Pacific Highway / Italia Road Intersection

Transport Impact Assessment

Boral Resources (NSW) Pty Ltd

02 August 2024

→ **The Power of Commitment**

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Contents

Table index

Figure index

Appendices

1. Introduction

1.1 Background and project overview

Boral Resources (NSW) Pty Ltd (Boral) acts on behalf of Eagleton Rock Syndicate (Eagleton) and Australian Resource Development Group Pty Limited (ARDG) (collectively referred to as the 'quarry operators') in submitting a development application (DA) to Port Stephens Council (Council), pursuant to Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act), for proposed upgrades to the Italia Road / Pacific Highway intersection (the proposed development).

The proposed development involves safety upgrades to the intersection of Italia Road and Pacific Highway, including the following:

– Construction of a dedicated left-turn northbound acceleration lane from Italia Road onto the Pacific Highway.
– Widening of the existing bridge over the Balickera Canal (to accommodate the northbound acceleration lane).
– Lengthening of the northbound deceleration lane into Italia Road.

All works are proposed to be undertaken within the existing road reserve.

1.2 Related development

Boral has consulted extensively with Transport for NSW (TfNSW) regarding access to the Pacific Highway from Italia Road. As a result, and in conjunction with two other proposed quarry operators using Italia Road (Australian Resource Development Group [ARDG] and Eagleton Rock Syndicate [ERS]), TfNSW has accepted in-principle a proposal by the three parties to improve road safety at the existing Italia Road and Pacific Highway intersection.

Following detailed consultation during 2022 between TfNSW, Boral, ARDG, ERS and Port Stephens Council, it has been determined that a separate Development Application will be lodged by Boral for an upgrade of the existing Italia Road-Pacific Highway intersection to meet TfNSW requirements.

The traffic generation projections for a proposed Boral expansion are not included in this report, given that the Scoping Report for this project had yet to be submitted to the Department of Planning and Environment.

1.3 Purpose of this report

GHD was engaged by Boral to prepare a Transport Impact Assessment (TIA) to support the upgrade of the intersection of Italia Road and Pacific Highway as described above.

1.4 Scope and limitations

This report has been prepared by GHD for Boral Resources (NSW) Pty Ltd and may only be used and relied on by Boral Resources (NSW) Pty Ltd for the purpose agreed between GHD and Boral Resources (NSW) Pty Ltd.

GHD otherwise disclaims responsibility to any person other than Boral Resources (NSW) Pty Ltd arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer Section 1.5 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Boral Resources (NSW) Pty Ltd and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

1.5 Assumptions

This TIA was developed based on the following assumptions developed with Boral, as well as other assumptions documented within this report:

– Over the next 10 years the Pacific Highway may experience 20% growth to the through traffic volumes.
– The traffic generation projections for the Stone Ridge Quarry and the Eagleton Quarry are from previous reports as listed in Section 6.
– For the purposes of this assessment, it has been assumed that all material is transported south of the site to represent a 'worst case' scenario for access to the Pacific Highway.

2. Existing conditions

2.1 Site location

Boral's Seaham Quarry is located on the southern side of Italia Road in Balickera, to the east of the township of Seaham and to the north of Newcastle. The Seaham Quarry is a primary source of hard rock for aggregate products used in the Hunter and Port Stephens regions of NSW.

The area to the south of the Seaham Quarry is proposed by ERS to be developed as a quarry known as the 'Eagleton Quarry'. On the northern side of Italia Road is the Wallaroo State Forrest, a portion of which is proposed to be developed into a new quarry by ARDG, the 'Stone Ridge Quarry'. In addition to these proposed quarries, the site is surrounded by a recreational motorway and a paintball facility. The nearest residential lots are located approximately 1 km to the northwest of the site on Italia Road, as well as approximately 1.5 km to the southeast of the site adjacent to the Pacific Highway. Each of these lots are low density semi-rural in nature.

The Seaham Quarry and both proposed quarries are accessed from Italia Road, which connects to Pacific Highway.

An aerial view of the site is provided below in Figure 2.1, illustrating the location of the quarries in relation to the external road network.

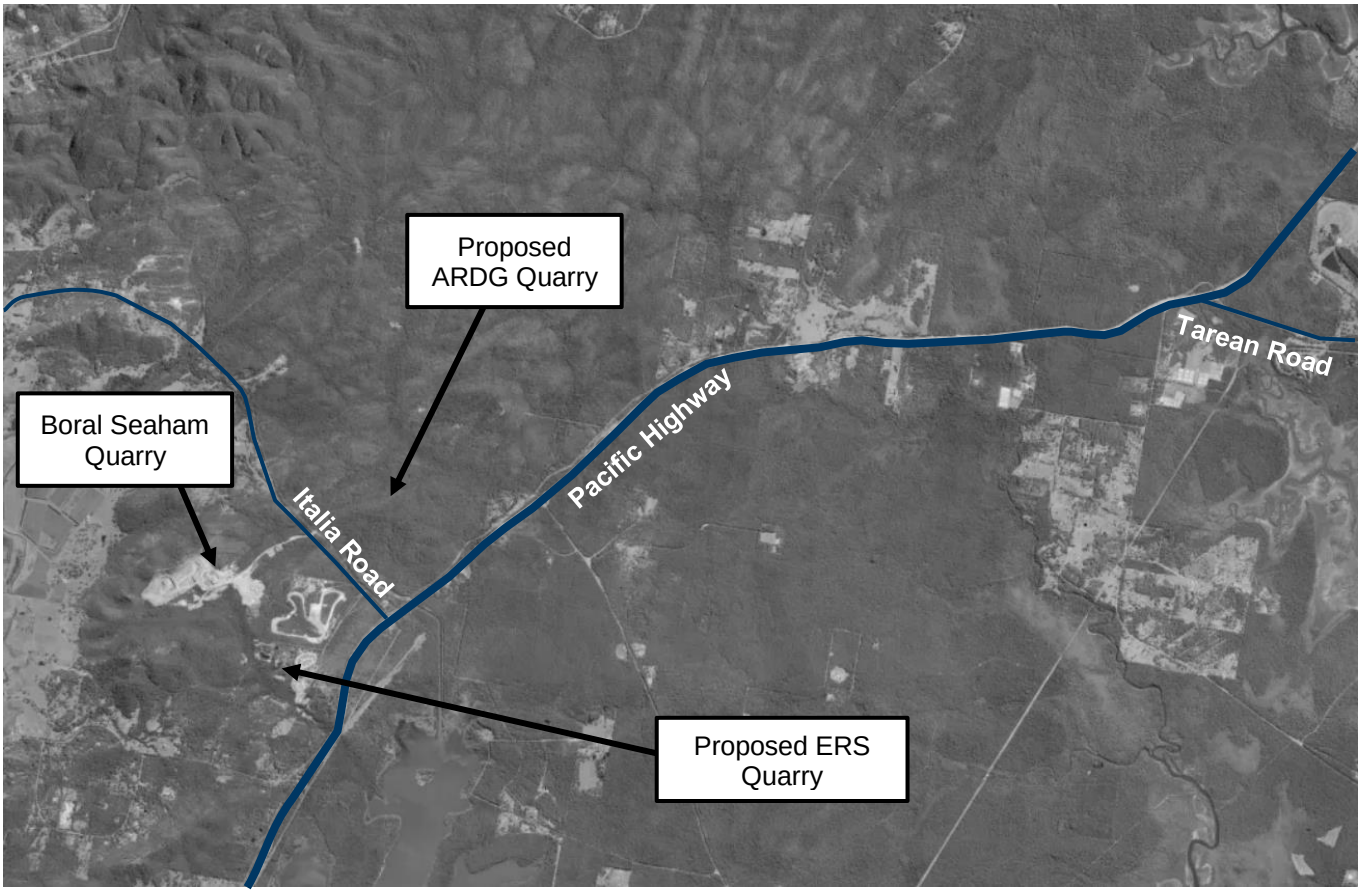


Figure 2.1 Existing site

Image source: MetroMap, accessed June 2022

2.2 Road network

2.2.1 Pacific Highway

The Pacific Highway is an arterial road generally aligned north-south, which runs along the east coast of Australia between Sydney and Brisbane. The Pacific Highway is a strategic freight corridor along the east coast and is accordingly approved for use by vehicles including 25/26 m B-doubles without specific permit conditions.

The Pacific Highway has an average daily traffic volume of approximately 15,000-16,000 vehicles based on actual peak hour traffic count data factored up to a daily estimate (two-way northbound and southbound combined) with around 2,000 of those being trucks.

Publicly available daily traffic count data is highly variable for the Pacific Highway, with no data available near this location. The latest 7-day count data at Twelve Mile Creek from 2024 shows southbound only traffic volumes of around 12,000 vehicles and at Taree, some 25,000 vehicles two way per day in 2024. Over the last 3 years since the pandemic ended, the Pacific Highway traffic volumes have seen approximately 1-2% growth per annum based on historic traffic volume data published by TfNSW.

Publicly available daily traffic count data is highly variable for the Pacific Highway, with no recent data available near this location. The latest 7-day count data at Twelve Mile Creek from 2018, shows southbound only traffic volumes of around 10,700 vehicles and at Taree, some 30,000 vehicles two way per day in 2023. Over the last 7 years, the Pacific Highway traffic volumes have seen approximately 2-3% growth per annum based on historic traffic volume data published by TfNSW.

The Pacific Highway is a divided carriageway road with two to three lanes in each direction. In this regard, two lanes are provided in each direction adjacent to Italia Road, with the acceleration lane in the southbound direction from Italia Road providing a third lane for approximately 1.2 km. Sealed shoulders are provided on either side of the Highway with a width of 2.2-2.5 m, allowing for vehicles to pull over if required.

No car parking or bicycle lanes are provided along the Pacific Highway in the vicinity of the site. A posted speed limit of 100 km/h applies in the vicinity of the site, reducing to 60 km/h through towns.

2.2.2 Italia Road

Italia Road is a local road generally runs northwest from the Pacific Highway for approximately 8.5 km to the intersection with East Seaham Road.

At the southeast end of Italia Road, the Seaham Quarry, Ringwood Park Motor Complex and Hunter Valley Paintball are located on the southern side of the road while the Wallaroo Forrest is located on the northern side. To the northwest end of Italia Road, either side of the road is occupied by low density/semi-rural residential lots.

Italia Road is fully sealed and provides one traffic lane in each direction. No parking or bicycle lanes are provided along the length of Italia Road. A posted speed limit of 90 km/h applies to Italia Road however this drops to 60 km/h approximately 130 m from the Pacific Highway.

2.2.3 Tarean Road

Tarean Road is a Council controlled local road which runs generally east-west through the town of Karuah, linking to the Pacific Highway at each end. The southern interchange at Pacific Highway provides for access to and from Tarean Road for areas south and west of the interchange only.

Tarean Road is configured as a two-lane two-way undivided road, with sealed shoulders. Furthermore, Tarean Road has a posted speed limit of 80 km/h near the Pacific Highway, reducing to 60 km/h through Karuah and at the Highway merge points.

No provision for car parking or cycle lanes is provided in the vicinity of the Pacific Highway.

2.3 Sustainable transport

Noting the rural nature of the area, there are currently no public transport services which service the site. Furthermore, no bicycle lanes or pedestrian/shared paths are provided along Italia Road, the Pacific Highway or any of the surrounding road network. As such, all access to the site and the surrounding land uses is typically undertaken by private vehicle.

It is noted that bus services for four schools have been identified (Irrawang Public School, Irrawang High School, Hunter River High School and Raymond Terrace Public School) with routes along Italia Road.

2.4 Traffic volumes

2.4.1 Italia Road

GHD commissioned Matrix Traffic and Transport Data to undertake two 7-day tube counts on Italia Road, commencing 14 June 2022. The locations of the tube counters are shown in Figure 2.2.

Figure 2.2 Tube counter locations

Image source: MetroMap, accessed June 2022

Based on the tube count results, Italia Road carries approximately 1376 vehicles per day on weekdays, including approximately 108 vehicles per hour in the AM peak and approximately 114 vehicles per hour in the PM peak. Heavy vehicles make up approximately 20-30% of the traffic stream.

The hourly traffic volumes surveyed at each counter are shown below in Figure 2.3 and Figure 2.4, illustrating the split between eastbound and westbound movements, whereby traffic peaks slightly later and more intensely in the eastbound direction. Furthermore, the curves for heavy vehicles at each counter are close to identical, demonstrating the surveyed heavy vehicles are travelling across both counters.

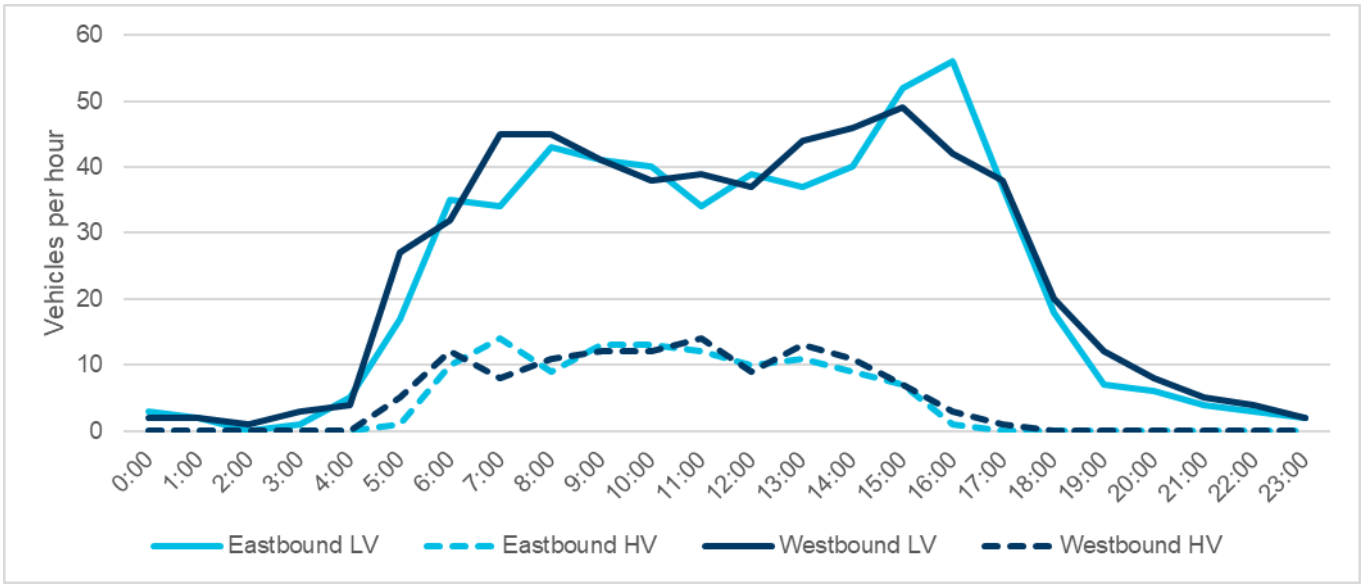


Figure 2.3 Counter 1 – Vehicles per hour

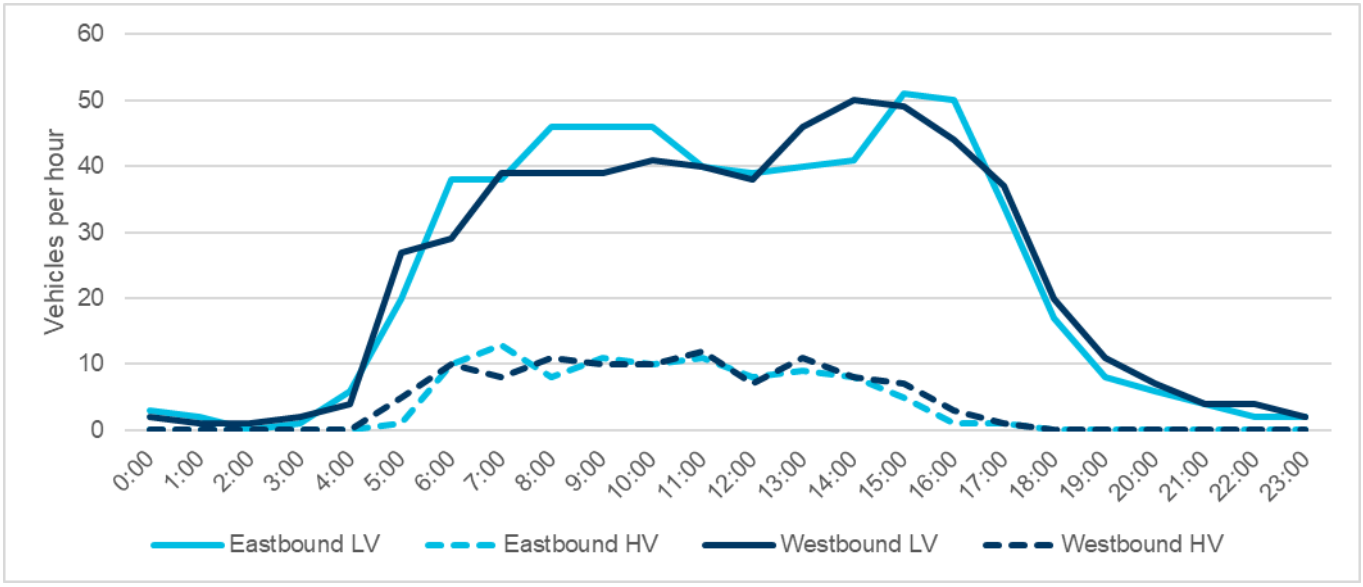


Figure 2.4 Counter 2 – Vehicles per hour

2.4.2 Italia Road / Pacific Highway

Turning movement count surveys were undertaken at the intersection of Italia Road and the Pacific Highway on Tuesday 14 June and Wednesday 15 June 2022. The turning movement counts were undertaken between 07:00 and 10:00 in the morning and again between 15:00 and 18:00 in the afternoon on each survey day. The peak hour results of each the Tuesday and Wednesday surveys are shown below in Figure 2.5 and Figure 2.6, separating light vehicle and heavy vehicle movements.

On Tuesday the peak hours occurred between 08:30-09:30 and 15:15-16:15, while on the Wednesday the peak hours occurred from 08:15-09:15 and 15:00-16:00.

Based on the surveyed volumes, both the AM and PM peak hours on the Tuesday saw a greater volume of vehicles pass through the intersection. As such, for purposes of a more conservative assessment, the Tuesday volumes will be adopted as the existing conditions.

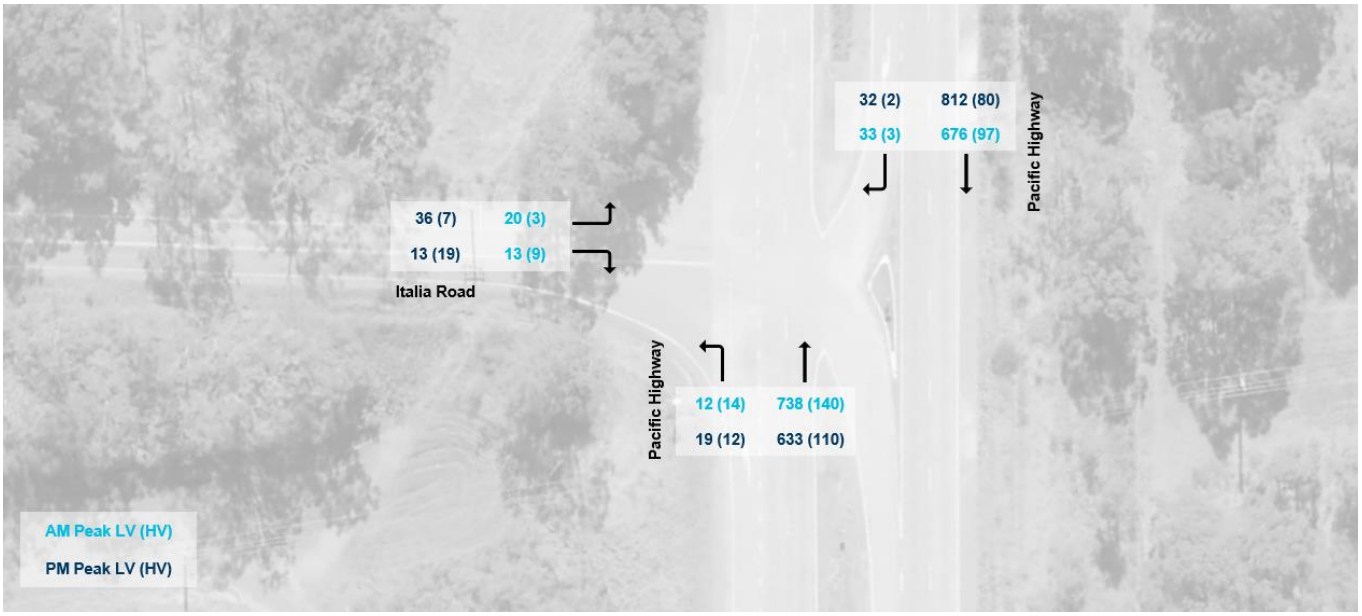


Figure 2.5 Italia Road / Pacific Highway – Tuesday survey

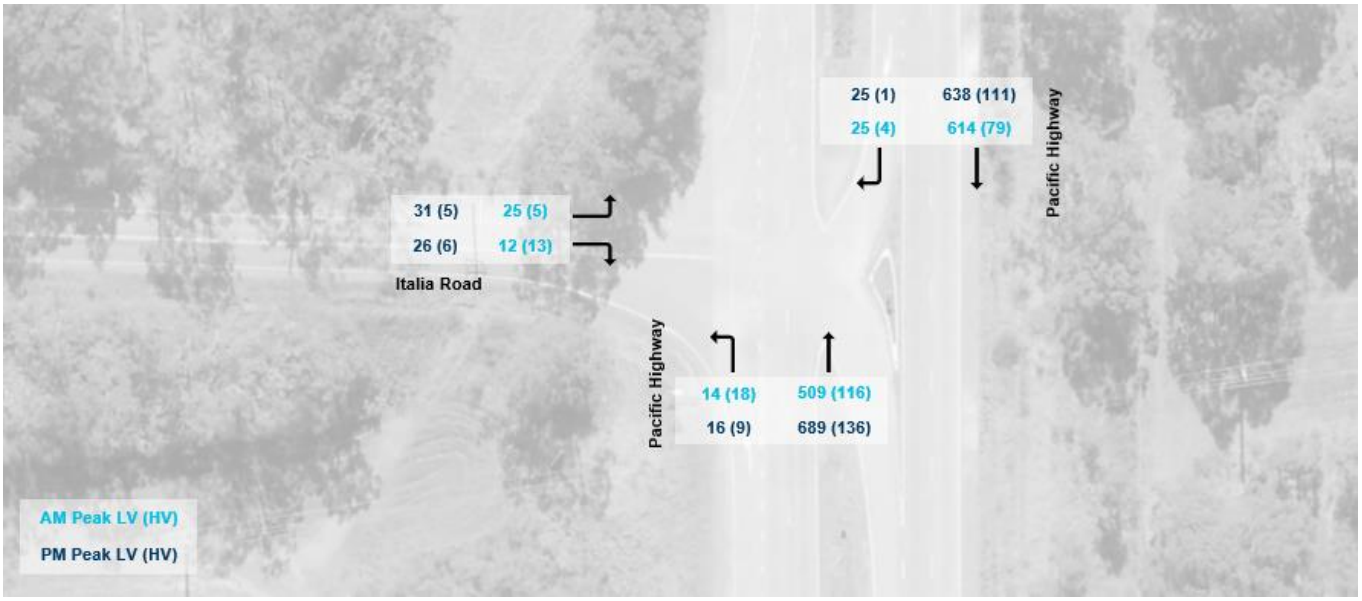


Figure 2.6 Italia Road / Pacific Highway – Wednesday survey

Base image source: MetroMap, accessed June 2022

2.5 Crash history

Road crash history for the five-year period from January 2018 to December 2022 was obtained from TfNSW Centre for Road Safety. Within this analysis period, there were a total of 11 recorded crashes. A summary of the extracted crash data is provided in Table 2.1 and Figure 2.7.

Seven of the 11 crashes recorded within the last five years occurred at midblock locations, with the remaining four crashes occurring at the intersection with Italia Road. There was one fatal crash in 2021 on Italia Road to the west of the Seaham Quarry site access, where the driver veered off the road into an object. Furthermore, two serious crashes occurred in 2021 and 2022, both of which saw the vehicle veer off the Pacific Highway to the left, into an object, each injuring one person. It is noted that only two crashes occurred in dark conditions, with the remainder occurring in daylight conditions.

Table 2.1 Summary of five-year crash data

Location	Number of crashes				Dominant crash type(s)
	Fatal	Serious	Other	Total	
Midblock					
Pacific Highway	0	2	4	6	Lane change right (1), off road right into an object (2), off road left into an object (3)
Italia Road	1	0	0	1	Off road right into an object (1)
Intersection					
Italia Road / Pacific Highway	0	0	4	4	Right near (2), rear end (1), left near (1)
Total				**11**	

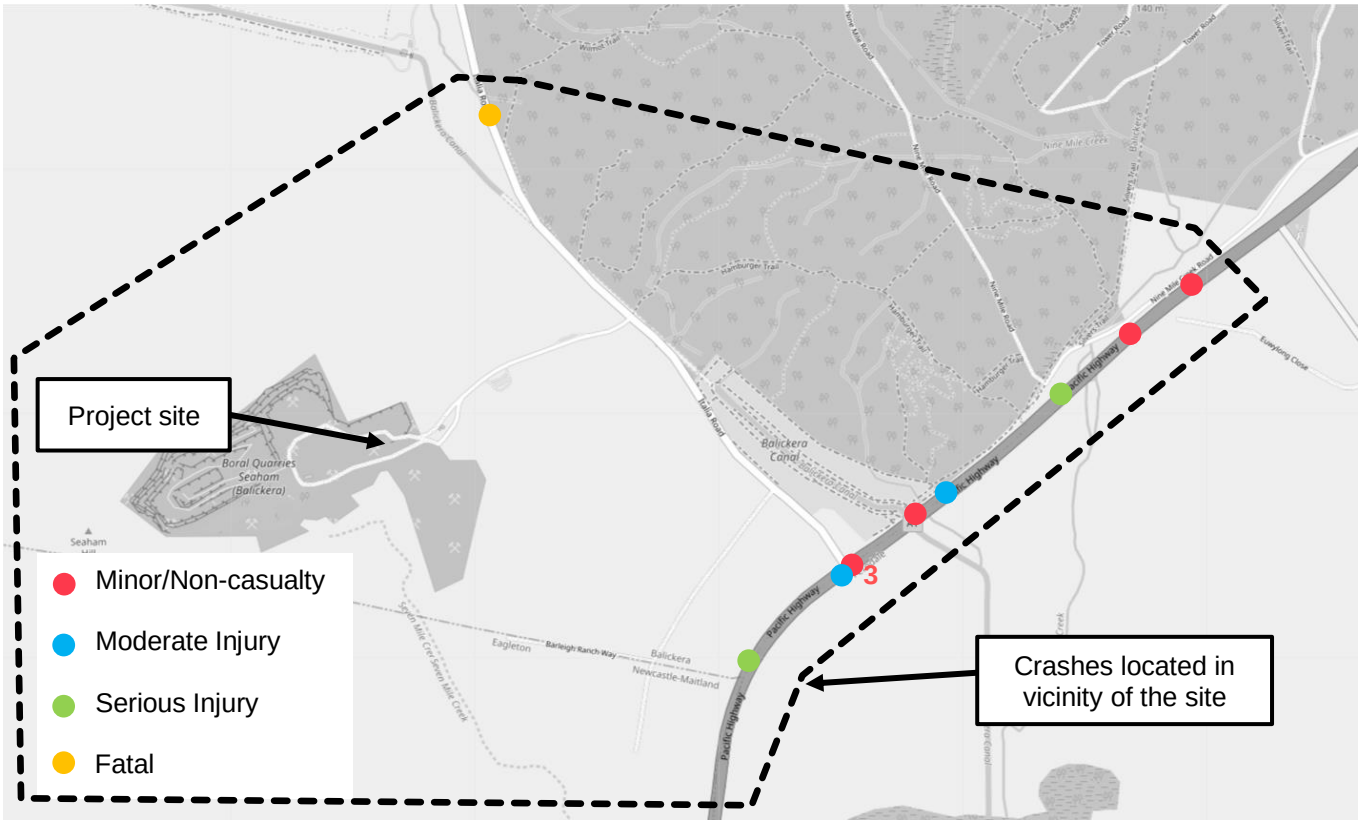


Figure 2.7 Crash history within vicinity of the project

Image source: Open Street Map, accessed June 2022

3. Project description

3.1 Overview

Boral Resources (NSW) Pty Ltd (Boral) acts on behalf of Eagleton Rock Syndicate (Eagleton) and Australian Resource Development Group Pty Limited (ARDG) (collectively referred to as the 'quarry operators') in submitting a development application (DA) to Port Stephens Council (Council), pursuant to Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act), for proposed upgrades to the Italia Road / Pacific Highway intersection.

Transport for NSW (TfNSW) has identified the need for safety upgrades to the intersection to meet the future predicted traffic growth of the area. The need to bring forward the safety upgrades to the Italia Road / Pacific Highway intersection is in direct response to the vehicle movements predicted to be generated by the State significant development (SSD) applications submitted by all three quarry operators. Consequently, the quarry operators have been working closely with TfNSW since 2020 to prepare a design for the intersection upgrades.

In-principle support was provided by TfNSW for a concept design in June 2022 on the basis that the quarry operators agreed to jointly fund all costs associated with the approval and construction of the required upgrades. A commercial agreement between the quarry operators is in place and (subject to approvals) construction of the intersection is expected to be finalised and operational within the last quarter of 2025.

The concept design has now been further developed to meet the requirements of TfNSW, Council and Hunter Water Corporation (HWC) and this refined design forms the basis of the DA.

3.2 The existing intersection

The Italia Road / Pacific Highway intersection is located approximately 10 km north of Raymond Terrace, 25 km north of Newcastle and is in the Port Stephens local government area. The location of the intersection in relation to the existing and proposed quarries is shown in Figure 2.1.

As shown in Figure 3.1, the Italia Road / Pacific Highway intersection is a seagull type intersection, with short right turn and left turn deceleration lanes. The intersection features a long acceleration lane for southbound vehicles turning right onto the Pacific Highway, which forms a third lane on the Highway until it merges approximately 1.2 km downstream of the intersection. This allows right turning vehicles to enter Pacific Highway giving way to traffic in the northbound direction and vehicles turning into Italia Road heading southbound only.

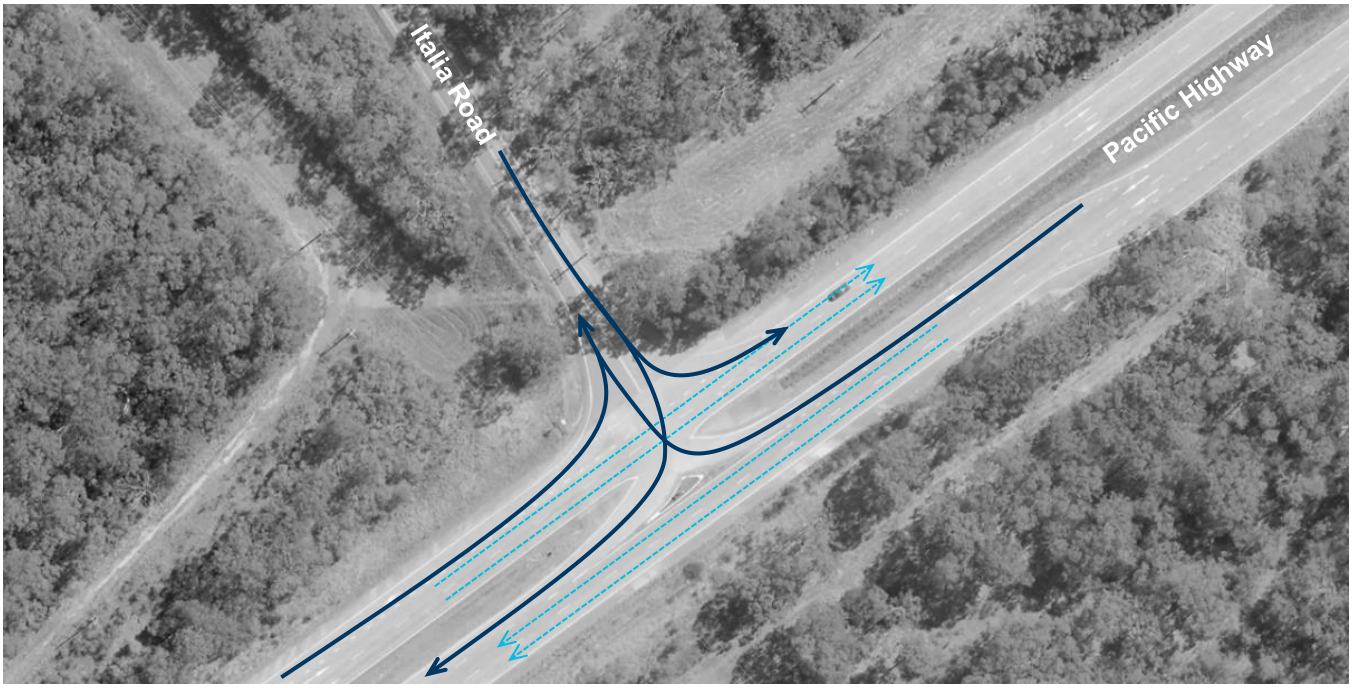


Figure 3.1 Italia Road / Pacific Highway intersection

Image source: MetroMap, accessed June 2022

3.3 The proposed development

The proposed development involves safety upgrades to the intersection of Italia Road and Pacific Highway, including the following:

– Construction of a dedicated left-turn northbound acceleration lane from Italia Road onto the Pacific Highway, which will replace the current left-turn give-way movement with a safer downstream merge movement.
– Widening of the existing bridge over the Balickera Canal (to accommodate the northbound acceleration lane).
– Lengthening of the northbound deceleration lane into Italia Road.

All works are proposed to be undertaken within the existing road reserve.

3.4 Proposed access routes

With due consideration of the location of the site in relation to the external road network, as well as the expectation that the bulk of materials produced by the site would be sent to regions to the south, it is expected that the bulk of truck movements to and from the quarries would be generated to/from the south.

Following previous consultation with TfNSW, in conjunction with the ARDG and ERS potentially using Italia Road, TfNSW has accepted in-principle a proposal to retain the existing priority-controlled intersection arrangement at Italia Road and Pacific Highway (with the upgrades described above) and disallow right turns out of Italia Road by heavy vehicles associated with the three quarries, which would be required to undertake left-out movements only at Italia Road.

As such, the vast majority of inbound truck movements to the project site would turn left into Italia Road, with a much smaller number of trucks from the north turning right into Italia Road using the existing right turn lane. All outbound movements would turn left out, travelling to the Tarean Road interchange approximately 11 km to the north to undertake a U-turn. The proposed U-turn movements is shown below in Figure 3.2. Further discussion regarding the use of the Tarean Road interchange is provided in Section 4.6.2.

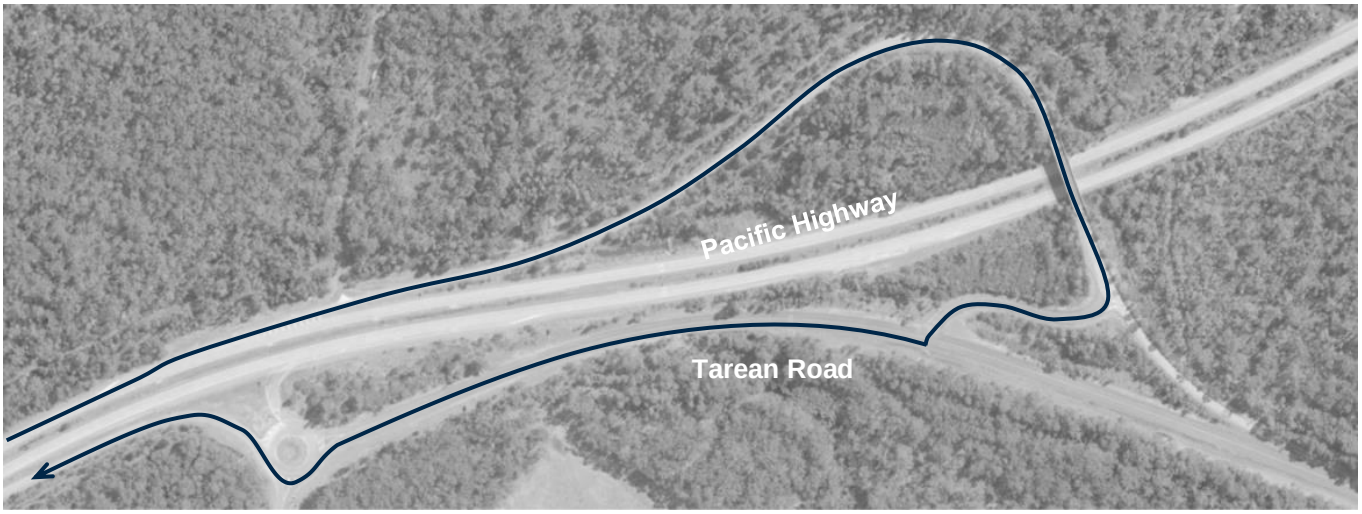


Figure 3.2 Tarean Road U-turn movement

Image source: MetroMap, accessed June 2022

4. Traffic assessment

4.1 Overview

Section 4 outlines our assessment of existing and future traffic conditions at the intersection of Italia Road / Pacific Highway. As part of these assessments, we have investigated several different traffic scenarios which are expected to play out at the intersection, these include:

– Scenario 1: Existing conditions
  - The 'existing conditions' are based on the volumes surveyed at the intersection in 2022, which are outlined in Section 2.4.2.
  - It is noted that the surveys were undertaken during the current operation of the Seaham Quarry, and therefore include existing Seaham Quarry traffic demand.
  - Existing intersection configuration of Italia Road / Pacific Highway.
– Scenario 2: Existing + 10 years growth
  - Scenario 1 plus ten years' growth has been applied to the through volumes on the Pacific Highway to represent the expected volumes in 2032.
  - The inclusion of 10 years' growth provides a more conservative assessment of the intersection.
  - No growth has been applied to the Italia Road traffic.
  - Existing intersection configuration of Italia Road / Pacific Highway.
– Scenario 3: Existing + 10 years growth + existing uplift at Seaham Quarry + Stone Ridge Quarry + Eagleton Quarry
  - Scenario 2 plus the uplift to the existing Seaham Quarry traffic volumes plus the Stone Ridge Quarry and Eagleton Quarry traffic demand.
  - Upgraded intersection of Italia Road / Pacific Highway.
– Scenario 4: Existing + 10 years growth + expanded Seaham Quarry + Stone Ridge Quarry + Eagleton Quarry
  - Scenario 2 plus uplift in traffic demand resulting from the expansion of the Seaham Quarry operations, plus the Stone Ridge Quarry and Eagleton Quarry traffic demand.
  - Upgraded intersection of Italia Road / Pacific Highway.

4.2 Background traffic growth

Traffic volumes along the Pacific Highway were obtained through the TfNSW Traffic Volume Viewer and assessed to determine the annual growth. Based on the historic volumes, 20% growth has been applied to the through volumes along the Pacific Highway in order to forecast the volumes in 10 years' time (2032).

4.3 Traffic generation

4.3.1 Seaham Quarry

4.3.1.1 Existing uplift

The Seaham Quarry is currently operating in accordance with the Development Consent No. DA 2683/85 and therefore, any traffic movements generated by this use has been included in the existing conditions traffic surveys conducted in June 2022 and documented in Sections 2.4.1 and 2.4.2 of this report.

It is understood that Boral is expecting the volume of sales and therefore truck movements to remain in line with the existing volumes while on-site staff are expected to increase to the maximum number currently approved (from 28 to 32), when compared to those on-site during the traffic surveys. Accordingly, the only anticipated change in traffic volumes will be that generated by the additional staff travelling to and from the site, and these occur generally outside of peak hour.

For purposes of a conservative assessment, an additional four (4) outbound traffic movements were added to the existing volumes during the PM peak hour. Noting staff arrive to the site between 5:30 am and 5:45 am, the AM peak volumes are not impacted.

Based on the foregoing, the additional volumes to be generated by the Seaham Quarry are outlined in Table 4.1, with all other volumes already captured in the existing conditions surveys.

Table 4.1 Existing uplift at Seaham Quarry – Peak hour traffic generation (additional)

	Inbound	Outbound
PM Peak		
Light vehicles	-	+ 4
Heavy vehicles	-	-
Total	**-**	**+ 4**

4.3.1.2 Proposed expansion

Boral is proposing an expansion of operations at the Seaham Quarry, which is subject to an application for a State Significant Development (SSD) with the NSW Department of Planning and Environment. In this regard, Boral recently submitted an Environmental Impact Statement (EIS) which included a Traffic Impact Assessment (TIA) prepared by EMM, to support the proposed SSD.

The forecast uplift in traffic compared to the existing Seaham Quarry operation has been determined by taking volumes published in the EMM TIA and is shown in Table 4.2.

Table 4.2 Expanded Seaham Quarry – Additional peak hour traffic generation to reflect latest planning estimates (EMM TIA)

	Inbound	Outbound
AM Peak		
Light vehicles	17	4
Heavy vehicles	36	31
Total	**53**	**35**
PM Peak		
Light vehicles	9	6
Heavy vehicles	37	39
Total	**46**	**45**

4.3.2 Construction traffic (Italia Road/Pacific Highway upgrade)

In order to construct the intersection upgrade, an existing hardstand area within the Boral site is to be used by the contractors as their site compound.

The nature of the intersection upgrade comprises mostly earthworks (gravel and pavement to be supplied by Boral directly from the Seaham Quarry and not stored onsite or in the compound) and concrete structure construction, the storage of minor materials will generally be limited to the compound.

It is therefore anticipated the only items requiring traffic movements to site would be floating in site sheds and their removal at completion of the project, delivery and maintenance of portable toilets, construction workers driving to and from site at start and end of shift as well as delivery and storage of bridge beams, reinforcement, and guard rails with other ancillary items. Additional traffic generation to the proposed compound for these activities is considered very low and would consist of:

– A peak of 20 staff light vehicles (bridge crew as well as civil works).
– A total of 6 semi-trailer and crane movements to transport the bridge planks to the compound.
– On average 4 deliveries a day for reinforcement bar, sub soil lines and guard rail systems.

It is noted that construction traffic will be generated between the compound and the intersection. As such, traffic won't necessarily travel through the intersection as this traffic will only be temporary, it has not been included in the assessment of the upgraded intersection.

4.3.3 Stone Ridge Quarry

The Stone Ridge Quarry is proposed on a greenfield site and is not currently operational. A Traffic Impact Assessment (TIA) was prepared for the Stone Ridge Quarry by GHD in 2022. An EIS has been prepared and submitted as part of a State Significant Development application to the NSW Department of Planning and Environment.

The peak hour traffic generation of the Stone Ridge Quarry was projected and is outlined in Table 4.3.

Table 4.3 Stone Ridge Quarry – Peak hour traffic generation

	Inbound	Outbound
AM Peak		
Light vehicles	15	0
Heavy vehicles	17	17
Total	**32**	**17**
PM Peak		
Light vehicles	0	15
Heavy vehicles	17	17
Total	**17**	**32**

4.3.4 Eagleton Quarry

The Eagleton Quarry is proposed on a greenfield site and is not currently operational. A Traffic Impact Assessment

(TIA) for the Eagleton Quarry was prepared by GHD in 2017. An EIS has been prepared and submitted as part of an State Significant Development application to the NSW Department of Planning and Environment and was recently approved. The peak hour traffic generation projected for the Eagleton Quarry is outlined in Table 4.4.

Table 4.4 Eagleton Quarry – Peak hour traffic generation

	Inbound	Outbound
AM Peak		
Light vehicles	11	0
Heavy vehicles	10	10
Total	**21**	**10**
PM Peak		
Light vehicles	0	11
Heavy vehicles	10	10
Total	**10**	**21**

4.3.5 Total traffic generation

The total additional traffic generated during Scenario 3 and 4 is outlined in Table 4.5.

Table 4.5 Generated traffic volumes – Scenario 3 and 4

		Inbound	Outbound
Scenario 3 Existing uplift at Seaham Quarry + Stone Ridge Quarry + Eagleton Quarry	**AM Peak**		
	Light vehicles	26	0
	Heavy vehicles	27	27
	Total	**53**	**27**
	PM Peak		
	Light vehicles	0	30
	Heavy vehicles	27	27
	Total	**27**	**57**
Scenario 4 Expanded Seaham Quarry + Stone Ridge Quarry + Eagleton Quarry	**AM Peak**		
	Light vehicles	69	4
	Heavy vehicles	63	58
	Total	**106**	**62**
	PM Peak		
	Light vehicles	9	32
	Heavy vehicles	64	66
	Total	**73**	**98**

4.4 Traffic distribution

In accordance with discussions held with TfNSW, all heavy vehicle traffic is anticipated to be directed to/from the south of the site, with all outbound traffic directed left-out of Italia Road using the Tarean Road interchange to divert to the south via grade separation. In this regard, all existing heavy vehicle quarry traffic which turned right-out of Italia Road will be redirected as per this route.

With regard to light vehicle movements, it will be assumed that these are distributed as per the existing conditions surveys, with approximately 70% directed to/from the north and 30% directed to/from the south.

4.5 Modelled traffic volumes

This section outlines the future traffic volumes at the intersection of Italia Road and Pacific Highway which have been adopted for our modelling scenarios. The Scenario 1 volumes are taken from the surveyed volumes in Section 2.4.2, while the Scenario 2-4 volumes are shown below in Figure 4.1-Figure 4.3.

Figure 4.1 Italia Road / Pacific Highway – Scenario 2 volumes

Figure 4.2 Italia Road / Pacific Highway – Scenario 3 volumes

Figure 4.3 Italia Road / Pacific Highway – Scenario 4 volumes

4.6 Traffic modelling

4.6.1 SIDRA parameters

SIDRA Intersection is a computer software program that was developed to design and analyse the performance of both signalised and unsignalised intersections. SIDRA Intersection is endorsed by the RTA Guide to Traffic Generating Developments and Austroads and is common use across all Australian jurisdictions for the purpose of intersection modelling. The parameters used to assess the intersections are summarised as follows.

Degree of Saturation (DoS) is a ratio of arrival (or demand) flow to capacity. A DoS above 1.0 represents oversaturated conditions and a DoS below 1.0 represents undersaturated conditions. The practical DoS thresholds for each intersection type are summarised in Table 4.6.

Table 4.6 Degree of Saturation thresholds

Unsignalised intersection	Roundabout	Signalised intersection
0.80	0.85	0.90

Source: Austroads Guide to Road Design Part 3: Transport Study and Analysis Methods, 2020

The **95th percentile queue length (95%ile queue)** is the value below which 95% of all observed cycle queue lengths fall, or 5% of all observed queue lengths exceed.

Average delay is the average time, in seconds, that vehicles can be expected to wait at an intersection. A Level of Service (LoS) classification is assigned based on the delay calculated. These ratings are shown in Table 4.7.

Table 4.7 Average delay based on Level of Service classification summary

Level of Service (LoS)	Average Delay (s)		
	Unsignalised intersection	Roundabout and give-way	Signalised intersection
A	≤ 10	≤ 10	≤ 10
B	10-15	10-20	10-20
C	15-25	20-35	20-35
D	25-35	35-50	35-55
E	35-50	50-70	55-80
F	>50	> 70	>80

Source: Table 7.7 of Austroads Guide to Road Design Part 3: Transport Study and Analysis Methods, 2020

4.6.2 SIDRA modelling

Tarean Road / Pacific Highway

Previous modelling was undertaken at the Tarean Road interchange, where vehicles would be required to undertake a U-turn to travel south. The previous modelling assessed the interchange under three scenarios, including the existing surveyed conditions, a scenario where an additional 50 articulated trucks per hour undertook a U-turn movement (such as that proposed for vehicles exiting the quarry) and under a third scenario where 20% growth was applied to the existing volumes and an additional 100 articulated trucks per hour undertook a U-turn.

The modelling suggested that under all three scenarios the interchange would operate at a satisfactory level. Noting the combined traffic generation of the three quarries is expected to be less than 60 outbound heavy vehicle movements per hour, the future conditions are expected to perform better than the modelled future scenarios.

The report summarising the traffic modelling undertaken at the Tarean Road interchange was prepared for ARDG and was issued TfNSW in 2022.

Italia Road / Pacific Highway

This section outlined the results from the SIDRA assessment of the intersection of Italia Road and Pacific Highway. Three SIDRA scenarios were developed as outlined below:

– Scenario 1: Existing conditions
– Scenario 2: Existing + 10 years growth
– Scenario 3: Existing + 10 years growth + existing uplift at Seaham Quarry + Stone Ridge Quarry + Eagleton Quarry
– Scenario 4: Existing + 10 years growth + expanded Seaham Quarry + Stone Ridge Quarry + Eagleton Quarry

Each of the scenarios were assessed under both the AM and PM peak hour conditions.

The following assumptions were made throughout the SIDRA analysis:

– The existing layouts were developed based on aerial photography
– The volumes surveyed on Tuesday 14 June 2022 were adopted as the existing volumes

The SIDRA outputs for the existing Italia Road / Pacific Highway layout under each of the modelled scenarios is included below in Table 4.8.

Table 4.8 SIDRA results

Approach	Movement	DoS				Average delay (s)				Level of Service				95th Percentile Queue (m)			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
AM Peak																	
Pacific Highway (westbound)	Through	0.22	0.27	0.28	0.29	0.0	0.0	0.0	0.0	**A**	**A**	**A**	**A**	0.0	0.0	0.0	0.0
	Right	0.18	0.28	0.20	0.22	25.0	36.5	22.0	21.6	**C**	**E**	**C**	**C**	4.0	5.9	4.8	5.6
Italia Road (southbound)	Left	0.04	0.41	0.05	0.07	10.7	11.8	12.1	12.4	**B**	**B**	**B**	**B**	0.9	1.0	0.0	0.0
	Right	0.39	0.78	0.14	0.16	78.1	191.0	42.0	44.9	**F**	**F**	**E**	**E**	9.3	18.0	2.7	3.2
Pacific Highway (eastbound)	Left	0.02	0.02	0.06	0.08	9.8	9.8	10.9	11.2	**A**	**A**	**B**	**B**	0.0	0.0	2.5	4.0
	Through	0.26	0.31	0.31	0.31	0.0	0.0	0.0	0.0	**A**	**A**	**A**	**A**	0.0	0.0	0.0	0.0
PM Peak																	
Pacific Highway (westbound)	Through	0.25	0.30	0.31	0.33	0.0	0.0	0.0	0.0	**A**	**A**	**A**	**A**	0.0	0.0	0.0	0.0
	Right	0.12	0.17	0.09	0.11	19.3	24.3	17.3	17.2	**C**	**C**	**C**	**C**	2.7	3.6	2.2	2.6
Italia Road (southbound)	Left	0.06	0.07	0.08	0.12	10.3	11.1	10.9	11.4	**B**	**B**	**B**	**B**	1.6	1.8	0.0	0.0
	Right	0.43	0.74	0.14	0.07	64.6	135.4	29.2	30.0	**F**	**F**	**D**	**D**	13.5	23.6	3.1	1.5
Pacific Highway (eastbound)	Left	0.02	0.02	0.05	0.09	9.3	9.3	10.8	11.1	**A**	**A**	**B**	**B**	0.0	0.0	2.3	4.4
	Through	0.22	0.26	0.26	0.26	0.0	0.0	0.0	0.0	**A**	**A**	**A**	**A**	0.0	0.0	0.0	0.0

4.6.3 Discussion

The SIDRA results demonstrate the impact of 10 years' of traffic growth along Pacific Highway on the intersection with Italia Road as well as the impact of the operation of three neighbouring quarries, where all heavy vehicles are restricted to turning left-out of Italia Road onto the Pacific Highway.

As can be seen by the results, the background traffic growth alone sees the right-turn out of Italia Road onto the Pacific Highway become much more difficult, with delays increasing from 78 seconds to 191 seconds in the AM peak and from 65 seconds to 135 seconds in the PM peak. Some more modest impacts are seen to the left-turn out while all movements from and along Pacific Highway are mostly unaffected.

The Scenario 3 results, which represent the upgraded intersection with background growth and additional quarry traffic, show significantly improved performance at Italia Road / Pacific Highway. The intersection would operate generally at acceptable level of service. The right turn out of Italia Road would continue to experience some delay (level of service E in the AM peak and level of service D in the PM peak), however, it is noted that quarry trucks would not be making this movement, instead turning left to use the Tarean Road interchange for U-turns.

As part of updates to this report, we have added a fourth Scenario which looks at the performance following the Seaham Quarry expansion. As can be seen by the Scenario 4 results, performance is generally similar to that in Scenario 3 with minor increases to queues and delays, and no change to the level or service.

While there are noted impacts in performance, the intersection will generally operate better than without any upgrade works undertaken, and better than current operations without any quarry development. Furthermore, the purpose of the intersection upgrade works is to improve safety at the intersection. With this in mind, minor impacts in performance are considered acceptable and adequately mitigate impacts at the intersection of the three proposed quarry developments.

It is noted that the above SIDRA modelling has included conservative estimates and assumptions of the heavy vehicle traffic generated. In practice there may be some B-doubles which transport material out of the site, and as such reduce the number of heavy vehicle movements based on the greater freight efficiency.

The detailed SIDRA outputs are included in Appendix A.

4.7 Safety assessment

As outlined within previous sections, the right turn movement out of Italia Road into the Pacific Highway has been deemed a potential safety risk by Port Stephens Council, particularly for long and heavy vehicles which require larger gaps in the downstream traffic stream to cross and turn. This is due to its configuration as an at-grade sign controlled intersection on a high speed road with high opposing traffic flows.

To address concerns regarding the safety of vehicles turning in and out of Italia Road, it has previously been agreed with TfNSW as an interim solution to add both an acceleration lane and deceleration lane on the Pacific Highway. Each of the quarry operators are in agreement that these upgrade works would be jointly funded following approval of a detailed design by TfNSW.

4.8 Impacts on other road users

There are no pedestrian or cycle paths along Italia Road or Pacific Highway. Based on the surrounding land uses, there is not expected to be a great demand for pedestrian or cycle paths along these roads.

Bus services for four schools have been identified with routes along Italia Road (refer Section 2.3). No material impacts are anticipated on the bus routes based on the following:

– AM bus movements head west along Italia Road and will follow vehicles along Italia Road who then turn left or right into one of the quarry sites. There may be minor incidental delays due to truck movements required to give way to oncoming traffic for the right turn, however these would not be significant due to the low existing volumes, and the limited volume of vehicles turning right into the Stone Ridge Quarry.
– PM bus movements will have priority heading east along Italia Road with trucks exiting the proposal site yielding to traffic along Italia Road. Minor improvements in travel time may be experienced with an improved intersection left turn treatment at the Pacific Highway.

It is not proposed for trucks to queue on Italia Road for entry into the site, with sufficient space on the internal access driveways at each site for storage of vehicles if required.

With due consideration of the above, the proposal is not expected to impact any pedestrian, cyclist or public transport users.

5. Conclusions

This report documents the potential traffic related impacts associated with the proposed extension to the Boral Quarry, as well as the cumulative impacts of the neighbouring proposed quarry developments along Italia Road. The key findings are summarised below.

Trip generation and distribution

- The existing uplift at the Seaham Quarry will see:
  - An additional four (4) staff accessing the site in light vehicles each day compared to the surveyed conditions and in line with the existing approvals.
  - Additional staff traffic will see inbound movements occur outside of the AM peak, with outbound movements dispersed over six hours in the evening, therefore having very little material impact on the road network.
- The proposed Stone Ridge Quarry is anticipated to generate:
  - 49 vehicles trips in the AM peak and 49 vehicle trips in the PM peak.
- The proposed Eagleton Quarry is anticipated to generate:
  - 31 vehicle trips in the AM peak and 31 vehicle trips in the PM peak.
- The proposed expansion to the Seaham Quarry is anticipated to generate:
  - 88 vehicle trips in the AM peak and 91 vehicle trips in the PM peak.
- Based on existing trends, through volumes along the Pacific Highway may be expected to grow by 20% over the next 10 years.

Traffic and safety impacts

- SIDRA modelling demonstrates 10 years' traffic growth is expected to have a notable impact on the capacity of the Italia Road/Pacific Highway intersection.
- The traffic impact of the traffic growth is largely concentrated on the right-turn out of Italia Road onto the Pacific Highway, whereby delays increase by over a minute in both peak hours.
- The proposed intersection upgrade, which would include a northbound acceleration lane for left turns and would disallow all heavy vehicles associated with the three quarries from turning right out of Italia Road, will see an improvement on the operation and capacity of the Italia Road / Pacific Highway intersection. The performance of the intersection would improve significantly compared to the 10-year forecast conditions.
- Noting the lack of pedestrians, cyclists and public transport users in the vicinity of the site, there is not expected to be any impact to these road users.

6. References

The following documents and materials were referred to during the preparation of this report:

– Seaham Quarry Project – Traffic Impact Assessment, EMM, March 2024
– Scoping Report – Stone Ridge Quarry, Australian Development Group Pty Limited, February 2020
– Eagleton Rock Syndicate Traffic Impact Assessment, GHD, 2016
– Centre for Road Safety, Crash and casualty statistics, Transport for New South Wales
– Traffic Volume Viewer, Transport for New South Wales
– Traffic volume surveys, Matrix, 2022

Appendices

Appendix A

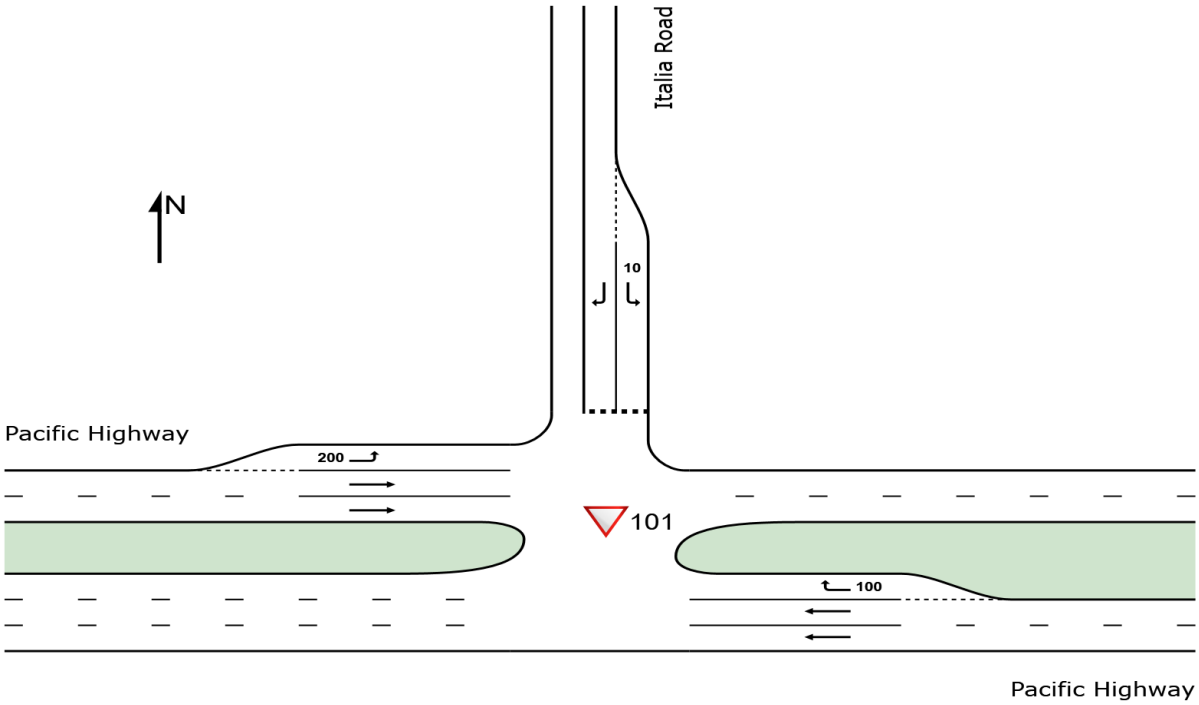
SIDRA outputs

SITE LAYOUT

Site: 101 [1. Italia Rd / Pacific Hwy AM Peak Existing (Site Folder: Existing Conditions)]

Intersection of Italia Road and Pacific Highway
Existing Conditions
AM Peak (8:30 - 9:30)
Site Category: (None)
Give-Way (Two-Way)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.

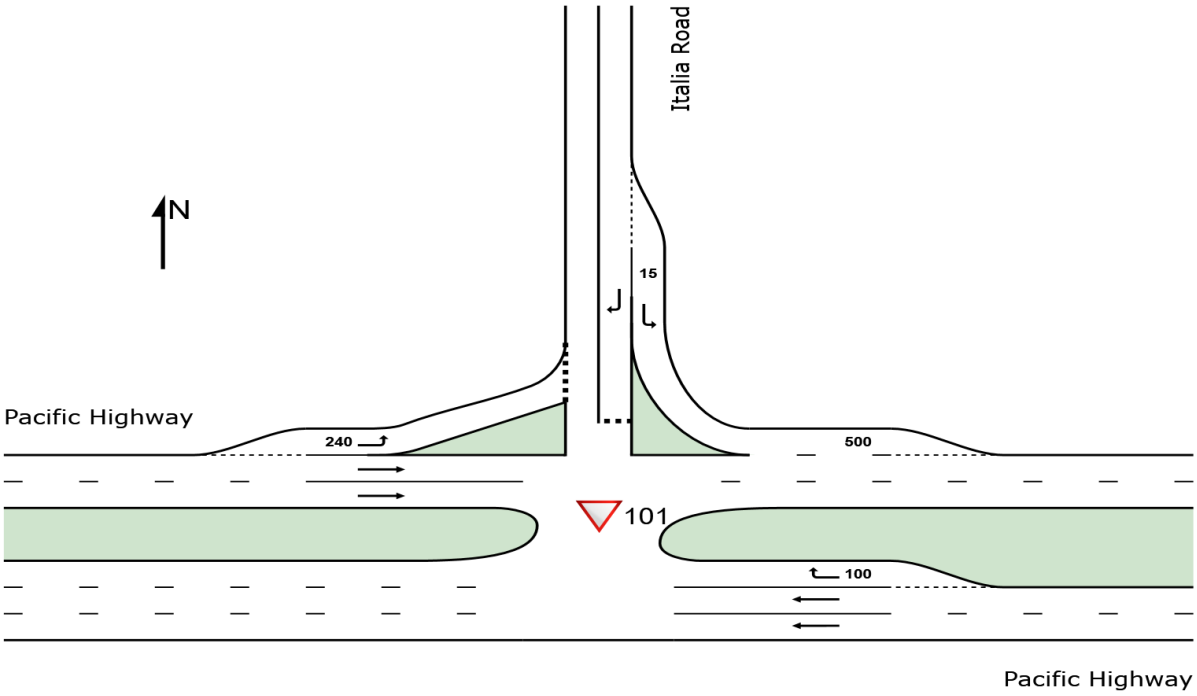


SITE LAYOUT

Site: 101 [3. Italia Rd / Pacific Hwy AM Peak Stage 1 (Site Folder: Stage 1)]

Intersection of Italia Road and Pacific Highway
Proposed Conditions (Future)
AM Peak (8:30 - 9:30)
Site Category: (None)
Give-Way (Two-Way)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



MOVEMENT SUMMARY

Site: 101 [1. Italia Rd / Pacific Hwy AM Peak Existing (Site Folder: Existing Conditions)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

Intersection of Italia Road and Pacific Highway
Existing Conditions
AM Peak (8:30 - 9:30)
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Pacific Highway															
5	T1	All MCs	814	12.5	814	12.5	0.223	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	109.9
6	R2	All MCs	38	8.3	38	8.3	0.180	25.0	LOS C	0.5	4.0	0.81	0.94	0.83	53.9
Approach			852	12.4	852	12.4	0.223	1.1	NA	0.5	4.0	0.04	0.04	0.04	105.0
North: Italia Road															
7	L2	All MCs	24	13.0	24	13.0	0.035	10.7	LOS B	0.1	0.9	0.49	0.73	0.49	61.7
9	R2	All MCs	23	40.9	23	40.9	0.393	78.1	LOS F	1.0	9.3	0.93	1.01	1.13	28.5
Approach			47	26.7	47	26.7	0.393	43.6	LOS E	1.0	9.3	0.70	0.87	0.80	39.2
West: Pacific Highway															
10	L2	All MCs	27	53.8	27	53.8	0.020	9.8	LOS A	0.0	0.0	0.00	0.68	0.00	61.7
11	T1	All MCs	924	15.9	924	15.9	0.259	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	109.9
Approach			952	17.0	952	17.0	0.259	0.3	NA	0.0	0.0	0.00	0.02	0.00	107.5
All Vehicles			1851	15.1	1851	15.1	0.393	1.8	NA	1.0	9.3	0.03	0.05	0.04	101.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [1. Italia Rd / Pacific Hwy PM Peak Existing (Site Folder: Existing Conditions)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

Intersection of Italia Road and Pacific Highway
Existing Conditions
PM Peak (3:15 - 4:15)
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Pacific Highway															
5	T1	All MCs	939	9.0	939	9.0	0.252	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	109.9
6	R2	All MCs	36	5.9	36	5.9	0.122	19.3	LOS C	0.4	2.7	0.72	0.90	0.72	59.4
Approach			975	8.9	975	8.9	0.252	0.7	NA	0.4	2.7	0.03	0.03	0.03	106.6
North: Italia Road															
7	L2	All MCs	45	16.3	45	16.3	0.060	10.3	LOS B	0.2	1.6	0.45	0.72	0.45	61.7
9	R2	All MCs	34	59.4	34	59.4	0.431	64.6	LOS F	1.3	13.5	0.92	1.02	1.17	31.2
Approach			79	34.7	79	34.7	0.431	33.4	LOS D	1.3	13.5	0.65	0.85	0.76	43.5
West: Pacific Highway															
10	L2	All MCs	33	38.7	33	38.7	0.022	9.3	LOS A	0.0	0.0	0.00	0.67	0.00	64.1
11	T1	All MCs	782	14.8	782	14.8	0.218	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	109.9
Approach			815	15.8	815	15.8	0.218	0.4	NA	0.0	0.0	0.00	0.03	0.00	106.9
All Vehicles			1868	13.0	1868	13.0	0.431	2.0	NA	1.3	13.5	0.04	0.06	0.05	100.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [2. Italia Rd / Pacific Hwy AM Peak Forecast (+20%) (Site Folder: Forecast Conditions)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

Intersection of Italia Road and Pacific Highway
Forecast Conditions (+20% traffic)
AM Peak (8:30 - 9:30)
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Pacific Highway															
5	T1	All MCs	976	12.5	976	12.5	0.268	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	109.9
6	R2	All MCs	38	8.3	38	8.3	0.276	36.5	LOS E	0.8	5.9	0.88	0.98	1.00	46.1
Approach			1014	12.4	1014	12.4	0.276	1.4	NA	0.8	5.9	0.03	0.04	0.04	104.5
North: Italia Road															
7	L2	All MCs	24	13.0	24	13.0	0.041	11.8	LOS B	0.1	1.0	0.53	0.77	0.53	60.6
9	R2	All MCs	23	40.9	23	40.9	0.777	191.0	LOS F	1.9	18.0	0.99	1.10	1.54	15.2
Approach			47	26.7	47	26.7	0.777	99.4	LOS F	1.9	18.0	0.75	0.93	1.03	24.6
West: Pacific Highway															
10	L2	All MCs	27	53.8	27	53.8	0.020	9.8	LOS A	0.0	0.0	0.00	0.68	0.00	61.7
11	T1	All MCs	1109	15.9	1109	15.9	0.311	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	109.9
Approach			1137	16.9	1137	16.9	0.311	0.3	NA	0.0	0.0	0.00	0.02	0.00	107.9
All Vehicles			2198	15.0	2198	15.0	0.777	2.9	NA	1.9	18.0	0.03	0.05	0.04	99.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [2. Italia Rd / Pacific Hwy PM Peak Forecast (+20%) (Site Folder: Forecast Conditions)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

Intersection of Italia Road and Pacific Highway
Forecast Conditions (+20% traffic)
PM Peak (3:15 - 4:15)
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Pacific Highway															
5	T1	All MCs	1126	9.0	1126	9.0	0.302	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	109.9
6	R2	All MCs	36	5.9	36	5.9	0.167	24.3	LOS C	0.5	3.6	0.80	0.93	0.82	54.9
Approach			1162	8.9	1162	8.9	0.302	0.8	NA	0.5	3.6	0.02	0.03	0.03	106.6
North: Italia Road															
7	L2	All MCs	45	16.3	45	16.3	0.068	11.1	LOS B	0.2	1.8	0.50	0.76	0.50	60.9
9	R2	All MCs	34	59.4	34	59.4	0.741	135.4	LOS F	2.2	23.6	0.98	1.11	1.58	19.5
Approach			79	34.7	79	34.7	0.741	64.1	LOS F	2.2	23.6	0.70	0.91	0.96	31.9
West: Pacific Highway															
10	L2	All MCs	33	38.7	33	38.7	0.022	9.3	LOS A	0.0	0.0	0.00	0.67	0.00	64.1
11	T1	All MCs	939	14.8	939	14.8	0.261	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	109.9
Approach			972	15.6	972	15.6	0.261	0.3	NA	0.0	0.0	0.00	0.02	0.00	107.3
All Vehicles			2213	12.7	2213	12.7	0.741	2.8	NA	2.2	23.6	0.04	0.06	0.05	98.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [3. Italia Rd / Pacific Hwy AM Peak Stage 1 (Site Folder: Stage 1)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

Intersection of Italia Road and Pacific Highway
Proposed Conditions (Future)
AM Peak (8:30 - 9:30)
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Pacific Highway															
5	T1	All MCs	1014	15.8	1014	15.8	0.284	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	109.9
6	R2	All MCs	57	5.6	57	5.6	0.200	22.0	LOS C	0.7	4.8	0.82	0.94	0.86	57.1
Approach			1071	15.2	1071	15.2	0.284	1.2	NA	0.7	4.8	0.04	0.05	0.05	104.7
North: Italia Road															
7	L2	All MCs	62	66.1	62	66.1	0.049	12.1	LOS B	0.0	0.0	0.00	0.59	0.00	52.7
9	R2	All MCs	14	0.0	14	0.0	0.135	42.0	LOS E	0.4	2.7	0.91	0.97	0.91	43.8
Approach			76	54.2	76	54.2	0.135	17.5	LOS C	0.4	2.7	0.16	0.66	0.16	50.8
West: Pacific Highway															
10	L2	All MCs	64	67.2	64	67.2	0.056	10.9	LOS B	0.2	2.5	0.17	0.60	0.17	53.6
11	T1	All MCs	1109	15.9	1109	15.9	0.311	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	109.9
Approach			1174	18.7	1174	18.7	0.311	0.6	LOS A	0.2	2.5	0.01	0.03	0.01	103.9
All Vehicles			2320	18.3	2320	18.3	0.311	1.4	NA	0.7	4.8	0.03	0.06	0.03	100.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [3. Italia Rd / Pacific Hwy PM Peak Stage 1 (Site Folder: Stage 1)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

Intersection of Italia Road and Pacific Highway
Proposed Conditions (Future)
PM Peak (3:15 - 4:15)
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Pacific Highway															
5	T1	All MCs	1175	12.7	1175	12.7	0.323	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	109.9
6	R2	All MCs	36	5.9	36	5.9	0.091	17.3	LOS C	0.3	2.2	0.73	0.90	0.73	61.5
Approach			1211	12.5	1211	12.5	0.323	0.5	NA	0.3	2.2	0.02	0.03	0.02	107.4
North: Italia Road															
7	L2	All MCs	116	48.2	116	48.2	0.083	10.9	LOS B	0.0	0.0	0.00	0.60	0.00	56.3
9	R2	All MCs	23	0.0	23	0.0	0.143	29.2	LOS D	0.4	3.1	0.85	0.94	0.85	51.7
Approach			139	40.2	139	40.2	0.143	13.9	LOS B	0.4	3.1	0.14	0.66	0.14	55.5
West: Pacific Highway															
10	L2	All MCs	61	67.2	61	67.2	0.052	10.8	LOS B	0.2	2.3	0.13	0.61	0.13	53.7
11	T1	All MCs	939	14.8	939	14.8	0.261	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	109.9
Approach			1000	18.0	1000	18.0	0.261	0.7	LOS A	0.2	2.3	0.01	0.04	0.01	103.3
All Vehicles			2349	16.5	2349	16.5	0.323	1.4	NA	0.4	3.1	0.02	0.07	0.02	100.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [4. Italia Rd / Pacific Hwy AM Peak Stage 2 (Site Folder: Stage 2)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

Intersection of Italia Road and Pacific Highway
Proposed Conditions (Future)
AM Peak (8:30 - 9:30)
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Pacific Highway															
5	T1	All MCs	1037	17.7	1037	17.7	0.293	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	109.9
6	R2	All MCs	67	3.1	67	3.1	0.224	21.6	LOS C	0.8	5.6	0.82	0.95	0.89	58.0
Approach			1104	16.8	1104	16.8	0.293	1.3	NA	0.8	5.6	0.05	0.06	0.05	104.1
North: Italia Road															
7	L2	All MCs	85	71.6	85	71.6	0.069	12.4	LOS B	0.0	0.0	0.00	0.59	0.00	51.6
9	R2	All MCs	15	0.0	15	0.0	0.156	44.9	LOS E	0.5	3.2	0.91	0.97	0.92	42.3
Approach			100	61.1	100	61.1	0.156	17.2	LOS C	0.5	3.2	0.13	0.65	0.14	50.0
West: Pacific Highway															
10	L2	All MCs	92	75.9	92	75.9	0.084	11.2	LOS B	0.3	4.0	0.19	0.60	0.19	51.8
11	T1	All MCs	1109	15.9	1109	15.9	0.311	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	109.9
Approach			1201	20.5	1201	20.5	0.311	0.9	LOS A	0.3	4.0	0.01	0.05	0.01	101.1
All Vehicles			2405	20.5	2405	20.5	0.311	1.8	NA	0.8	5.6	0.04	0.08	0.04	98.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [4. Italia Rd / Pacific Hwy PM Peak Stage 2 (Site Folder: Stage 2)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

Intersection of Italia Road and Pacific Highway
Proposed Conditions (Future)
PM Peak (3:15 - 4:15)
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Pacific Highway															
5	T1	All MCs	1196	14.3	1196	14.3	0.332	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	109.9
6	R2	All MCs	42	5.0	42	5.0	0.105	17.2	LOS C	0.4	2.6	0.73	0.91	0.73	61.8
Approach			1238	13.9	1238	13.9	0.332	0.6	NA	0.4	2.6	0.02	0.03	0.02	107.0
North: Italia Road															
7	L2	All MCs	153	60.0	153	60.0	0.116	11.4	LOS B	0.0	0.0	0.00	0.60	0.00	53.8
9	R2	All MCs	11	0.0	11	0.0	0.069	30.0	LOS D	0.2	1.5	0.85	0.94	0.85	51.1
Approach			163	56.1	163	56.1	0.116	12.6	LOS B	0.2	1.5	0.05	0.62	0.05	53.6
West: Pacific Highway															
10	L2	All MCs	100	76.8	100	76.8	0.089	11.1	LOS B	0.4	4.4	0.15	0.60	0.15	51.7
11	T1	All MCs	939	14.8	939	14.8	0.261	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	109.9
Approach			1039	20.8	1039	20.8	0.261	1.1	LOS A	0.4	4.4	0.01	0.06	0.01	99.1
All Vehicles			2440	19.7	2440	19.7	0.332	1.6	NA	0.4	4.4	0.02	0.08	0.02	97.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

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