GLADSTONE NICKEL PROJECT ENVIRONMENTAL IMPACT STATEMENT SUPPLEMENT

Updated Traffic Report

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Gladstone Pacific Nickel Refinery Traffic Report Update

Prepared for Gladstone Pacific Nickel Limited

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Contents Page Number

TABLES:

FIGURES:

APPENDICES:

Document Control
Gladstone Pacific Nickel Refinery Traffic Report Update

Version	Date	Author		Reviewer	
		Name	Initials	Name	Initials
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Final	10 December 2007	Michael Pickerill	Original signed	Deborah Hutchison	Original signed
A	13 December 2007	Michael Pickerill	MPi	Deborah Hutchison	DRH

1.0 INTRODUCTION

1.1 Study Background

In December 2006 Cardno Eppell Olsen prepared a traffic impact assessment of the proposed Gladstone Pacific Nickel Ltd nickel refinery and associated operations at Yarwun on the outskirts of Gladstone. This traffic impact assessment formed part of the Draft Environmental Impact Statement (EIS) for the nickel project. The Draft EIS was subsequently submitted to various stakeholders for their review and comments. Comments on the Draft EIS have now been received and collated by the Queensland Department of Infrastructure.

Concomitantly, the nickel project development progressed with more details becoming confirmed, resulting in some changes to different aspects of the project.

1.2 Scope of Work

Cardno Eppell Olsen has now been commissioned by Gladstone Pacific Nickel Ltd to review the original traffic impact assessment in light of both the project changes and the Draft EIS comments relating to the traffic operations of the project. That review forms the basis of this report.

2.0 EIS TRAFFIC COMMENTS

The Draft EIS was reviewed by a number of government stakeholders including the Queensland Department of Main Roads (Main Roads) and Calliope Shire Council (Council).

2.1 Department of Main Roads

Main Roads' comments, as they relate to the traffic operations and impacts of the Gladstone Pacific Nickel Project, are summarised as follows:

- Main Roads considered the high proportion (67%) of staff assumed to travel to site by bus as unrealistic and suggested it be amended to 50% by bus and 50% by private vehicle;
- some traffic volumes in the traffic impact assessment did not match the volumes on figures. The correct volumes should be confirmed;
- the proposed overtaking lanes on Hanson Road between Blain Drive and Red Rover Road were considered inappropriate due to the short distance between the two intersections. The impact mitigation strategy for this section of road should be reassessed, in particular, the threshold for duplication needs to consider the percentage of heavy vehicles, the directional splits between traffic and the morning and evening peak periods;
- design details of the proposed roundabout at Hanson Road/Reid Road should be provided especially with regards to the ability of heavy vehicles to safely negotiate the roundabout;
- the Dawson Highway/Blain Drive/Herberton Street roundabout should also be analysed for demand driven peak hour traffic signals on one or two of the roundabout legs;
- the Hanson Road/Red Rover Road intersection should be reconsidered in light of Main Road's assessment that duplication will be required;
- the Bruce Highway access to the residue storage facility should be reconsidered as it is in the middle of a horizontal curve and therefore may have sight distance restrictions;
- the heavy vehicle impacts of the pipeline construction should be assessed over all impacted road segments;
- the heavy vehicle construction impacts for 2008 and 2009 should be considered as one construction year;
- the temporary construction village location should be confirmed and the traffic assessment amended accordingly.

2.2 Calliope Shire Council

Council's comments, as they relate to the traffic operations and impacts of the Gladstone Pacific Nickel Project, are summarised as follows:

- the EIS is based on limited manual traffic counts undertaken in 2006, updated from 2003 and 2004 traffic data, which is not considered to reflect recent traffic growth;
- sensitivity tests regarding the mode split and vehicle occupancies of construction worker traffic should be undertaken to accurately test the impact on the road network;
- the mid-block capacity of the road network should also be tested for peak hour performance, particularly during the construction phase;
- possible increases in traffic using Philip Street should be addressed;
- the Hanson Road/Reid Road intersection layout should be considered for alternative arrangements to the proposed roundabout;
- the Gladstone-Mt Larcom Road/Hanson Road/Landing Road intersection is considered by Council to have design and layout deficiencies and any identification by Main Roads of this intersection as an issue would be supported by Council.

3.0 GLADSTONE PACIFIC NICKEL PROJECT CHANGES

3.1 Construction and Operation Processes

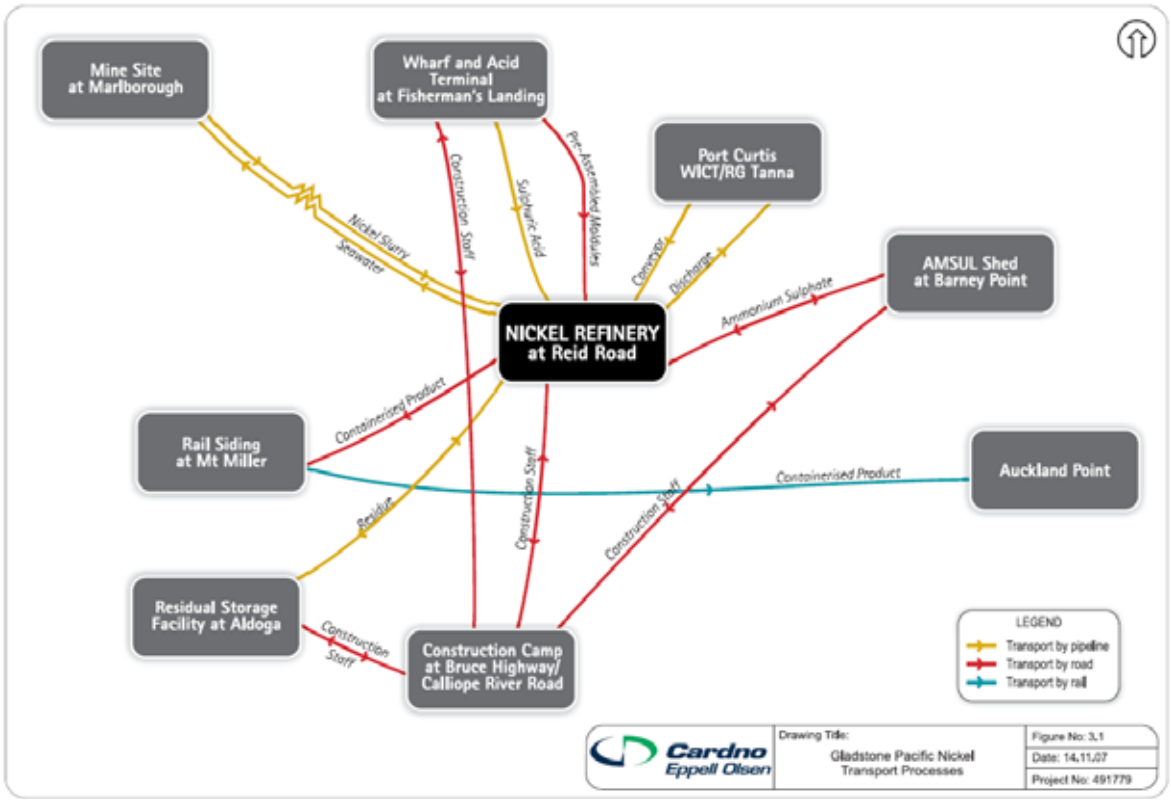
Refinement of the project has resulted in a number of changes to the construction and operation processes. Of the changes that have come about as a result of project refinement those which have an impact on traffic operations are listed as follows:

- the nickel refinery will be partially constructed off-shore with Pre-Assembled Modules (PAMS) shipped to Gladstone and consolidated on site. This results in a significant reduction in construction staff at the Yarwun site. It also has a reduction in construction material traffic although the transport of PAMS to the refinery site will result in some major temporary traffic control exercises. The PAMS marine facility will be located north of the refinery site, off Landing Road;
- the labour pool within Gladstone is not sufficient for the construction requirements. Therefore the majority of construction staff (about 80%) will be brought in from external locations and housed at a staff camp. This enables more control over staff transport to the refinery site and more certainty that buses to site will be utilised. The camp site will be located north of Bruce Highway on Calliope River Road;
- an ammonium sulphate (AMSUL) shed will be constructed at Gladstone Port to accommodate that by-product of the nickel refinery process. This was not included in the original Draft EIS and will generate heavy vehicle traffic during the operations phase;
- the residue storage facility (RSF) will be accessed from Bruce Highway via an access at Koncina Road. The RSF will now be constructed in stages with construction traffic ongoing through the operations phase.

It is also proposed that, during the first stage of operations, nickel ore will be transported by rail from Marlborough down to the refinery location. This will potentially increase the number of rail services through the Rockhampton area and in particular the frequency of trains through level crossings. Queensland Rail may have the flexibility to put scheduling measures in place to mitigate the effects in peak periods of these increased frequencies. From discussions with Queensland Rail, It is understood that Queensland Transport have a warrant framework which addresses the levels of treatment required at crossing locations, based on a number of operational and environmental factors. Consideration may be required to investigate if the increased frequency of services is sufficient to warrant level crossing upgrades. Queensland Rail has had the opportunity to address this in their submission on the Gladstone Pacific Nickel Ltd EIS.

An overview of the processes associated with the Gladstone Pacific Nickel Project and the associated transport modes is included on Figure 3.1.

Figure 3.1 ***Transport Processes***



3.2 Study Area

The Gladstone Pacific Nickel Project EIS covers the construction and operation processes in the vicinity of the refinery at Yarwun. The construction and operation processes associated with the mine site at Marlborough are covered by a separate approvals process.

The study area for this traffic impact assessment therefore extends from the Port of Gladstone in the east to Dawson Highway and Bruce Highway in the south and Gladstone-Mt Larcom Road, extending north to include the marine facility at Port Curtis.

3.3 Site Locations and Accesses

Table 3.1 sets out the location and access for each of the operational activities shown on Figure 3.1 that are situated within the study area.

Table 3.1 ***Site Locations and Accesses***

Facility	Location	Site Access (frontage)
Nickel Refinery	Reid Road	Reid Road
AMSUL Plant	Barney Point	Port Access Road
Residue Storage Facility	Aldoga	Bruce Highway
Construction Camp	Calliope area	Calliope River Road
Rail Siding	Mt Millar	Reid Road
Wharf and Acid Terminal	Port Curtis	via Landing Road
Gladstone Port	Auckland Point	Port Access Road

3.4 Transport Routes

The primary movement of construction staff will occur between the Construction Camp at Calliope and the nickel refinery on Reid Road by private bus. The buses will travel from the camp, which is situated on the southern end of Calliope River Road just north of the Bruce highway, along the entire length of Calliope River Road, onto Gladstone-Mt Larcom Road and then Hanson Road before turning in to Reid Road and the refinery site.

Buses transporting a smaller number of construction staff between the camp and various other locations will utilise the following routes:

- Calliope River Road and the Bruce Highway to the Residue Storage Facility;
- Calliope River Road, Gladstone-Mt Larcom Road, Hanson Road and Port Access Road to the AMSUL plant;
- Calliope River Road, Gladstone-Mt Larcom Road and Hanson Road to the Port Curtis conveyor;
- Calliope River Road, Gladstone-Mt Larcom Road and Landing Road to the wharf/marine facility and marina pipeline;
- Calliope River Road and Gladstone-Mt Larcom Road (to the west of Calliope River Road) to various RSF pipelines.

Operational staff will not be housed in the camp and hence will travel to the refinery from their places of residence in and around Gladstone, as will a smaller proportion of construction staff. Table 3.2 lists the locations for the residence of operational staff and the assumed routes between these locations and the nickel refinery adopted for the purposes of this traffic impact assessment.

Table 3.2 ***Non-Campsite Staff Commuter Routes***

Location	Route
Gladstone City area	Hanson Road, Reid Road
Gladstone north of Hanson Road (via Lord Street)	Lord Street, Hanson Road, Reid Road
Phillip Street area	Philip Street, Dawson Highway, Blain Drive, Hanson Road, Reid Road
West Gladstone	Blain Drive, Hanson Road, Reid Road
Clinton	Don Young Drive, Red Rover Road, Hanson Road, Reid Road
Calliope	Bruce Highway, Calliope River Road, Gladstone-Mt Larcom Road, Hanson Road, Reid Road
Yarwun	Gladstone-Mt Larcom Road, Hanson Road, Reid Road
Rockhampton	Bruce Highway, Gladstone-Mt Larcom Road, Hanson Road, Reid Road

Movements of materials between the refinery and the various ports to the east of the Gladstone city centre (e.g. Barney Point, Auckland Point) will occur via Hanson Road and Port Access Road.

The movement of the Pre-Assembled Modules between the Wharf and the Reid Road refinery will occur via an as yet unconstructed temporary road.

4.0 METHODOLOGY

4.1 Site Inspection

An inspection of the road network in the vicinity of the Yarwun refinery site was undertaken in August 2007 as part of this traffic impact assessment update. Particular attention was made to sight distances along the transport routes, operational requirements for heavy vehicle turning movements and any road network changes implemented since the traffic impact assessment that formed part of the Draft EIS was undertaken. Key observations include:

- the Gladstone-Mt Larcom Road/Landing Road/Hanson Road intersection has recently been upgraded to change priority from Hanson Road – Gladstone-Mt Larcom Road to Hanson Road – Landing Road, refer Figure 4.1. The upgraded intersection has painted traffic islands which were wearing away due to poor lane discipline from turning vehicles, as can be seen on Figure 4.2;
- the Gladstone-Mt Larcom Road/Targinie Road/Calliope River Road intersection has also been recently upgraded with right turn bays and let turn slip lanes on the Gladstone-Mt Larcom Road approached, refer to Figure 4.3;
- sight distances at all impacted intersections and access locations were considered to be appropriate for the existing operating speeds.

Figure 4.1 Gladstone-Mt Larcom Road/Landing Road Upgrade

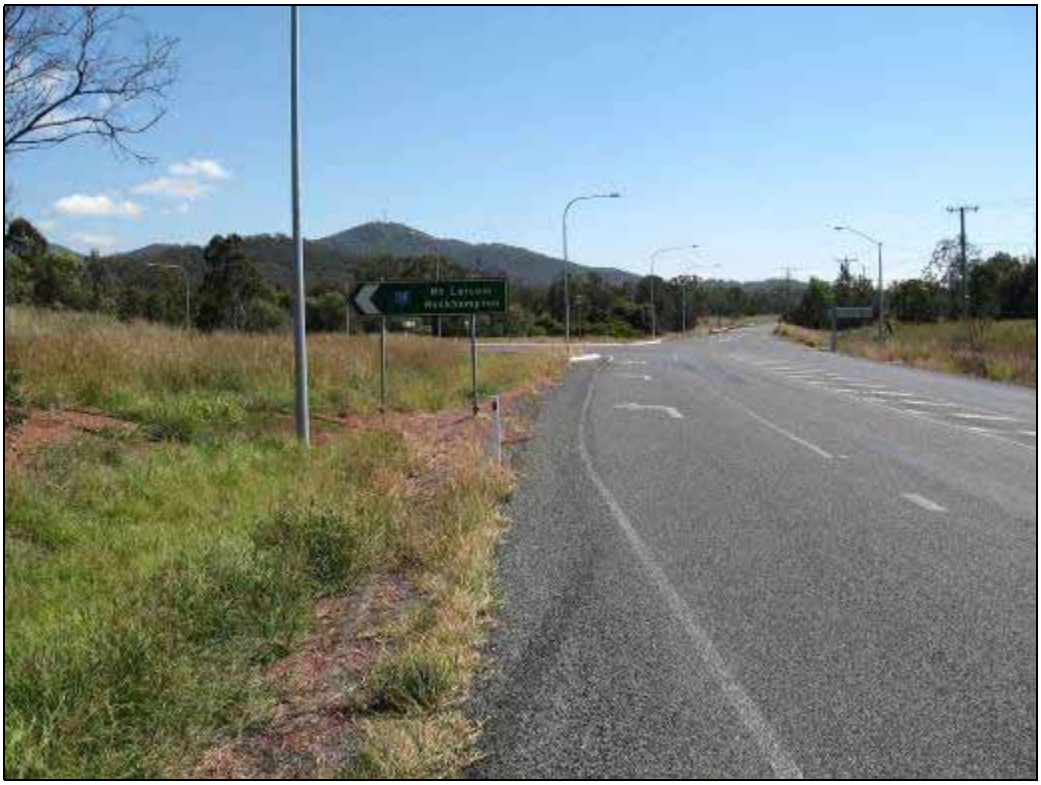


Figure 4.2 ***Gladstone-Mt Larcom Road/Landing Road Worn Markings***

Figure 4.3 ***Gladstone-Mt Larcom Road/Targinie Road/Calliope River Road***

4.2 Assessment Revision Approach

While the Draft EIS was being reviewed by Main Roads and Council, the Gladstone Pacific Nickel Project was subject to further refinement, with some of the changes now making the comments on the Draft EIS redundant. In particular, the following changes have implications for the traffic impact assessment:

- sourcing construction labour externally instead of from the general labour pool in Gladstone means the majority of staff will be based at a construction camp. This gives more certainty and control in the transport of staff to the construction sites. Therefore the assumed mode split can be increased for the bus share and not decreased as requested by both Main Roads and Council when considering sourcing staff from Gladstone;
- a consequence of the majority of construction staff being accommodated at the construction camp means that any increases in traffic on Philip Street as a result of the refinery would be negligible;
- construction of the refinery using Pre-Assembled Modules has decreased the number of construction staff required at Yarwun, thus reducing the traffic impacts during construction;
- the recent changes to the Gladstone-Mt Larcom Road/Landing Road/Hanson Road intersection priority go some way in addressing Council's concerns about design and layout;
- the recent improvements at the Gladstone-Mt Larcom Road/Targinie Road/Calliope River Road intersection have increased both it's capacity and safety, particularly for turning vehicles;
- a significant increase in development proposals within the Hanson Road corridor mean that traffic patterns will become increasingly dominated by local staff and heavy vehicle traffic. This shift from predominantly through traffic will correspond to a shift from a rural road environment to an urban operating environment.

The traffic impact assessment has been revised from that included in the Draft EIS to account for the revised construction and operation processes, the comments made by Main Roads and Council and to consider Hanson Road as an increasingly urban traffic environment.

5.0 REVISED TRAFFIC OPERATIONS ASSESSMENT

5.1 Assumptions

Due to the changes in some construction and operation processes, the inputs to the traffic impact assessment have been revised. The initial and revised traffic generation inputs are summarised in Table 5.1 for construction traffic and Table 5.2 for operation traffic. Note that construction impacts are assumed to be the same for stages 1 and 2.

The traffic distribution assumptions include:

- a single shift occurs in both the construction and operation phases;
- a five day working week for both the construction and operation phases;
- 10% of materials are delivered in each peak hour.

Table 5.1 ***Traffic Generation Inputs – Construction***

Activity		**Quantity Per Day (Original)**	**Quantity Per Day (Revised)**	**Vehicle**	**Vehicle Occupancy**
Construction camp staff (90% of camp staff)	Stage 1	N/A	1,152	Bus	30/bus
	Stage 2		756		
Construction camp supervisors (10% of camp staff)	Stage 1	N/A	128	Ute	1/ute
	Stage 2		84		
Gladstone staff (20% of all staff)	Stage 1	1,500	320	Car	1.1/car
	Stage 2		210		
PAM delivery		N/A	special event	N/A	N/A
Refinery materials – local		N/A	10 loads	Semi-trailer	N/A
Refinery materials – overseas		N/A	N/A	rail	N/A
Port Curtis Marine Facility materials and construction machines delivery		N/A	10 loads	Semi-trailer	N/A
RSF materials – sand/rock		N/A	33 loads	B-double	N/A
Conveyor & seawater pipeline – delivery of pipes along route		N/A	10 loads	Semi-trailer	N/A
Nickel slurry pipeline – delivery of pipes along route		N/A	10 loads	Semi-trailer	N/A
AMSUL shed – materials and construction machines delivery		N/A	5 loads	Semi-trailer	N/A

Table 5.2 ***Traffic Generation Inputs – Operation***

Activity	Stage 1 Operation		Stage 2 Operation		Vehicle	Vehicle occupancy
	Quantity (original)	Quantity (revised)	Quantity (original)	Quantity (revised)		
Operational staff	550 per day	550 per day	700 per day	700 per day	Car	1.1
Refinery delivery – LPG	13 per year	13 per year	26 per year	26 per year	Semi-flat top	N/A
Refinery delivery – diesel	47 per year	47 per year	97 per year	97 per year	Semi-tanker	N/A
Refinery delivery – quick lime	1,486 per year	1,486 per year	2,943 per year	2,943 per year	B-double tanker	N/A
Refinery delivery – flocculent	241 per year	241 per year	355 per year	355 per year	Semi-trailer	N/A
Refinery delivery – polymer	25 per year	25 per year	52 per year	52 per year	Semi-trailer	N/A
Refinery delivery – antiscalant	24 per year	24 per year	50 per year	50 per year	Semi-trailer	N/A
Refinery delivery – steel grinding balls	85 per year	85 per year	174 per year	174 per year	Semi-trailer	N/A
Refinery delivery – lime hydrate	30 per year	30 per year	60 per year	60 per year	Semi-trailer	N/A
Refinery delivery – catalyst	25 per year	25 per year	50 per year	50 per year	Semi-trailer	N/A
Refinery delivery – caustic	286 per year	286 per year	360 per year	360 per year	B-double	N/A
Refinery delivery – hydrogen peroxide	N/A	N/A	30 per year	30 per year	Semi-trailer	N/A
Refinery delivery – filter aid	55 per year	55 per year	141 per year	141 per year	Semi-trailer	N/A
Refinery delivery – polyacrylic acid	21 per year	21 per year	43 per year	43 per year	Semi-trailer	N/A
Refinery delivery – miscellaneous chemicals	19 per year	19 per year	25 per year	25 per year	Semi-trailer	N/A
Refinery delivery – miscellaneous chemicals	55 per year	55 per year	83 per year	83 per year	Small truck	N/A
Product – nickel and cobalt	65,000t/year	65,000t/year	125,000t/year	125,000t/year	B-double	20t/veh

Table Cont…

Activity	Stage 1 Construction		Stage 2 Construction		Vehicle	Vehicle occupancy
	Quantity (original)	Quantity (revised)	Quantity (original)	Quantity (revised)		
Product – ammonia sulphate	180,000t/year	180,000t/year	300,000t/year	300,000t/year	B-double	37 t/veh
Product – organic curds	2 per year	2 per year	3 per year	3 per year	Small truck	N/A
Product – spent activated carbon	3 per year	3 per year	5 per year	5 per year	Semi-trailer	N/A
Miscellaneous solid waste	200 per year	200 per year	400 per year	400 per year	Semi-trailer	N/A
Sulphuric acid plant filter residue	N/A	4,000t/year	N/A	8,000t/year	Semi-trailer	20t/veh
RSF ongoing construction – materials (rock)	N/A	52 per year	N/A	52 per year	Semi-trailer	N/A
RSF ongoing construction – materials (sand)	N/A	156 per year	N/A	156 per year	B-double	N/A

5.2 Background Traffic

The existing and future expected background traffic volumes (i.e. traffic without the nickel refinery) have been retained from the EIS traffic impact assessment. These traffic volumes are shown on Figures B.1 to B.6 at Appendix B.

In their comments on the EIS, Council raised some questions regarding the relevance of the traffic count data used to build a picture of the background traffic. In particular, Council queried the use of 2003 count data when they considered that more recent data was available to more accurately reflect recent changes in traffic patterns in the Gladstone area.

The traffic counts used to develop the background traffic volumes and patterns, their dates and sources are summarised in Table 5.3.

Table 5.3 ***Traffic Count Inventory***

Count Location	Count Type	Count Date	Source
Hanson Road/Alf O'Rouke Drive/Blain Drive	Intersection turning count, peak periods	11/06/2003	Australasian Traffic Surveys
Bruce Highway/Port Curtis Way	Intersection turning count, peak periods	09/02/2006	Australasian Traffic Surveys
Bruce Highway/Targinie-Calliope River Road	Intersection turning count, peak periods	15/03/2006	Australasian Traffic Surveys
Bruce Highway/Targinie-Calliope River Road	Intersection turning count, 12 hour	15/02/2005	Main Roads
Gladstone-Mt Larcom Road /Reid Road	Intersection turning count, peak periods	09/02/2006	Australasian Traffic Surveys
Gladstone-Mt Larcom Road /Blain Drive	Intersection turning count, peak periods	09/02/2006	Australasian Traffic Surveys
Gladstone-Mt Larcom Road /Red Rover Road	Intersection turning count, peak periods	09/02/2006	Australasian Traffic Surveys
Gladstone-Mt Larcom Road /Targinie-Calliope River Road	Intersection turning count, peak periods	15/03/2006	Australasian Traffic Surveys
Gladstone-Mt Larcom Road /Targinie-Calliope River Road	Intersection turning count, 12 hour	09/09/2003	Main Roads
Gladstone-Mt Larcom Road /Landing Road	Intersection turning count, peak periods	15/03/2006	Australasian Traffic Surveys
Gladstone-Mt Larcom Road/Landing Road	Intersection turning count, 12 hour	18/02/2003	Main Roads

Table Cont…

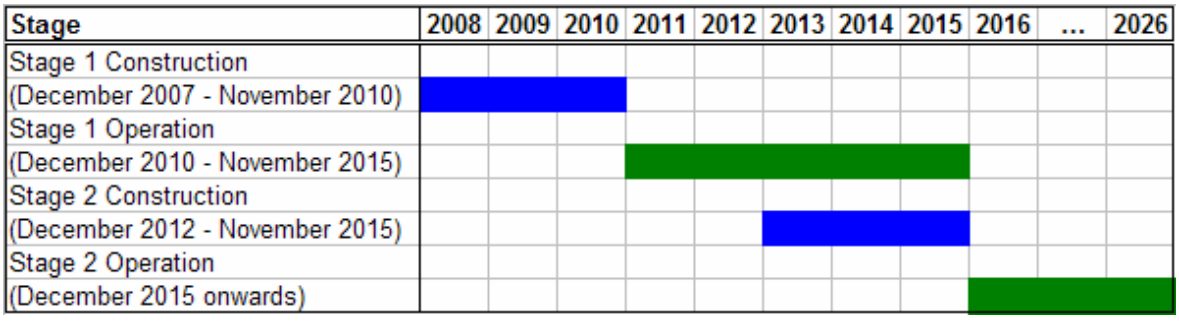
Count Location	Count Type	Count Date	Source
Dawson Highway/Blain Drive	Intersection turning count, peak periods	09/02/2006	Australasian Traffic Surveys
Dawson Highway/Don Young Drive	Intersection turning count, peak periods	09/02/2006	Australasian Traffic Surveys
Dawson Highway/Philip Street	Intersection turning count, peak periods	15/03/2006	Australasian Traffic Surveys
Gladstone-Mt Larcom Road	Mid-block AADT	2004	Main Roads
Bruce Highway	Mid-block AADT	2005	Main Roads
Dawson Highway	Mid-block AADT	2006	Main Roads

As can be seen, the majority of traffic counts used in the traffic impact assessment were undertaken in 2006. It is considered that these counts give a very reasonable picture of existing background traffic. An approach to Main Roads to discuss and/or obtain more recent data went unanswered.

5.3 Development Traffic

The traffic generated by the nickel refinery is associated with both the construction and operations phases of the project. The construction works will be spread over two phases. The first phase of construction is for Stage 1 of the nickel project which involves constructing a refinery producing 60,000t per annum of nickel. Stage 2 of the nickel project will involve doubling the refinery capacity to produce 120,000t per annum of nickel. There will be some overlap of construction and operation traffic when Stage 1 is operational and Stage 2 is under construction. The construction and operation staging timeline is shown on Figure 5.1.

Figure 5.1 ***Project Staging***



The traffic impact of a development is typically assessed for a ten year design horizon from when the development becomes fully operational. For the Gladstone Pacific Nickel Project, this means that the design horizon is ten years from when Stage 2 operations begin. Construction and operation impacts within this timeframe must also be assessed.

The inputs to calculating the amount of traffic generated by the Gladstone Pacific Nickel Project are outlined in Section 5.1. The distribution of this traffic on the existing road network was assumed to be via the shortest routes based on both time and distance. The traffic volumes associated with the nickel project are shown on Figures B.7 to B.11 at Appendix B.

5.4 Intersection Impacts

The traffic impact of the Gladstone Pacific Nickel Project has been assessed for the ability of the existing road network to adequately cater for the expected increase in traffic. The following summarises the analysis undertaken to determine the suitability of the existing intersections to absorb the additional traffic. This analysis was undertaken using the conventional intersection analysis software, SIDRA Intersection 3.2. The detailed results of the analysis for each intersection are provided on the accompanying CD.

Bruce Highway/Calliope River Road

The Bruce Highway/Calliope River Road intersection is a three way priority junction, with Calliope River Road forming the minor road movement. The results of the SIDRA analysis for this intersection are presented in Table 5.4.

Table 5.4 Bruce Highway/Calliope River Road – SIDRA Analysis Results

Scenarios	AM Peak			PM Peak		
	DOS	Delay	95th %le Queue	DOS	Delay	95th %le Queue
2006 Existing	0.05	3.4 sec	2m	0.05	2.3 sec	1m
2009 Background	0.06	3.4 sec	2m	0.06	2.3 sec	2m
2009 With Development	0.09	4.8 sec	4m	0.08	3.5 sec	3m
2011 Background	0.06	3.3 sec	3m	0.06	2.2 sec	2m
2011 With Development	0.05	3.9 sec	3m	0.07	2.8 sec	2m
2014 Background	0.07	3.3 sec	3m	0.07	2.1 sec	2m
2014 With Development	0.11	4.9 sec	5m	0.11	3.7 sec	4m
2016 Background	0.07	3.3 sec	3m	0.07	2.2 sec	2m
2016 With Development	0.07	3.9 sec	3m	0.09	2.8 sec	3m
2026 Background	0.09	3.2 sec	4m	0.10	2.2 sec	3m
2026 With Development	0.10	3.8 sec	4m	0.12	2.7 sec	4m

Analysis of this intersection shows that it will operate with a high level of service with the addition of development traffic through to the 2030 design horizon.

Bruce Highway / Residue Storage Facility Access

The Residue Storage Facility (RSF) access will be at the existing Koncina Road intersection. This intersection currently has no additional widening for turning traffic and has an excessively wide, unsealed throat. It is a priority-controlled, three-way intersection although no traffic

control signs are installed. Traffic associated with the RSF is low volume construction traffic comprising construction staff and B-doubles with sand and rock deliveries. The RSF access will be used throughout the life of the Gladstone Pacific Nickel Project as the RSF is gradually constructed. The low turning volumes mean that the warrants for turn treatments from the Department of Main Roads' *Road Planning and Design Manual* Section 13.4.4 will reach the requirement for a short channelised right turn bay at about the design horizon (2026). However, given that a large proportion of turning vehicles will be B-doubles and hence have longer storage and deceleration requirements, a fully channelised intersection should be built.

Gladstone-Mt Larcom Road/Targinie Road/Calliope River Road

The Gladstone-Mt Larcom Road/Targinie Road/Calliope River Road intersection is a four-way priority junction with Gladstone-Mt Larcom Road forming the major road movement. SIDRA analysis results for this intersection are provided in Table 5.5.

Table 5.5 Gladstone-Mt Larcom Road/Targinie Road/ Calliope River Road – SIDRA Analysis Results

Scenarios	AM Peak			PM Peak		
	DOS	Delay	95th %le Queue	DOS	Delay	95th %le Queue
2006 Existing	0.12	4.3 sec	4m	0.07	3.8 sec	2m
2009 Background	0.15	4.3 sec	5m	0.08	3.7 sec	2m
2009 With Development	0.63	10 sec	43m	0.34	7.8 sec	19m
2011 Background	0.16	4.3 sec	6m	0.09	3.6 sec	2m
2011 With Development	0.25	4.9 sec	9m	0.10	4.0 sec	2m
2014 Background	0.19	4.4 sec	6m	0.10	3.6 sec	2m
2014 With Development	0.65	9.6 sec	45m	0.31	6.7 sec	15m
2016 Background	0.21	4.5 sec	7m	0.11	3.6 sec	2m
2016 With Development	0.34	5.4 sec	13m	0.13	4.0 sec	2m
2026 Background	0.31	5.1 sec	13m	0.14	3.6 sec	3m
2026 With Development	0.46	6.3 sec	22m	0.16	4.0 sec	3m

The analysis shows that the intersection will operate within desirable limits until 2030 with development traffic. It should be noted that with the inclusion of development traffic in the 2009 and 2014 AM scenarios, the intersection is operating with a significantly higher Degree of Saturation than the background scenarios due to the substantial volumes turning right out of Calliope River Road; however this is within acceptable limits.

Gladstone-Mt Larcom Road/Landing Road/Hanson Road

The Gladstone-Mt Larcom Road/Landing Road/Hanson Road intersection is controlled by a three way priority junction, with Landing Road and Hanson Road forming the priority movements. The results of the analysis for this intersection are presented in Table 5.6.

Table 5.6 ***Gladstone-Mt Larcom Road/Landing Road /Hanson Road – SIDRA Analysis Results***

Scenarios	AM Peak			PM Peak		
	DOS	Delay	95th %le Queue	DOS	Delay	95th %le Queue
2006 Existing	0.17	7.8 sec	7m	0.12	7.5 sec	5m
2009 Background	0.20	7.9 sec	8m	0.15	7.5 sec	6m
2009 With Development	0.51	10.3 sec	38m	0.32	9.2 sec	17m
2011 Background	0.23	7.9 sec	9m	0.16	7.6 sec	6m
2011 With Development	0.30	8.2 sec	13m	0.17	7.8 sec	7m
2014 Background	0.26	8.1 sec	11m	0.19	7.7 sec	7m
2014 With Development	0.56	10.5 sec	46m	0.34	9.0 sec	18m
2016 Background	0.28	8.1 sec	12m	0.20	7.7 sec	8m
2016 With Development	0.38	8.6 sec	19m	0.22	7.9 sec	9m
2026 Background	0.41	8.8 sec	23m	0.30	8.0 sec	13m
2026 With Development	0.52	9.5 sec	36m	0.32	8.2 sec	15m

Analysis of this intersection using the SIDRA Intersection software demonstrates that it will operate comfortably with the inclusion of development traffic for each of the scenarios tested.

Hanson Road/Reid Road

The existing Hanson Road/Reid Road intersection is of an unsignalised form, with the Reid Road leg under Give Way control. The results of the SIDRA analysis for this intersection are included in Table 5.7.

Table 5.7 ***Hanson Road/Reid Road – SIDRA Analysis Results***

Scenarios	AM Peak			PM Peak		
	DOS	Delay	95th %le Queue	DOS	Delay	95th %le Queue
2006 Existing	0.27	2.1 sec	6m	0.17	2.4 sec	5m
2009 Background	0.40	4.0 sec	19m	0.25	3.1 sec	12m
2009 With Development	1.00	17.7 sec	74m	0.44	6.4 sec	21m
2011 Background	0.50	4.5 sec	23m	0.29	3.3 sec	14m
2011 With Development	1.00	14.8 sec	76m	1.73	468 sec	1781m
2014 Background	0.71	6.3 sec	34m	0.37	3.5 sec	17m
2014 With Development	1.00	31.7 sec	106m	2.51	794 sec	2536m
2016 Background	0.88	9.2 sec	50m	0.45	3.9 sec	21m
2016 With Development	1.00	23.2 sec	99m	2.84	1213.4	3397m
2026 Background	1.00	18.1 sec	80m	1.00	11.5 sec	68m
2026 With Development	1.00	51.8 sec	149m	4.73	2100 sec	4144m

Analysis of this intersection shows that it will fail operationally without development traffic by the year 2015. However, the inclusion of development traffic will cause it to fail from 2009 onwards. A bring forwards analysis shows that Gladstone Pacific Nickel Limited would be responsible for 26% of the 2007 value of the any required remediation work to this intersection.

Using SIDRA Intersection, the intersection was tested with a single circulating lane roundabout form. The results are presented in Table 5.8.

Table 5.8 Hanson Road/Reid Road (potential form) – SIDRA Analysis Results

Scenarios	AM Peak			PM Peak		
	DOS	Delay	95th %le Queue	DOS	Delay	95th %le Queue
2009 Background	0.45	6.3 sec	30m	0.30	5.9 sec	19m
2009 With Development	0.68	11.8 sec	71m	0.37	7.5 sec	28m
2011 Background	0.48	6.2 sec	34m	0.32	5.8 sec	21m
2011 With Development	0.85	9.2 sec	124m	0.57	10.3 sec	46m
2014 Background	0.53	6.2 sec	40m	0.35	5.8 sec	24m
2014 With Development	0.59	10.0 sec	49m	0.76	12.8 sec	90m
2016 Background	0.56	6.2 sec	45m	0.38	5.8 sec	26m
2016 With Development	1.06	96.6 sec	1025m	0.78	14.1 sec	92m
2026 Background	0.72	6.3 sec	77m	0.48	5.7 sec	40m
2026 with Development	1.24	342.7 sec	3150m	1.12	103.0 sec	880m

The results in Table 5.8 show that conversion of the Hanson Road/Reid Road intersection to a single circulating lane roundabout form can cater with the addition of development traffic up to 2016, however it still fails operationally in the 2016 and at 2026 design horizon.

As a potential future mediation measure, the roundabout was analysed with a dual circulating lane form for the post development scenarios in 2016 and 2026. This is consistent with plans for ultimately four-laning Hanson Road. The analysis results for this are presented in Table 5.9.

Table 5.9 Hanson Road/Reid Road (potential dual circulating lane roundabout form) – SIDRA Analysis Results

Scenarios	AM Peak			PM Peak		
	DOS	Delay	95th %le Queue	DOS	Delay	95th %le Queue
2016 With Development	0.52	6.5 sec	36m	0.64	10.6 sec	53m
2026 With Development	0.68	6.6 sec	61m	0.75	12.8 sec	92m

The results in Table 5.9 show that an upgrade to a dual circulating lane roundabout form will allow the intersection to cope with development traffic volume scenarios to the 2026 design horizon.

Hanson Road/Red Rover Road

The intersection of Hanson Road and Red Rover Road intersection is controlled by a single circulating roundabout. Table 5.10 presents the results of the analysis on this intersection.

Table 5.10 Hanson Road/Red Rover Road – SIDRA Analysis Results

Scenarios	AM Peak			PM Peak		
	DOS	Delay	95th %le Queue	DOS	Delay	95th %le Queue
2006 Existing	0.33	3.9 sec	20m	0.30	4.9 sec	19m
2009 Background	0.38	4.0 sec	24m	0.35	5.0 sec	24m
2009 With Development	0.51	4.2 sec	37m	0.51	4.8 sec	40m
2011 Background	0.41	4.1 sec	27m	0.39	5.1 sec	27m
2011 With Development	0.62	4.6 sec	55m	0.64	4.9 sec	59m
2014 Background	0.47	4.3 sec	33m	0.44	5.2 sec	32m
2014 With Development	0.76	9.1 sec	98m	0.81	5.3 sec	100m
2016 Background	0.50	4.4 sec	37m	0.47	5.3 sec	36m
2016 With Development	0.76	10.8 sec	100m	0.81	5.5 sec	100m
2026 Background	0.67	6.5 sec	69m	0.66	5.8 sec	63m
2026 With Development	1.88	259.7 sec	1608m	1.02	35.8	619m

Though the intersection continues to operate acceptably with background volumes through to 2026, the inclusion of development traffic causes the intersection to fail in the AM peak scenario by 2026.

The intersection has been re-analysed as a dual circulating lane roundabout, the results for which are presented in Table 5.11.

Table 5.11 Hanson Road/Red Rover Road (potential form) – SIDRA Analysis Results

Scenarios	AM Peak			PM Peak		
	DOS	Delay	95th %le Queue	DOS	Delay	95th %le Queue
2026 With Development	0.78	5.1 sec	108m	0.77	5.5	88m

Analysis shows that a dual circulating roundabout performs acceptably with the inclusion of development traffic in 2026. This is consistent with plans for ultimately four-laning Hanson Road.

Hanson Road/Blain Drive/Alf O'Rourke Drive

The Hanson Road/Blain Drive/Alf O'Rourke Drive intersection is comprised of a single circulating roundabout. The SIDRA analysis summary of this intersection is provided in Table 5.12.

Table 5.12 Hanson Road/Blain Drive/Alf O'Rourke Drive – SIDRA Analysis Results

Scenarios	AM Peak			PM Peak		
	DOS	Delay	95th %le Queue	DOS	Delay	95th %le Queue
2006 Existing	0.49	5.0 sec	34m	0.34	6.8 sec	22m
2009 Background	0.54	5.1 sec	39m	0.37	6.9 sec	25m
2009 With Development	0.70	6.2 sec	73m	0.53	8.1 sec	42m
2011 Background	0.58	5.3 sec	45m	0.40	7.1 sec	27m
2011 With Development	0.84	8.5 sec	136m	0.64	9.4 sec	58m
2014 Background	0.63	5.7 sec	57m	0.44	7.3 sec	30m
2014 With Development	1.06	57.4 sec	817m	0.78	14.8 sec	96m
2016 Background	0.67	6.0 sec	68m	0.46	7.5 sec	33m
2016 With Development	1.05	56.1 sec	814m	0.76	14.2 sec	89m
2026 Background	0.89	10.2 sec	179m	0.63	9.6 sec	63m
2026 With Development	1.34	273.9 sec	3389m	1.35	128.9 sec	974m

The analysis of this intersection identifies that the introduction of development traffic will cause it to cease operating within acceptable limits by 2012. Without the inclusion of development traffic, the intersection will fail by 2024. A bring forward contribution of 42% of the 2007 value would be required for remediation works.

This intersection has been assessed in an upgraded form, with the inclusion of a left turn bypass lane from the southern leg. The results of this analysis are presented in Table 5.13.

Table 5.13 Hanson Road/Blain Drive/Alf O'Rourke Drive (potential layout) – SIDRA Analysis Results

Scenarios	AM Peak			PM Peak		
	DOS	Delay	95th %le Queue	DOS	Delay	95th %le Queue
2014 With Development	0.58	4.4 sec	50m	0.78	14.7 sec	95m
2016 Background	0.50	4.6 sec	40m	0.46	7.4 sec	33m
2016 With Development	0.58	4.4 sec	50m	0.76	14.1 sec	89m
2026 Background	0.63	4.8 sec	60m	0.63	9.5 sec	63m
2026 With Development	0.70	4.8 sec	76m	1.35	127.0 sec	962m

Analysis of the intersection in this upgraded form shows that can operate acceptably up to 2016 without the inclusion of development traffic; however by 2026 it fails operationally.

The intersection has been re-analysed as a dual circulation lane roundabout with continuous left turn slip lane from Blain Drive. The results of the SIDRA analysis for this potential future form are presented in Table 5.14.

Table 5.14 Hanson Road/Blain Drive/Alf O'Rourke Drive (potential dual circulating lane roundabout form) – SIDRA Analysis Results

Scenarios	AM Peak			PM Peak		
	DOS	Delay	95th %le Queue	DOS	Delay	95th %le Queue
2026 With Development	0.63	4.6 sec	28m	0.56	10.3 sec	44m

Analysis shows that the upgraded intersection performs acceptably with the inclusion of development traffic in 2026. This is consistent with plans for ultimately four-laning Hanson Road.

Dawson Highway/Blain Drive/Herbertson Street

The intersection of the Dawson Highway with Blain Drive and Herbertson Street is controlled by a single circulating lane roundabout. Table 5.15 presents the results of the analysis performed on this intersection.

Table 5.15 ***Dawson Highway/Blain Drive/Herbertson Street – SIDRA Analysis Results***

Scenarios	AM Peak			PM Peak		
	DOS	Delay	95th %le Queue	DOS	Delay	95th %le Queue
2006 Existing	0.34	5.0 sec	18m	0.51	7.2 sec	32m
2009 Background	0.37	5.1 sec	20m	0.58	7.8 sec	41m
2009 With Development	0.44	5.2 sec	24m	0.66	9.5 sec	55m
2011 Background	0.40	5.2 sec	22m	0.63	8.3 sec	49m
2011 With Development	0.50	5.3 sec	30m	0.81	14.1 sec	92m
2014 Background	0.44	5.3 sec	25m	0.71	9.4 sec	63m
2014 With Development	0.57	5.5 sec	38m	1.07	85.0 sec	580m
2016 Background	0.46	5.4 sec	27m	0.77	10.6 sec	77m
2016 With Development	0.59	5.5 sec	40m	1.13	127.0 sec	945m
2026 Background	0.59	5.9 sec	41m	1.18	150.4 sec	1207m
2026 With Development	0.71	6.6 sec	65m	1.70	576.7 sec	3737m

The analysis results show that the intersection will fail to operate acceptably by 2011 with, and 2018 without, the inclusion of development traffic volumes. The bring forward responsibility of the development proponent would be 27% of the value of any required works in 2007.

The intersection has also been analysed with the simulation of metering on the Blain Drive approach. The results for this modified intersection form are provided in Table 5.16.

Table 5.16 ***Dawson Highway/Blain Drive/Herbertson Street (one metered approach) – SIDRA Analysis Results***

Scenarios	AM Peak			PM Peak		
	DOS	Delay	95th %le Queue	DOS	Delay	95th %le Queue
2014 With Development	0.57	5.1 sec	38m	0.67	8.7 sec	57m
2016 Background	0.46	5.0 sec	27m	0.62	6.8 sec	44m
2016 With Development	0.59	5.2 sec	39m	0.71	9.1 sec	64m
2026 Background	0.59	5.4 sec	40m	0.82	10.0 sec	93m
2026 With Development	0.71	6.2 sec	65m	0.99	33.2 sec	241m

The results in Table 5.16 show that the metering of the Blain Drive approach will allow the intersection to operate with the inclusion of development traffic until 2016, however not in 2026.

Table 5.17 presents the results of further analysis which included metering on both the Blain Drive approach and the northern Dawson Highway approach.

Table 5.17 ***Dawson Highway/Blain Drive/Herbertson Street (two metered approaches) – SIDRA Analysis Results***

Scenarios	AM Peak			PM Peak		
	DOS	Delay	95th %le Queue	DOS	Delay	95th %le Queue
2026 With Development	0.71	6.1 sec	62m	0.80	12.2 sec	89m

The analysis confirms that the metering of both the western and northern approach legs will allow the intersection to operate successfully to 2026 with the inclusion of development traffic volumes.

Dawson Highway/Philip Street/Shopping Centre access

The intersection of the Dawson Highway with Philip Street and the shopping centre access is currently of a dual circulating roundabout form. The SIDRA analysis results of this intersection are presented in Table 5.18.

Table 5.18 ***Dawson Highway/Philip Street/Shopping Centre access – SIDRA Analysis Results***

Scenarios	AM Peak			PM Peak		
	DOS	Delay	95th %le Queue	DOS	Delay	95th %le Queue
2006 Existing	0.58	7.7 sec	38m	0.69	9.6 sec	55m
2009 Background	0.64	8.2 sec	49m	0.82	11.3 sec	82m
2009 With Development	0.71	9.7 sec	64m	0.86	12.8 sec	101m
2011 Background	0.68	8.6 sec	58m	0.92	14.2 sec	131m
2011 With Development	0.83	12.5 sec	102m	1.00	26.5 sec	322m
2014 Background	0.76	9.5 sec	75m	1.10	48.9 sec	750m
2014 With Development	1.02	42.2 sec	407m	1.14	102.9 sec	999m
2016 Background	0.81	10.3 sec	91m	1.21	91.4 sec	1371m
2016 With Development	1.05	68.7 sec	663m	1.18	155.3 sec	1229m
2026 Background	1.08	95.4 sec	1011m	1.43	396.5 sec	2733m
2026 With Development	1.46	416.8 sec	3603m	1.67	533.3 sec	4464m

The results of analysis of this intersection indicate that the intersection will be operating beyond acceptable limits by 2011 both with and without development traffic volumes. It is noted the contribution of development traffic does not represent a significant detriment to performance of the intersection, rather it provides a small contribution to an existing deficiency.

Dawson Highway/Don Young Drive

The intersection of Dawson Highway with Don Young Drive is currently a three way priority junction, with Don Young Drive under Give Way control. Table 5.19 presents the results of the analysis performed for this intersection.

Table 5.19 Dawson Highway/Don Young Drive – SIDRA Analysis Results

Scenarios	AM Peak			PM Peak		
	DOS	Delay	95th %le Queue	DOS	Delay	95th %le Queue
2006 Existing	0.19	1.5 sec	2m	0.17	2.3 sec	5m
2009 Background	0.22	1.5 sec	2m	0.20	2.4 sec	7m
2009 With Development	0.22	1.5 sec	2m	0.20	2.5 sec	7m
2011 Background	0.23	1.5 sec	2m	0.22	2.5 sec	8m
2011 With Development	0.24	1.6 sec	2m	0.22	2.6 sec	8m
2014 Background	0.26	1.6 sec	2m	0.27	2.7 sec	10m
2014 With Development	0.27	1.6 sec	2m	0.28	2.8 sec	11m
2016 Background	0.28	1.6 sec	3m	0.31	2.9 sec	12m
2016 With Development	0.29	1.7 sec	3m	0.31	2.9 sec	13m
2026 Background	0.37	1.9 sec	5m	0.57	4.2 sec	28m
2026 With Development	0.38	1.9 sec	5m	0.57	4.2 sec	28m

The analysis of this intersection shows that the addition of development traffic has no discernable impact on the operation of the intersection, and that it will operate comfortably for all scenarios tested.

5.5 Mid-Block Impacts

The Gladstone Pacific Nickel Project has also been assessed for the ability of the existing mid-block sections of the road network to absorb the expected traffic generation, in particular along Hanson Road.

Hanson Road is operating under increasingly urban conditions with a lower proportion of through traffic and with traffic patterns becoming increasingly dominated by work travel. Previous mid-block capacity analysis evaluated Hanson Road for a rural operating environment, which considers daily two-way traffic volumes and lower duplication thresholds. The Department of Main Roads and Calliope Shire Council have requested that Hanson Road be evaluated for an urban operating environment, which considers peak hour by-direction traffic volumes and higher mid-block capacities.

The process to investigate mid-block capacity requirements for an urban operating environment is as follows:

- estimate peak hour traffic volumes by direction from traffic generation and distribution assumptions;
- AUSTROADS Guide to Traffic Engineering *Practice Part 2 Roadway Capacity* and AUSTROADS *Urban Road Design* suggest that the urban mid-block capacity of a road with interrupted traffic flow is 900 vehicles per hour (vph) per lane for a single lane in that direction or 1,900vph for two lanes in the same direction. These capacities correspond to a very high level of traffic operating conditions;
- AUSTROADS Guide to Traffic Engineering *Practice Part 2 Roadway Capacity* Table 7.2 provides Level of Service (LOS) values for different average travel speeds;
- the Bureau of Public Roads' (BPR) industry-accepted speed-flow equation is used along with the estimated traffic volumes and mid-block capacity to calculate the average travel speed by direction for the different sections of road under consideration;
- the AUSTROADS LOS values for the estimated average travel speeds are then used to allocate a LOS to each section of road, by direction. Typically in urban environments, LOS D and better is considered adequate for the peak hour in the design year. Any LOS below this will necessitate additional mid-block capacity.

From this analysis, the mid-block requirements for the study area and assessment timeframe have been determined. The mid-block sections for which an upgrade is required are along Hanson Road, which is summarised in Table 5.20.

Table 5.20 ***Mid-Block Lane Requirements – Hanson Road***

Location	Direction	Current Configuration	Required Configuration	Upgrade Required By
Lord Street to Alf O'Rourke Drive	Eastbound	1 Lane	1 Lane	N/A
Lord Street to Alf O'Rourke Drive	Westbound	1 Lane	1 Lane	N/A
Blain Drive to Red Rover Road	Eastbound	1 Lane	1 Lane	N/A
Blain Drive to Red Rover Road	Westbound	1 Lane	2 Lanes	2020
Red Rover Road to Reid Road	Eastbound	1 Lane	1 Lane	N/A
Red Rover Road to Reid Road	Westbound	1 Lane	2 Lanes	2017
Reid Road to Calliope River Rd	Eastbound	1 Lane	1 Lane	N/A
Reid Road to Calliope River Rd	Westbound	1 Lane	1 Lane	N/A
West of Calliope River Road	Eastbound	1 Lane	1 Lane	N/A
West of Calliope River Road	Westbound	1 Lane	1 Lane	N/A

As shown in Table 5.20, the westbound section of Hanson Road between Alf O'Rourke Drive and Reid Road will require an additional traffic lane by 2026. This directional imbalance is due to the AM and PM peak period trends with the AM peak period typically experiencing higher traffic volumes than the PM.

During the height of the Stage 2 construction period, which is concurrent to Stage 1 operation, westbound traffic volumes are likely to reach the threshold requirement for an additional traffic lane between Red Rover Road and Reid Road. However, this threshold is met for a short duration during the peak of the construction program and is then not met with permanent traffic volumes until 2017. Given the short-term nature of the traffic volumes in 2014, it is considered that duplication of this section of road is not required until 2017.

It should be noted that the requirements for additional mid-block capacity are similar to the requirements determined in the Draft EIS when Hanson Road was assessed as a rural road environment. It should also be noted that the additional mid-block capacity requirements tie in with the additional intersection capacity requirements. This reflects the robustness of the mid-block assessment.

While the assessment shows that two eastbound lanes are not required to accommodate the additional traffic generated by the Gladstone Pacific Nickel Project, the two westbound lanes will be a requirement of Gladstone Pacific Nickel Limited as they would not be needed otherwise. It is also considered that these sections of Hanson Road will ultimately need to be two lanes in each direction.

6.0 REVISED PAVEMENT IMPACT ASSESSMENT

6.1 Pavement Assessment Approach

For the revised pavement impact assessment, traffic relating to the construction of the various pipelines has not been included in assessment volumes and thus no additional scoping test has been undertaken. Construction traffic for the pipelines will occur sporadically over the project assessment years and will be dealt with by specific management plans.

Due to the location of the AMSUL plant and the distribution of materials between it and the refinery, the segment of assessment along Hanson Road was extended eastwards from a point 1.9km east of Blain Drive to the Port Access Road intersection (3.0km east of Blain Drive). Using DMR supplied pavement condition data the base roughness for this segment was updated accordingly.

6.2 State Controlled Road Network

Table 6.1 shows a summary of the bring forward levels on the State Controlled Road network as a result of the proposed development. A more detailed summary is provided at Appendix C.

Table 6.1 ***Summary of Bring Forward Costs***

Road	Section	Direction	Rehabilitation Year		Bring Forward (%)
			No Development	With Development	
Gladstone – Mt Larcom Road	Bruce Highway – Targinie Road	Southbound	>2027	>2027	n/a
		Northbound	>2027	>2027	n/a
	Targinie Road – Landing Road	Southbound	>2027	>2027	n/a
		Northbound	>2027	2026.7	n/a
Hanson Road	Landing Road – Reid Road	Westbound	2022.7	2022.6	n/a
		Eastbound	2022.7	2022.3	n/a
	Reid Road – Red Rover Road	Westbound	2020.0	2019.8	n/a
		Eastbound	2020.0	2019.4	n/a
	Red Rover Road – Blain Drive	Westbound	2018.0	2017.8	n/a
		Eastbound	2018.0	2017.5	n/a
	Blain Drive – Port Access Road	Westbound	2021.7	2021.6	n/a
		Eastbound	2021.7	2021.2	n/a
Dawson Highway	West of Don Young Drive	Southbound	2026.0	2026.0	n/a
		Northbound	2026.0	2026.0	n/a
	North of Bruce Highway	Southbound	>2027	>2027	n/a
		Northbound	>2027	>2027	n/a

As shown in Table 6.1, for no road segments of Gladstone-Mt Larcom Road and Hanson Road will the increased heavy vehicle loading due to the proposed Gladstone Pacific Nickel Project have a significant impact on the timing (1 year or more) for pavement rehabilitation works on the State Controlled Network.

The obligations of the Gladstone Pacific Nickel Project towards routine maintenance of the State Controlled Road network has been calculated by assigning the relative responsibility to the refinery based on the percentage increase in ESA's on each road segment through to 2026. This has been reported as a percentage for each link and each year of the development until 2026, and can be found at Appendix C. The average of these percentages has been calculated and is reported in Table 6.2.

Table 6.2 ***Average Development Impact - Maintenance***

Road	Section	Average Impact (%)
Gladstone – Mt Larcom Road	Bruce Highway – Targinie Road	4.8%
Gladstone – Mt Larcom Road	Targinie Road – Landing Road	3.4%
Hanson Road	Landing Road – Reid Road	2.2%
Hanson Road	Reid Road – Red Rover Road	4.3%
Hanson Road	Red Rover Road – Blain Drive	3.9%
Hanson Road	East of Blain Drive	3.2%
Dawson Highway	West of Don Young Drive	0.0%
Dawson Highway	North of Bruce Highway	0.2%

Due to the number of factors that influence the size of the contribution required by the refinery as a result of pavement maintenance and intersection upgrades, it is recommended that Gladstone Pacific Nickel Limited enter into an infrastructure agreement with Main Roads.

To provide guidance to the level of contribution, the maintenance assessment at Appendix C shows that the refinery would be responsible for a contribution of approximately $280,000 for activities through to 2026.

7.0 CONCLUSIONS

The traffic impact assessment that formed part of the Draft EIS for the Gladstone Pacific Nickel Project has been updated to reflect changes in project processes due to ongoing refinement and to address comments raised by the Department of Main Roads and Calliope Shire Council. These revisions have resulted in changes to the expected traffic impacts and, as a result, changes to the proposed traffic mitigation measures to ensure the surrounding road network can adequately accommodate the additional nickel refinery traffic. These mitigation measures are outlined below.

7.1 Intersection Requirements

The intersection of Hanson Road and Reid Road will need to be upgraded by 2009 with the addition of development traffic volumes. The existing intersection form would fail by 2015 without the inclusion of development traffic and Gladstone Pacific Nickel would be responsible for a bring forward contribution of 26% of the value of required works in 2007. Analysis shows that a single circulating lane roundabout would operate adequately in the interim with a dual circulating lane roundabout ultimately required by 2026. Upgrading the intersection to a dual circulating lane roundabout will provide adequate traffic capacity for the design life and would be consistent with the future duplication of Hanson Road. It is also consistent with the Department of Main Roads potential implementation of a grade separated, dual circulating lane roundabout at this location to accommodate the additional traffic requirements of other significant developments in the region.

The Hanson Road/Red Rover Road intersection will require upgrading by 2022 to accommodate the additional traffic demands of the refinery. The intersection would operate adequately beyond 2026 without the addition of refinery traffic. Upgrading the intersection to a dual circulating lane roundabout will allow it to operate acceptably to the 2026 design horizon and would be consistent with the ultimate duplication of Hanson Road.

The Hanson Road/Blain Drive intersection will require similar works by 2012 to mitigate the impacts of the refinery traffic. The addition of development traffic can be compensated for by the provision of a bypass lane from the southern leg, though the requirements for additional lanes on carriageways approaching the intersection mean a dual circulating lane roundabout form is more appropriate. Development traffic brings forward the required upgrade works by 12 years, with a bring forward responsibility of 42% of the value of the works in 2007.

The Residue Storage Facility (RSF) access from the intersection of Bruce Highway and Koncina Road will require that intersection to be upgraded to a fully channelised intersection to safely accommodate turning B-doubles.

Development traffic will trigger the requirement to upgrade the intersection of the Dawson Highway with Blain Drive by 2013. Though metering of only the western and northern legs would be required to cater for development traffic through to the design horizon, it is believed that signalisation works on all four legs are currently, or soon to be, undertaken as part of another development's approval process. A bring forward responsibility of 18% of the value of the works in 2007 has been calculated, as the intersection would fail with background traffic volumes only by 2018.

7.2 Mid-Block Requirements

Hanson Road will require additional westbound lanes by 2026 between Blain Drive and Reid Road, however, it is recognised that this section of road will eventually require four-laning. The Department of Main Roads 2007-08 to 2011-12 RIP (Roads Implementation Program) details a funding allocation for the provision of overtaking lanes along Hanson Road between the Calliope River and Reid Road. This provision of these overtaking lanes would contribute toward the additional lane requirement for Hanson Road.

7.3 Pavement Requirements

The additional traffic impacts placed on road pavement sections in the area of assessment by the development will not bring forward the need for rehabilitation works by more than a year on Hanson Road, Gladstone-Mt Larcom Road or the Bruce Highway.

7.4 Infrastructure Requirements

Due to the number of factors that influence the size of the contribution required by the refinery as a result of pavement maintenance, rehabilitation and intersection upgrades, it is recommended that Gladstone Pacific Nickel Limited enter into an infrastructure agreement with the Department of Main Roads.

7.5 Summary of Proposed Traffic Mitigation Measures

Table 7.1 summarises the revised mitigation measures recommended as a result of this updated traffic impact assessment.

Table 7.1 ***Revised Traffic Mitigation Measures***

Location	Original Recommendation	Revised Recommendation	Explanation
Gladstone-Mt Larcom Road/Targinie Road Intersection	2009 background volumes warrant channelisation of left turn on northern leg	No works required	Intersection has been upgraded since the previous assessment
Bruce Highway/Koncina Road Intersection	No works required	Upgrade intersection to fully channelised to safely accommodate turning B-doubles	Revised plans to gain access to RSF
Hanson Road/Reid Road Intersection	Upgrade to single circulating lane roundabout with east-west bypass lane by 2009 OR dual circulating lane roundabout	Upgrade to dual circulating lane roundabout by 2009 to support inclusion of development traffic	No change from previous assessment
Hanson Road/Red Rover Road Intersection	No works required	Upgrade to dual circulating lane roundabout by 2022 to support inclusion of development traffic	Revised traffic volumes trigger requirement for upgrade works within the assessment period
Hanson Road/Blain Drive/Alf O'Rourke Drive Intersection	Upgrade to dual circulating lane roundabout by 2009 to support inclusion of development traffic	Upgrade to dual circulating lane roundabout by 2012 to support inclusion of development traffic	Revised traffic volumes push back requirement for upgrade works
Dawson Highway/Blain Drive Intersection	Signalise by 2014 to support inclusion of development traffic	Meter roundabout approaches by 2013 to support inclusion of development traffic	Analysis has shown the complete conversion to signalised form is not required
Gladstone-Mt Larcom Road between Calliope River Road and Landing Road	No works required	No works required	Pavement rehabilitation is not triggered in assessment period
Hanson Road between Landing Road and Reid Road	No works required	No works required	Pavement rehabilitation is not triggered in assessment period
Hanson Road between Reid Road and Red Rover Road	Provide overtaking lanes by 2009 to support inclusion of development volumes	Provide additional westbound lane by 2017	Revised traffic volumes trigger an additional westbound lane.

Table Cont…

Location	Original Recommendation	Revised Recommendation	Explanation
Hanson Road between Red Rover Road and Blain Drive	Provide overtaking lanes by 2011 to support inclusion of development volumes	Provide additional westbound lane by 2020	Revised traffic volumes trigger an additional westbound lane.
Hanson Road between Blain Drive and Port Access Road	No works required	No works required	Pavement rehabilitation is not triggered in assessment period

Appendix A

Plans

PAM Route
Acid Terminal
Limestone Pipeline Option
Reclaim Area
Ammonium Sulphate Shed
Sulphuric Acid Pipeline
PORT
CURTIS
LANDING ROAD
Landing Road & Gladstone - Mt Larcom Road
Reid Road & Hanson Road
HANSON ROAD
Hanson Road & Blain Drive
Hanson Road & Red Rover Road
BLAIN DRIVE
RED ROVER ROAD
Dawson Highway & Blain Drive
PHILIP STREET
Dawson Highway & Philip Street
DON YOUNG DRIVE
DAWSON HIGHWAY
Dawson Highway & Don Young Drive
Bruce Highway & Gladstone - Mt Larcom Road
BRUCE HIGHWAY
GLADSTONE MOUNT LARCOM ROAD
TARGINIE ROAD
Targinie Road & Gladstone - Mt Larcom Road
CALLIOPE RIVER ROAD
156
157
158
159
160
161
162
163
164
165
166
167
168
169
170
171
172
173
174
175
176
177
178
179
180
Thickener Pad
BRUCE HIGHWAY
Bruce Highway & Calliope River Road
0
1500
3000
metres

LEGEND

- Existing Rail Line
- Rail Freight - Mt Miller
- Discreet Freight - Auckland Point
- RSF Access Road
- Road Upgrades Required
- Kilometre Post
- Nickel Slurry Pipeline
- Sulphuric Acid Pipeline
- Residue Pipeline
- Alternate Residue Pipeline
- GPNL Conveyor & Seawater Pipeline
- PAM Route
- GPNL - Limestone Pipeline Options
- GPNL Refinery - Cadastral Boundary
- Reclaim Area C
- GPNL Residue Storage Facility S
- GPNL - Lot 52 on Plan CTN 198
- GSDA Boundary
- Bruce's Camp
- CEO Identified Road Intersection 'Hotspots'

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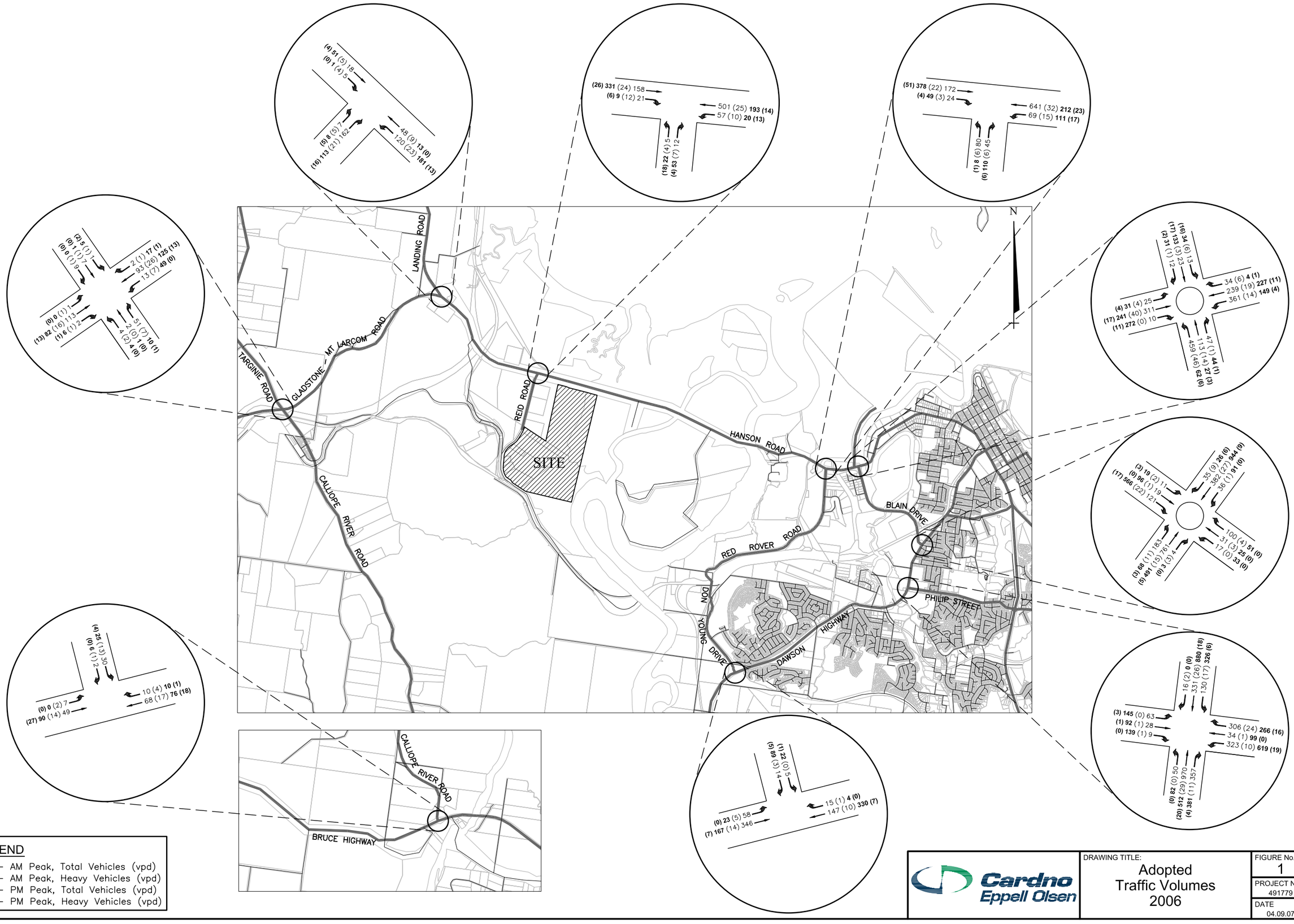
File Path: Z:\clients\GladstonePacificNickel\Slurry_Pipeline\workspaces\AS_GPN_MainRoads_Aug07.wor

Appendix B

Traffic Volumes



LEGEND

6 – AM Peak, Total Vehicles (vpd)
(19) – AM Peak, Heavy Vehicles (vpd)
6 – PM Peak, Total Vehicles (vpd)
(19) – PM Peak, Heavy Vehicles (vpd)

Cardno Eppell Olsen

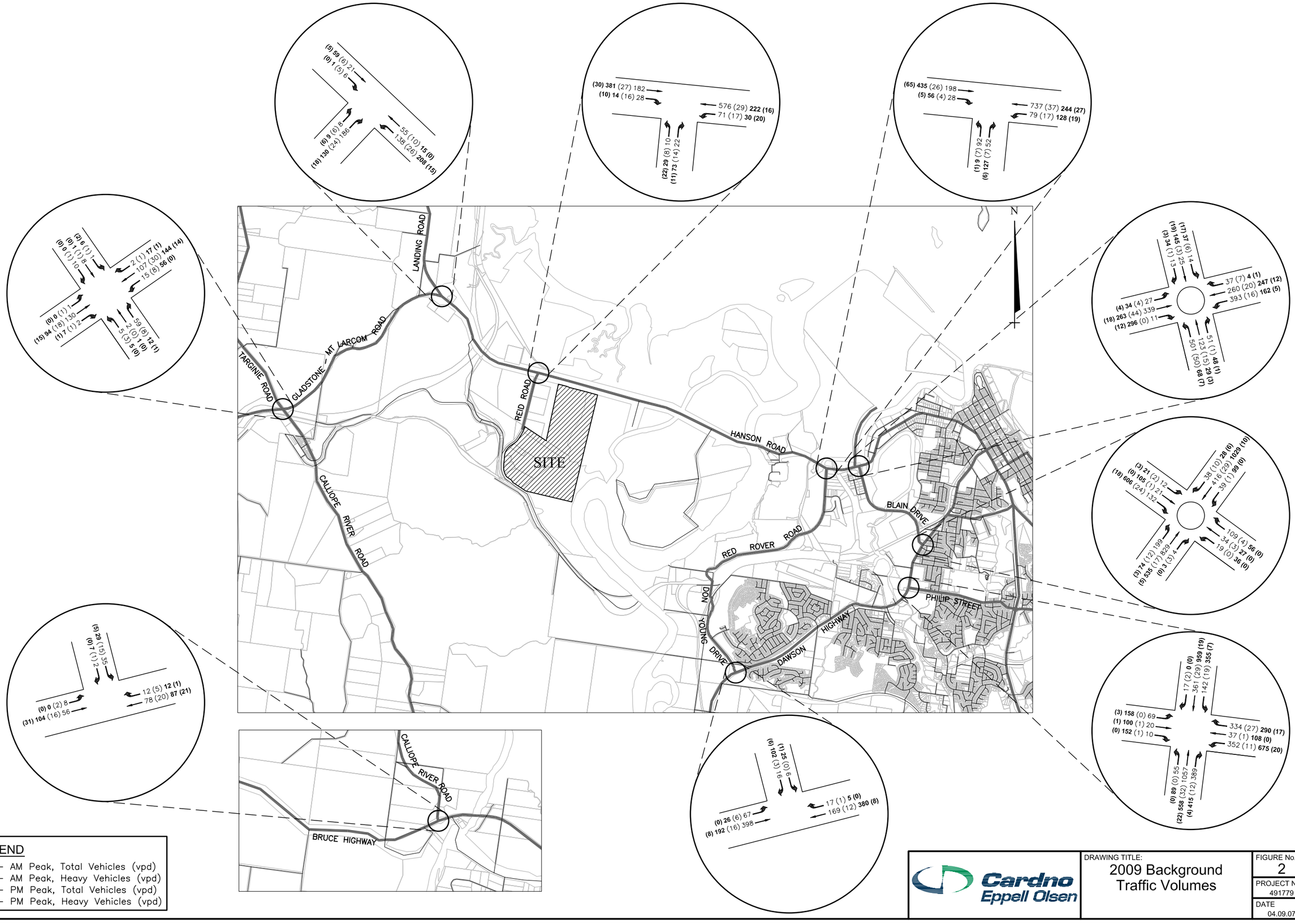
DRAWING TITLE: Adopted Traffic Volumes 2006

FIGURE No. 1

PROJECT No. 491779

DATE 04.09.07

FILE NAME: X:/ 491779_Volumes.DWG



LEGEND

6 – AM Peak, Total Vehicles (vpd)
(19) – AM Peak, Heavy Vehicles (vpd)
6 – PM Peak, Total Vehicles (vpd)
(19) – PM Peak, Heavy Vehicles (vpd)

Cardno Eppell Olsen

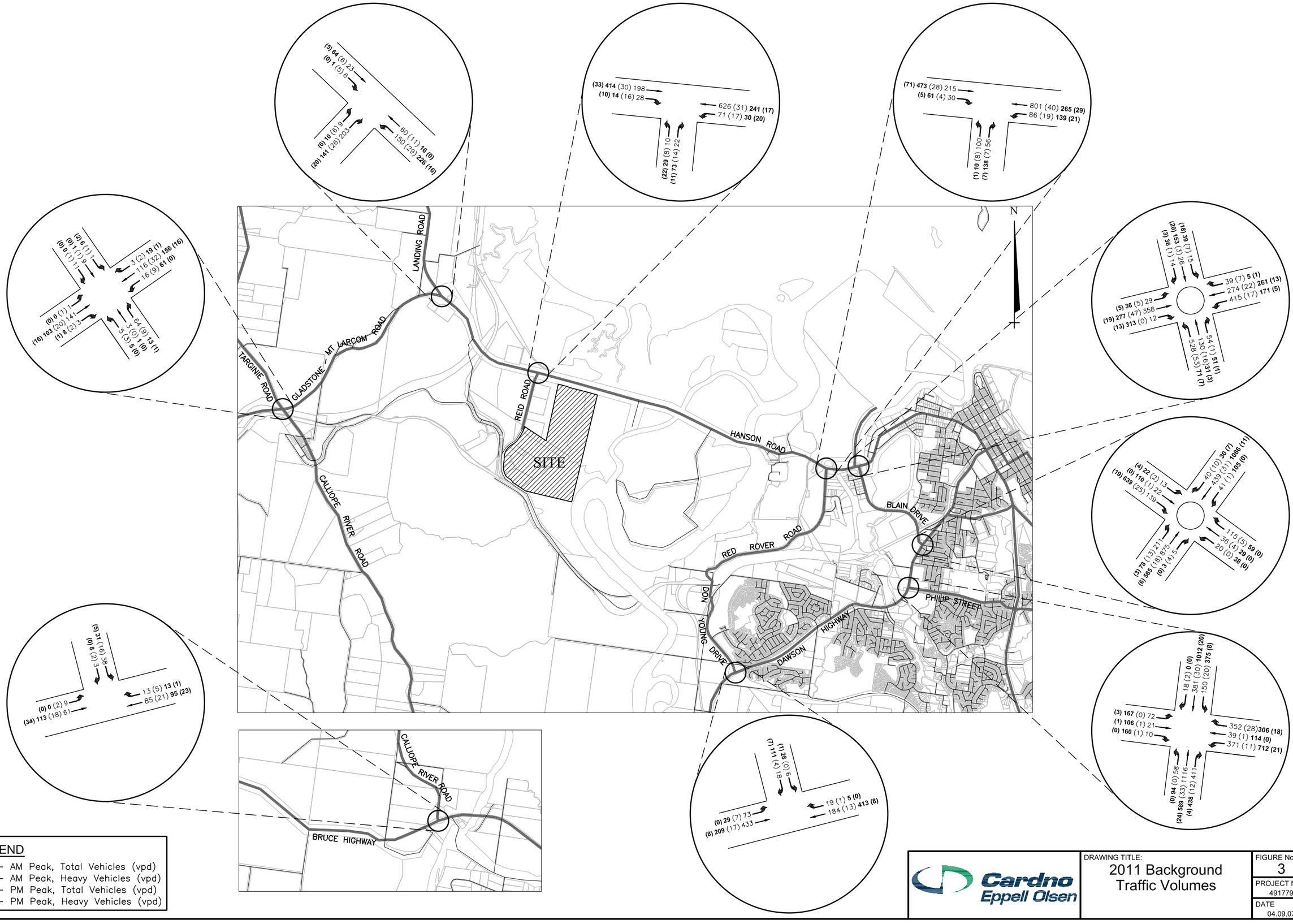
DRAWING TITLE: 2009 Background Traffic Volumes

FIGURE No. 2

PROJECT No. 491779

DATE 04.09.07

FILE NAME: X:/ 491779_Volumes.DWG



LEGEND

6 – AM Peak, Total Vehicles (vpd)
(19) – AM Peak, Heavy Vehicles (vpd)
6 – PM Peak, Total Vehicles (vpd)
(19) – PM Peak, Heavy Vehicles (vpd)

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DRAWING TITLE: 2011 Background Traffic Volumes

FIGURE No. 3

PROJECT No. 491779

DATE 04.09.07

FILE NAME: X:/ 491779_Volumes.DWG

LEGEND

6 – AM Peak, Total Vehicles (vpd)
(19) – AM Peak, Heavy Vehicles (vpd)
6 – PM Peak, Total Vehicles (vpd)
(19) – PM Peak, Heavy Vehicles (vpd)

Cardno Eppell Olsen

DRAWING TITLE:
2014 Background Traffic Volumes

FIGURE No. 4
PROJECT No. 491779
DATE 04.09.07

FILE NAME: X:/ 491779_Volumes.DWG