximise the safety of participants and other road users, whilst minimising disruption to the public road network.

The Western Plains Tourist Circuit includes the length of Obley Road from the Newell Highway south to Camp Road. The circuit then proceeds west along Camp Road to the Newell Highway.

It is unknown what proportion of tourists follow the Circuit in a clockwise direction, and therefore turn right off Obley Road into Camp Road.

Dubbo Motorsport Complex is also located on Obley Road, approximately 5 kilometres south of the Newell Highway.

A concrete bridge crosses Cumboogle Creek at chainage 6.5 (see **Plate 3**). The bridge is 7m in width, with steel bridge rails and concrete wearing surface. The guardrail terminals on both approaches are substandard.

Plate 3 - Bridge over Cumboogle Creek

The other major waterway crossings are a causeway with box culverts across Hyandra Creek at chainage 15.1 and a floodway at Twelve Mile Creek with one 450mm diameter reinforced concrete pipe (chainage 15.5). The road width reduces to 7m at both locations.

Obley Road is currently designated as a State B-Double route from the Newell Highway to Benolong Road at chainage 9.3 according to the RMS Restricted Access Vehicle (RAV) maps. It is noted, however, that Obley Road is a local road and therefore Dubbo City Council (DCC) is responsible for maintaining the road and authorising multi-combination vehicle access.

At the request of the Applicant, a pavement investigation was undertaken to provide an overview of the existing pavement condition of Obley Road between the Newell Highway and Toongi Road. This formed the basis for the development of two concept pavement upgrade design options for different Project transport scenarios. The results of the pavement investigation and design options are summarised in Section 3.3 and detailed in **Appendix F**.

Forecast reagent haulage volumes have reduced since the completion of the pavement design and are therefore considered conservative.

The age, quality and depth of the existing pavement were found to vary significantly. **Table 4** below summarises the range of findings related to the existing pavement.

Table 4 - Existing Pavement – Obley Road

Characteristic	Maximum	Minimum	Unit
Pavement Thickness	440	110	mm
Subgrade CBR	43.6	3.7	%

Falling weight deflectometer (FWD) results were also taken to assist in determining the suitability of the existing pavement. The results of the FWD testing are included within **Appendix F**. Deflections up to 2.3mm were evident. The deflection in the pavement, combined with the CBR results, were utilised to determine suitable pavement designs.

2.2.3 Toongi Road

Toongi Road is a no through road which services several rural properties along its length and also provides access to The Springs Road. **Plate 4** shows the typical alignment and condition. The road begins at Obley Road with a 4.5m seal width before narrowing to 3m to 3.5m after The Springs Road intersection. Toongi Road ends at several property entrances after crossing the Dubbo-Molong Rail Line at the locality of Toongi. The alignment is good with the exception of two right angle curves which have no warning or speed advisory signage. Little delineation is present on Toongi Road. The average daily traffic is 91, based on the 2012 traffic count.

Plate 4 - Toongi Road Typical Alignment and Condition (taken looking west from The Springs Road Intersection)

No pedestrians or cyclists were observed on Toongi Road. It is anticipated that pedestrian activity is very low with the exception of the Toongi Rural Waste Transfer Station, located between Obley Road and Wambangalang Creek, where pedestrians may be present during the disposal of rubbish.

There are occasional group bicycle rides along Toongi Road from Obley Road to The Springs Road and return, involving up to 30 cyclists. These occur between October and March each year. The majority of these rides are on Sundays and occasionally on Saturdays. Sports cyclists also train along Toongi Road, individually or in small groups.

The Dubbo-Molong Rail Line crosses Toongi Road at chainage 1.6 and this crossing is detailed in Section 2.3.9 below. Dubbo City Council is the authority responsible for the road.

Toongi Road crosses Wambangalang Creek on a causeway with six 1,050mm reinforced concrete low flow pipes. The seal narrows at the crossing and approaches restricting passing opportunities for oncoming traffic. Both approaches to the causeway have excessive grades (see **Plate 5** - Causeway on Toongi Road).

Plate 5 - Causeway on Toongi Road

2.2.4 Boothenba Road

Boothenba Road is a two-way, two-lane undivided sealed local road on the northern periphery of the Dubbo urban area that links the Newell Highway to Yarrandale Road (see **Plate 6**). It has line-marking for only a short distance east of the Newell Highway. The alignment is generally straight and flat. The road has wide unsealed shoulders suitable for heavy vehicles to pull off.

This section of Boothenba Road is characterised by low-density industrial development with several transport warehouses and bulky goods stores. Existing high volumes of heavy vehicles traffic is therefore expected. There is sparse residential development. There is an active railway level crossing approximately 50m west of the Newell Highway.

One school bus service is known to operate in the morning westbound along Boothenba Road to Yarrandale Road (and therefore not on the subject length of road). In the afternoon it only uses Boothenba Road to return empty to the depot. Therefore there are no known school bus stops along the subject length of Boothenba Road between the Newell Highway and Yarrandale Road.

Boothenba Road is used by both sporting and leisure cyclists. It forms part of the 'town loop' that also includes Yarrandale Road, which is regularly used for training by sports cyclists. The Orana Veterans regularly travel along Boothenba Road as a part of a 'Coffee Club' group ride with around 10 riders.

Plate 6 - Boothenba Road at the intersection with Yarrandale Road

2.2.5 Yarrandale Road

Yarrandale Road is a two-way, two-lane undivided sealed road local road on the northern periphery of the Dubbo urban area. It terminates at Boothenba Road at the north and links it to the access to Fletcher International Exports.

It is consistently line-marked along the subject length and has 1m width sealed shoulders south of the railway crossing which is located approximately 150m south of Boothenba Road. Roadside development on the northern section of Yarrandale Road includes transport depots such as Fletcher International Exports, and is generally non-residential. This suggests large volumes of heavy vehicles already use the road.

One school bus service is known to operate in the morning southbound along Yarrandale Road from Boothenba Road to Purvis Lane. It does not stop before the Dubbo College, Senior Campus, approximately 1km south of Fletcher International Exports. In the afternoon the bus does not operate along Yarrandale Road north of Purvis Lane. Therefore there are no known school bus stops along Yarrandale Road.

Sports cyclists regularly use Yarrandale Road for training, as part of the Dubbo 'town loop'. However, it is understood that recreational cyclists avoid Yarrandale Road due to its high volume of heavy vehicles.

2.3 INTERSECTIONS

2.3.1 Newell Highway and Obley Road

Obley Road approaches the Newell Highway at an acute angle, however, the intersection is dimensionally adequate for 26m B-Doubles. The Newell Highway includes a channelised right turn (CHR) and an auxiliary left turn treatment (AUL) for movements into Obley Road. Give way controls include a give way sign and a hold line on Obley Road. The give way sign is located on a finger island in the centre of Obley Road. A sight screen has been located opposite the T-

junction and there is no street lighting. Both the Newell Highway and Obley Road are signposted at 80km/hr at the intersection. The road pavement is generally considered to be in good condition. Sight distance is estimated to exceed 500m to the north and be approximately 310m to the southwest. These are greater than the minimum desirable sight distance of 126m at 80km/hr (see **Plates 7** to **9**).

Plate 7 - Looking South on the Newell Highway at Obley Road

Plate 8 - Looking North on the Newell Highway at Obley Road

Plate 9 - Obley Road Approaching the Newell Highway

2.3.2 Obley Road and the entrance to Taronga Western Plains Zoo

The access road to Taronga Western Plains Zoo forms a T-junction with Obley Road. Obley Road has been widened at this intersection to include a Channelised Right Turn (CHR) (see **Plates 10** and **11**). Give way controls consist of a give way sign and a holding line on the Zoo access road. Obley Road is signposted at 80km/hr at this location. The pavement is in good condition and the sight distance exceeds 500m in both directions which exceeds the minimum desirable sight distance of 126m at 80km/hr. There is no street lighting at the intersection.

Plate 10 - Looking North on Obley Road at the Zoo Intersection

Plate 11 - Looking South on Obley Road at the Zoo Intersection

A central raised median refuge island is provided south of the intersection where the shared pedestrian/bicycle path crosses Obley Road (see **Plate 12**). Its dimensions provide for several pedestrians and/or cyclists to wait wholly outside of the road vehicle travelling lanes. Signage instructs cyclists to both stop and dismount before crossing Obley Road (see **Plate 13**). Sight distance of the road for pedestrians and cyclists on the path on both sides of the carriageway is good. Sight distance of the refuge island for Obley Road users is also good.

Plate 12 - Looking South to Pedestrian Refuge Island on Obley Road

Plate 13 - Looking West at Pedestrian Refuge Island on Obley Road

2.3.3 Obley Road and Dundullimal Homestead

Dundullimal Homestead is a less significant tourist attraction than the nearby Zoo, with visitor numbers estimated to average 223 per week. The driveway to the homestead is unsealed, however, the mouth of the intersection is sealed. There are no give way controls and no sight screen opposite the T-Junction. Obley Road is signposted at 100km/hr at this location. The pavement is in good condition. Sight distance is good in both directions (see **Plate 14**). There is no street lighting at the intersection.

Plate 14 - Looking north on Obley Road at the Dundullimal Homestead intersection (Google 2012)

Taronga Western Plains Zoo has established a second access road, intersecting with Obley Road directly opposite the Dundullimal Homestead Road. This will be known as the Zoofari Lodge Access Road. As shown in **Figure 7**, the intersection comprises a BAR and AUL and includes modifications to the Obley Road alignment to improve the available sight distance.

There have been no associated improvements to the Dundullimal Homestead intersection.

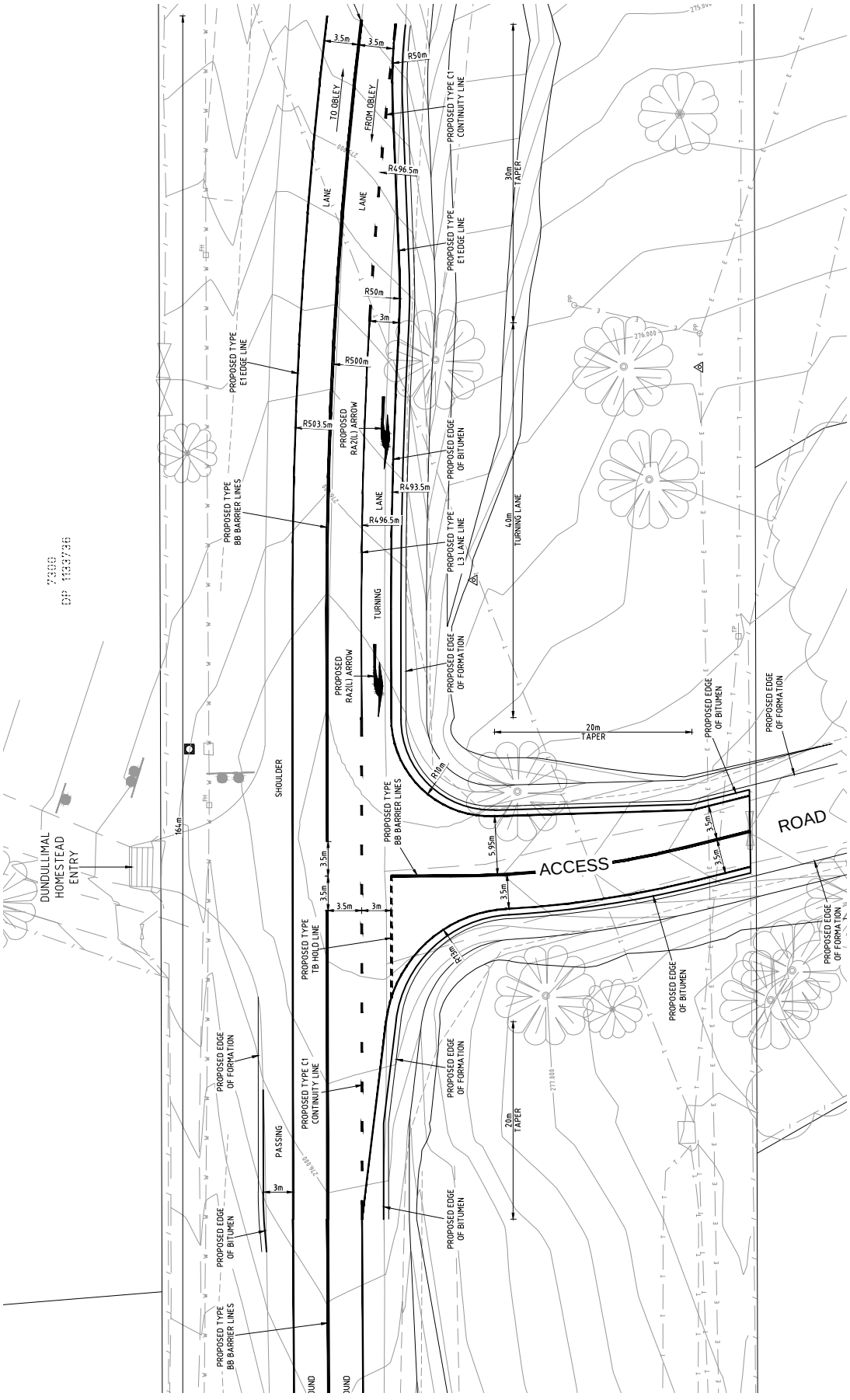

Figure 7 – Proposed New Intersection – Zoofari Lodge Access Road (Geolyse August 2012)

2.3.4 Obley Road and Camp Road

Camp Road is a through road which links Obley Road and the Newell Hwy and also forms part of the 'Western Plains Tourist Circuit'. A T-junction joins Camp Road with Obley Road and is basic in configuration. Give way controls consist of a hold line but no give way sign. A sightscreen is located opposite the intersection. Obley Road is signposted at 100km/hr at this location. The pavement is in good condition. Sight distance is good in both directions. To the north it is 500m and to the south 290m, with both distances greatly exceeding the minimum desirable sight distance of 179m at 100km/hr (see **Plate 15**).

Plate 15 - Looking North on Obley Road at the Camp Road Intersection (Google 2012)

2.3.5 Obley Road and Belowrie Road

Belowrie Road forms a T-junction with Obley Road and is basic in configuration. The road provides access to the Morris Park Raceway. There are no give way controls. A small sightscreen is located opposite the intersection. Obley Road is signposted at 100km/hr at this location. The pavement is in average condition. Sight distance is good to the north at 500m but average to the south on Obley Road due to the horizontal and vertical alignment. At approximately 140m it is less than the minimum desirable sight distance of 179m at 100km/hr (see **Plate 16**).

Plate 16 - Looking South on Obley Road at the Belowrie Road Intersection (Google 2012)

2.3.6 Obley Road, Cumboogle Road and Belmont Road

Cumboogle and Belmont Roads form a cross intersection with Obley Road. Both Cumboogle and Belmont Road are no through roads that provide access to various rural properties along their length. Give way controls consist of give way signs on both minor roads but no holding lines are present. Obley Road is signposted at 100km/hr at this location.

Pavement on Obley Road is in good condition, however, the seal at the mouth of Cumboogle Road is average (see **Plate 17**). Sight distance is good in both directions at 500m to north and south exceeding the minimum desirable sight distance of 179m at 100km/hr. A school bus stop and shelter is located immediately south of the intersection on the western side of Obley Road. Its location, with a bus parked adjacent to it, is considered unlikely to reduce this sight distance to the south to less than a safe standard (see **Plate 18**).

Plate 17 - The Obley Road and Cumboogle Road Intersection

Plate 18 - The Obley Road and Belmont Road Intersection

2.3.7 Obley Road and Benolong Road

Benolong Road forms a T-junction with Obley Road on the outside of a curve. Benolong Road is a through road that provides access to various rural properties along its length. An Auxiliary Right Turn (AUR) and an Auxiliary Left Turn (AUL) have been constructed on Obley Road at the intersection. Give way controls consist of a give way sign and hold line. A sightscreen is located opposite the intersection. Obley Road is signposted at 100km/hr at this location. The pavement is in reasonable condition. Sight distance is good in both directions, at 190m to the south and 280m to the north exceeding the minimum desirable sight distance of 179m at 100km/hr (see **Plate 19** and **Plate 20**).

Plate 19 - Looking North on Obley Road at the Benolong Road Intersection

Plate 20 - Looking South on Obley Road at the Benolong Road Intersection

2.3.8 Obley Road and Bellevue Road

Bellevue Road forms a T-junction with Obley Road and is basic in configuration. The Road provides access to a rural property. There are no give way controls, no sight screen, and the mouth of the intersection is unsealed. Obley Road is signposted at 100km/hr at this location. The pavement is in reasonable condition. Sight distance is good in both directions, at 240m to the south and 300m to the north exceeding the minimum desirable sight distance of 179m at 100km/hr (see **Plate 21** and **Plate 22**).

Plate 21 - Looking North on Obley Road at the Bellevue Road Intersection

Plate 22 - Looking South on Obley Road at the Bellevue Road Intersection

2.3.9 Obley Road and Oakdene Road

Oakdene Road forms a T-junction with Obley Road and is basic in configuration. It is a no through road that provides access to various rural properties. There are no give way controls and no sight screen at the intersection (see **Plate 23**). Obley Road is signposted at 100km/hr at this location. The pavement is in good condition. Obley Road Rail Crossing 2 (see Section 2.4.7) is located 170m to the north of the intersection. Sight distance is good to the south at 500m exceeding the minimum desirable sight distance of 179m at 100km/hr. However sight distance to the north is limited to 110m due to the horizontal and vertical alignment at the rail crossing.

Plate 23 - Looking South on Obley Road at the Oakdene Road Intersection

2.3.10 Obley Road and Hyandra Road

Hyandra Road forms a T-junction with Obley Road and is basic in configuration. Hyandra Road provides access to a rural property. There are no give way controls, no sight screen, and the mouth of the intersection is unsealed. Obley Road is signposted at 100km/hr at this location. The pavement is in reasonable condition. Sight distance is good in both directions, being 500m to the south and 300m to the north exceeding the minimum desirable sight distance of 179m at 100km/hr (see **Plate 24**).

2.3.11 Obley Road and Toongi Road

Toongi Road forms a T-junction with Obley Road and is basic in configuration. The shoulders on Obley Road have been widened to form a basic right turn (BAR) and a basic left turn (BAL).

Give way controls consist of a hold line but no give way sign. A sightscreen is located opposite Toongi Road but it has been set low. Obley Road is signposted at 100km/hr at this location. The geometry of the intersection is adequate for B-Double movements, and the pavement is in good condition. Sight distance is reasonable to the north at 240m but average, at 200m, to the south

due to the horizontal and vertical alignment. However sight distance in both directions exceeds the minimum desirable sight distance of 179m at 100km/hr (see **Plate 25** to **Plate 27**).

Plate 24 - Looking north on Obley Road at the Hyandra Road intersection

Plate 25 - Looking South on Obley Road at the Toongi Road Intersection

There is a rural property driveway access 25m north of the intersection on the western side of Obley Road. A school bus stop is located immediately north east of the intersection (see **Plate 25**).

Plate 26 - Looking North on Obley Road at Toongi Road
(Note the Property Access on the Left and the School Bus Stop on the Right)

Plate 27 - Toongi Road from the Obley Road Intersection

2.3.12 Toongi Road and The Springs Road

The Springs Road forms a T-junction with Toongi Road approximately 70m east of the Wambangalang Creek causeway and is basic in configuration. There are no give way controls, with no give way signage or holding lines. There is a small sight screen opposite The Springs Road approach.

The existing sight distance to the west is estimated to be less than 50m due to the proximity of the Wambangalang Creek Crossing.

2.3.13 Fletcher International Exports and Yarrandale Road

The access to the Fletcher International Exports rail terminal meets Yarrandale Road approximately 100m south of Boothenba Road. It is approximately 50m north of an active single track railway level crossing on Yarrandale Road.

There is a concrete median in the access roadway where it meets Yarrandale Road yet no give way controls (see **Plate 28**)

Plate 28 - Looking West into the Fletcher International Exports Rail Terminal Access Roadway from Yarrandale Road

2.3.14 Boothenba Road and Yarrandale Road

Yarrandale Road forms a T-intersection with Boothenba Road approximately 1.9km east of the Newell Highway (see **Plate 29**). Traffic controls consist of a give way sign and holding line on Yarrandale Road. There is also a small sight screen at the end of the intersection opposite Boothenba Road. There are no turning lanes for traffic either entering or exiting Yarrandale Road. The geometry of the intersection is adequate for B-Doubles to turn left or right into to or out of Yarrandale Road.

Sight distance at the intersection is good in both directions at 340m to the west and 300m to the east exceeding the minimum desirable sight distance of 126m at 80km/hr.

Plate 29 - Looking South Along Yarrandale Road from the Intersection with Boothenba Road

2.3.15 Newell Highway and Boothenba Road

Boothenba Road is the eastern leg of a cross-intersection with the Newell Highway, with the western leg opposite Boothenba Road known as Troy Bridge Road. The intersection includes a channelised right turn (CHR) and an auxiliary left turn treatment (AUL) for movements into Boothenba Road. Give way controls include a give way sign and holding line on Boothenba Road. Lighting is provided along the Newell highway on both approaches (see **Plate 30** and **Plate 31**).

There is an active single track railway level crossing located on Boothenba Road approximately 35m east of the give way holding line at the Newell Highway. Traffic controls at the crossing include flashing red stop lights and boom gates. Given the proximity of the level crossing to the intersection, traffic queuing, particularly involving heavy vehicles, has the potential to encroach upon the Newell Highway. This has previously been identified as a concern, independent of the DZP or any related assessments.

Due to this concern, DCC has secured State funding to realign the railway line so it crosses Boothenba Road further to the east. This will provide for a total queue length of approximately 150 metres from the Newell Highway to the relocated level crossing. This is designed for up to three B-Triple (road train) heavy vehicles to queue westbound on Boothenba Road without any encroachment onto the Newell Highway. All land required for the new alignment has been purchased, detailed engineering studies and the finalised design have been completed. Construction is scheduled to begin in 2013 and be fully complete by 2014.

Plate 30 - Looking South Along the Newell Highway from the Boothenba Road Intersection

Plate 31 - Looking North Along the Newell Highway from the Boothenba Road Intersection

Plate 30 and **31** show the available sight distance to the south and north respectively and are estimated to be greater than 500m in each direction which exceeds the minimum desirable sight distance of 151m at 90km/hr.

2.4 RAILWAY LEVEL CROSSINGS

2.4.1 Introduction

The preferred option of AZL (Option A – see Section 1.3.4) is to reopen the Dubbo to Toongi section of the disused Dubbo-Molong Rail Line. If implemented, this option would require the reopening of four level crossings within the Dubbo urban area and five level crossings between Dubbo and Toongi. The Rail Line consists of one track at all locations.

The railway crossings are as follows.

Dubbo

- Wingewarra Street.
- The Mitchell Highway (Cobra Street).
- Boundary Street.
- Macquarie Street (Old Dubbo Road).

Dubbo to Toongi

- Obley Road (Crossing 1).
- Obley Road (Crossing 2).
- Cumboogle Road.
- Bellevue Road.
- Toongi Road.

The rail line also crosses numerous rural property driveways and farm tracks along its length, however, consideration of these crossings are not within the scope of this report. The nine major rail crossings are described in the sections below.

2.4.2 Wingewarra Street Rail Crossing

At the disused level crossing, Wingewarra Street is a 2 lane, 2 way road. It consists of two 3.5m travel lanes with a 4.5m painted median, 3.5m sealed shoulders and kerb and gutter (see **Plate 32**). The crossing is located in a 60km/hr speed zone. Sight distances on both approaches are good. Overhead street lights are located on both approaches to the rail crossing. Nearby intersections and accesses have the potential to complicate traffic interaction during and after train movements. There are no existing traffic controls at the rail crossing.

Plate 32 - Looking East on Wingewarra Street from the Rail Crossing

2.4.3 Cobra Street (Mitchell Highway) Rail Crossing

At the rail crossing Cobra Street consists of four 3m travel lanes with a 3m channelised right into Chelmsford St to the west and a 0.5m raised median (see **Plate 33**). The crossing is located in a 60km/hr speed zone and sight distance is good for both approaches. Access to Chelmsford St to the west and several businesses will be impeded whilst traffic is stopped when trains pass. Overhead street lights are located on both approaches to the rail crossing. There are no existing traffic controls at the rail crossing.

Plate 33 - Looking West on Cobra Street from the Rail Crossing

2.4.4 Boundary Street Rail Crossing

Boundary Road is a two-lane, two-way road with a 7.5m seal but no line-marking at the disused rail crossing (see **Plate 34**). Overhead street lights are located on both approaches to the rail crossing. The crossing is located within a 60km/hr speed zone. The road alignment is straight and sight distance is good for both approaches. A four way intersection with Margaret Crescent is located 30m to the west. Traffic in and out of Margaret Crescent is likely to be impeded due to traffic queued on Boundary Street waiting for trains to pass.

Plate 34 - Looking West on Boundary Street from the Rail Crossing

2.4.5 Macquarie Street (Old Dubbo Road) Rail Crossing

Macquarie Street is a two-way, two-lane road with 3.5m sealed travel lanes and unsealed shoulders at the rail crossing (see **Plate 35**). The sign posted speed limit is 60km/hr and overhead street lights are located at the rail crossing. The crossing is located within a 60km/hr speed zone. The road alignment is straight and sight distance is good from both approaches. A T-junction with Margaret Crescent is located 30m to the west and a property access is located 60m to the east. Traffic in and out of Margaret Crescent and the property access will be impeded due to traffic queued on Boundary Street during train movements. There are no existing traffic controls at the rail crossing.

Plate 35 - Looking West on Macquarie Street from the Rail Crossing

2.4.6 Obley Road Rail Crossing (Crossing 1)

The railway first crosses Obley Road at chainage 8.2km. At this location Obley Road consists of two 3.5m sealed travel lanes and unsealed shoulders, with central barrier line-marking at the rail crossing (see **Plate 36**). The speed limit is 100km/hr and there is no street lighting in the vicinity. The railway crosses Obley Road at an approximately 40 degree angle. The approach sight distance is good to the south but average to the north as Obley Road is mid-way through a horizontal curve at the crossing. A property access is located immediately to the north and would require relocation upon reopening of the rail crossing. There are no existing traffic controls at the rail crossing.

Plate 36 - Looking North on Obley Road from Rail Crossing 1

2.4.7 Obley Road Rail Crossing (Crossing 2)

The railway crosses Obley Road again at chainage 14.9km. At this location Obley Road has two 3m sealed travel lanes and unsealed shoulders but no line-marking (see **Plate 37**). The posted speed limit is 100km/hr and there in no street lighting in the vicinity. The crossing is located on a curve and a crest, however, sight distance is good both to the north and south. There are no existing traffic controls at the rail crossing.

Plate 37 - Looking South on Obley Road from Rail Crossing 2

2.4.8 Cumboogle Road Rail Crossing

Cumboogle Road is unsealed at the crossing (see **Plate 38**). There is no posted speed limit on Cumboogle Road. The road alignment is straight and sight distance is good for both approaches. There is no street lighting in the vicinity of the crossing. There are no existing traffic controls at the rail crossing.

2.4.9 Bellevue Road Rail Crossing

Bellevue Road is a no through road that services a rural property (see **Plate 39**). It is unsealed and there is no street lighting in the vicinity of the crossing. Sight distance is limited to the east as the crossing is located on a horizontal curve, however, visibility to the west is good. There is no posted speed limit on Bellevue Road. There are no existing traffic controls at the rail crossing.

Plate 38 - Looking East on Cumboogle Road at the Rail Crossing

Plate 39 - Looking West on Bellevue Road at the Rail Crossing

2.4.10 Toongi Road Rail Crossing

Toongi Road is minor road with a 3.5m seal at the crossing (see **Plate 40**). Sight distance is good in both directions. There is no posted speed limit on Toongi Road or street lighting at the rail crossing. Sight distance is good for both approaches. There are no existing traffic controls at the rail crossing.

Plate 40 - Looking East on Toongi Road at the Rail Crossing

2.5 CURRENT AND FORECAST TRAFFIC VOLUMES

2.5.1 State Controlled Roads

Historic annual average daily traffic data (AADT) for the Mitchell Highway (SH7) and the Newell Hwy (SH17) was sourced from Transport NSW Roads and Maritime Services (RMS). This is summarised in **Tables 5** and **6**, with the latest data available being from 2005.

A growth factor of 1.5% was applied to this data to estimate traffic volumes at both 2016 and 2036, that is, towards the completion of the 20 year life of the DZP. This growth rate is considered to be conservative as it likely over estimates actual traffic growth, providing an adequate figure of baseline traffic to add the forecast Proposal generated traffic to.

Table 5 - Roads and Maritime Services Traffic Counts: Mitchell Highway (SH 7)

Station No.	Road (Location)	1992 AADT	1996 AADT	1999 AADT	2002 AADT	2005 AADT	2016 AADT (est.)	2036 AADT (est.)
93.001	Wellington Rd (Mitchell Hwy, SH7) - west of Sheraton Rd, Dubbo	4,637	5,031	7,626	8,580	8,941	10,532	14,185
93.607	Cobra St (Mitchell Hwy SH7) - east of Darling St, Dubbo, Rr7502		15,056		16,884	16,321	19,225	25,894
93.82	Cobra St (Mitchell Hwy SH7) - at Macquarie River Bridge, Dubbo	18,625	15,736	16,312	16,647	15,785	18,594	25,043
93.839	Cobra St (Mitchell Hwy SH7) - at Level Crossing, Dubbo		15,008	17,201	17,147	17,718	20,871	28,110
Source: RMS, 2005								

Table 6 - Roads and Maritime Services Traffic Counts: Newell Highway (SH 17)

Station No.	Road (Location)	1992 AADT	1996 AADT	1999 AADT	2002 AADT	2005 AADT	2016 AADT (est.)	2036 AADT (est.)
93.046	Newell Hwy, SH17 - 1.5km south of Victoria St (Mitchell Hwy, SH7), Dubbo	5,928	6,443	6,774	6,863	5,153	6,070	8,175
93.61	Whylandra St, (Newell Hwy, SH17) - south of Victoria St (Mitchell Hwy, SH7), Dubbo		16,257	17,550	18,448	18,363	21,631	29,133
93.861	Newell Hwy SH17 - 13 Mile Ck, Narromine/Dubbo Boundary	3,103	3,715	4,044	4,314	4,304	5,070	6,828
Source: RMS, 2005								

2.5.2 Local Roads

Two counters were placed on Obley Road, one between the Newell Highway and the Taronga Western Plains Zoo entrance (100m to the west) and the other 100m east of the Zoo entrance. They collected data from 20th June 2012 to 9th July 2012, which is summarised in **Table 7**. It is noted that school holidays coincided with the second week of this period. The AADTs from these 2 traffic counts either side of the Zoo entrance show that 46% of traffic leaves Obley Rd at the Zoo.

A third counter was placed on Obley Road approximately 2km south of the Newell Highway intersection (250m north of the Dundullimal Homestead access) from 22nd February to 12th March 2012. Advice from the Dundullimal Homestead indicates visitor numbers averaged 223 per week over a recent 10 month period. Homestead management estimates a minimum of 2 – 4 coaches per month.

An additional two traffic counters were placed adjacent to the Obley Road and Toongi Road intersection for two weeks from 2nd December to 22nd December 2011 and also on 31st January to 14th February 2012. The locations of these traffic counters and the data from these traffic counts is summarised in **Table 7**.

Table 7 - Current and Forecast Traffic Volumes: Obley Road and Toongi Road

Site	Year	AADT	Heavy Vehicles %	Max peak/hr vehicles	AADT 2036 (est.)	AADT 2036 HV (est.)
Obley Road (between Newell Hwy & Zoo entry)	2012	2,330	10.9	332	3,331	363
Obley Road, 100m East of Zoo entry	2012	1,257	11.2	166	1,797	201
Obley Road (250m north of Dundullimal Homestead)	2012	1,201	18	178	1,717	309
Obley Road (100m north of Toongi Road)	2011	390	21	47	566	119
	2012	388	38	51	555	211
Toongi Road (Immediately east of Obley Road)	2011	105	23	18	152	35
	2012	91	17	16	130	22
Source: DCC						

Traffic counts made available by DCC for Boothenba Road and Yarrandale Road are summarised in **Table 8**.

Table 8 - Current and Forecast Traffic Volumes: Boothenba Road and Yarrandale Road

Site	Year	AADT	Heavy Vehicles %	Max peak/hr vehicles	AADT 2036 (est.)	AADT 2036 HV (est.)
Boothenba Road (East of Yarrandale Road)	2001	750	24.1	NA	-	-
	2016 equivalent	938	24.1	NA	1263	304
Boothenba Road (50m west of Saleyards entry)	2002	1436	20.7	NA	-	-
	2016 equivalent	1768	20.7	NA	2382	493
Yarrandale Road (200m north of Purvis Lane)	2010	2701	39.3	NA	-	-
	2016 equivalent	2953	39.3	NA	3978	1563
Source: DCC						

A growth factor of 1.5% was applied to the above data, from the time the counts were done, to 2016 (the baseline), and then to estimate traffic volumes at 2036.

Dubbo City Council (DCC) supplied traffic volume data at the location of the disused railway crossings within Dubbo as summarised in **Table 9** below. DCC advises that 1.5% per annum growth factor should be applied to the data to estimate approximate current traffic volumes.

Table 9 - Traffic Volumes at Rail Crossings

Road	Location	Year of Data	Average Total Daily Volume	Max peak vehicles/hr	AADT 2036 (Est)
Wingewarra Street	Between Chelmsford & Kokoda St	2008	9,703	1,173	-
		2016 equivalent	10,930	1,245	14,722
Mitchell Highway (Cobra Street)	Near Apex Oval	2011	19,575	2,052	-
		2016 equivalent	21,088	2,083	28,402
Boundary Street	West of Wheeler's Lane	2007	3,146	341	-
		2016 equivalent	3,597	367	4,845
Macquarie Street (Old Dubbo Road)	North of Margaret Cres intersection	2010	1,386	164	-
		2016 equivalent	1,516	169	2,041
Source: Dubbo City Council					

2.5.3 Intersections

Manual traffic counts were conducted at the following intersections, and the results were used for the SIDRA analysis (see **Appendix E**).

1. Newell Highway and Obley Road.
2. Newell Highway and Boothenba Road / Troy Bridge Road.

Traffic at other intersections including Obley Road / Toongi Road and Boothenba Road / Yarrandale Road was not counted for this study because the respective volumes are inadequate to justify further assessment.

2.6 TRAFFIC GENERATED BY THE PROPOSAL

2.6.1 Construction Traffic

The construction phase of the DZP will last between 18 months to two years. During this period, in which the processing and other DZP Site infrastructure will be constructed and installed, a workforce of between 300 and 400 employees will be required. Virtually all of them will reside in Dubbo, so there is no plan to develop a “mining village” or construction camp to house this workforce.

The Applicant will seek local suppliers and employees for construction activities where feasible. It is likely there will be some Fly In-Fly Out (FIFO) specialists and consultants required during the construction phase.

If you presume a vehicle occupancy rate of 2 this equates to 150 to 200 vehicle trips per day (300 to 400 movements). For the purpose of this assessment a maximum of 200 one way trips have been assumed.

Heavy vehicle deliveries of construction materials and equipment are expected on a daily basis. There would be oversize vehicles travelling to the DZP Site. As an example, roasters up to 36m long would be delivered to the Site by road. There would be an estimated average of 9 heavy vehicle deliveries per day for six days per week over an estimated 70 weeks. This is considered the ‘worst case’ scenario as the total figure determined included a 20% increase for contingencies.

Logistics coordination would aim to ensure construction heavy vehicle movements are minimised. This Applicant has an interest in controlling and coordinating heavy vehicle movements on the public road network to minimise their own transport costs. At all times the Applicant would coordinate delivery of materials during the construction phase to favour fully-laden and fewer vehicles than partially loaded and more vehicles.

The preliminary estimate of heavy vehicle trips for DZP construction is 3,780 over a 70 week construction period, working 6 days per week (420 days total). This figure represents one way movements, therefore two-way is 7,560 heavy vehicle movements over 420 days.

The ranges shown of estimated vehicle movements per day (**Table 10**) are indicative of the volumes anticipated. As with any construction, variability in generated traffic will be significantly different on a day to day basis.

Table 10 - Estimated Total Traffic Movements During Site Establishment and Construction

	Movements Per Day*	
	Light Vehicles	**Heavy Vehicles**
Obley Road	300 – 400	5 - 60
Toongi Road	300 – 400	5 - 60
* 1 return trip generates 2 movements.		

2.6.2 Operational Traffic

2.6.2.1 Transport of DZP Products and Reagents

As outlined in Section 1 there are three options being considered for transport of reagents to, and despatch of products from, the DZP Site. For each of the proposed options the following heavy vehicle movements are anticipated as shown in **Table 11**. The option that generates the most traffic on the respective roads has been included to reflect the worst case transport scenario for each road. These figures include movements of processed product form the site, and the movements of these unloaded vehicles to reach the site.

Table 11 - Worst Case Heavy Vehicle Scenario Based on Reagent Transport Options

	Largest Haulage Vehicle	**Option A**	**Option B**	**Option C**	**HV AADT (worst case)**
Obley Road	B-double / single	88	158	138	158
Toongi Road	B-double / single	88	158	138	158
Boothenba Road	Single	28	98	0	98
Yarrandale Road	Single	28	98	0	98

For the purpose of this assessment the transport option likely to generate the greatest number of heavy vehicles (Option B) has been referenced to ensure the recommendations provided are in accordance with the worst case transport scenario.

2.6.2.2 Employees and General Traffic

Once fully operational the DZP will have approximately 250 permanent employees on the Site. It is anticipated these employees would reside locally in Dubbo. It is highly unlikely there would be any FIFO employees within the operational workforce. Approximately 25-30 people with specialist technical skills, including Chemical Engineers, Metallurgists and Industrial Chemists, will be required to relocate to Dubbo to operate the project as these skills do not currently exist locally.

Using the assumption that the majority of employees will commute to and from the DZP Site in their own vehicle, with the remainder travelling to and from in a car pool arrangement, a maximum of 150 light vehicles (300 movements) per day are anticipated on the route between

Dubbo and Toongi. It is anticipated that a small percentage of the workforce would begin their journey south of Toongi, however, this increase would be negligible.

2.6.2.3 Combined Traffic Generation

Combining 150 light vehicle trips (300 movements) with 79 heavy vehicle trips (158 movements) plus an additional 10 miscellaneous vehicle trips (20 movements), the total movements on an average day have been assumed to be an additional 478 movements per day (see **Table 12**).

Table 12 - Total Traffic Movements During DZP Site Operations

	Vehicles Movements* Per Day	
	Light Vehicles	**Heavy Vehicles**
Obley Road	320	158
Toongi Road	320	158
* 1 return trip generates 2 movements.		

The DZP is expected to begin construction in 2013 and operation in 2016. The AADT without DZP traffic for 2016 was forecast using a conservative growth factor of 1.5%. The increase in AADT due to the DZP for on Obley Road and Toongi Roads is shown below in **Table 13**.

Table 13 - DZP Operation and Combined Traffic Volumes

		Forecast Traffic (2036)*		DZP Traffic		Combined Traffic (2036)		Increase	
Road	**Site**	**LV**	**HV**	**LV**	**HV**	**LV**	**HV**	**TOTAL**	**%**
Obley Road	Btwn Newell Hwy & TWP Zoo Entry	2,968	363	320	158	3,288	521	3,809	14%
	100m North of Toongi Road	344	211	320	158	664	369	1,033	86%
Toongi Road	East of Obley Rd	108	22	320	158	428	180	608	368%
Boothenba Road	50m west of Saleyards	1,889	493	0	98	1,889	591	2,480	4%
Yarrandale Road	200m North of Purvis Ln	2,415	1,563	0	98	2,415	1,661	4,076	2.5%
LV & HV stand for light vehicles and heavy vehicles respectively.									
* Forecast background traffic is based on the most recent counts available as shown in **Tables 7** and **8**									

2.7 ACCIDENT (CRASH) DATA

Detailed crash reports were obtained from NSW Transport Centre for Road Safety. The data obtained summarised crashes on the subject roads between 1 January 2007 and 30 June 2011. A summary of the results are contained in **Table 14** below.

Table 14 - Crash Data

Road	Extent		Fatal	Injury	Non Casualty
Obley Road	Newell Highway	Toongi Road	0	6	8
Toongi Road	Toongi Road	The Springs Road	0	0	0
Boothenba Road	Newell Highway	Yarrandale Road	0	5	6
Yarrandale Road	Boothenba Road	Fletcher International Exports Access	0	0	0

2.7.1 Obley Road Accident (Crash) Data

Fourteen (14) crashes involving a total of 17 vehicles were recorded on Obley Road during the data analysis period between the Newell Highway and Toongi Road. Eleven (11) were single-vehicle accidents and 3 were collisions between 2 vehicles. Thirteen (13) vehicles were cars, 3 were light trucks and there was a single motorcycle. No heavy vehicles over 4.5t GVM featured in the crash profile.

Non-road environment factors contributed significantly to Obley Road crashes, with 5 featuring speeding, 4 fatigue and 2 alcohol. Avoiding an animal contributed to 2 crashes, one struck an animal, whilst a driver disobeying a traffic control contributed to another crash. Loose gravel on road shoulders contributed to 3 crashes.

No clusters of multiple crashes at one location were identified, other than two separated by 50m just north of Oakdene Road. Yet this appears coincidental rather than related to the road environment of the location. One crash involved a motorcyclist leaving the carriageway to the left of a right-hand curve, with loose gravel identified as a hazardous factor, whilst the other involved a car leaving a straight length of road.

2.7.2 Obley Road – Newell Highway Intersection

One crash occurred with a southbound vehicle turning right into Obley Road collided with another northbound on the Newell Highway with alcohol identified as a contributing factor.

2.7.3 Toongi Road Accident (Crash) Data

No crashes were recorded on Toongi Road during the data analysis period.

2.7.4 Boothenba Road (Accident) Crash Data

2.7.4.1 General

Eleven (11) crashes involving a total of 18 vehicles were recorded on Boothenba Road during the data analysis period. Four (4) were single-vehicle accidents and seven (7) were collisions between 2 vehicles. Eleven (11) vehicles were cars, 6 were light trucks and there was one heavy vehicle over 4.5t GVM (semi-trailer). Two (2) crashes on Boothenba Road involved fatigue, 1 speeding and 1 alcohol. Another involved a driver disobeying a traffic control.

Two (2) clusters of multiple crashes were identified on Boothenba Road: the intersections with the Newell Highway and Yarrandale Road.

2.7.4.1 Boothenba Road - Newell Highway Intersection Accident (Crash) Data

All 3 crashes at this cross-intersection were cross traffic, right-angle two-vehicle collisions. There were 2 injury crashes resulting in 3 injuries and 1 non-injury crash. Four (4) of the vehicles involved were cars, the other 2 were light trucks. No speeding, fatigue or alcohol contributed to any of the collisions, yet 2 had a contributing factor of the driver disobeying the Give Way traffic control.

2.7.4.2 Boothenba Road and Yarrandale Road Intersection

Two crashes at this T-intersection featured single northbound vehicles running off the end of Yarrandale Road where it terminates at Boothenba Road. Both resulted in no injuries. The second involved a semi-trailer eastbound on Boothenba Road turning right into Yarrandale Road, colliding with a car, resulting in 7 injuries. One of the runoff-road crashes involved driver fatigue.

2.8 SIDRA INTERSECTION ANALYSIS

2.8.1 Intersection Performance

Based on the higher volume of background traffic relative to other intersections along the expected access routes to the DZP Site, the Obley Road and Boothenba Road intersections with the Newell Highway are considered to be the key intersections for performance assessment. Therefore the performance of these intersections was modelled using SIDRA, an intersection performance simulation software package. The remaining intersections along the nominated access route were not modelled as the peak traffic at these intersections is significantly less than the corresponding effective capacity. Therefore any SIDRA modelling would provide no additional value to the assessment.

The performance of the intersection is summarised by four performance indicators, namely:

- Level of Service (LoS);
- Degree of Saturation (DoS);
- Maximum queue length (in metres); and
- Average delay per vehicle (in seconds).

The assumptions used to generate the estimates are included in **Appendix E**.

2.8.2 Level of Service (LoS)

At sign controlled intersections (Give Way and Stop Signs), the LoS is based on the average delay (seconds per vehicle) for the worst movement. **Table 15** summarises the intersection LoS criteria.

Table 15 - LoS Criteria

Level of Service	Average Delay (seconds per vehicle)	Give Way and Stop Signs
A	Less than 14	Good operation
B	15 to 28	Acceptable delays & spare capacity
C	29 to 42	Satisfactory but accident study required.
D	43 to 56	Near capacity and accident study required.
E	57 to 70	At capacity, requires other control mode.
F	Over 70	Over capacity
Source: RMS, 2002.		

2.8.3 Degree of Saturation (DoS)

DoS is defined as the ratio of demand flow to capacity and therefore has no unit. As it approaches 1, extensive delays and queues would be expected. For DoS values greater than 1, a small increment in traffic volumes would result in an exponential increase in delays and queue length. For a satisfactory situation, the DoS values should be less than the nominated practical degree of saturation, usually 0.9. The intersection DoS value is based on the movement with the highest ratio.

2.8.4 Average Delay

Delay is the difference between interrupted and uninterrupted travel times through the intersection and is measured in seconds per vehicle. The delays include queued vehicles decelerating and accelerating to and/or from the stop, as well as delays experienced by all vehicles negotiating the intersection. At sign controlled intersections, the average delay for the worst movement is usually reported.

2.8.5 Maximum Queue Length

Queue length is the number of vehicles waiting at the hold line and is usually quoted as the 95th percentile back of the queue, which is the value below which 95% of all observed queue lengths fall. The intersection queue length is usually taken from the movement with the longest queue length.

2.8.6 Results

The purpose of the intersection analysis was to determine whether the existing intersections have the capacity to perform satisfactorily at peak times with the additional traffic anticipated during the DZP operations phase. Manual counts were taken to determine the peak periods of the day and a peak 15 minute period for analysis. The peak 15 minute periods were converted to an assumed number of movements for each turn manoeuvre for the year 2036 which is considered to be the worst case scenario.

Each intersection was analysed with and without presumed DZP traffic during the peak period. It is important to note that traffic associated with employee shift changes has not been taken into consideration as a commitment has been made to schedule shift start and end times outside the peak periods.

The performance of the two intersections, assuming existing and forecast background traffic, is summarised in **Table 16** below. Detailed SIDRA outputs for each intersection are attached as **Appendix E.**

Table 16 - Modelled Future Traffic Conditions – Peak Operation

Intersection	Scenarios	Peak Flow	DoS	Delays (Sec)	LoS (worst)	Queue (m)
Newell Highway and Obley Road	Background Traffic (2036)	905	0.312	15.0	B	10.3
	Background Traffic (2036) + DZP Traffic	939	0.339	15.1	B	11.8
Newell Highway and Boothenba Road	Background Traffic (2036)	1,217	0.500	32.4	C	20.6
	Background Traffic (2036) + DZP Traffic	1,238	0.508	33.8	C	20.8

The results indicate that the two intersections modelled would still operate far below their capacity, even in the Year 2036 where traffic growth has been presumed to increase at 1.5% per year. The worst level of service is anticipated to be C based on the worst anticipated delay although it should be recognised that the transport of reagents is not significantly exacerbating the situation.

The results clearly indicate that the introduction of traffic by the DZP, which represents only a relatively minor percentage, does not significantly exacerbate the performance of the intersections.

3. ASSESSMENT OF OPERATIONAL TRAFFIC & RAIL IMPACTS

3.1 INTRODUCTION

The following sections review the potential impacts the operational traffic would have on the local and regional road network and associated traffic volumes. Discussion relevant to the recommendations for impact mitigation or other controls is also included, where appropriate.

3.2 NEWELL HIGHWAY

Use of the Newell Highway varies significantly between the various reagent transport options (described in Section 1.3.4), however, the primary impact is at the Obley Road intersection followed by the Boothenba Road intersection. At both intersections the volume of turning traffic increases as a result of the Proposal.

The manual counts undertaken showed a peak period in the morning and afternoon as being between 8:00am and 9:00am and 3:00pm and 4:00pm respectively. The SIDRA analysis demonstrated that the addition of DZP-related transport through both intersections (associated with the worst case Option B) has a negligible impact and both of the intersections have remaining capacity.

It is not anticipated that the traffic associated with shift changes will affect the intersection performance as the Applicant has provided a commitment to schedule shift changes outside the peak hour traffic at these intersections. The shift changes should be scheduled such that the bulk of the vehicles are well outside the peak periods outlined by at least one hour.

Aspects that would improve intersection performance, and consequently safety, at Obley Road include a reduction in approach speed from the south and the incorporation of an acceleration lane for vehicles turning right out of Obley Road, however, the need for the acceleration lane is not justified by the SIDRA analysis and the delays for merging traffic turning right out of Obley Road would not be significantly exacerbated by DZP traffic.

The Boothenba Road intersection is of a suitable standard to accommodate the transport of reagents. The primary concern associated with this intersection was the proximity of the rail crossing causing encroachment of queued traffic onto the Newell Highway whilst a train is passing. It is noted, however, that works are scheduled to relocate the crossing over 100m to the east to alleviate this concern prior to operations commencing at the DZP.

3.3 OBLEY ROAD

The introduction of DZP traffic to Obley Road represents a significant increase over and above existing and forecast background traffic particularly south of the Zoo and Dundullimal Homestead (which combined generate a significant volume of tourist traffic).

The increase in traffic does not put the traffic volumes beyond the effective capacity of Obley Road, however, it does exacerbate issues associated with the current road standard. Sections of the road have poor road geometry, inadequate stormwater drainage and inadequate pavement to accommodate the anticipated increase in traffic.

Major road and stormwater drainage upgrades have been discussed with Council and have received in principle support, however, it is acknowledged that further work is required to establish agreed principles associated with stormwater drainage improvements and pavement designs. The crossings at Twelve Mile Creek and Hyandra Creek have been reviewed utilising detailed survey and hydrological analysis. Hyandra Creek will require a bridge structure approximately 60m to 90m long and approximately 4m to 7m higher than the existing structure to achieve an ARI of 1:50. The required flow rate for Twelve Mile Creek is likely to be achieved utilising a multi box culvert structure although the crossing would remain below local flood levels. The conceptual bridge deck levels are included as **Appendix D(ii)**.

As all traffic associated with the DZP would turn onto Toongi Road, an auxiliary left lane and channelised right turn lane are proposed. Given that there will be a number of slow moving heavy vehicles turning right out of Toongi Road onto Obley Road an acceleration lane has been provided to enable the vehicles to obtain a suitable merge speed albeit into low volumes of through traffic.

The conceptual layout for the intersection is included as **Appendix D(i)**. It outlines the recommended alignment and intersection upgrades along the route. A minimum formation standard of an 8m seal on a 10m formation is required.

The Obley Road Upgrade and Associated Works – Pavement Thickness Design is contained as **Appendix F**. Two pavement upgrade options have been developed. Option 1 is the equivalent of Option A and Option 2 is the equivalent of Option C considered in this report. It includes recommendations for each section of Obley Road between the Newell Highway and Toongi Road. Table 4 of that document provides a summary of the site-specific treatments recommended.

Both Options recommend the large majority of the existing alignment be retained. Three lengths are proposed for re-alignment, the most significant between chainage 3500 and 7400. Road widening involving partial reconstruction is recommended between chainage 9800 and 11550.

The recommendations for a pavement overlay are shown in **Figures 8, 9** and **10** below. The recommendations vary depending on the actual subgrade CBR which results in a variable thickness of base, sub-base and select fill.

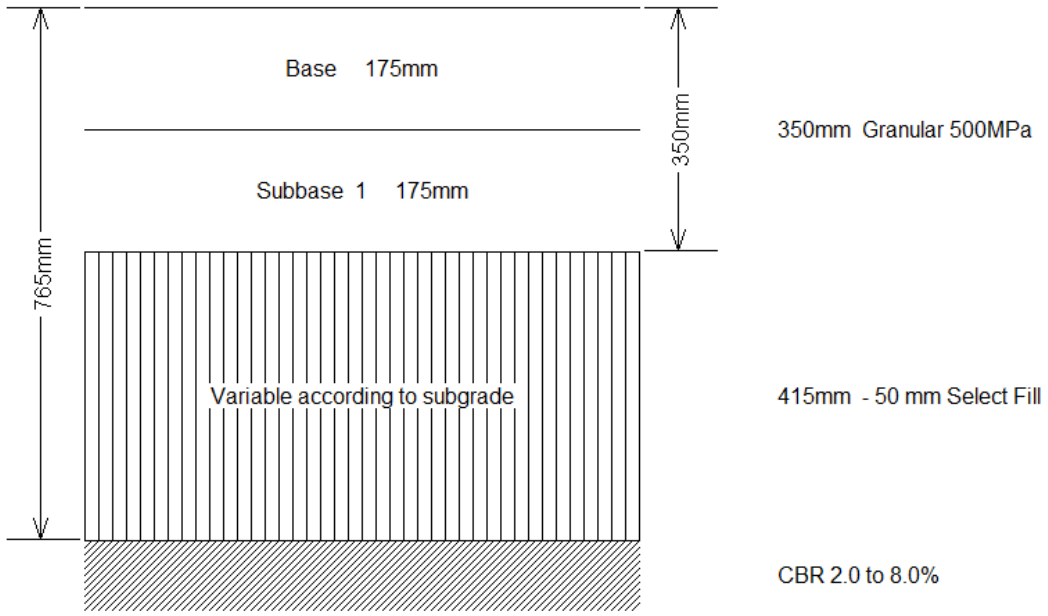

Figure 8 - Base, Sub-Base and Select Fill Thickness (CBR 2 to 8%)

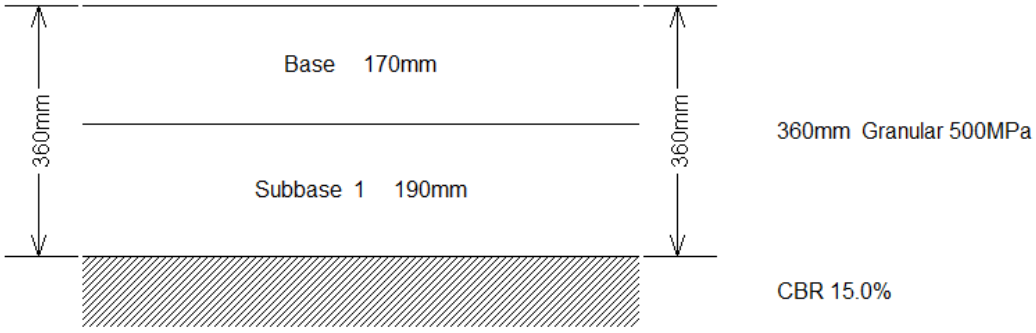

Figure 9 - Base and Sub-base Overlay Thickness (CBR 12%)

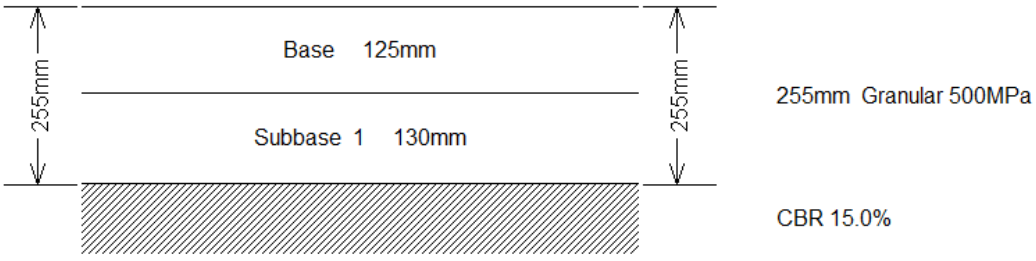

Figure 10 - Base and Sub-base Overlay Thickness (CBR >15%)

Further pavement investigation will be required, along with a redesign of the pavement, once the option for reagent to delivery to the DZP Site is determined.

3.4 TOONGI ROAD

The short section of Toongi Road utilised for access between Obley Road and the DZP Site is primarily associated with a major stormwater drainage upgrade to obtain a suitable vertical road alignment for heavy vehicles and improve flood immunity.

A conceptual bridge arrangement over Wambangalang Creek has been proposed, however, the final bridge arrangements would be subject to further design parameters being established with Council. The deck height is likely to be between 6m and 7m above the existing causeway. This height suits the vertical alignment for the road and ties into the Eastern stream bank at a suitable level. The length of the structure will depend on further analysis of the cost of significant fill embankments behind the abutments compared with the cost of having a longer structure. The conceptual bridge deck levels are included as **Appendix D(ii)**.

Toongi Road is required to be constructed to the same standard as Obley Road (see Section 3.3 above). Consideration of the access of the waste transfer station and The Springs Road intersection are required during the design phase. It is envisaged that the right of way for Toongi Road will remain at the intersection with The Springs Road given the low traffic volumes and existing traffic arrangements.

A new intersection shall be established with Toongi Road to provide access to the DZP Site. The intersection will be situated approximately 100m east of The Springs Road Intersection. As with most private accesses to the public road network the DZP Site traffic will be required to give way to traffic on Toongi Road. Given the relatively low volumes of traffic on Toongi Road a basic rural intersection treatment is recommended, however, the design will need to consider the risk posed by complacency of DZP Site traffic turning in and out of the intersection with very low background traffic. Potential mitigation measures to address this issue include:

- appropriate advanced warning signage of the requirement to give way when exiting the DZP Site;
- incorporate a raised centre median to the DZP Site approach to the intersection to prevent heavy vehicles cutting the corner hence reducing travel speed; and
- transverse tactile lines on the DZP Site approach to reinforce the requirement to give way.

3.5 YARRANDALE ROAD

If Option A or Option B are adopted for the transport of reagents, a short section of Yarrandale Road between the Fletcher International Exports rail terminal and Boothenba Road would be utilised. Yarrandale Road currently has a high volume of heavy vehicle traffic associated with the prevailing land uses it serves.

This section is generally considered suitable for the increase in heavy vehicle movements given the road and associated intersections have been constructed to a suitable standard and therefore appear to have reasonable dimensional capacity and associated controls at both the intersection with the rail terminal and Boothenba Road.

The introduction of additional heavy vehicle movements, associated with the transport of reagents is not anticipated to have any significant impact on the capacity of Yarrandale Road or the associated intersections which are proposed for use.

3.6 BOOTHENBA ROAD

Boothenba Road is of a reasonable standard and currently caters for a significant amount of heavy vehicles accessing the Fletcher International Exports rail terminal and the Dubbo Saleyards. The road is generally straight and is in reasonable condition.

An assessment of the pavement was not undertaken, however, it is considered that the pavement has a reasonable residual life.

There are a number of intersecting accesses and roads which have limited controls and/or advanced warning. The installation of additional controls including give way and/or stop signs and associated hold lines is considered appropriate to improve awareness.

3.7 RAIL LEVEL CROSSINGS

Under the option to re-open the disused Dubbo – Toongi Rail Line (Option A) several currently inactive level crossings would be used. Along the subject 27km of rail line, 26 level crossings have been identified. Nineteen (19) of these are on minor access crossings for farmers and/or livestock. Less than this number may be considered for upgrading if they are deemed illegal by the relevant rail authority. However, the legal status of each of these crossings is currently unknown.

As part of our assessment we have only considered the crossing associated with public roads.

There are 7 public road crossings that require probable treatment as determined by UTS Rail (2012) and outlined in **Table 17** below. Precise control measures required at each crossing are currently unknown, as the NSW Level Crossing Strategy Council (LCSC) still needs to assess them in accordance with the Australian Level Crossing Assessment Model (ALCAM).

The impact of reinstating the crossings on traffic is difficult to establish given that two of the primary parameters are unknown which includes the time(s) of day the trains shall pass and their likely speed, which combined will provide an estimate of the impact at the respective crossings.

However, if you presume an average train length of 500m and a travel speed of 10km/hr (in town) and a total of 50 seconds for advanced warning and departure time the delay to traffic at the intersections equates to 4:00 minutes. As a worst case scenario 5:00 minutes has been presumed to calculate the associated queue lengths as shown in **Table 18** below.

Table 17 - Likely Control Measures at Railway Level Crossings

Location	General Active Measures	Road	Pedestrian
Wingewarra Street	Type F flashing lights & warning bells	Boom posts, 4 way LED lights	'Red Man' LED warning lights and sirens, fencing formed paths
Cobra Street (Mitchell Hwy)	Type F flashing lights & warning bells	Boom posts, 4 way LED lights	Red Man' LED warning lights and sirens, fencing formed paths
Boundary Road	Type F flashing lights & warning bells	Boom posts, 4 way LED lights	Warning signage
Macquarie Street	Type F flashing lights & warning bells	Boom posts, 4 way LED lights	Warning signage
Obley Road No. 1	Type F flashing lights & warning bells	Boom posts, 4 way LED lights	Warning signage
Obley Road No. 2	Type F flashing lights & warning bells	Boom posts, 4 way LED lights	Warning signage
Toongi Road	Type F flashing lights & warning bells	Boom posts, 4 way LED lights	Warning signage

Table 18 - Queue Lengths at Rail Crossings

Road	2036 Equiv. Max Peak Vehicles/hr	Vehicles in Each Direction	Max 5 Minute Queue length (Vehicles)
Wingewarra Street	1,411	706	59
The Mitchell Highway (Cobra Street)	2,307	1,153	96
Boundary Street	511	256	21
Macquarie Street (Old Dubbo Road)	200	100	8

A 5:00 minute delay, six times per week is unlikely to have a significant impact on traffic movement within the Dubbo urban area provided the number of movements during peak hour traffic are limited and that trains do not need to be held at the associated rail crossings waiting to obtain access to the main lines. With an anticipated 96 and 59 vehicles queuing during peak hour at the Mitchell Highway and Wingewarra Street crossings respectively the queue lengths will be significant. This is likely to have some impact at the following intersections during peak hour.

- Chelmsford Street and The Mitchell Highway.
- Chelmsford Street and Wingewarra Street.
- Hakea Place and Wingewarra Street.
- Kokoda Place and Wingewarra Street.
- Strickland Street and Wingewarra Street.

- Grevillea Close and Wingewarra Street.
- Hampden Street and Wingewarra Street.

Although counts for these roads have not been obtained significant volumes out of the side roads listed above are considered to be unlikely during the 5:00 minute delay. Considering the short duration and infrequent nature of the proposed train movements (once per day), the overall impact on the associated adjacent roads is not considered significant.

Delays at the associated rail crossings with Obley Road and Toongi Road will have a negligible impact as there is significantly less traffic than there is in the Dubbo urban area, and the delays are likely to be less than they are in town given that the train speeds will be greater than 10km/hr.

4. RECOMMENDATIONS

4.1 CONSTRUCTION SCHEDULING

Once a detailed construction schedule is developed a DZP Traffic Management Plan is recommended to identify and manage associated traffic impacts. Of particular importance shall be the road and bridge construction along the nominated access route coupled with construction traffic.

Careful consideration shall be required of the following.

- Road and bridgeworks during the construction phase.
- Utility upgrades adjacent to or across public roads.
- Significant deliveries including any oversize and overmass loads and the suitability of the existing road to accommodate them (the existing causeway over Wambangalang Creek is likely to be a significant constraint).
- Traffic interaction at key intersections where there is a marked increase in traffic.
- Arrangements for employees to have suitable access to and from the site.
- Impacts on other road users during the construction phase including the school bus, cyclists and pedestrians.
- Impacts on the operation of the Zoo.
- Avoidance of traffic delays during public holidays.

4.2 ROAD UPGRADES

4.2.1 Newell Highway

No road upgrades are proposed for the Newell Highway, however, it is recommended that the approach speed to the intersection with Obley Road from the south be lowered. This should be achieved by extending the 60km/hr speed zone to the south of this intersection.

Although the incorporation of an acceleration lane would improve intersection performance, the traffic associated with the DZP is not anticipated to significantly exacerbate this pre-existing issue.

4.2.2 Obley Road

It is recommended that Obley Road be significantly upgraded to a standard appropriate for the forecast volumes of heavy vehicles. The road standard shall include an 8.5m seal on a 10m formation and the design vehicle shall be a B-double up to 25m in length (Class 2). The conceptual alignment included in **Appendix D(i)** provides an overview of the proposed alignment and proposed intersection treatments, however, is subject to detailed survey and final design.

Further consultation may be required with school bus service providers to determine the need for any specific improvements to existing school bus stops.

The conceptual alignment also details a significant intersection upgrade for the Toongi Road intersection to accommodate turning traffic to and from the DZP Site.

The pavement should also be upgraded to a final design dependent on the chosen methods for the transport of reagents, the final alignment, existing pavement and subgrade conditions.

It is also recommended that the following stormwater structures be upgraded to improve the vertical road alignment and flood immunity:

- Hyandra Creek; and
- Twelve Mile Creek.

An extension of the 60km/hr zone is also recommended from its existing location to south of the Dundullimal Homestead access roadway. This will improve safety at the private accesses to the Zoo and Dundullimal Homestead, and at the pedestrian refuge island crossing from the northern side of Obley Road into the Zoo.

Given the use of Obley Road by cyclists it is recommended that a further extension of the seal width be investigated in certain sections where available sight distance may be limited. It is also recommended to consult with organisers of the two “Zoo to Zoo” cycling special events regarding construction and operational DZP traffic impacts. Further discussions with the nominated groups who use the road is recommended to determine other safety initiatives.

4.2.3 Toongi Road

It is recommended that Toongi Road be significantly upgraded to a standard appropriate for the forecast volumes of heavy vehicles. The road standard shall include an 8.5m seal on a 10m formation and the design vehicle shall be a B-double up to 25m in length (Class 2).

Since Toongi Road is occasionally used by cyclists, further consultation with local groups is recommended to determine any appropriate safety measures.

The upgrade of stormwater drainage over Wambangalang Creek will be a significant component of the upgrade and will primarily determine the alignment over this short section. The design will also need to consider access to and from the existing waste transfer station located adjacent to the existing road near the intersection with Obley Road.

A basic rural intersection treatment is recommended for the DZP Site access. Suitable controls at the site access are required including a stop sign, associated hold line and sight screen.

4.2.4 Yarrandale Road

There are no recommended road upgrades to Yarrandale Road or the associated intersections as this section is generally considered as being ‘fit for purpose’ and of a reasonable standard. The increase in traffic generated by the Proposal represents only a minor increase in heavy vehicles at 2.5%.

4.2.5 Boothenba Road

Boothenba Road is generally considered as being 'fit for purpose', however, improvements to the controls at accesses and other roads intersecting with Boothenba Road is considered desirable. Although the pavement is considered to be in reasonable condition a suitable s94 contribution should be negotiated with Council to account for a reduction in pavement life associated with the roads use.

4.2.6 Rail Level Crossings

It is recommended that the rail crossing standards as detailed in **Table 17** be adopted, however, noting that the final requirements for each crossing remains subject to an ALCAM assessment.

Where possible rail movements should be coordinated to minimise the delays to traffic particularly where the crossings are to be reinstated within Dubbo town at Wingewarra Street, Cobra Street, Boundary Road and Macquarie Street. This would primarily involve scheduling the train movements through Dubbo outside of peak hour traffic and maintaining reasonable train speeds to avoid lengthy delays. Once further details are available for the rail upgrade and train movements, further analysis is required to determine suitable mitigation measures associated with this option.

The design of the proposed upgrade and signalling needs to ensure that trains are not required to be stationary at the rail crossings at any time and where possible can pass through Dubbo urban area at a reasonable speed to further minimise delays.

4.3 ROAD MAINTENANCE

Maintenance of the roads utilised for the Proposal would be an ongoing requirement of Council as the Road Authority. Given the increase in traffic volumes associated with the Proposal, it would be reasonable to expect that road maintenance contributions be made commensurate with the traffic generated by the Proposal.

Notwithstanding, the negotiations should take into consideration the extensive road and bridge upgrades recommended and the associated impact of the traffic generated by the development on the roads discussed within this assessment.

In summary, the impact of operational traffic generated by the Proposal can be adequately mitigated by undertaking the capital upgrades and establishing suitable maintenance regimes and agreements as described in this section.

4.4 DZP SITE TRAFFIC

Although a preliminary layout for the DZP Site has been developed, the internal road network has not been designed. Provision within the layout has been made for two separate car parking areas and storage for up to 30 heavy vehicle combinations. In developing the DZP Site layout, associated traffic arrangements and road design, the following should be taken into consideration.

1. That there is suitable separation between mine plant, road haulage vehicles and general vehicles.
2. That suitable controls and advanced warning are available to guide traffic around the site to the appropriate areas within the DZP Site.
3. That the sections of road within the DZP Site utilised by road traffic be designed generally in accordance with Austroads standards.

4.5 MITIGATION SUMMARY

A summary of proposed road upgrades and related mitigation measures is provided in **Table 19** for the DZP.

Table 19 - Summary of Proposed Road Upgrading Activities

Page 1 of 3

Location	Recommendations	Responsibility
All	• All recommended road and intersection upgrades should be constructed in accordance with Austroads Standards and Council specifications and should have suitable dimensional capacity to accommodate the dimensions of the oversized loads anticipated.	DZP/Council
	• Intersection upgrades should provide simplified traffic interaction and provide appropriate warning(s) relating to the increased volume of heavy vehicles.	DZP
	• Suitable Code of Conduct should be developed for contractors / drivers of heavy vehicles travelling to and from the Site. The code would identify the designated access routes to the mine areas, and cover the expectations of driver behaviour and the avoidance (wherever practical) of the school bus travel periods. The code would also include disciplinary procedures to monitor and control driver activity. Speed, fatigue and other related driving characteristics need to be appropriately managed.	DZP
	• S94 contributions for pavement impacts and other road maintenance shall be established with Council on the roads applicable	DZP/Council
	• Develop and implement a DZP Transport Management Plan for the construction phase. Consideration of the following is required: – Consideration of the respective intersections including temporary speed limits and other controls; – Road and bridge construction works and what impact that has for vehicles accessing the DZP Site;	

Table 19 - Summary of Proposed Road Upgrading Activities (Cont'd)

Location	Recommendations	Responsibility
All (Cont'd)	– Utility upgrades adjacent to or crossing public roads; – Consideration of pedestrians and cyclists; and – Avoiding construction traffic during busy periods such as the Christmas or Easter holidays. • Specific consideration of the timing of the associated roadworks and bridgeworks is required to ensure there is adequate capacity and that the road network is suitable for the intended use.	DZP
	• Communicate with organisers of "Zoo to Zoo" road cycling annual events to minimise impacts on construction activities, mine operations and the events	DZP
Obley Road	• Complete a detailed design for the section of Obley Road between the Newell Highway and Toongi Road to the satisfaction of DCC in line with the Conceptual alignment developed. Subsequently upgrade Obley Road and the associated intersections.	DZP
	• Upgrade the associated culvert structures over Hyandra Creek and Twelve Mile Creek in consultation with Council	DZP
	• Provide additional school bus stop pull over areas in consultation with the school bus operator and Council	DZP
	• Consult with the relevant cycling groups and specifically consider safety aspects associated with their use of the road particularly where sight distance is limited	DZP
Toongi Road	• Complete a detailed design for the section of Toongi Road between Obley Road and the nominated site access to the satisfaction of DCC. • Subsequently upgrade Toongi Road and the associated intersections.	DZP
	• Upgrade the existing causeway over Wambangalang Creek to a bridge in consultation with Council	DZP
	• Cater for the existing waste transfer station and ensure that a suitable access point is established.	DZP
	• Consult with the relevant cycling groups and specifically consider safety aspects associated with their use of the road particularly where sight distance is limited.	DZP
Boothenba Road	• Review and address the lack of controls at private accesses and other roads intersecting with Boothenba Road.	DZP
	• Ensure the relocation of the rail crossing is complete prior to haulage. If it is not specific measures to consider the risks of queuing onto the highway need to be determined	DZP
Rail Level Crossings	• Upgrade the rail level crossings in accordance with the treatments outlined in Table 17 and the relevant ALCAM assessments (yet to be complete).	DZP
	• Where possible reduce the impact of traffic delays at rail crossings by scheduling trains outside the peak traffic periods considered to be between 8:00 AM and 9:00AM in the morning and 3:00PM and 4:00PM in the afternoon. • Ensure the signalling design prevents trains stopping, or travelling at an unnecessary slow speed, at the rail crossings.	DZP

Table 19 - Summary of Proposed Road Upgrading Activities (Cont'd)

Location	Recommendations	Responsibility
Utility Upgrades	• Liaise with RMS and DCC in relation to all utility upgrades and ensure that traffic impacts are clearly mitigated in the Project TMP.	DZP
DZP Site Traffic	• Ensure there is suitable separation between various types of plant, heavy vehicles and general vehicles. • Install suitable controls and advanced warning to guide traffic around the DZP Site • Roads within the DZP Site utilised by general traffic be designed generally in accordance with Austroads standards	DZP

5. REFERENCES

Australian Standards (AS) (2007) 1742.7 – Manual of Uniform Traffic Control Devices Part 7: Railway crossings.

Austroads (2009) Guide to Road Design – Part 4A: Unsignalised and Signalised Intersections

New South Wales Roads and Traffic Authority (2004) Traffic Volumes for Northern Region 2004.

Dept. of Transport NSW (2010) Australian Level Crossing Assessment Model.

New South Wales Roads and Traffic Authority (2002) Guide to Traffic Generating Development

UTS Rail (2012) Alkane Resources LTD Dubbo Zirconia Project Operations & Signalling Concept Report, Plan SFS-10.

This page has been intentionally left blank