

FINAL REPORT

**Coraki Quarry**  
**Traffic Impact and Pavement Assessment Report**

Quarry Solutions Pty Ltd

Prepared by:

**MRCagney Pty Ltd**

October 2015



**MRCagney**

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# 1. Introduction

MRCagney has been commissioned by Quarry Solutions Pty Ltd to prepare a traffic impact assessment (TIA) and pavement impact assessment (PIA) report to support the development application of the proposed Coraki Quarry to be located to the north of Seelems Road, Coraki.

The likely production schedules of the proposed development are listed below:

- Maximum annual production rate - up to 1M tonnes per year; and
- Average annual production rate - approximately 0.8M tonnes per year over 5 to 7 years.

It is anticipated that the proposed quarry will start operating in July 2016 for 5 to 7 years.

We have been advised that the proposed development constitutes 'State Significant Development' and will be assessed by the NSW State Government in consultation with the Richmond Valley Council. It is understood that the quarry is proposed to predominately supply materials to the scheduled upgrade works of the Pacific Highway at Woodburn.

The traffic impact of the proposal has been assessed based on maximum production rates to ensure satisfactory operation of road infrastructure components at all times during the operational period of the site. In contrast, pavement impacts associated with the proposal are usually assessed based on the average production rates over the operational life as pavement impacts are fundamentally based on cumulative impacts. In this instance, however, the maximum annual production rate of 1M tonnes per annum has been considered as a conservative assumption in consideration of the Seelems Road pavement.

It is of course not possible to forecast the future actual annual maximum and average production volumes at this planning stage, with the actual rates being subject to variables such as operating costs and the specific demands of the upgrade works of the Pacific Highway. Notwithstanding this, the targeted maximum and average operating conditions of the proposed quarry mentioned above have been modelled and assessed herein as they are understood to be appropriate yardsticks in this instance.

In the event actual production rates ultimately are above the targeted maximum and / or average production rates identified, updated traffic and / or pavement assessment could be undertaken.

It is noted that access is proposed from Seelems Road as well as through an adjoining property, which is a quarry site owned by Council and to be also operated by the applicant.

A summary of findings is provided in Section 9 of this report.

## 2. Existing Conditions

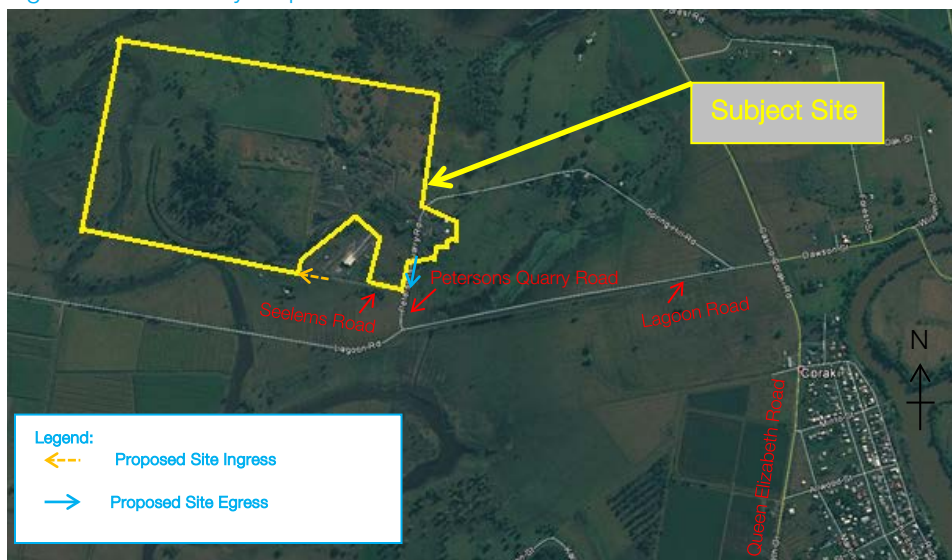
### 2.1 Subject Site

The subject site is located on Seelems Road, Coraki and is adjacent to the existing Petersons Quarry. The location of the site is illustrated on the Locality Map in Figure 2-1.

The locations of the proposed site ingress and egress are illustrated in Figure 2-1.

The site plan of the proposed development is included in Appendix A of this report.

Figure 2-1 Locality Map



## 2.2 Existing Road Network

The hierarchical classification and characteristics of roads in the vicinity of the subject site are described in Table 2-1 below.

Table 2-1 Existing Local Road Hierarchy

| Road                      | Speed limit | Characteristics                  | Authority                   |
|---------------------------|-------------|----------------------------------|-----------------------------|
| Seelems Road <sup>1</sup> | ~*          | Unsealed road                    | Richmond Valley Council     |
| Petersons Quarry Road     | ~*          | Sealed road                      | Richmond Valley Council     |
| Lagoon Road               | 100km/h     | Sealed (undivided) two-lane road | Richmond Valley Council     |
| Queen Elizabeth Drive     | 80km/h**    | Sealed (undivided) two-lane road | Richmond Valley Council     |
| Coraki Woodburn Road      | 100km/h     | Sealed (undivided) two-lane road | Richmond Valley Council     |
| Pacific Highway           | 50km/h***   | Sealed (undivided) two-lane road | Roads and Maritime Services |

Note:

<sup>1</sup>Seelems Road is the road section extending to Lot 407 of DP1166287 up to the site boundary, it is approximately 380m long from Petersons Quarry Road

\*Speed limit sign is not present.

\*\*Speed limit varies; the speed limit reduces to 40km/h from 8:00am to 9:00am and from 2:30pm to 4:00pm on school days within the school zone.

\*\*\*Speed limit of Pacific Highway near the Coraki Woodburn Road / Pacific Highway intersection.

The typical cross-section of Seelems Road is displayed in Figure 2-2.

Figure 2-2: Seelems Road looking east towards Petersons Quarry Road



The typical cross-section of Petersons Quarry Road is displayed in Figure 2-3.

Figure 2-3: Petersons Quarry Road looking north



The typical cross-section of Lagoon Road is displayed in Figure 2-4.

Figure 2-4: Lagoon Road looking west



The typical cross-sections of Queen Elizabeth Drive are displayed in Figures 2-5 and 2-6.

Figure 2-5: Queen Elizabeth Drive looking north





Figure 2-6: Queen Elizabeth Drive looking south near school zone



The typical cross-sections of Coraki Woodburn Road are displayed in Figure 2-7.

Figure 2-7: Coraki Woodburn Road looking north-west





### 3. The Transport Route

It is understood that the quarry is proposed to predominately supply materials to the scheduled upgrade works of the Pacific Highway at Woodburn.

The proposed internal transport route, illustrated in Figure 3-1, comprises the haul vehicle drivers entering the site via Seelems Road (the section fronting Lot 407 of DP1166287) and exiting the site via Petersons Quarry Road; the haul vehicles will circulate the site in a clockwise direction (one-way flow). Accordingly, only unladen haul vehicles would utilise Seelems Road.

We have been advised that staff vehicles are unlikely to utilise Seelems Road as the site office and the staff car parking area will be within the existing Petersons Quarry weighbridge area accessed via Petersons Quarry Road; upon review of the site plan, this appears to be an appropriate assumption.

The proposed external transport route from the site to the Pacific Highway, Woodburn is via Petersons Quarry Road, Lagoon Road, Queen Elizabeth Drive, Coraki Woodburn Road and thence the Pacific Highway. The proposed external transport route is illustrated in Figure 3-2.

Figure 3-1 The Proposed Internal Transport Route within the Site

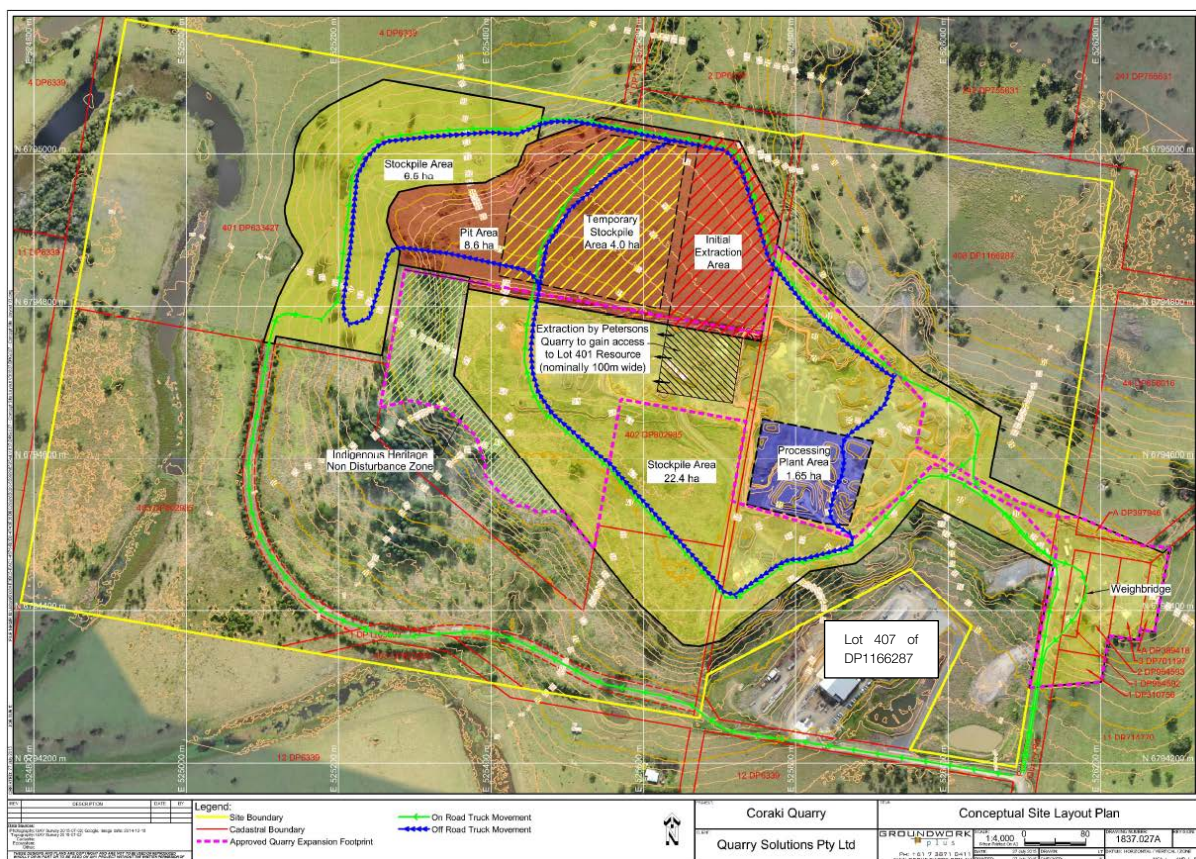
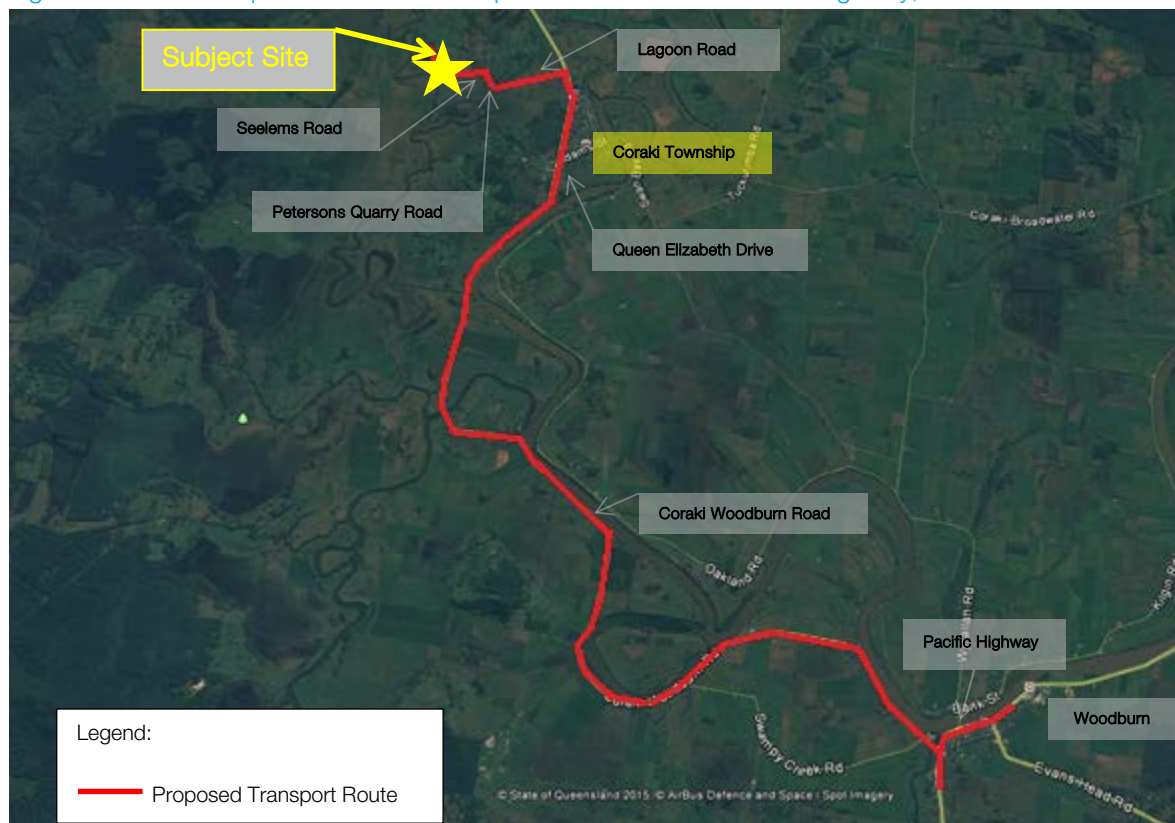


Figure 3-2 The Proposed External Transport Route to / from Pacific Highway, Woodburn Area





## 4. Base Traffic Volumes

### 4.1 2015 Traffic Volumes

As a part of this study, traffic surveys were commissioned to be undertaken by Austraffic at the following intersections in the vicinity of the site on Thursday 21<sup>st</sup> May 2015 from 6:30am to 10:30am and from 2:00pm to 6:00pm. The locations of traffic surveys are illustrated in Figure 4-1.

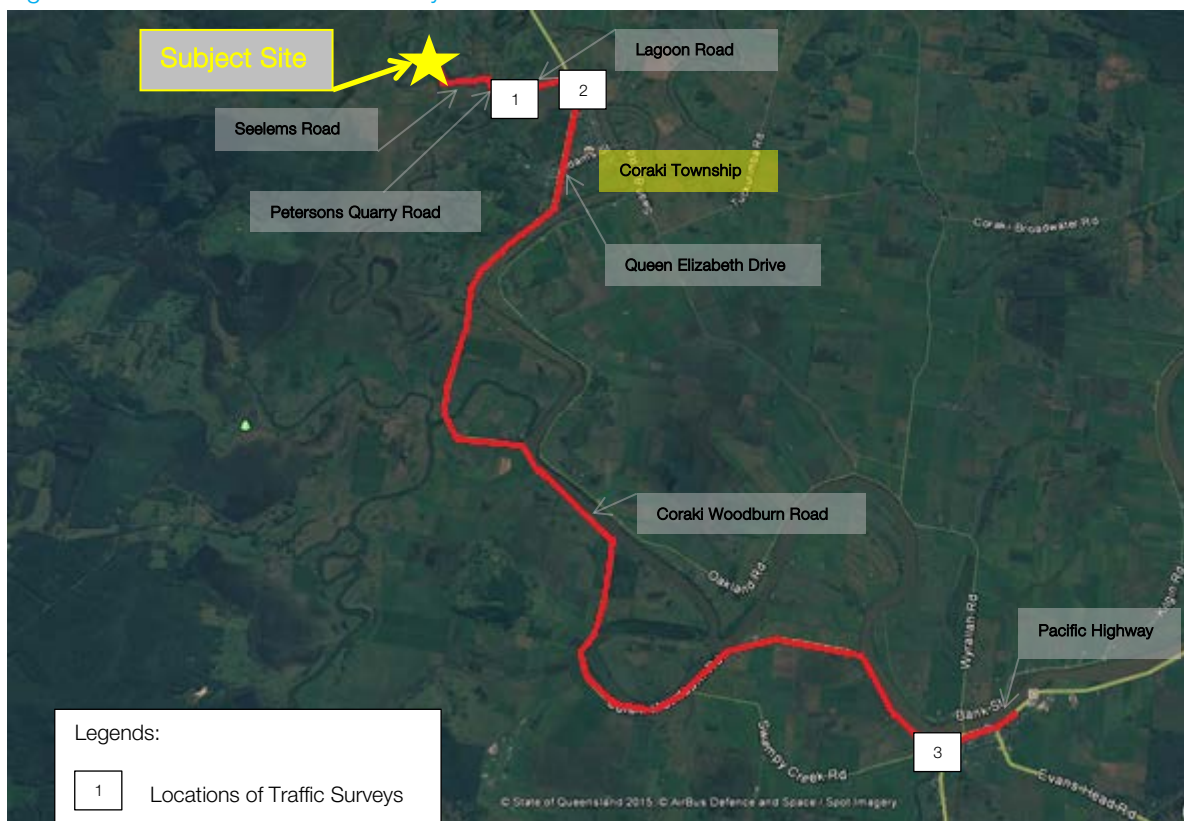
- Intersection 1: Petersons Quarry Road / Lagoon Road;
- Intersection 2: Lagoon Road / Queen Elizabeth Drive; and
- Intersection 3: Coraki Woodburn Road / Pacific Highway.

The detailed results of these traffic surveys are included in Appendix C of this report.

It is noted that it is the industry accepted traffic engineering practice to undertake the traffic impact assessment for a development of a small to medium scale based on the results of a single day's traffic survey. It is of course understood that there are daily / seasonal variations of traffic volumes at intersections or road corridors, however, the single day traffic survey as utilised in such cases provides suitable information in relation to the general traffic volumes / operational characteristics of intersections and provides a good indication of how the affected intersections would operate with and without the proposed development.

In this instance, the survey date was carefully chosen to avoid school holidays and Mondays / Fridays, so that the results of the survey could best represent the average traffic volumes of a normal weekday working day.

Figure 4-1: Locations of Traffic Surveys



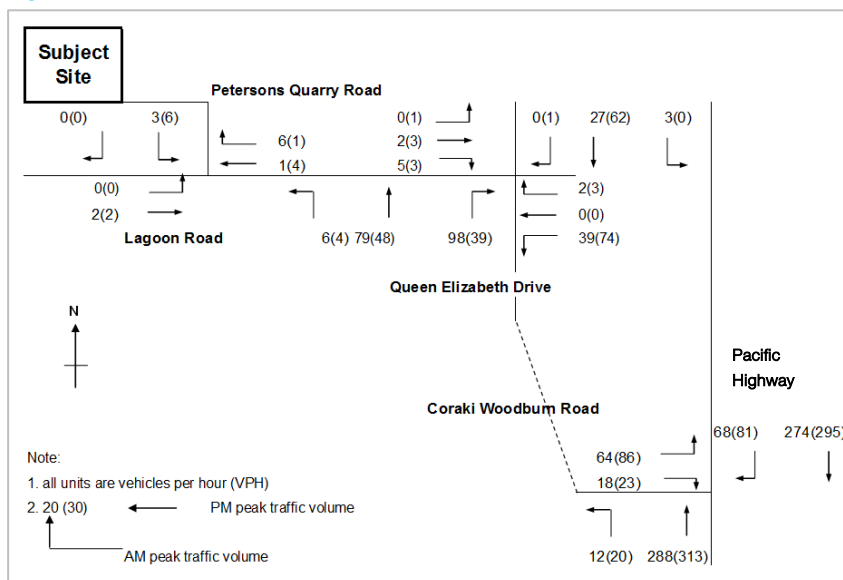
The observed AM and PM peak hour periods of traffic at the intersections are summarised in Table 4-1. The individual peak hour of traffic volumes of each intersection have been adopted for the analyses outlined in this traffic impact assessment. Accordingly traffic volumes will not match from intersection to intersection, however, it is considered that this approach will ensure the worst-case-scenario has been assessed for each location.

Figure 4-2 illustrates the 2015 observed traffic volumes during the peak hour periods.

Table 4-1: 2015 Observed AM and PM Peak Hour Periods

| Intersection                                           | AM Peak Hour Period | PM Peak Hour Period |
|--------------------------------------------------------|---------------------|---------------------|
| Intersection 1: Petersons Quarry Road / Lagoon Road    | 9:15am - 10:15am    | 3:15pm - 4:15pm     |
| Intersection 2: Lagoon Road / Queen Elizabeth Drive    | 7:30am - 8:30am     | 3:30pm - 4:30pm     |
| Intersection 3: Coraki Woodburn Road / Pacific Highway | 8:45am - 9:45am     | 3:00pm - 4:00pm     |

Figure 4-2 2015 Observed Traffic Volumes



## 4.2 Adjacent Existing Developments

From the point of view of undertaking holistic traffic loading on the road network, it is noted that adjacent to the subject site there is an industrial site and the Petersons Quarry. The survey undertaken on Thursday 21<sup>st</sup> May 2015 would include the traffic generated by the adjoining industrial site.

After the completion of the traffic survey, MRCagney was advised that the Petersons Quarry only operated on Wednesdays; therefore, the traffic generated by the Petersons Quarry would not have been included in the background traffic survey.

Based on results of intersection performance analysis (SIDRA analysis), included in Section 6 of this report, it is clear that all affected intersections have ample reserve capacity with and without the proposed development in the design year. All affected intersections would operate satisfactorily even if the total traffic volume generated was to double; therefore, there are no operational concerns with both the Petersons Quarry and the proposed development operating simultaneously.

The pavement impact of a development should be assessed based on the Annual Average Daily Traffic (AADT), not daily traffic volumes of a single survey day, therefore, the AADT (2015) on the adjacent road network already essentially includes the traffic generated by the Petersons Quarry.

Possible pavement contributions associated with the existing Petersons Quarry is a separate issue. As noted in Section 8 of this report, the pavement impact / contribution of the proposed development is calculated based on Section 94 Heavy Haulage Contributions Plans 2013 (Ref. 1).

### 4.3 Base Traffic Growth

It is anticipated that the proposed quarry will commence operations in July 2016 for 5 to 7 years. Therefore, the design horizon year of the proposed development would be 2023 (the last operational year of the proposed development).

#### Background Traffic Growth

For the purpose of this assessment, an average growth rate of 3% p.a. (compound) has been adopted to estimate future background traffic volumes. The growth of the traffic volumes on Petersons Quarry Road is assumed to be zero without the proposed development.

The 2016 base traffic volumes [Figure 4-3] are calculated as follows:

$$= 2015 \text{ observed traffic volumes [Figure 4-2]} \times (1 + 3\%)^1$$

The 2023 base traffic volumes [Figure 4-4] are calculated as follows:

$$= 2015 \text{ observed traffic volumes [Figure 4-2]} \times (1 + 3\%)^8$$

Figures 4-3 and 4-4 illustrate the 2016 and 2023 base traffic volumes without the proposed development during the peak hour periods that have been used as the basis of the traffic assessment outline herein.

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<sup>1</sup> "Section 94 Heavy Haulage Contributions Plans 2013", Richmond Valley Council, 2013.

Figure 4-3 2016 Base Traffic Volumes without the Proposed Development

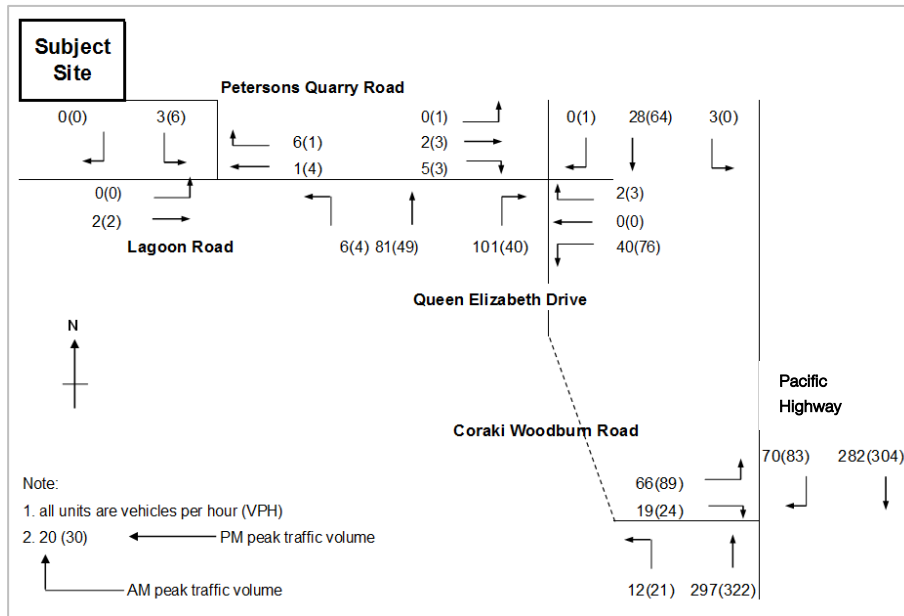
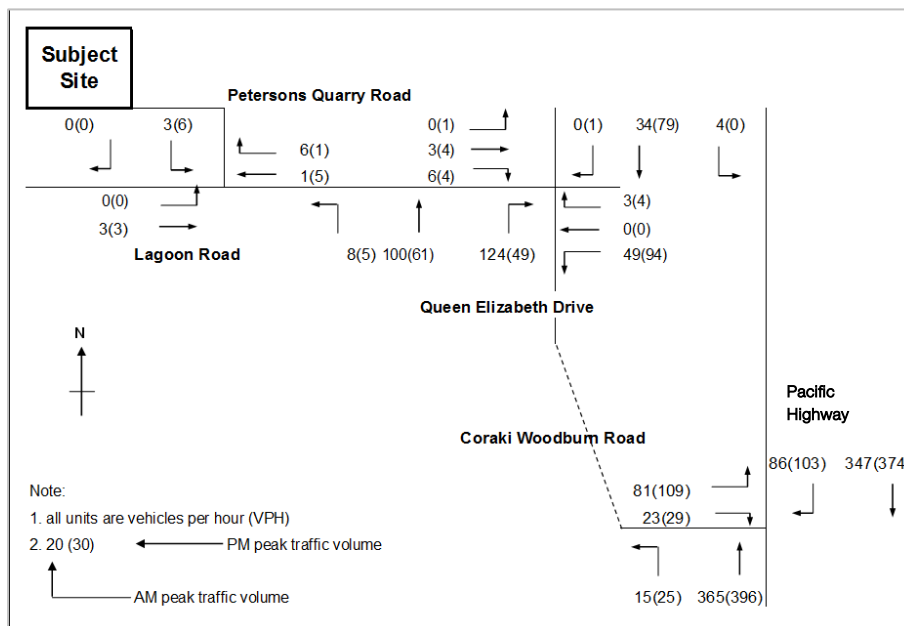


Figure 4-4 2023 Base Traffic Volumes without the Proposed Development



## 5. Traffic Volumes Generated by the Proposed Quarry

### 5.1 Trip Generation

The maximum annual production volume of the proposed development is anticipated to be 1M tonnes per year. It is not possible to forecast the future actual annual peak production volume at this planning stage, therefore, the maximum production threshold (1M tonnes per year) has been adopted to assess the traffic impact of the site on the surrounding road network; this is considered to be a conservative assumption. We have been advised that the proposed operating hours of the loading and hauling activities would be from 6:00am to 7:00pm from Monday to Saturday; there would be no operation on Sundays as well as major public holidays, such as Anzac Day, Good Friday, Easter Monday or Christmas Day.

The trips generated by the proposed development have been estimated by adopting the following project parameters. Whilst a number of these parameters have been based on assumptions, these are considered reasonable and reflective of the likely operations of the proposed development. Therefore, the resultant volume forecasts are considered appropriate for the purposes of this assessment.

|   |                                         |                                                        |
|---|-----------------------------------------|--------------------------------------------------------|
| ➤ | Total (max.) haulage*:                  | 1,000,000 tonnes per year;                             |
| ➤ | Working weeks per year:                 | 50 weeks;                                              |
| ➤ | Working days per week:                  | 6 days;                                                |
| ➤ | Working hours per day:                  | 13 hours;                                              |
| ➤ | Average mass of material per vehicle**: | 36 tonnes per vehicle;                                 |
| ➤ | Average hourly traffic volume (IN):     | $= [1,000,000 / 50 / 6 / 13 / 36] = 7\text{vph}$ ; and |
| ➤ | Average hourly traffic volume (OUT):    | 7vph (assumed same as IN traffic volumes).             |

\*MRCagney has been advised that the maximum production threshold would be 1M tonnes per year.

\*\*MRCagney has been advised that 36t payload truck & dog would be used.

It is noted that the proposed development would generate an average hourly traffic volume of 7vph (IN) and 7vph (OUT). However, in order to ensure sufficient infrastructure is proposed to be provided to cater for the 'worst-case' peak design scenario, it is conservatively assumed that the proposed development would generate more than the average hourly traffic volumes during the peak hour periods by introducing the concept of peak hour factor.

|   |                                   |                                                                                                  |
|---|-----------------------------------|--------------------------------------------------------------------------------------------------|
| ➤ | Peak hour factor***:              | 3 (for the purpose of this traffic impact assessment, a peak hour factor of 3 has been adopted); |
| ➤ | Peak hourly traffic volume (IN):  | $= [1,000,000 / 50 / 6 / 13 / 36 \times 3] = 21\text{vph}$ ; and                                 |
| ➤ | Peak hourly traffic volume (OUT): | 21vph (assumed same as IN traffic volumes).                                                      |

\*\*\*Peak hour factor is the ratio of the absolute peak operating conditions to the average operating conditions of a peak production year. This represents what is considered to be the 'worst-case' peak design scenario and has been used as the basis of this traffic impact assessment.

It is understood that there will be total of 15 on-site staff (on different shifts) working at the proposed development.

Whilst the staff may not necessarily arrive / leave the site during the AM and PM road peak hour periods, it is conservatively assumed that approximately one-third of staff would arrive at the site during the AM



peak hour period and leave the site during the PM peak hour period; ie. staff of the site would generate 5vph during the AM peak hour period (5vph IN + 0vph OUT) and the PM peak hour period (0vph IN + 5vph OUT). The trips generated by the staff are in addition to the trips generated by the hauling activities.

It is understood that the quarry is proposed to predominately supply materials to the scheduled upgrade works on the Pacific Highway at Woodburn. It is understood that all of the quarried materials will be delivered to the Pacific Highway to the north of the Pacific Highway / Coraki Woodburn Road intersection in the early stage of the Pacific Highway upgrade project; and all of the quarried materials will be delivered to the Pacific Highway to the south of the Pacific Highway / Coraki Woodburn Road intersection in the latter stage of the project. The location of the housing of staff working at the site cannot be known at this stage; however, it is conservatively assumed the staff come from the north during the early stage, and vice versa in the latter stage in this traffic assessment; which are considered as the 'worst-case' scenarios.

The peak hourly trips forecast to be generated by the proposed development based on the aforementioned assumptions are illustrated in Figure 5-1 (the early stage) and Figure 5-2 (the latter stage).

Figure 5-1 Trips Forecast to be Generated by the Site – the Early Stage of the Pacific Highway Upgrade Project

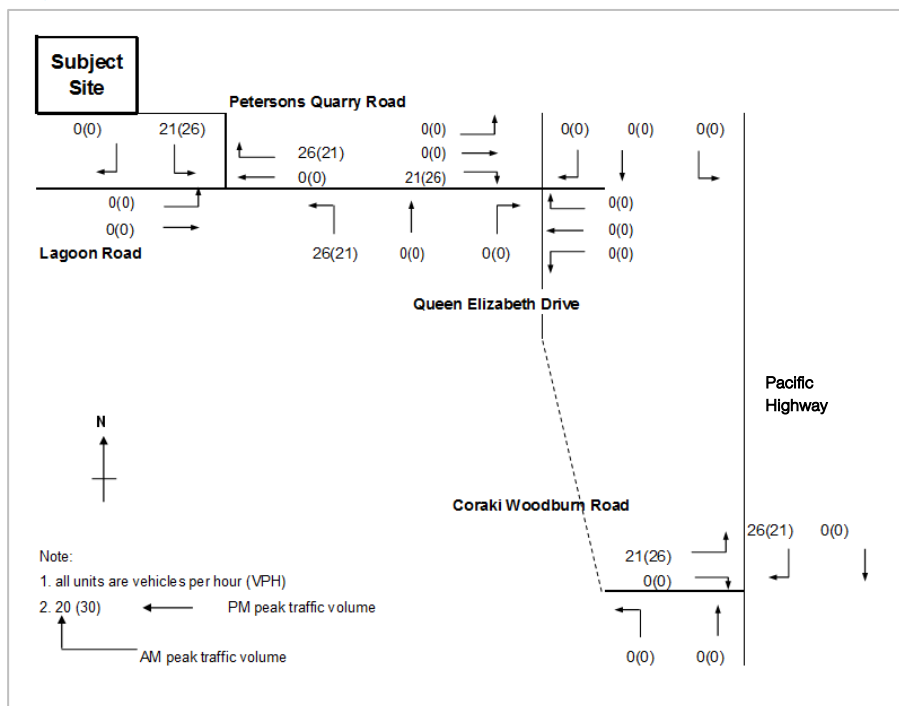
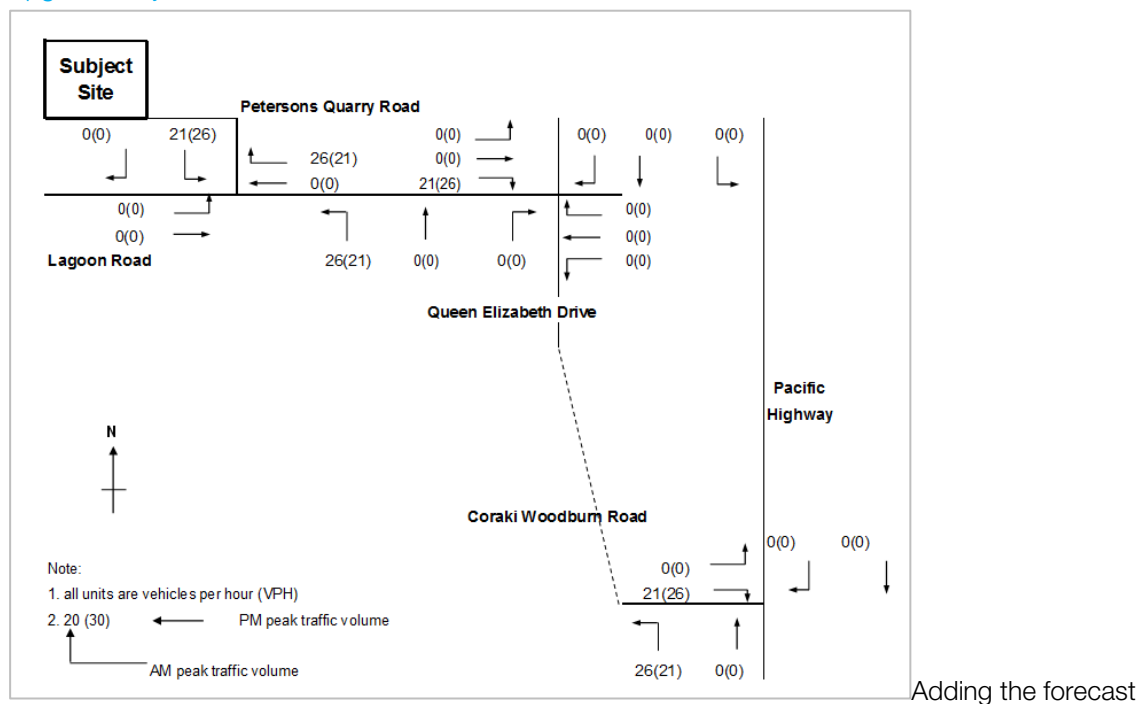


Figure 5-2 Trips Forecast to be Generated by the Site – the Latter Stage of the Pacific Highway Upgrade Project



Adding the forecast development-generated traffic to the base traffic volumes, the 2016 and 2023 design traffic volumes (the early stage) are illustrated in Figures 5-3 and 5-4 respectively.

Similarly, the 2016 and 2023 design traffic volumes (the latter stage) are illustrated in Figures 5-5 and 5-6 respectively.

Figure 5-3 2016 Design Traffic Volumes with the Proposed Development – the Early Stage of the Pacific Highway Upgrade Project

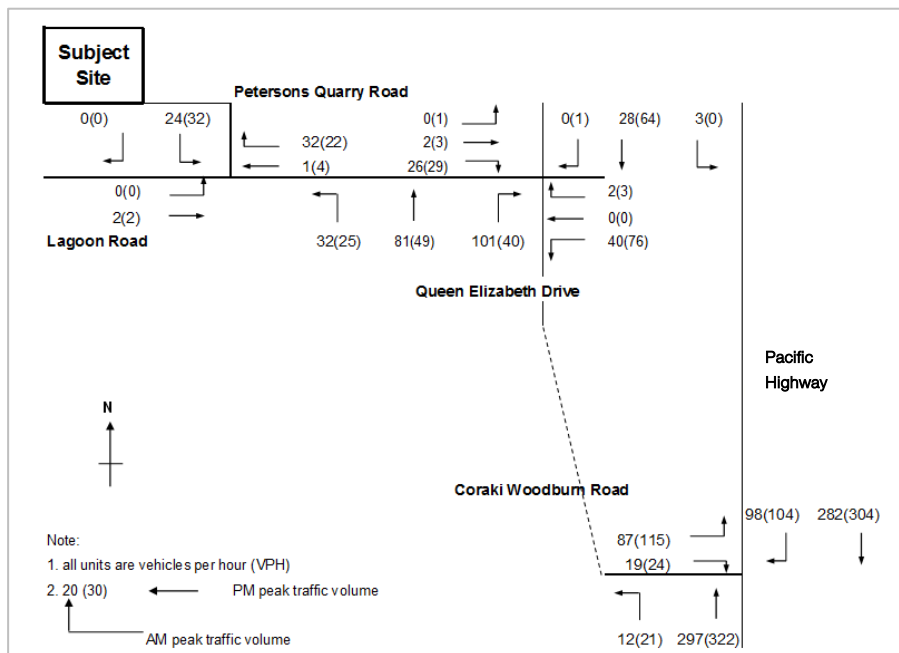


Figure 5-4 2023 Design Traffic Volumes with the Proposed Development – the Early Stage of the Pacific Highway Upgrade Project

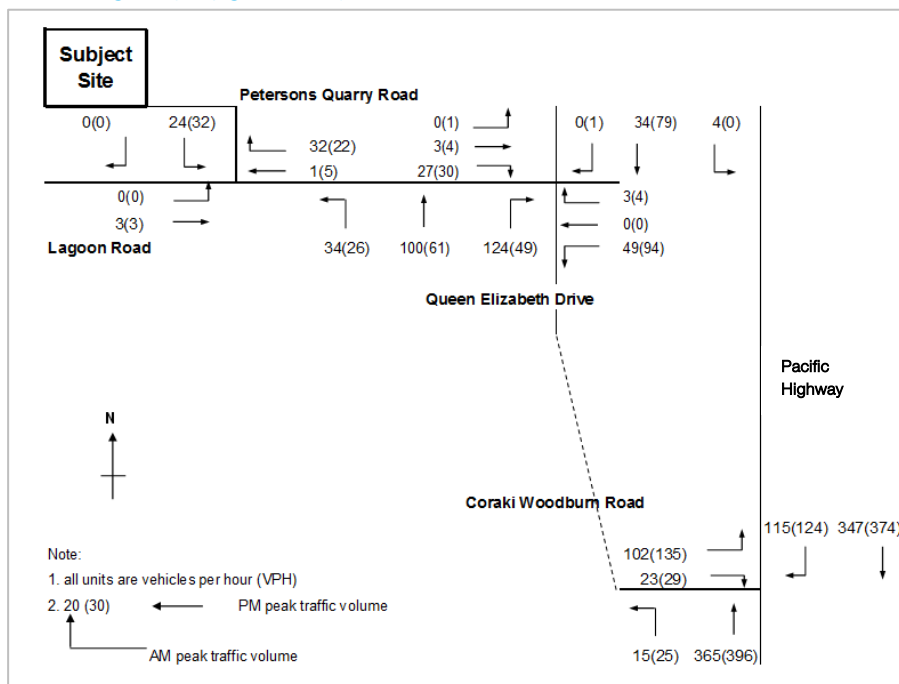


Figure 5-5 2016 Design Traffic Volumes with the Proposed Development – the Latter Stage of the Pacific Highway Upgrade Project

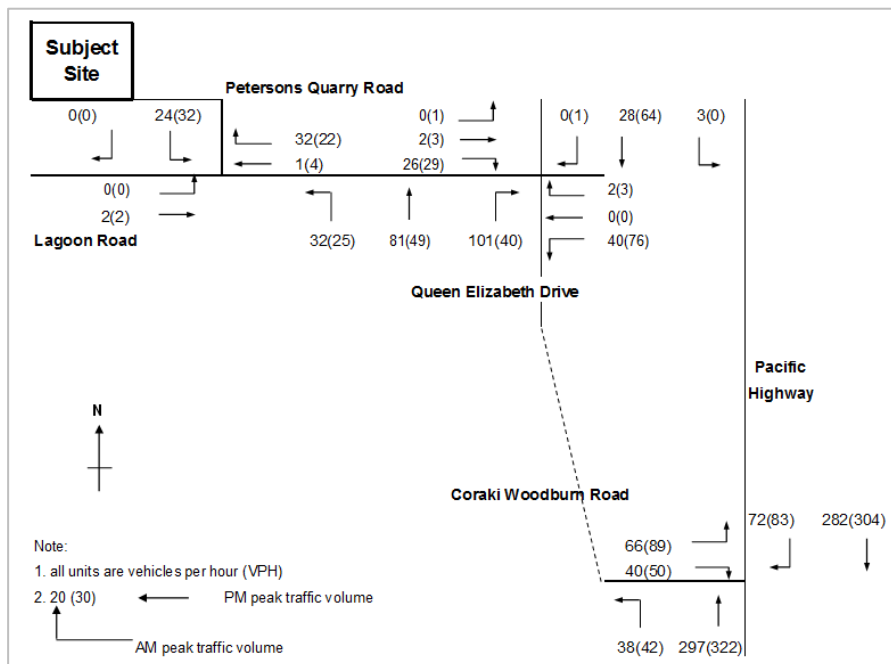
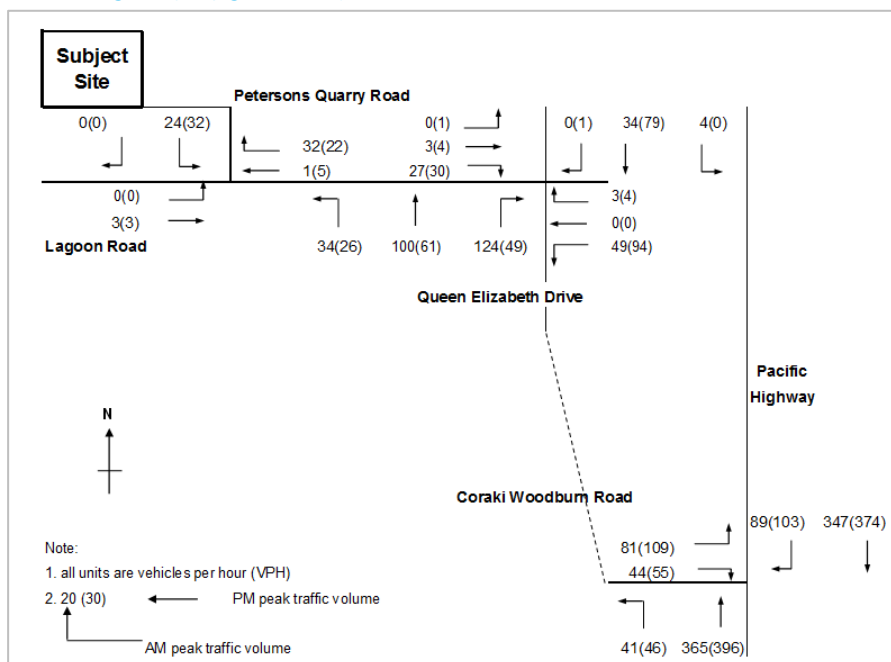


Figure 5-6 2023 Design Traffic Volumes with the Proposed Development – the Latter Stage of the Pacific Highway Upgrade Project



## 6. Intersection Performance

### 6.1 Intersection Capacity

To quantify the impact of the proposed development on the operation of the external road network, future operation of the following key intersections has been assessed:

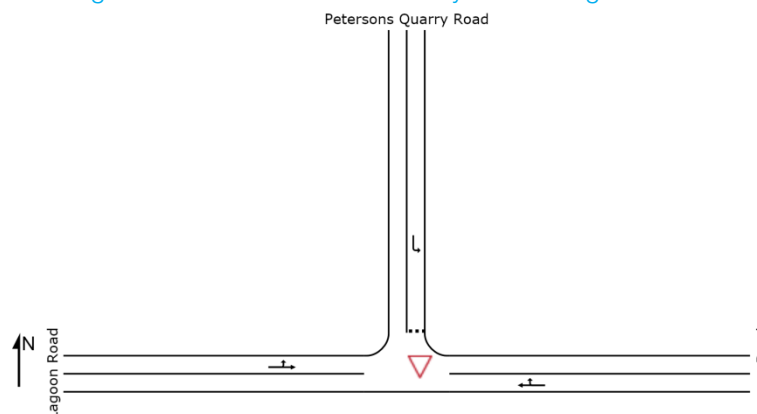
- Intersection 1: Petersons Quarry Road / Lagoon Road;
- Intersection 2: Lagoon Road / Queen Elizabeth Drive; and
- Intersection 3: Coraki Woodburn Road / Pacific Highway.

The following sections of this report summarise the findings of the analyses.

#### 6.1.1 Intersection 1: Petersons Quarry Road / Lagoon Road Intersection

The configuration of the Petersons Quarry Road / Lagoon Road intersection modelled in the SIDRA analyses is shown in Figure 6-1. The number of vehicles turning right from Petersons Quarry Road onto Lagoon Road during the entire traffic survey period was zero; it is anticipated that the right turn movement from Petersons Quarry Road will continue to be minimal. Therefore, no right turn on Petersons Quarry Road has been modelled in the SIDRA analyses for simplicity; notwithstanding this assumption, review of the results of the analysis will clearly reveal that such an assumption is immaterial.

Figure 6-1: Modelled Configuration of the Petersons Quarry Road / Lagoon Road Intersection



Results of the analyses of the operation of the Petersons Quarry Road / Lagoon Road intersection for the base and design scenarios in 2016 (the opening year of the site) and 2023 (design year - the last operational year of the site) are summarised in Tables 6-1 and 6-2 respectively. It is noted that the traffic generation / distribution at this intersection are the same for both the early and latter stages of the Pacific Highway upgrade project. Detailed results are provided within Appendix B.

Table 6-1: 2016 Operational Characteristics of the Petersons Quarry Road / Lagoon Road Intersection

| Leg                           | Movement | 2016 Base                  |                       |                            |                       | 2016 Design                |                       |                            |                       |
|-------------------------------|----------|----------------------------|-----------------------|----------------------------|-----------------------|----------------------------|-----------------------|----------------------------|-----------------------|
|                               |          | AM                         |                       | PM                         |                       | AM                         |                       | PM                         |                       |
|                               |          | Degree of Saturation (v/c) | 95% Back of Queue (m) | Degree of Saturation (v/c) | 95% Back of Queue (m) | Degree of Saturation (v/c) | 95% Back of Queue (m) | Degree of Saturation (v/c) | 95% Back of Queue (m) |
| Lagoon Road (East)            | T        | 0.01                       | 0                     | 0.00                       | 0                     | 0.03                       | 1                     | 0.02                       | 1                     |
|                               | R        | 0.01                       | 0                     | 0.00                       | 0                     | 0.03                       | 1                     | 0.02                       | 1                     |
| Petersons Quarry Road (North) | L        | 0.00                       | 0                     | 0.01                       | 0                     | 0.02                       | 1                     | 0.03                       | 2                     |
| Lagoon Road (West)            | L        | 0.00                       | 0                     | 0.00                       | 0                     | 0.00                       | 0                     | 0.00                       | 0                     |
|                               | T        | 0.00                       | 0                     | 0.00                       | 0                     | 0.00                       | 0                     | 0.00                       | 0                     |

Note: Practical Maximum Degree of Saturation ( $X_p$ ) for a priority intersection is 0.80.

Table 6-2: 2023 Operational Characteristics of the Petersons Quarry Road / Lagoon Road Intersection

| Leg                           | Movement | 2023 Base                  |                       |                            |                       | 2023 Design                |                       |                            |                       |
|-------------------------------|----------|----------------------------|-----------------------|----------------------------|-----------------------|----------------------------|-----------------------|----------------------------|-----------------------|
|                               |          | AM                         |                       | PM                         |                       | AM                         |                       | PM                         |                       |
|                               |          | Degree of Saturation (v/c) | 95% Back of Queue (m) | Degree of Saturation (v/c) | 95% Back of Queue (m) | Degree of Saturation (v/c) | 95% Back of Queue (m) | Degree of Saturation (v/c) | 95% Back of Queue (m) |
| Lagoon Road (East)            | T        | 0.01                       | 0                     | 0.00                       | 0                     | 0.03                       | 1                     | 0.02                       | 1                     |
|                               | R        | 0.01                       | 0                     | 0.00                       | 0                     | 0.03                       | 1                     | 0.02                       | 1                     |
| Petersons Quarry Road (North) | L        | 0.00                       | 0                     | 0.01                       | 0                     | 0.02                       | 1                     | 0.03                       | 2                     |
| Lagoon Road (West)            | L        | 0.00                       | 0                     | 0.00                       | 0                     | 0.02                       | 0                     | 0.00                       | 0                     |
|                               | T        | 0.00                       | 0                     | 0.00                       | 0                     | 0.02                       | 0                     | 0.00                       | 0                     |

Note: Practical Maximum Degree of Saturation ( $X_p$ ) for a priority intersection is 0.80.

The results provided in Tables 6-1 and 6-2 indicate that the Petersons Quarry Road / Lagoon Road intersection would continue to operate well within satisfactory operating conditions beyond the design horizon year (2023) with development of the subject proposal.

All development-related trips entering Petersons Quarry Road will turn right from Lagoon Road. It is also noted that the through traffic on Lagoon Road at the Petersons Quarry Road / Lagoon Road intersection will be less than 10vph during the AM and PM peak hour periods in 2023. Therefore, no right turn lane treatment is considered to be necessary at the Petersons Quarry Road / Lagoon Road intersection due to the extremely low through traffic on Lagoon Road.

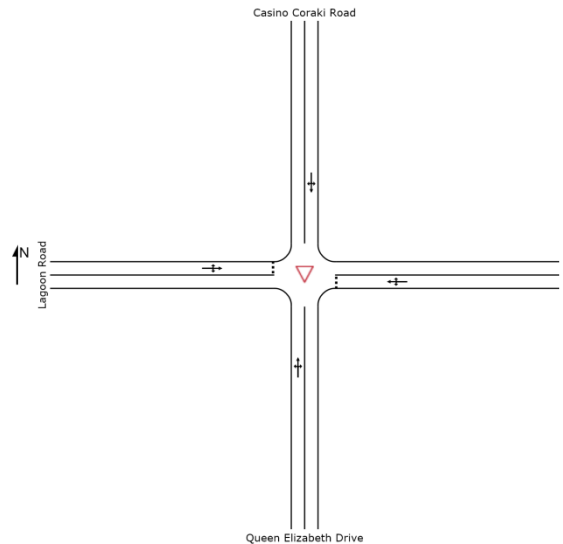
The intersection is forecast to operate safely and efficiently for the foreseeable future. As alluded to in Section 4 of this report, clearly this intersection would also accommodate traffic associated with the existing Petersons Quarry.



### 6.1.2 Intersection 2: Lagoon Road / Queen Elizabeth Road Intersection

The existing configuration of the Lagoon Road / Queen Elizabeth Road intersection modelled in the SIDRA analyses is shown in Figure 6-2.

Figure 6-2: Modelled Configuration of the Lagoon Road / Queen Elizabeth Road Intersection



Results of the analyses of the operation of the Lagoon Road / Queen Elizabeth Road intersection for the base and design scenarios in 2016 (the opening year of the site) and 2023 (design year - the last operational year of the site) are summarised in Tables 6-3 and 6-4 respectively. It is noted that the traffic generation / distribution at this intersection are the same for both the early and latter stages of the Pacific Highway upgrade project. Detailed results are provided within Appendix B.

Table 6-3: 2016 Operational Characteristics of the Lagoon Road / Queen Elizabeth Road Intersection

| Leg                           | Movement | 2016 Base                  |                       |                            |                       | 2016 Design                |                       |                            |                       |
|-------------------------------|----------|----------------------------|-----------------------|----------------------------|-----------------------|----------------------------|-----------------------|----------------------------|-----------------------|
|                               |          | AM                         |                       | PM                         |                       | AM                         |                       | PM                         |                       |
|                               |          | Degree of Saturation (v/c) | 95% Back of Queue (m) | Degree of Saturation (v/c) | 95% Back of Queue (m) | Degree of Saturation (v/c) | 95% Back of Queue (m) | Degree of Saturation (v/c) | 95% Back of Queue (m) |
| Queen Elizabeth Drive (South) | L        | 0.11                       | 4                     | 0.05                       | 2                     | 0.12                       | 4                     | 0.07                       | 2                     |
|                               | T        | 0.11                       | 4                     | 0.05                       | 2                     | 0.12                       | 4                     | 0.07                       | 2                     |
|                               | R        | 0.11                       | 4                     | 0.05                       | 2                     | 0.12                       | 4                     | 0.07                       | 2                     |
| Dawson Street (East)          | L        | 0.03                       | 1                     | 0.05                       | 2                     | 0.03                       | 1                     | 0.05                       | 2                     |
|                               | T        | 0.03                       | 1                     | 0.05                       | 2                     | 0.03                       | 1                     | 0.05                       | 2                     |
|                               | R        | 0.03                       | 1                     | 0.05                       | 2                     | 0.03                       | 1                     | 0.05                       | 2                     |
| Casino Coraki Road (North)    | L        | 0.02                       | 0                     | 0.04                       | 0                     | 0.02                       | 0                     | 0.04                       | 0                     |
|                               | T        | 0.02                       | 0                     | 0.04                       | 0                     | 0.02                       | 0                     | 0.04                       | 0                     |
|                               | R        | 0.02                       | 0                     | 0.04                       | 0                     | 0.02                       | 0                     | 0.04                       | 0                     |
| Lagoon Road (West)            | L        | 0.01                       | 1                     | 0.01                       | 1                     | 0.04                       | 1                     | 0.04                       | 1                     |
|                               | T        | 0.01                       | 1                     | 0.01                       | 1                     | 0.04                       | 1                     | 0.04                       | 1                     |
|                               | R        | 0.01                       | 1                     | 0.01                       | 1                     | 0.04                       | 1                     | 0.04                       | 1                     |

Note: Practical Maximum Degree of Saturation ( $X_p$ ) for a priority intersection is 0.80.

Table 6-4: 2023 Operational Characteristics of the Lagoon Road / Queen Elizabeth Road Intersection

| Leg                           | Movement | 2023 Base                  |                       |                            |                       | 2023 Design                |                       |                            |                       |
|-------------------------------|----------|----------------------------|-----------------------|----------------------------|-----------------------|----------------------------|-----------------------|----------------------------|-----------------------|
|                               |          | AM                         |                       | PM                         |                       | AM                         |                       | PM                         |                       |
|                               |          | Degree of Saturation (v/c) | 95% Back of Queue (m) | Degree of Saturation (v/c) | 95% Back of Queue (m) | Degree of Saturation (v/c) | 95% Back of Queue (m) | Degree of Saturation (v/c) | 95% Back of Queue (m) |
| Queen Elizabeth Drive (South) | L        | 0.13                       | 5                     | 0.07                       | 2                     | 0.15                       | 5                     | 0.08                       | 2                     |
|                               | T        | 0.13                       | 5                     | 0.07                       | 2                     | 0.15                       | 5                     | 0.08                       | 2                     |
|                               | R        | 0.13                       | 5                     | 0.07                       | 2                     | 0.15                       | 5                     | 0.08                       | 2                     |
| Dawson Street (East)          | L        | 0.04                       | 1                     | 0.07                       | 2                     | 0.04                       | 1                     | 0.07                       | 2                     |
|                               | T        | 0.04                       | 1                     | 0.07                       | 2                     | 0.04                       | 1                     | 0.07                       | 2                     |
|                               | R        | 0.04                       | 1                     | 0.07                       | 2                     | 0.04                       | 1                     | 0.07                       | 2                     |
| Casino Coraki Road (North)    | L        | 0.02                       | 0                     | 0.04                       | 0                     | 0.02                       | 0                     | 0.04                       | 0                     |
|                               | T        | 0.02                       | 0                     | 0.04                       | 0                     | 0.02                       | 0                     | 0.04                       | 0                     |
|                               | R        | 0.02                       | 0                     | 0.04                       | 0                     | 0.02                       | 0                     | 0.04                       | 0                     |
| Lagoon Road (West)            | L        | 0.01                       | 0                     | 0.03                       | 0                     | 0.05                       | 1                     | 0.04                       | 1                     |
|                               | T        | 0.01                       | 0                     | 0.03                       | 0                     | 0.05                       | 1                     | 0.04                       | 1                     |
|                               | R        | 0.01                       | 0                     | 0.03                       | 0                     | 0.05                       | 1                     | 0.04                       | 1                     |

Note: Practical Maximum Degree of Saturation ( $X_p$ ) for a priority intersection is 0.80.

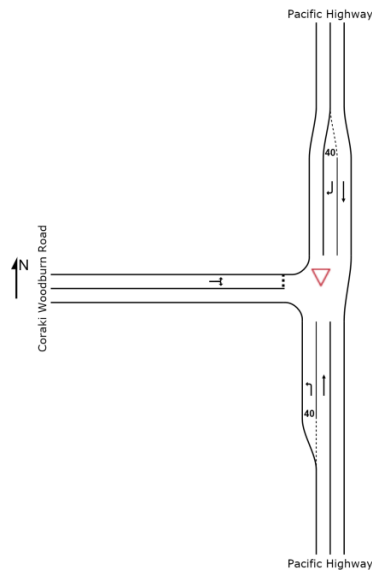
The results provided in Tables 6-3 and 6-4 indicate that the Lagoon Road / Queen Elizabeth Drive intersection would continue to operate well within satisfactory operating conditions beyond the design horizon year (2023) with development of the subject proposal. Traffic volumes are sufficiently low so as not to warrant turn lane treatments.

As alluded to in Section 4 of this report, clearly this intersection would also accommodate traffic associated with the existing Petersons Quarry.

### 6.1.3 Intersection 3: Coraki Woodburn Road / Pacific Highway Intersection

The existing Coraki Woodburn Road / Pacific Highway intersection is an old-style right turn Type B geometry, it operates in a similar fashion to an intersection with an auxiliary right turn lane; therefore, for the purpose of this assessment, the Coraki Woodburn Road / Pacific Highway intersection has been modelled as an intersection with an auxiliary right turn lane in the SIDRA analyses as shown in Figure 6-3. It is noted that this assumption does not indicate that a modified treatment for the right turn is required; it simply is the adopted modelling approach, which is generally accepted as being appropriate for such a circumstance.

Figure 6-3: Modelled Configuration of the Coraki Woodburn Road / Pacific Highway Intersection



Results of the analyses of the operation of the Coraki Woodburn Road / Pacific Highway intersection for the base and design scenarios in 2016 (the opening year of the site) and 2023 (design year - the last operational year of the site) for the early stage of the Pacific Highway upgrade project are summarised in Tables 6-5 and 6-6 respectively. The early stage of the Pacific Highway upgrade project will be completed before 2023, therefore, it is considered to be a conservative assumption to adopt the design year of 2023 for the early stage scenarios.

Results of the analyses of the operation of the Coraki Woodburn Road / Pacific Highway intersection for the base and design scenarios in 2016 and 2023 for the latter stage of the Pacific Highway upgrade project are summarised in Tables 6-7 and 6-8 respectively. Detailed results are provided within Appendix B.

Table 6-5: 2016 Operational Characteristics of the Coraki Woodburn Road / Pacific Highway Intersection – the Early Stage of the Pacific Highway Upgrade Project

| Leg                         | Movement | 2016 Base                  |                       |                            |                       | 2016 Design                |                       |                            |                       |
|-----------------------------|----------|----------------------------|-----------------------|----------------------------|-----------------------|----------------------------|-----------------------|----------------------------|-----------------------|
|                             |          | AM                         |                       | PM                         |                       | AM                         |                       | PM                         |                       |
|                             |          | Degree of Saturation (v/c) | 95% Back of Queue (m) | Degree of Saturation (v/c) | 95% Back of Queue (m) | Degree of Saturation (v/c) | 95% Back of Queue (m) | Degree of Saturation (v/c) | 95% Back of Queue (m) |
| Pacific Highway (South)     | L        | 0.01                       | 0                     | 0.01                       | 0                     | 0.07                       | 0                     | 0.01                       | 0                     |
|                             | T        | 0.17                       | 0                     | 0.18                       | 0                     | 0.17                       | 0                     | 0.18                       | 0                     |
| Pacific Highway (North)     | T        | 0.16                       | 0                     | 0.18                       | 0                     | 0.16                       | 0                     | 0.18                       | 0                     |
|                             | R        | 0.08                       | 2                     | 0.10                       | 3                     | 0.11                       | 4                     | 0.12                       | 4                     |
| Coraki Woodburn Road (West) | L        | 0.14                       | 4                     | 0.19                       | 5                     | 0.16                       | 5                     | 0.22                       | 6                     |
|                             | R        | 0.14                       | 4                     | 0.19                       | 5                     | 0.16                       | 5                     | 0.22                       | 6                     |

Note: Practical Maximum Degree of Saturation ( $X_p$ ) for a priority intersection is 0.80.

Table 6-6: 2023 Operational Characteristics of the Coraki Woodburn Road / Pacific Highway Intersection – the Early Stage of the Pacific Highway Upgrade Project

| Leg                         | Movement | 2023 Base                  |                       |                            |                       | 2023 Design                |                       |                            |                       |
|-----------------------------|----------|----------------------------|-----------------------|----------------------------|-----------------------|----------------------------|-----------------------|----------------------------|-----------------------|
|                             |          | AM                         |                       | PM                         |                       | AM                         |                       | PM                         |                       |
|                             |          | Degree of Saturation (v/c) | 95% Back of Queue (m) | Degree of Saturation (v/c) | 95% Back of Queue (m) | Degree of Saturation (v/c) | 95% Back of Queue (m) | Degree of Saturation (v/c) | 95% Back of Queue (m) |
| Pacific Highway (South)     | L        | 0.01                       | 0                     | 0.01                       | 0                     | 0.01                       | 0                     | 0.01                       | 0                     |
|                             | T        | 0.21                       | 0                     | 0.22                       | 0                     | 0.21                       | 0                     | 0.22                       | 0                     |
| Pacific Highway (North)     | T        | 0.19                       | 0                     | 0.22                       | 0                     | 0.19                       | 0                     | 0.22                       | 0                     |
|                             | R        | 0.11                       | 3                     | 0.13                       | 4                     | 0.14                       | 5                     | 0.16                       | 5                     |
| Coraki Woodburn Road (West) | L        | 0.20                       | 6                     | 0.29                       | 9                     | 0.23                       | 7                     | 0.32                       | 11                    |
|                             | R        | 0.20                       | 6                     | 0.29                       | 9                     | 0.23                       | 7                     | 0.32                       | 11                    |

Note: Practical Maximum Degree of Saturation ( $X_p$ ) for a priority intersection is 0.80.

Table 6-7: 2016 Operational Characteristics of the Coraki Woodburn Road / Pacific Highway Intersection – the Latter Stage of the Pacific Highway Upgrade Project

| Leg                         | Movement | 2016 Base                  |                       |                            |                       | 2016 Design                |                       |                            |                       |
|-----------------------------|----------|----------------------------|-----------------------|----------------------------|-----------------------|----------------------------|-----------------------|----------------------------|-----------------------|
|                             |          | AM                         |                       | PM                         |                       | AM                         |                       | PM                         |                       |
|                             |          | Degree of Saturation (v/c) | 95% Back of Queue (m) | Degree of Saturation (v/c) | 95% Back of Queue (m) | Degree of Saturation (v/c) | 95% Back of Queue (m) | Degree of Saturation (v/c) | 95% Back of Queue (m) |
| Pacific Highway (South)     | L        | 0.01                       | 0                     | 0.01                       | 0                     | 0.02                       | 0                     | 0.02                       | 0                     |
|                             | T        | 0.17                       | 0                     | 0.18                       | 0                     | 0.17                       | 0                     | 0.18                       | 0                     |
| Pacific Highway (North)     | T        | 0.16                       | 0                     | 0.18                       | 0                     | 0.16                       | 0                     | 0.18                       | 0                     |
|                             | R        | 0.08                       | 2                     | 0.10                       | 3                     | 0.08                       | 3                     | 0.10                       | 3                     |
| Coraki Woodburn Road (West) | L        | 0.14                       | 4                     | 0.19                       | 5                     | 0.21                       | 6                     | 0.27                       | 9                     |
|                             | R        | 0.14                       | 4                     | 0.19                       | 5                     | 0.21                       | 6                     | 0.27                       | 9                     |

Note: Practical Maximum Degree of Saturation ( $X_p$ ) for a priority intersection is 0.80.

Table 6-8: 2023 Operational Characteristics of the Coraki Woodburn Road / Pacific Highway Intersection – the Latter Stage of the Pacific Highway Upgrade Project

| Leg                         | Movement | 2023 Base                  |                       |                            |                       | 2023 Design                |                       |                            |                       |
|-----------------------------|----------|----------------------------|-----------------------|----------------------------|-----------------------|----------------------------|-----------------------|----------------------------|-----------------------|
|                             |          | AM                         |                       | PM                         |                       | AM                         |                       | PM                         |                       |
|                             |          | Degree of Saturation (v/c) | 95% Back of Queue (m) | Degree of Saturation (v/c) | 95% Back of Queue (m) | Degree of Saturation (v/c) | 95% Back of Queue (m) | Degree of Saturation (v/c) | 95% Back of Queue (m) |
| Pacific Highway (South)     | L        | 0.01                       | 0                     | 0.01                       | 0                     | 0.02                       | 0                     | 0.03                       | 0                     |
|                             | T        | 0.21                       | 0                     | 0.22                       | 0                     | 0.21                       | 0                     | 0.22                       | 0                     |
| Pacific Highway (North)     | T        | 0.19                       | 0                     | 0.22                       | 0                     | 0.19                       | 0                     | 0.22                       | 0                     |
|                             | R        | 0.11                       | 3                     | 0.13                       | 4                     | 0.11                       | 4                     | 0.13                       | 4                     |
| Coraki Woodburn Road (West) | L        | 0.20                       | 6                     | 0.29                       | 9                     | 0.31                       | 10                    | 0.43                       | 16                    |
|                             | R        | 0.20                       | 6                     | 0.29                       | 9                     | 0.31                       | 10                    | 0.43                       | 16                    |

Note: Practical Maximum Degree of Saturation ( $X_p$ ) for a priority intersection is 0.80.

The results provided in Tables 6-5 to 6-8 indicate that the Coraki Woodburn Road / Pacific Highway intersection would continue to operate within satisfactory operating conditions beyond the design horizon year (2023) with the proposed development in all scenarios. As alluded to in Section 4 of this report, clearly this intersection would also accommodate traffic associated with the existing Petersons Quarry.

The identified maximum design queue lengths of the right turn movement from the Pacific Highway (the northern approach of the intersection) and the left turn movement from the Pacific Highway (the southern approach of the intersection) would be typically be just one vehicle during the both AM and PM peak hour periods in 2023; it is considered that the existing old-style Type B treatment for the right turn movement on the northern approach and the existing left turn lane on the southern approach would continue to operate safely and efficiently in the future, particularly being mindful of the proposed lifespan of the proposal.

## 7. Seelems Road

The section of Petersons Quarry Road between Seelems Road and the Petersons Quarry Road / Lagoon Road intersection is sealed.

Seelems Road is the road section extending to Lot 407 of DP1166287 up to the site boundary; it is approximately 380m long from Petersons Quarry Road. It is currently unsealed.

As previously discussed, the haul vehicle drivers will enter the site via Seelems Road (the section fronting Lot 407 of DP1166287) and exit the site via Petersons Quarry Road; the haul vehicles would circulate the site in clockwise direction (one-way flow).

The assessment included in this section of this report has been prepared to determine whether Seelems Road is required to be sealed in conjunction with the development.

Richmond Valley Council's Planning Scheme does not provide clear guideline in relation to how much traffic would trigger the need for provision of a sealed road. Therefore, reference has been made to the document "Upgrading of Unsealed Rural Roads to Sealed Standard" (Ref.2) of Rockhampton Regional Council; this is considered to be an appropriate parallel and we have found use of the recommendations therein to be useful.

Ref.1 suggests that "*Traffic volumes – An unsealed rural road must be in the range of 150-500 AADT (Annual Average Daily Traffic). A road will not be considered for a minimum standard if there is less than 150 AADT unless there are significant issues shown in assessment score. A road that has an AADT greater than 500 will qualify for a full road design*".

The analysis is mindful that the proposed development will be the primary user of Seelems Road; and the proposed development will only operate until 2023. The identified maximum allowable Annual Average Daily Traffic Volumes (AADT) of 500vpd for an unsealed road has been adopted as an upper threshold for the purpose of this pavement assessment. The analysis also conservatively uses the maximum production rate rather than the average which would normally be considered appropriate in consideration of Annual Average Daily Traffic volumes (AADT).

As noted, the proposed development will be in operation until 2023. Therefore, the design year of the pavement requirement of Seelems Road is 2023.

The future AADT of Seelems Road is calculated as below:

- Step 1: Operational years of the proposed development = from Year 2016 to Year 2023;
- Step 2: Base daily traffic volumes in 2015\* = 80vpd;
- Step 3: Growth Rate\*\* = 0%;
- Step 4: Base daily traffic volumes in 2023 = 80vpd;
- Step 5: Total (max.) haulage\*\*\* = 1,000,000 tonnes per year;
- Step 6: Working weeks per year = 50 weeks;
- Step 7: Working days per week = 6 days;
- Step 8: Average mass of material per vehicle\*\*\*\* = 36 tonnes per vehicle;

---

<sup>2</sup> "Upgrading of Unsealed Rural Roads to Sealed Standard Procedure", Rockhampton Regional Council, 5 February 2015.

Step 9: Average daily traffic volume (haulage vehicles – IN trips only) =  $[1,000,000 / 50 / 6 / 36] = 93\text{vpd}$  ; and

Step 10: 2023 AADT (with the proposed development) =  $[80 + 93] = 173\text{vpd}^{*****}$ .

\*Assumes 2015 daily traffic volumes =  $((2015 \text{ AM peak hour traffic volume} + 2015 \text{ PM peak hour traffic volume}) \times 5) = ((9 + 7) \times 5) = 80\text{vpd}$ .

\*\*Assumes the growth rate of traffic volumes of Seelems Road (without the proposed development) is 0% p.a. (compound).

\*\*\*MRCagney has been advised that the maximum production threshold would be 1M tonnes per year.

\*\*\*\*MRCagney has been advised that 36t payload truck & dog would be used.

\*\*\*\*\*Staff tips are not anticipated to use Seelems Road.

Therefore the results of above calculations (including the conservative assumption of maximum production every year) indicate that the 2023 daily traffic with the proposed development is in order of 173vpd; whilst this traffic stream has a relatively high proportion of heavy vehicles, the fact that it is based on a conservative methodology and is somewhat less than 500vpd leads to the appropriate conclusion that providing a gravelled pavement is appropriate. Sealing of Seelems Road is not recommended to be required to cater for the forecast traffic generated by the proposed development.



## 8. Council Heavy Haulage Contribution

Section 94 Heavy Haulage Contributions Plans 2013 (Ref.1) enables *“Richmond Valley Council to levy developer contributions under section 94 of the Environmental planning and Assessment Act 1979 where the anticipated development will, or is likely to, generate additional heavy haulage vehicle movements, such as from mines and extractive industries”*.

The road / traffic impact of the proposal has been assessed based on the maximum production volumes (1,000,000 tonnes per year) to ensure satisfactory operation of road infrastructure components at all times. The traffic impact assessment of the proposal has been included in Section 6 of this report.

However, the pavement impact and the pavement contribution for this proposal should be assessed based on the average production over the operational years of the proposal. It is not considered appropriate to utilise maximum production rates for this calculation as pavement impact is fundamentally based on average daily ESAs and cumulative pavement impacts. We have been advised that the average production rate of the proposed development would be 800,000 tonnes per year from 2016 to 2023. In practical terms, the levy could be applied on the basis of actual tonnages with a reporting protocol put in place.

Section 94 Heavy Haulage Contributions Plans 2013 (Ref.1) notes that an extractive industry use with the proposed annual extraction is required to pay **\$1.08 / tonne** for the pavement impact likely to be generated on Council's roads.

## 9. Summary

MRCagney has been commissioned by Quarry Solutions Pty Ltd to prepare a traffic impact assessment (TIA) and pavement impact assessment (PIA) report to support the development application of the proposed Coraki Quarry to be located to the north of Seelems Road, Coraki.

The likely production schedules of the proposed development are listed below:

- Maximum annual production rate - up to 1M tonnes per year; and
- Average annual production rate – approximately 0.8M tonnes per year over 5 to 7 years.

### Site Access

The haul vehicle drivers will enter the site via Seelems Road (the section fronting Lot 407 of DP1166287) and exit the site via Petersons Quarry Road, the haul vehicles will circulate the site in a clockwise direction (one-way flow).

### Traffic Impact

It is anticipated that the proposed quarry will commence operations in July 2016 for 5 to 7 years. Therefore, the design horizon year of the proposed development will be 2023 (the last operational year of the proposed development).

The results of SIDRA analyses, included in Section 6 of this report, illustrate that all key intersections (the Petersons Quarry Road / Lagoon Road intersection, the Lagoon Road / Queen Elizabeth Drive intersection and the Coraki Woodburn Road / Pacific Highway intersection) along the haul route would operate within satisfactory operating conditions beyond the design horizon year (2023) of the proposed development with the existing geometries. This conclusion is cognisant of the existing operation of the Petersons Quarry and the adjacent industrial site.

Based on the results of SIDRA analyses of the Coraki Woodburn Road / Pacific Highway intersection, the identified maximum design queue lengths of the right turn movement from the Pacific Highway (the northern approach of the intersection) and the left turn movement from the Pacific Highway (the southern approach of the intersection) would be typically be just one vehicle during the both AM and PM peak hour periods in 2023; it is considered that the existing old-style Type B treatment for the right turn movement on the northern approach and the existing left turn lane on the southern approach would continue to be suitable in the future (in terms of capacity and safety), particularly being mindful of the proposed lifespan of the proposal (the proposed development will cease operation in 2023).

Therefore no external road network improvements are required in conjunction with the proposed development.

### Seelems Road

The results of calculations included in Section 7 of this report (including the conservative assumption of maximum production every year) indicate that the 2023 daily traffic with the proposed development is in order of 173vpd; whilst this traffic stream has a relatively high proportion of heavy vehicles, the fact that it is based on a conservative methodology and is somewhat less than 500vpd leads to the appropriate conclusion that providing a gravelled pavement is appropriate. Sealing of Seelems Road is not recommended to be required to cater for the forecast traffic generated by the proposed development.

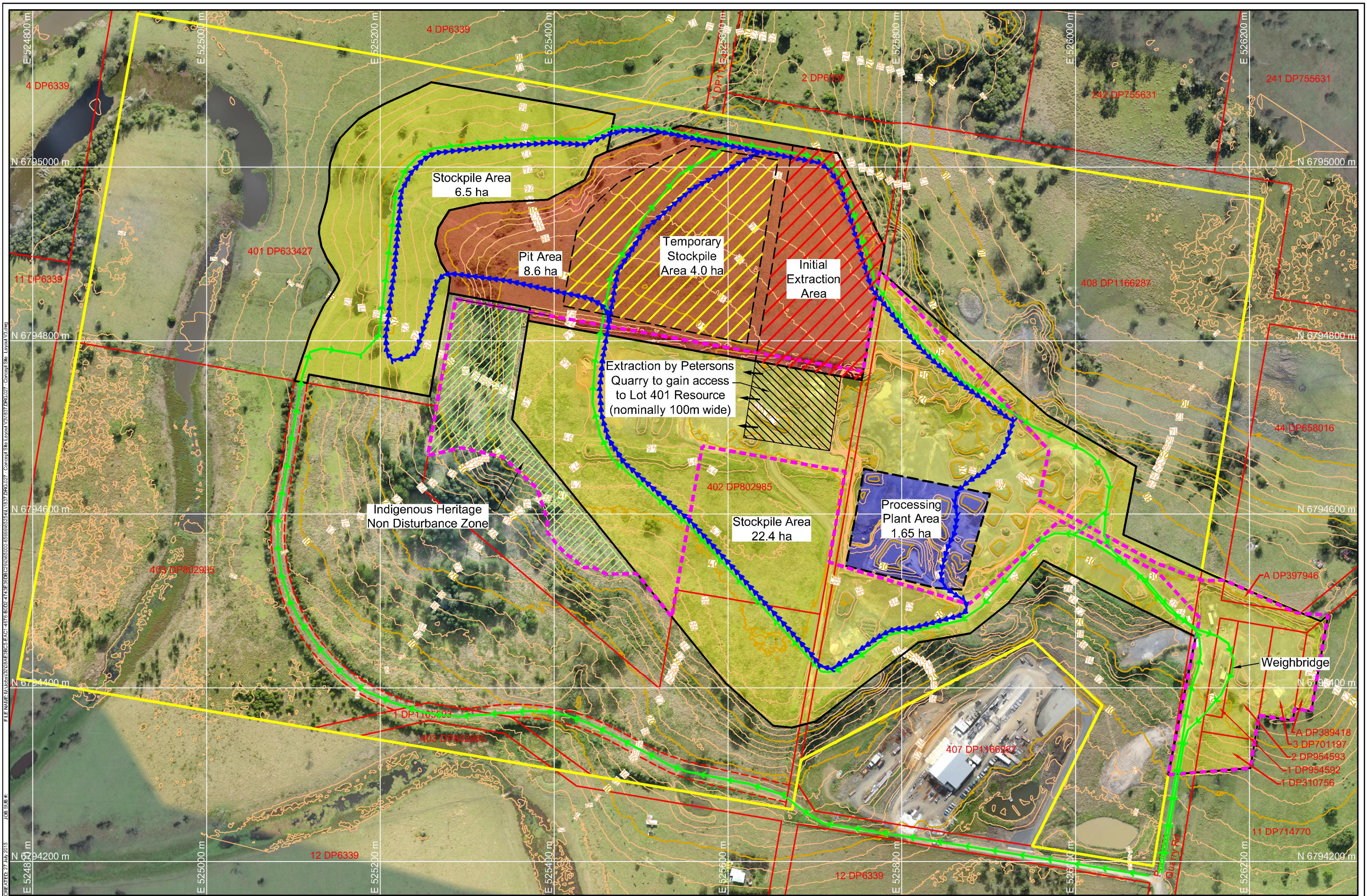
Pavement Requirements

Section 94 Heavy Haulage Contributions Plans 2013 (Ref.2) notes that an extractive industry use with the proposed annual extraction is required to pay **\$1.08 / tonne** for the pavement impact likely to be generated on Council's roads.

# Appendix A

## Site Plan





| REV | DESCRIPTION | DATE | BY |
|-----|-------------|------|----|
|     |             |      |    |
|     |             |      |    |
|     |             |      |    |

Data Sources:  
Photography: UAV Survey 2015-07-02; Google, Image date: 2014-12-18  
Topography: UAV Survey 2015-07-02  
Cadastral:  
Ecosystem:  
Other:

THESE DESIGNS AND PLANS ARE COPYRIGHT AND ARE NOT TO BE USED OR REPRODUCED WHOLLY OR IN PART OR TO BE USED ON ANY PROJECT WITHOUT THE WRITTEN PERMISSION OF GROUNDWORK PLUS. ABN: 90 625 155 008

**Legend:**

- Site Boundary
- Cadastral Boundary
- Approved Quarry Expansion Footprint
- On Road Truck Movement
- Off Road Truck Movement

CREATED: 27 JULY 2015

FILE NAME: I:\Data\2015\07\02\Coraki Quarry\1837.027A Concept Site Layout\1837.027A Concept Site Layout.dwg

JOB SITE #

PROJECT: Coraki Quarry

CLIENT: Quarry Solutions Pty Ltd

GROUNDWORK PLUS

PH: +61 7 3871 0411  
WWW.GROUNDWORK.COM.AU

DATE: 27 July 2015  
DRAWN: LT  
PRINTED: 27 July 2015  
CHECKED: JL

SCALE: 1:4,000  
When Printed On A3

DRAWING NUMBER: 1837.027A

REVISION:

DATUM: HORIZONTAL / VERTICAL / ZONE  
MGA / AHD / 56



# Appendix B

## Results of SIDRA Analyses

### Intersection 1: Petersons Quarry Road / Lagoon Road

|            |                          |
|------------|--------------------------|
| Figure 1.1 | 2016 Base AM Peak Hour   |
| Figure 1.2 | 2016 Base PM Peak Hour   |
| Figure 1.3 | 2023 Base AM Peak Hour   |
| Figure 1.4 | 2023 Base PM Peak Hour   |
| Figure 1.5 | 2016 Design AM Peak Hour |
| Figure 1.6 | 2016 Design PM Peak Hour |
| Figure 1.7 | 2023 Design AM Peak Hour |
| Figure 1.8 | 2023 Design PM Peak Hour |

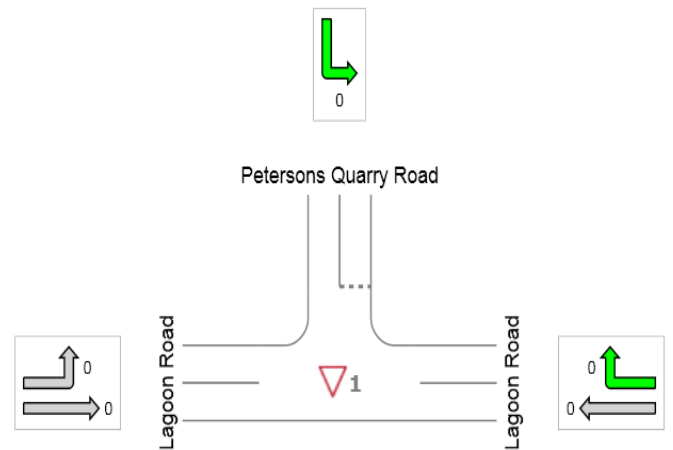
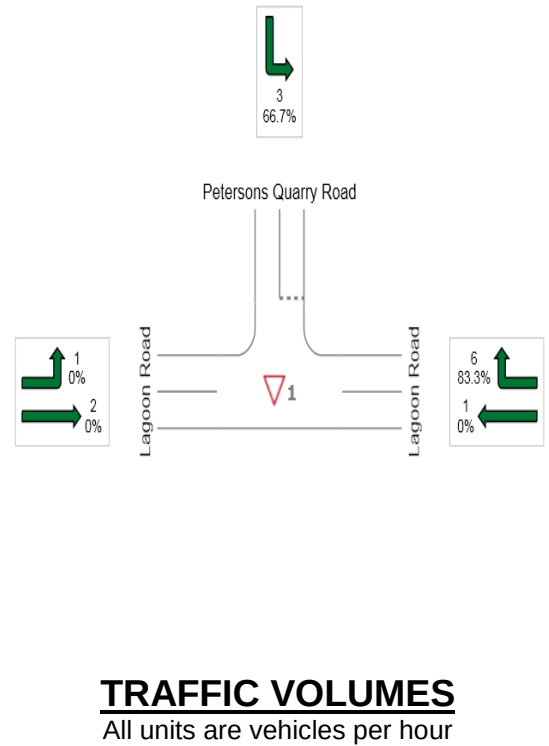
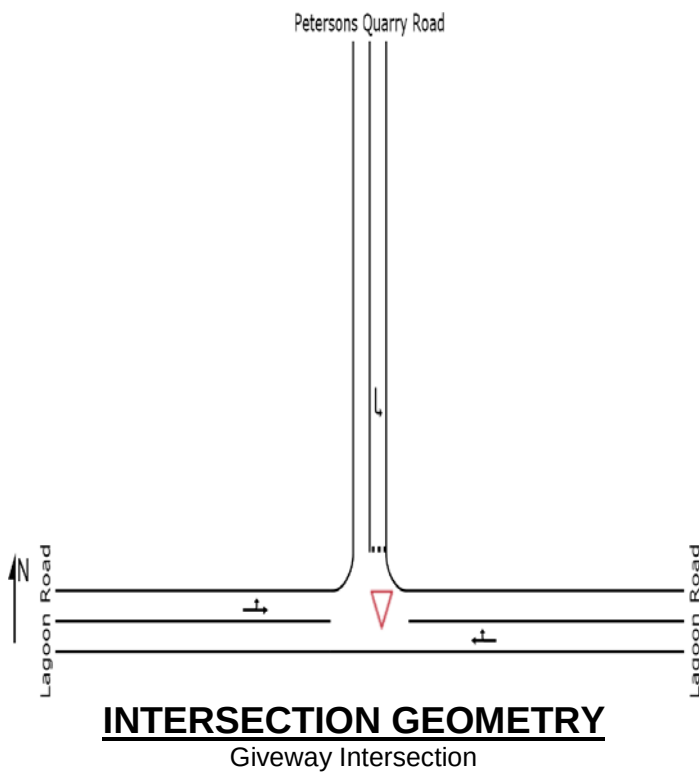
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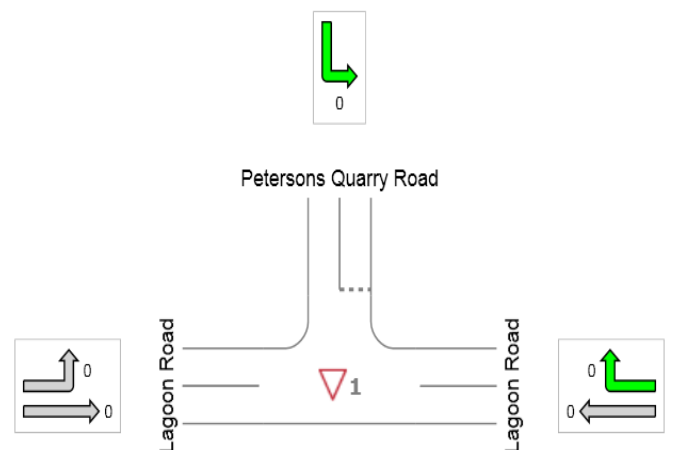
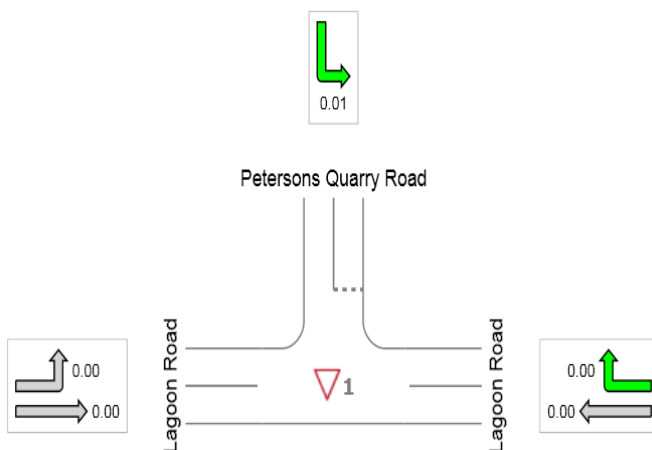
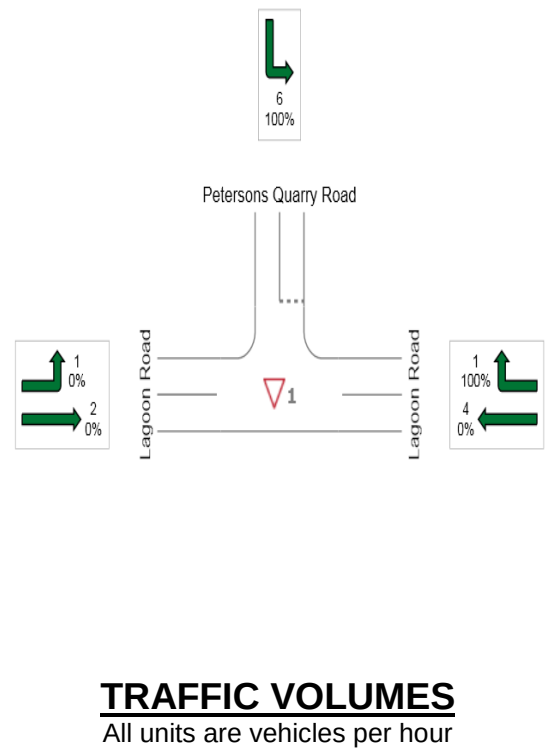
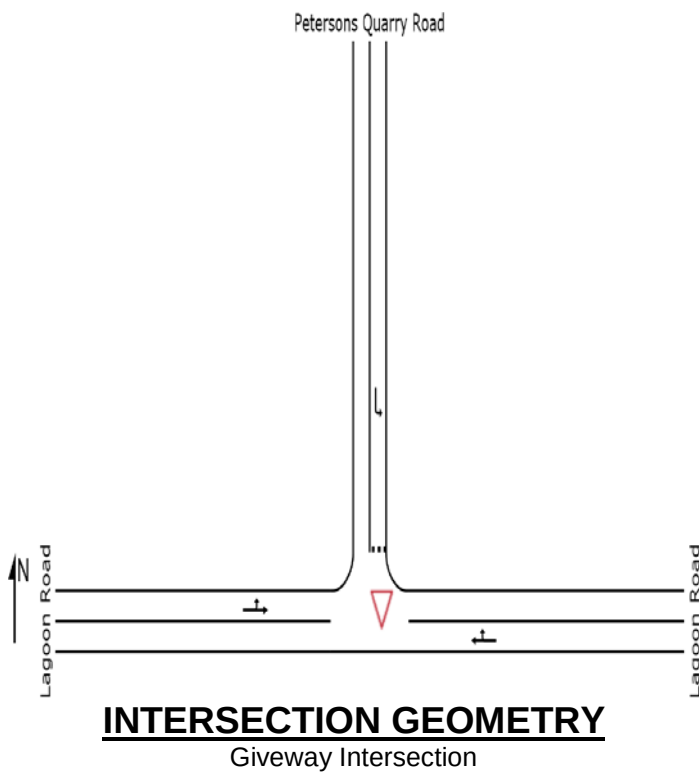
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|------------|--------------------------|
| Figure 2.1 | 2016 Base AM Peak Hour   |
| Figure 2.2 | 2016 Base PM Peak Hour   |
| Figure 2.3 | 2023 Base AM Peak Hour   |
| Figure 2.4 | 2023 Base PM Peak Hour   |
| Figure 2.5 | 2016 Design AM Peak Hour |
| Figure 2.6 | 2016 Design PM Peak Hour |
| Figure 2.7 | 2023 Design AM Peak Hour |
| Figure 2.8 | 2023 Design PM Peak Hour |

Intersection 3: Coraki Woodburn Road / Pacific Highway

|             |                                                                                |
|-------------|--------------------------------------------------------------------------------|
| Figure 3.1  | 2016 Base AM Peak Hour                                                         |
| Figure 3.2  | 2016 Base PM Peak Hour                                                         |
| Figure 3.3  | 2023 Base AM Peak Hour                                                         |
| Figure 3.4  | 2023 Base PM Peak Hour                                                         |
| Figure 3.5  | 2016 Design AM Peak Hour – Early Stage of the Pacific Highway Upgrade Project  |
| Figure 3.6  | 2016 Design PM Peak Hour – Early Stage of the Pacific Highway Upgrade Project  |
| Figure 3.7  | 2023 Design AM Peak Hour – Early Stage of the Pacific Highway Upgrade Project  |
| Figure 3.8  | 2023 Design PM Peak Hour – Early Stage of the Pacific Highway Upgrade Project  |
| Figure 3.9  | 2016 Design AM Peak Hour – Latter Stage of the Pacific Highway Upgrade Project |
| Figure 3.10 | 2016 Design PM Peak Hour – Latter Stage of the Pacific Highway Upgrade Project |
| Figure 3.11 | 2023 Design AM Peak Hour – Latter Stage of the Pacific Highway Upgrade Project |
| Figure 3.12 | 2023 Design PM Peak Hour – Latter Stage of the Pacific Highway Upgrade Project |







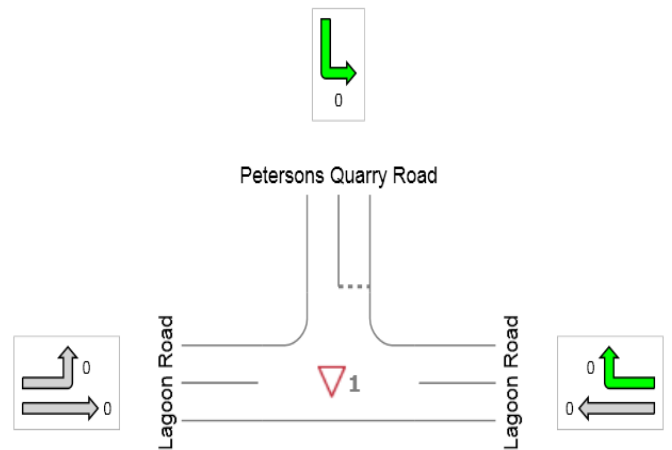
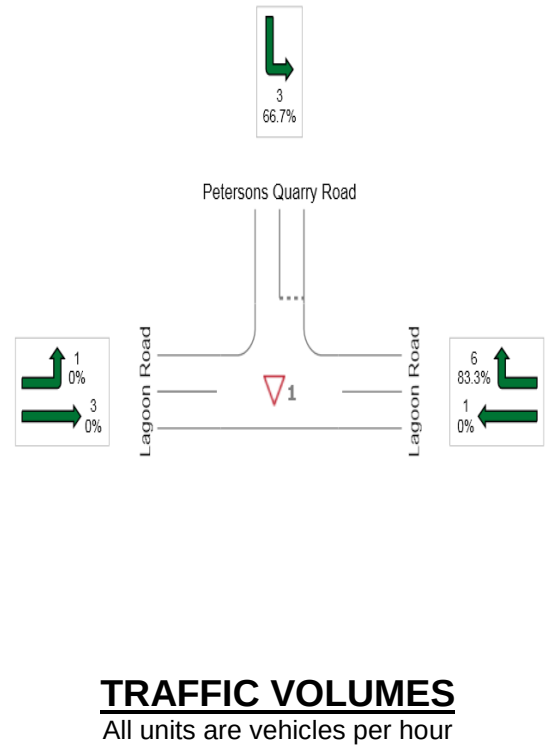
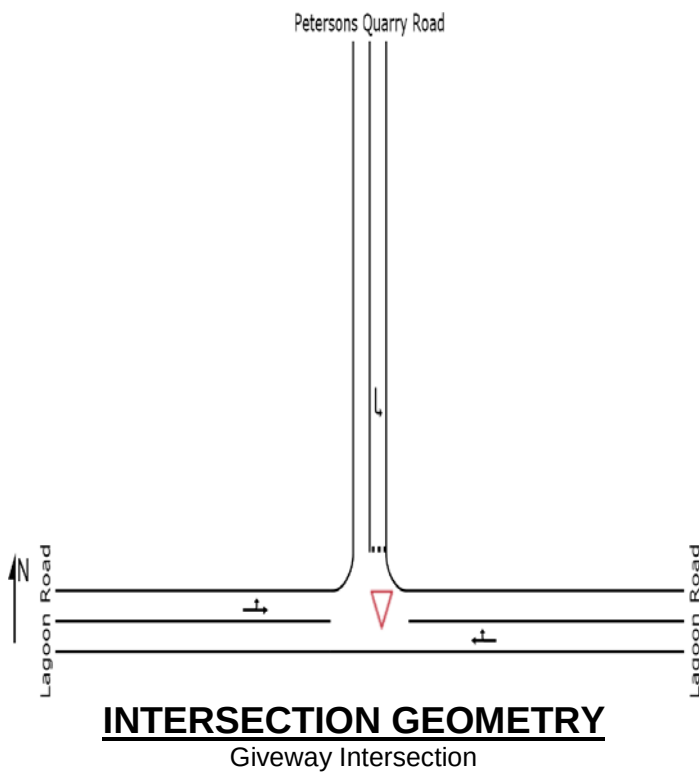
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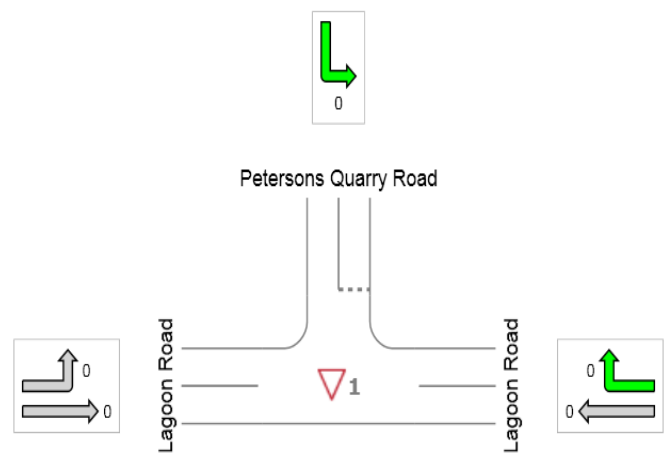
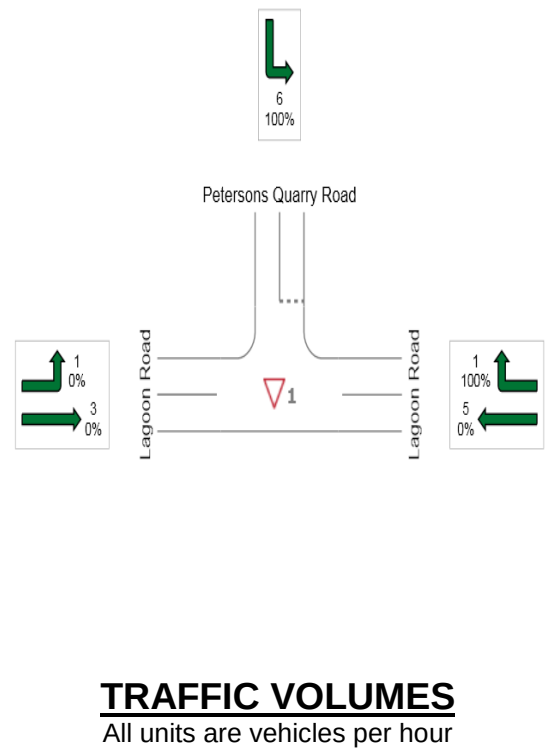
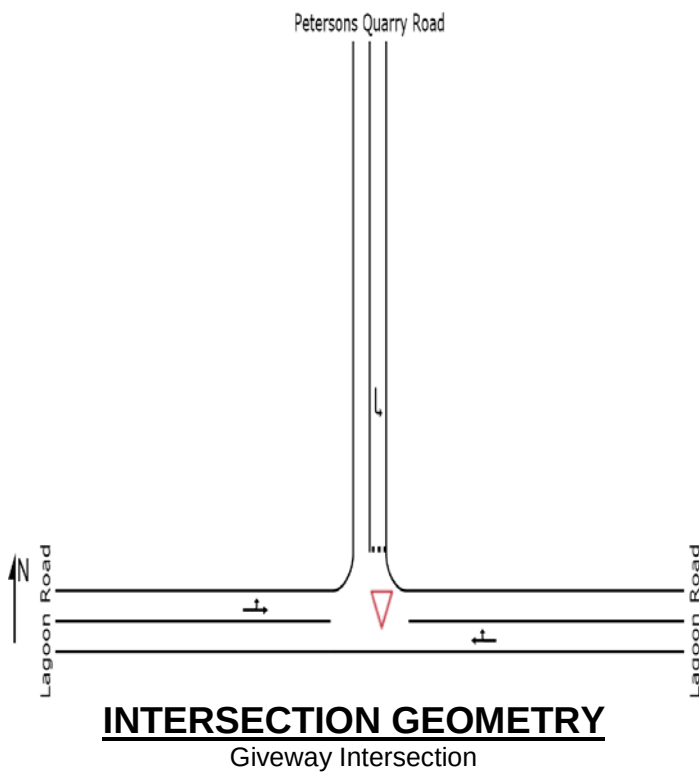
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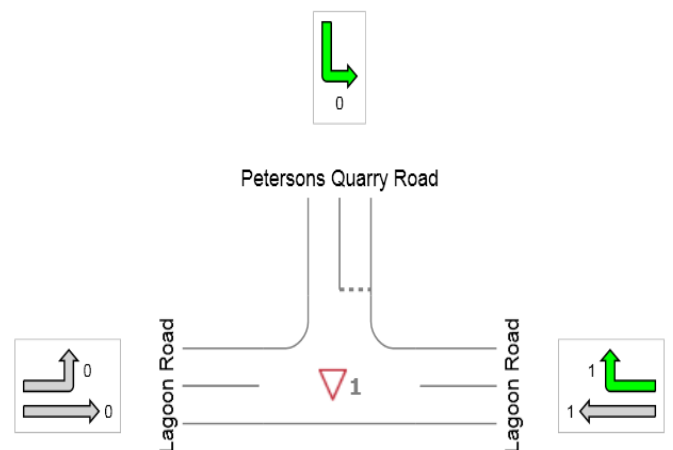
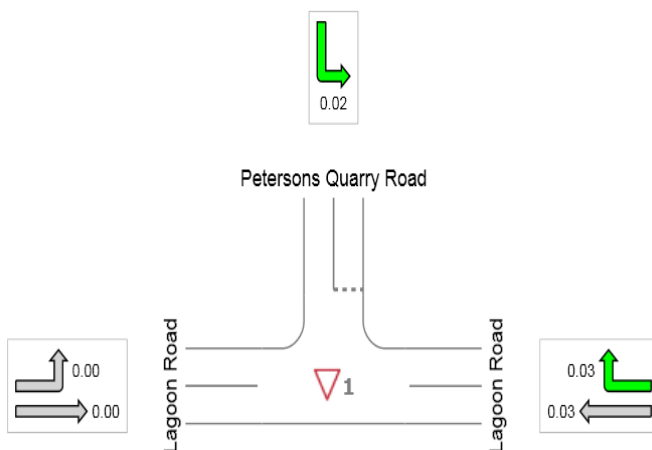
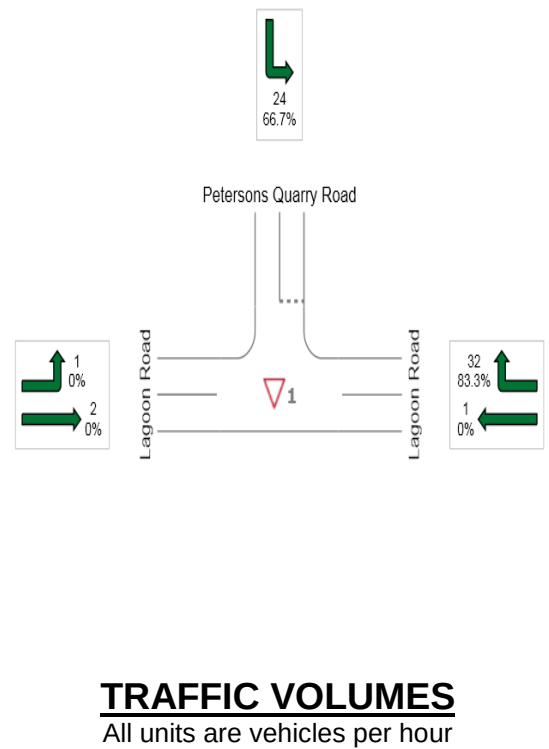
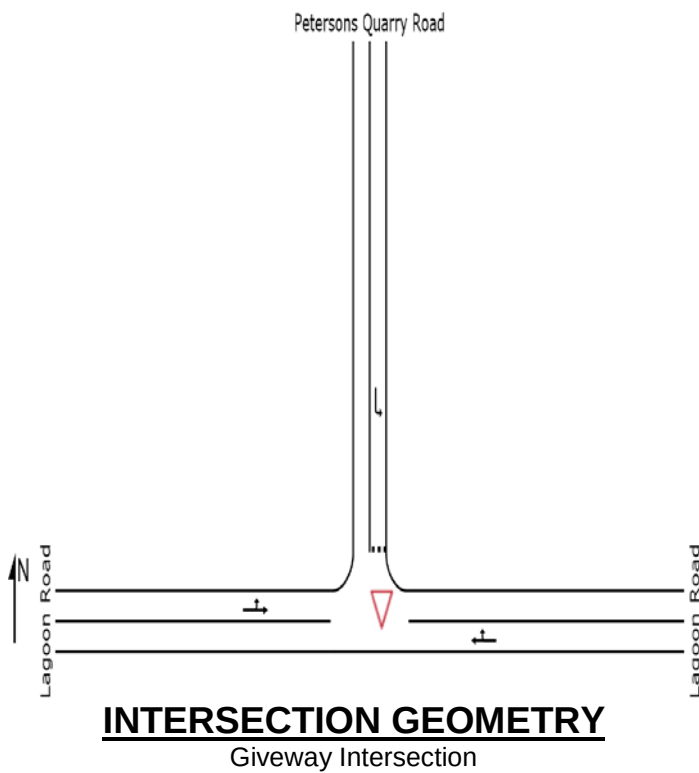


2016 BASE PM PEAK HOUR  
PETERSONS QUARRY ROAD / LAGOON ROAD UNSIGNALISED INTERSECTION

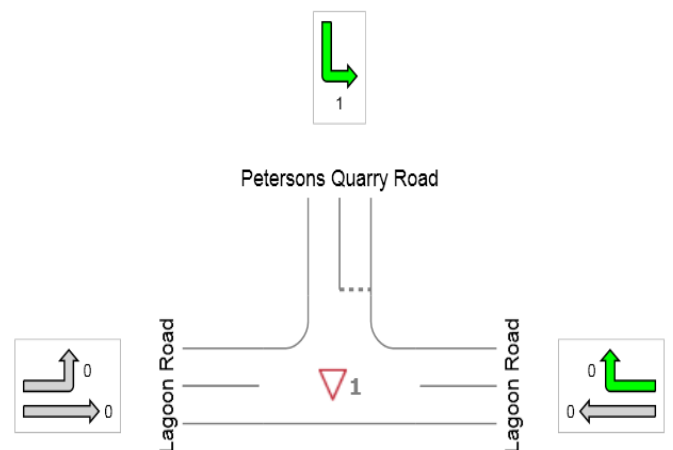
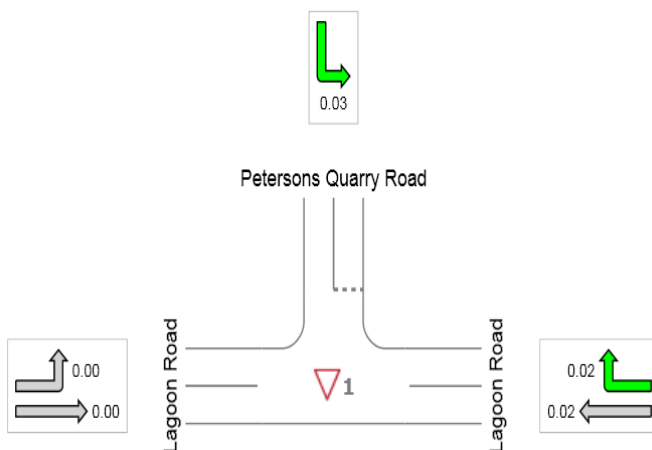
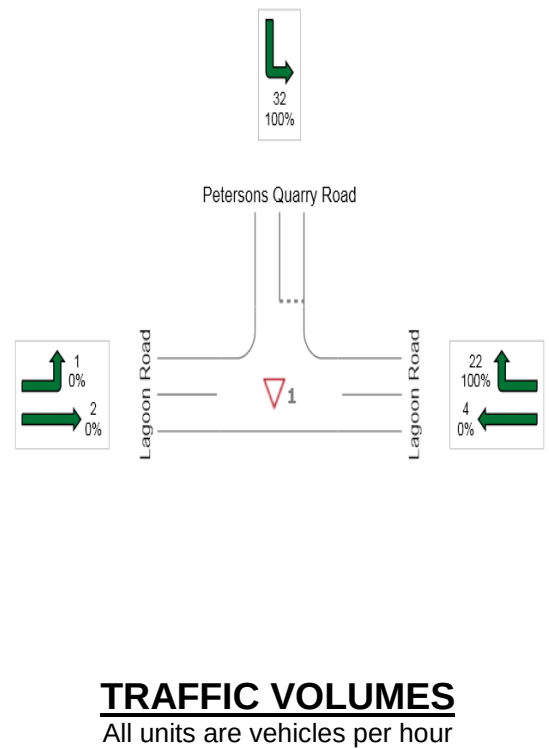
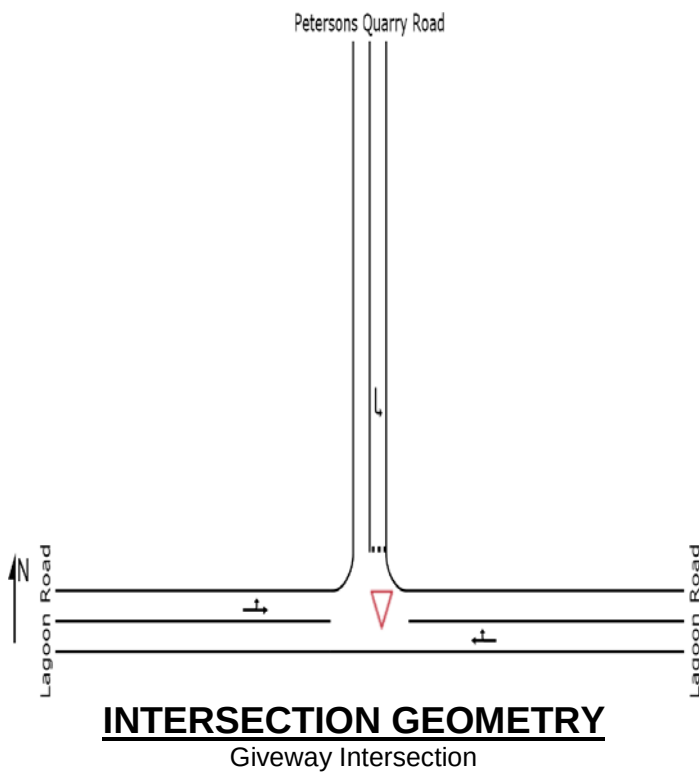
FIGURE 1.2

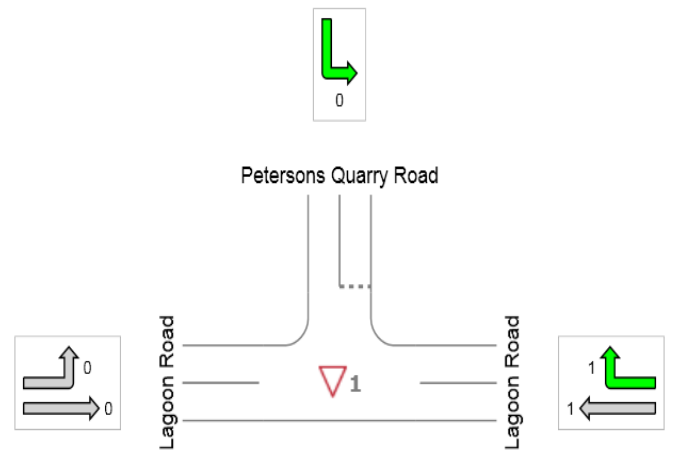
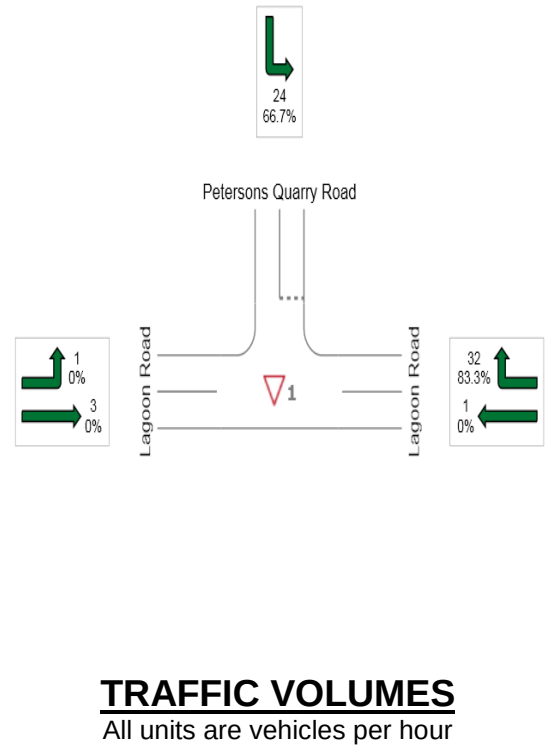
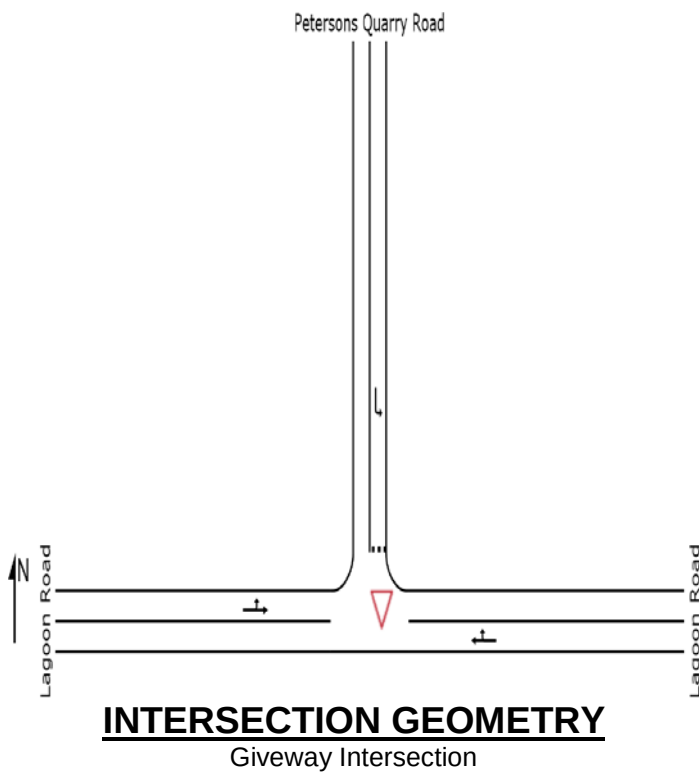


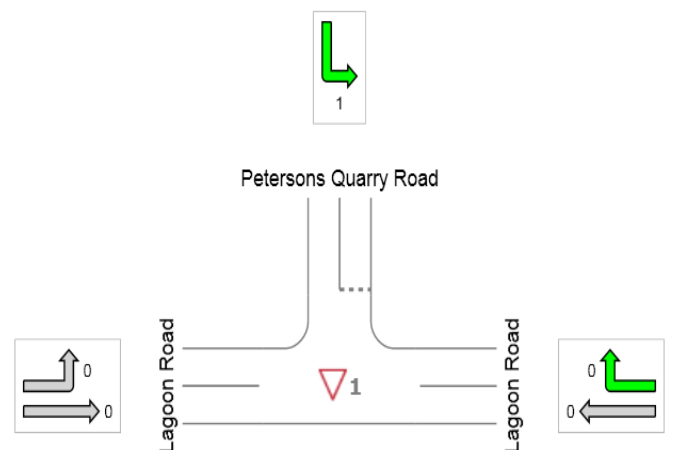
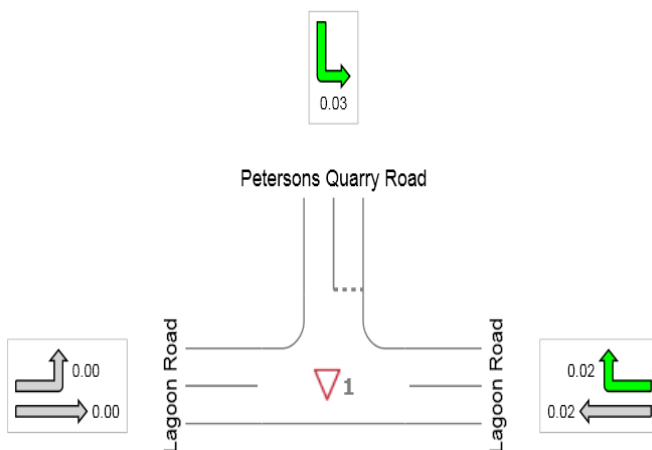
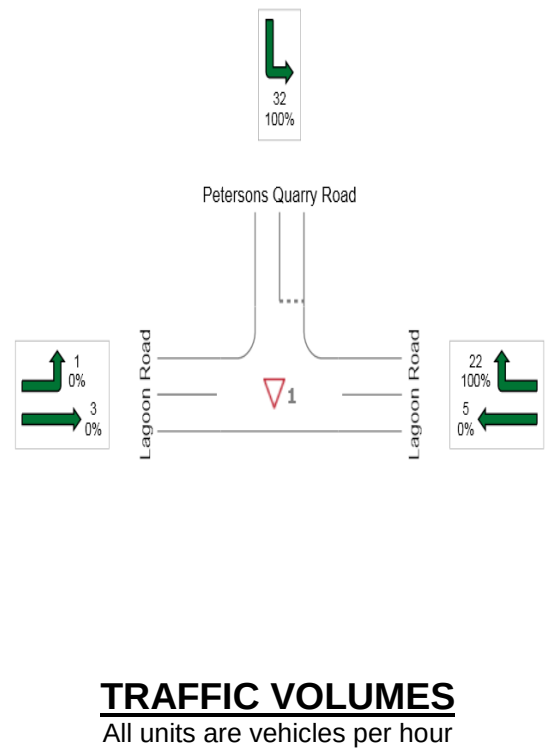
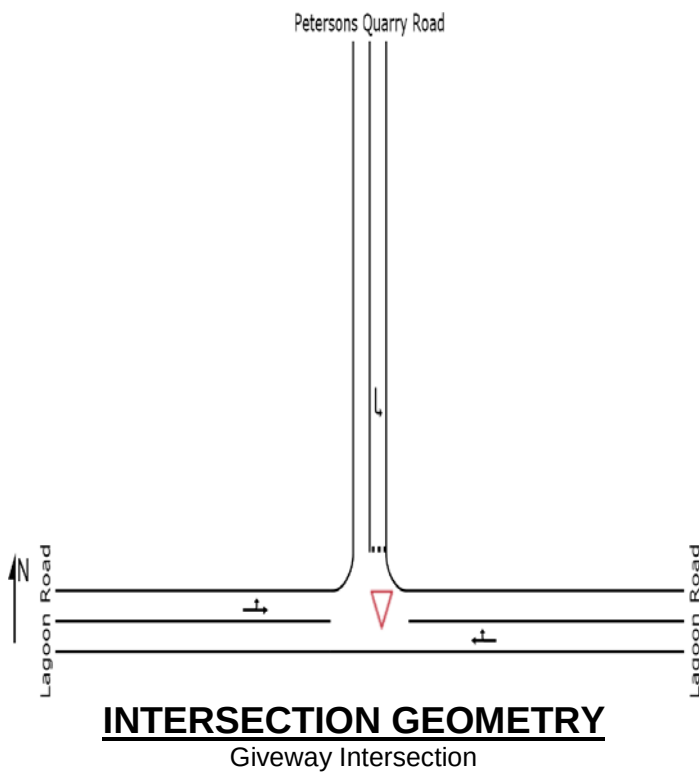


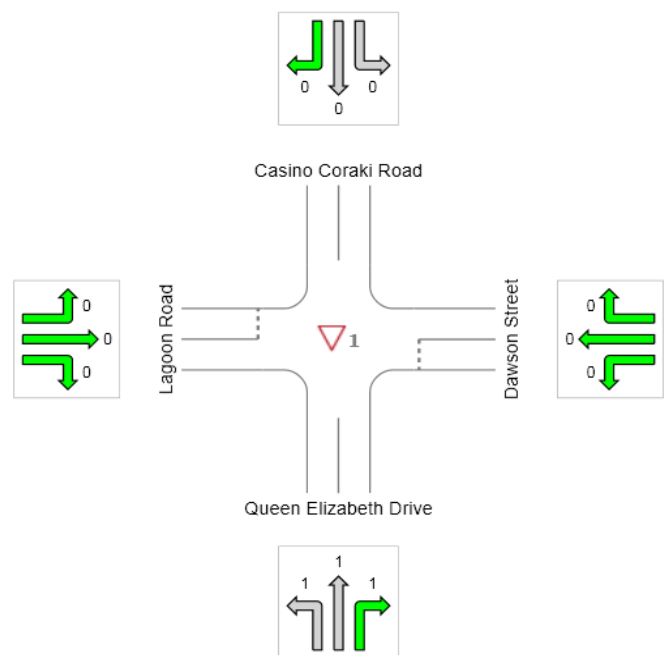
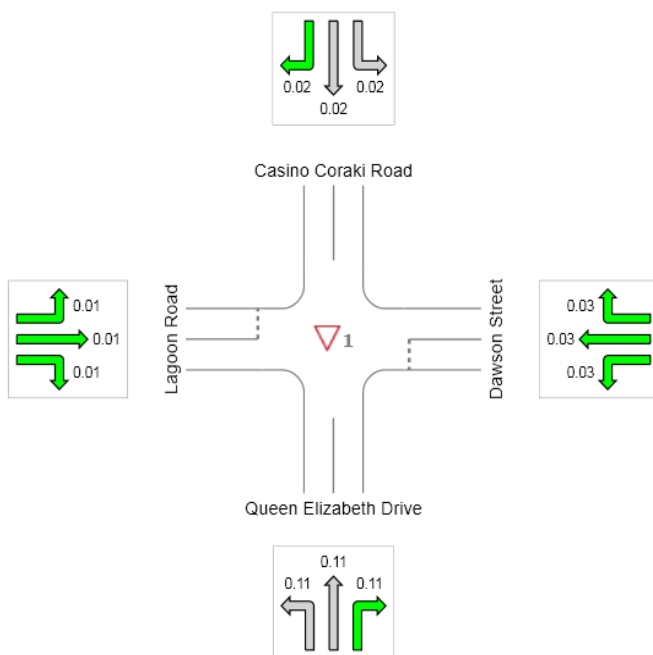
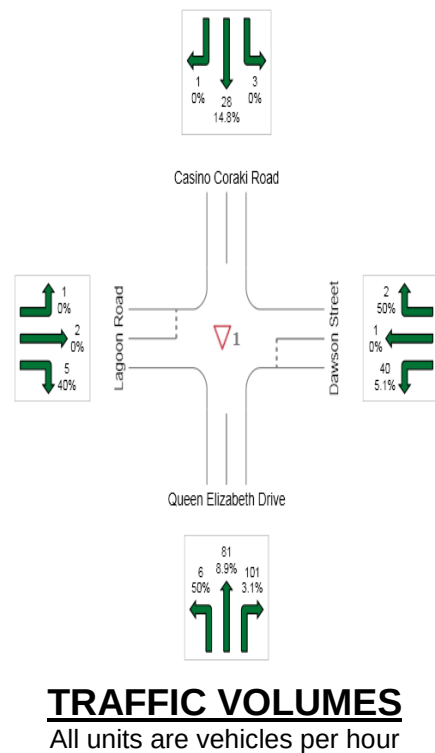
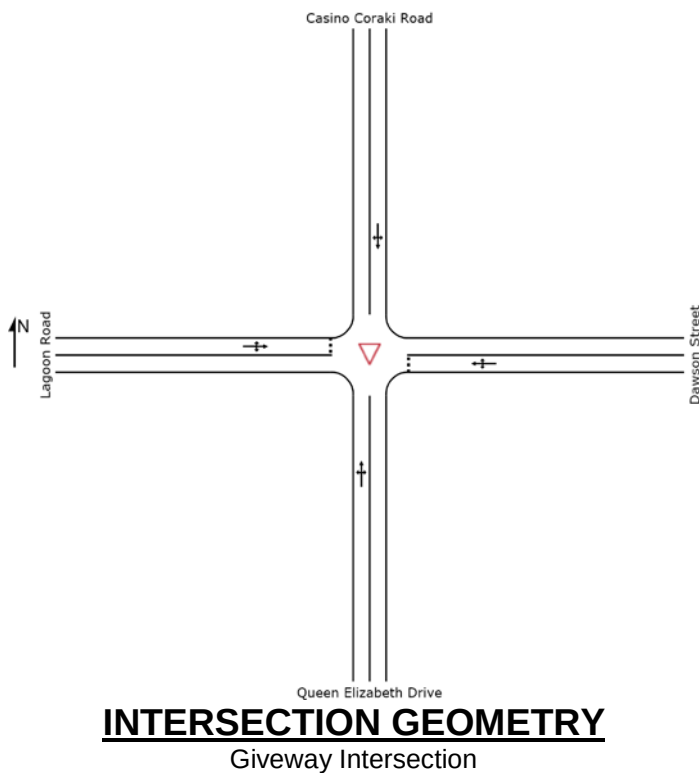










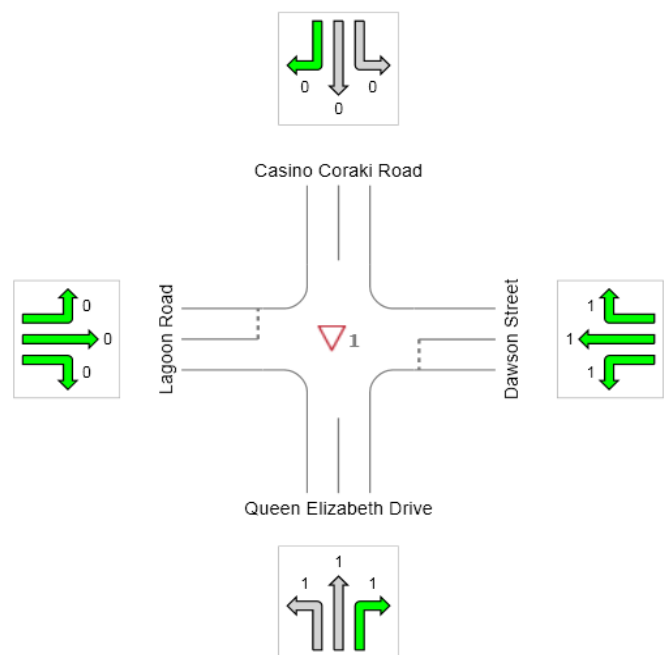
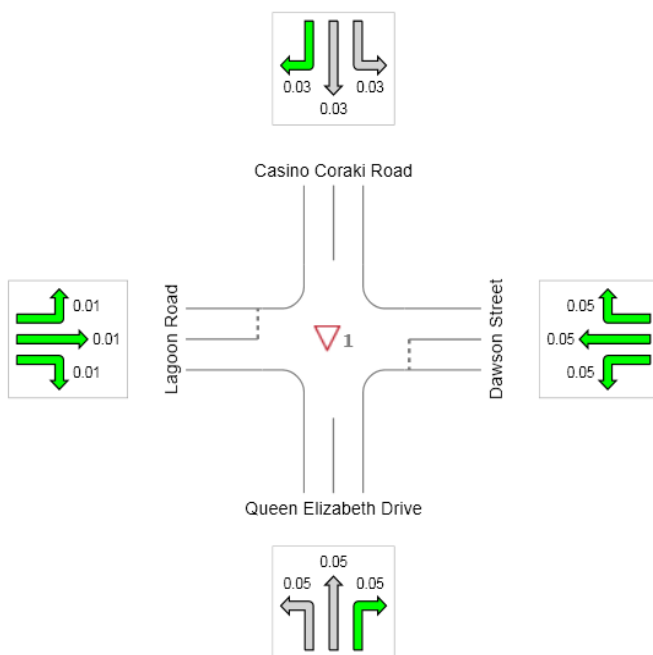
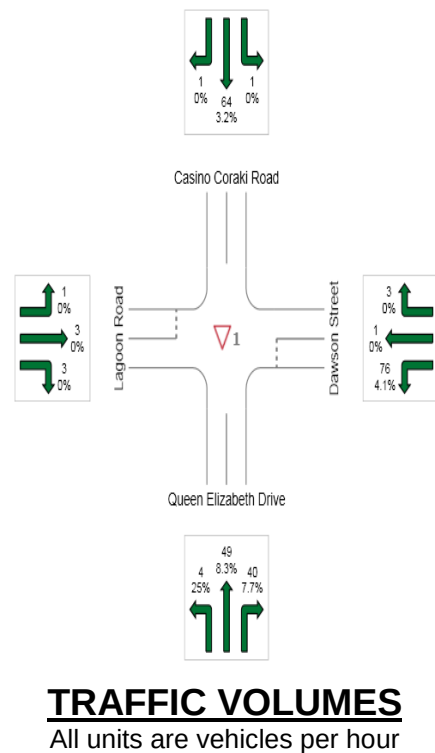
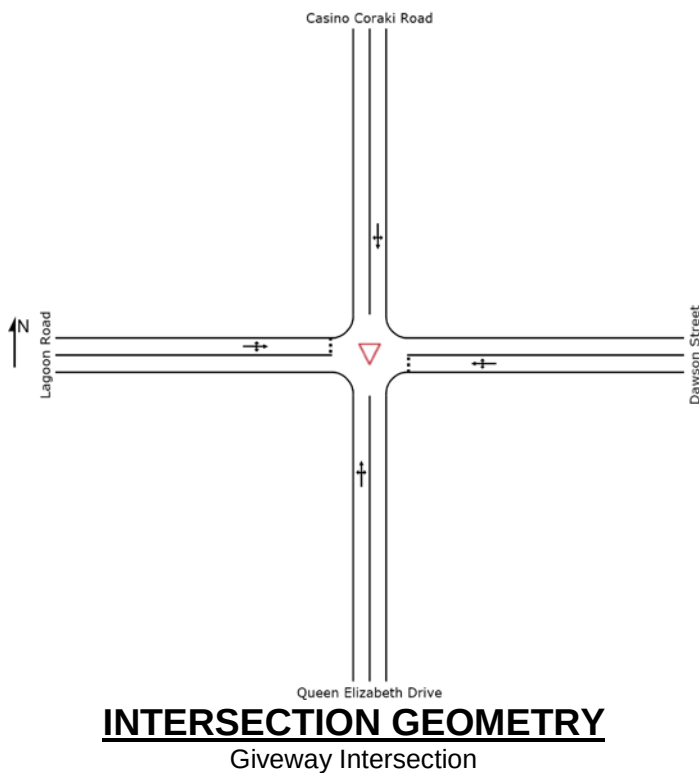


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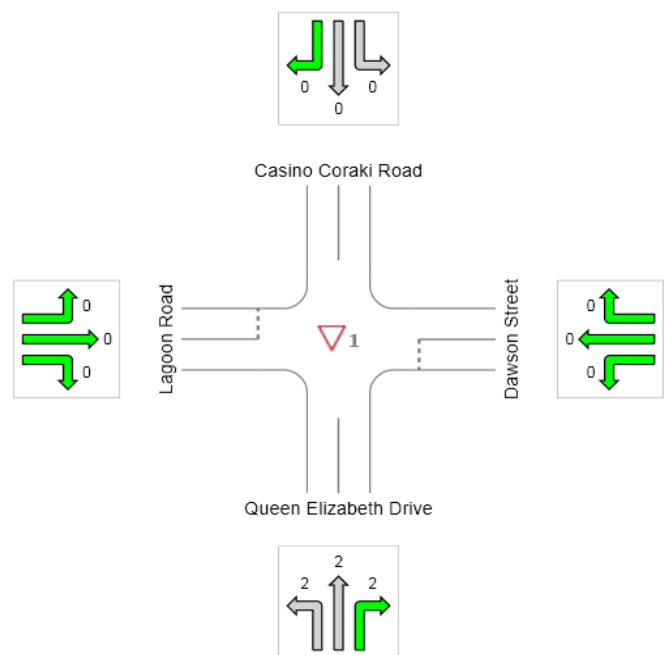
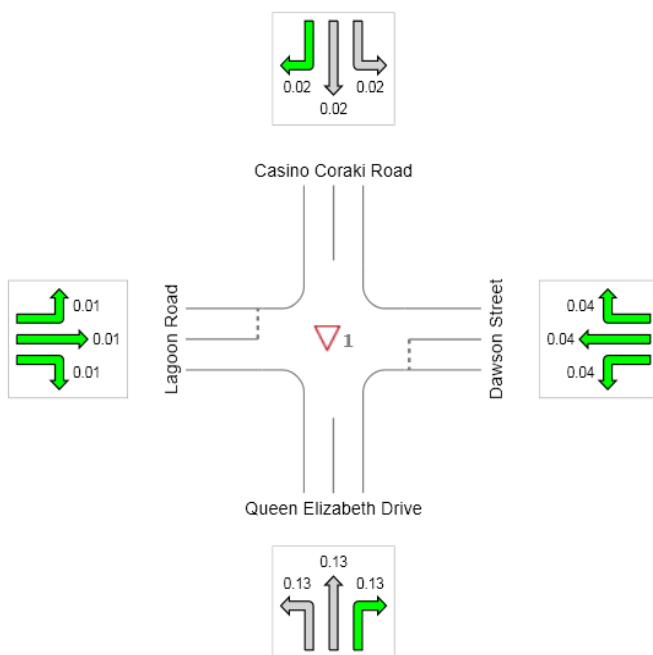
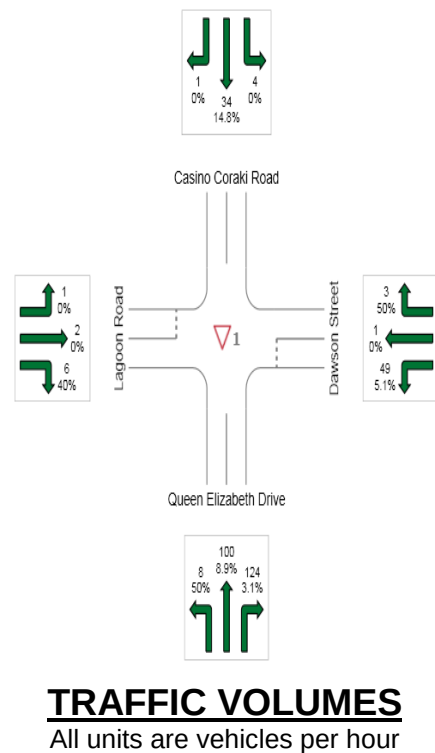
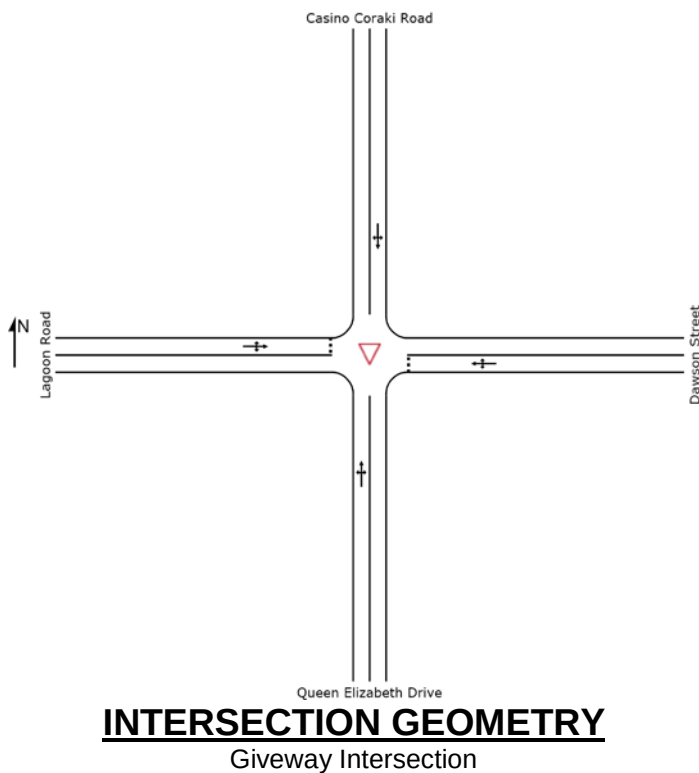


2016 BASE AM PEAK HOUR  
LAGOON ROAD / QUEEN ELIZABETH DRIVE UNSIGNALISED INTERSECTION

FIGURE 2.1





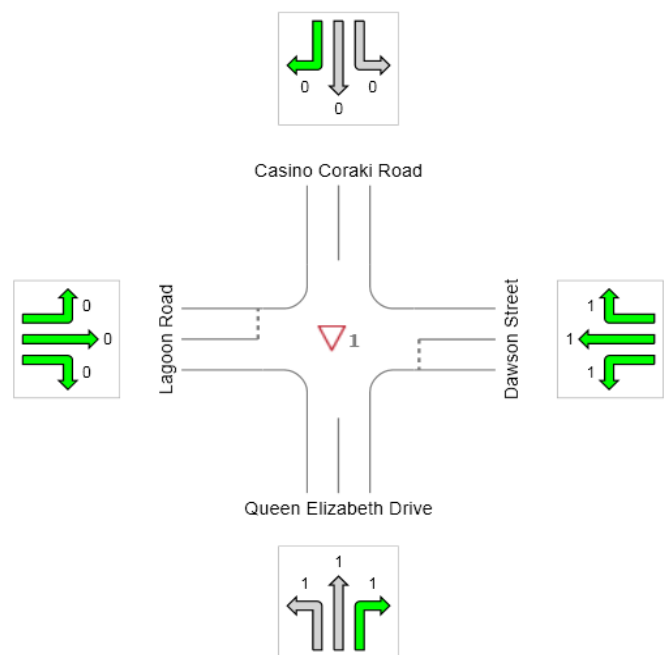
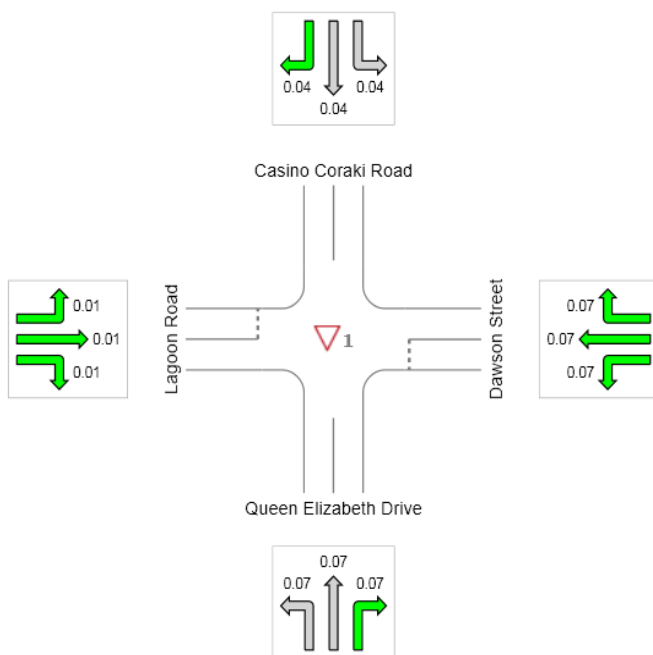
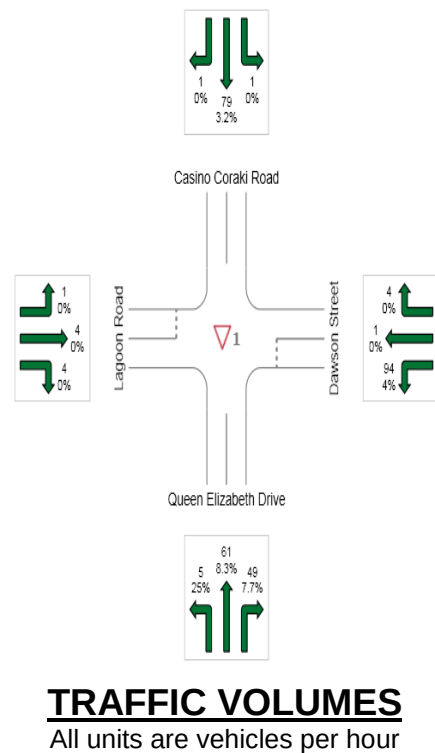
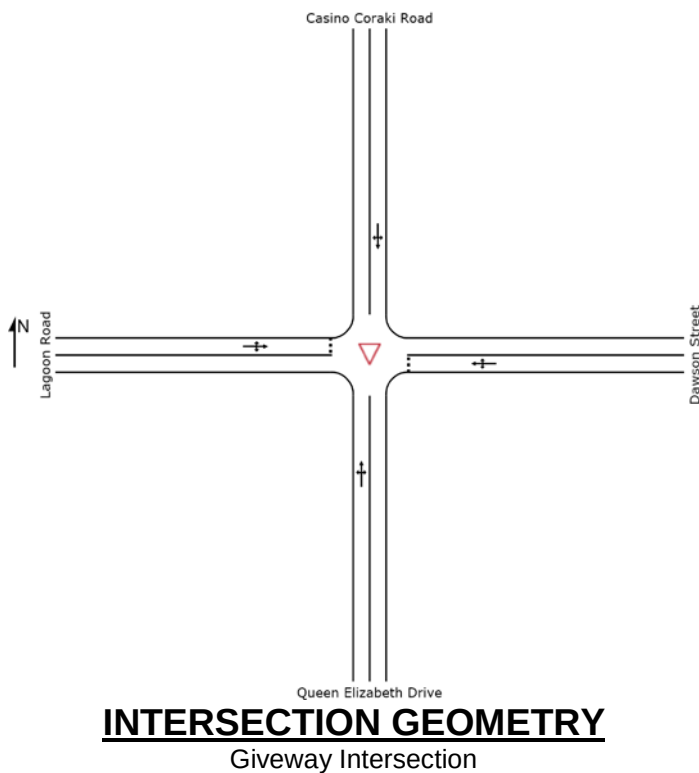


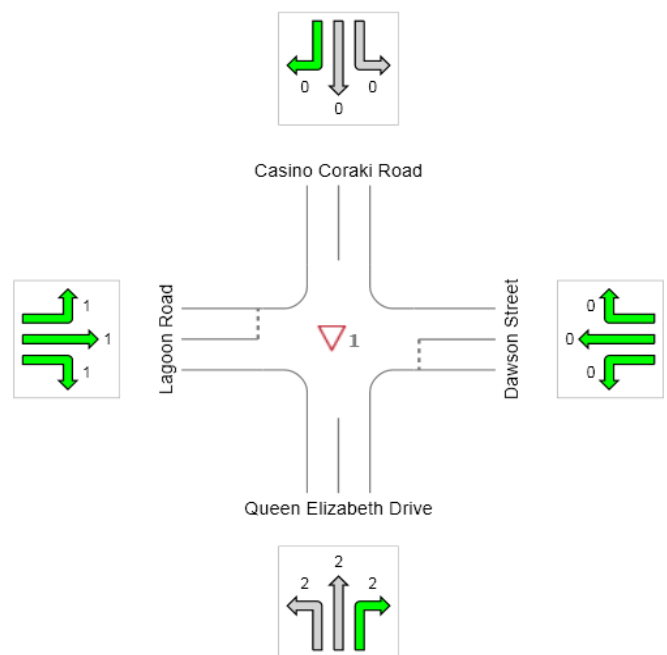
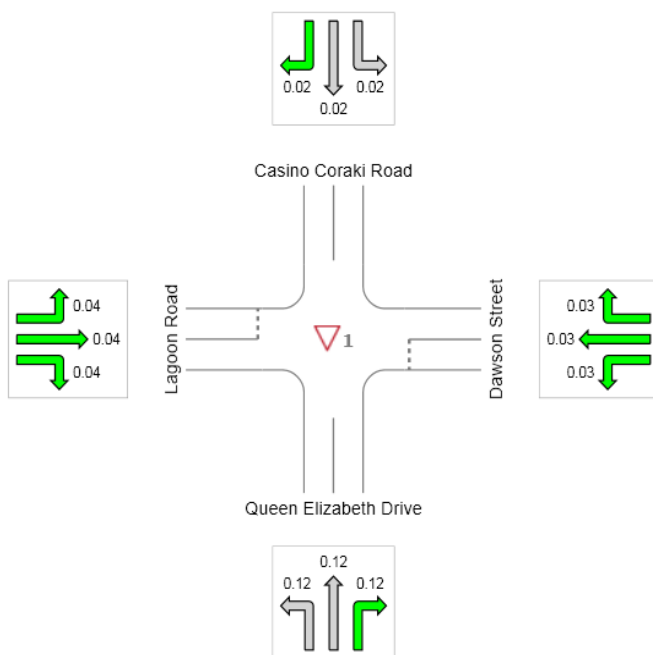
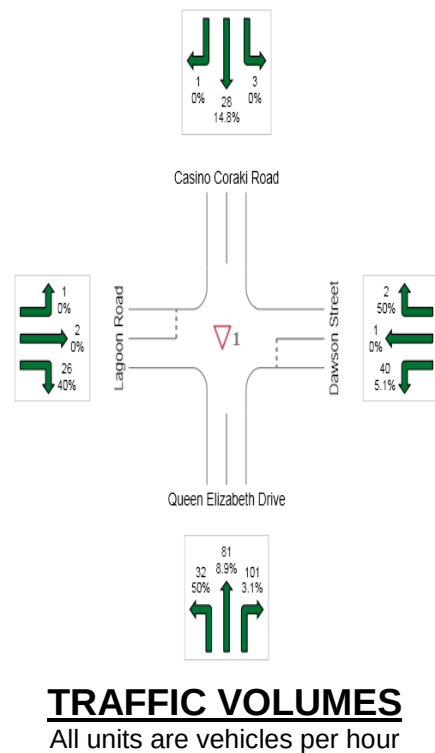
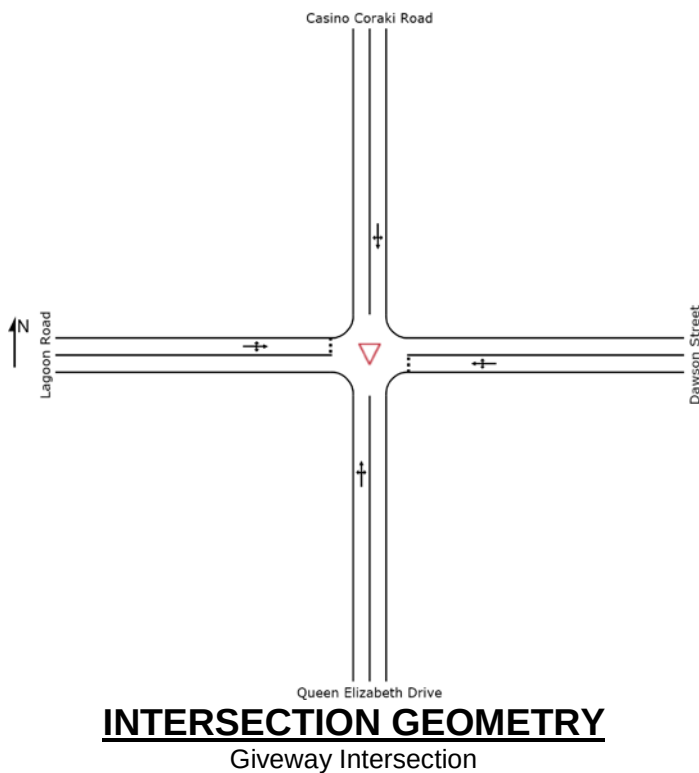
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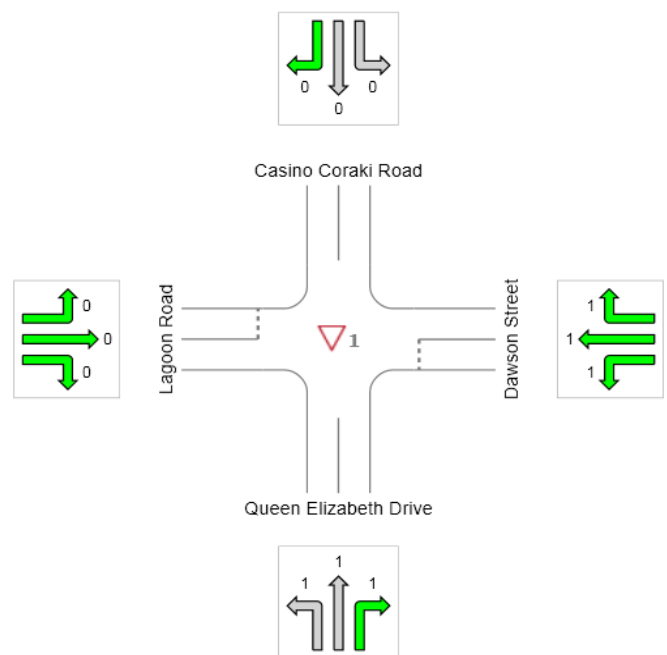
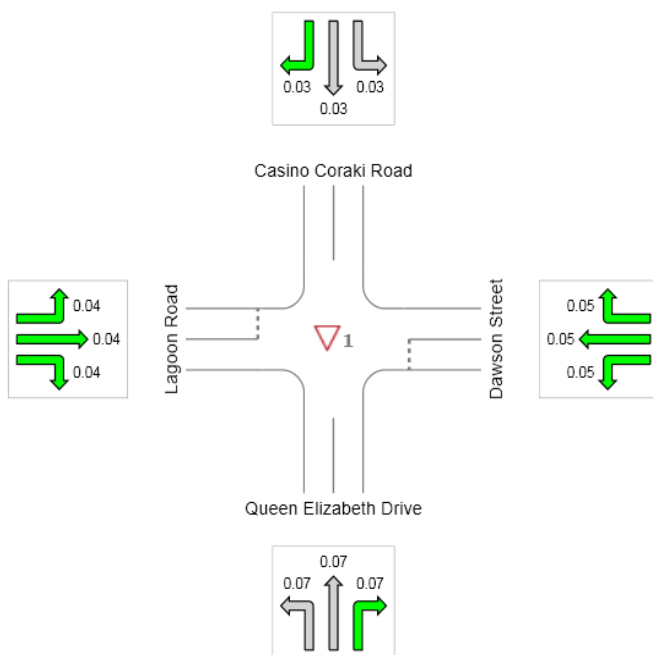
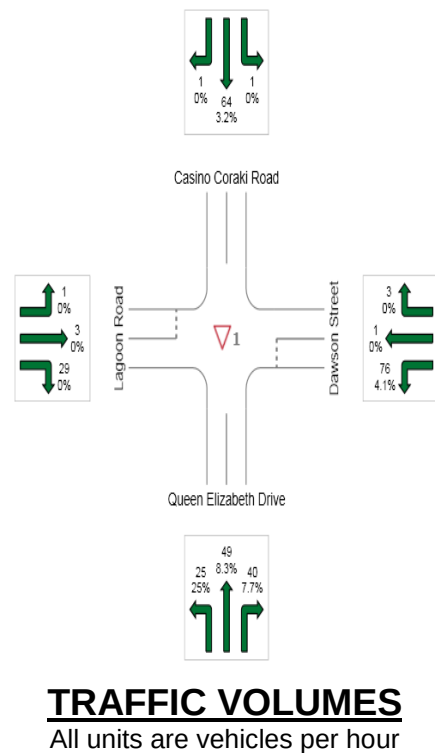
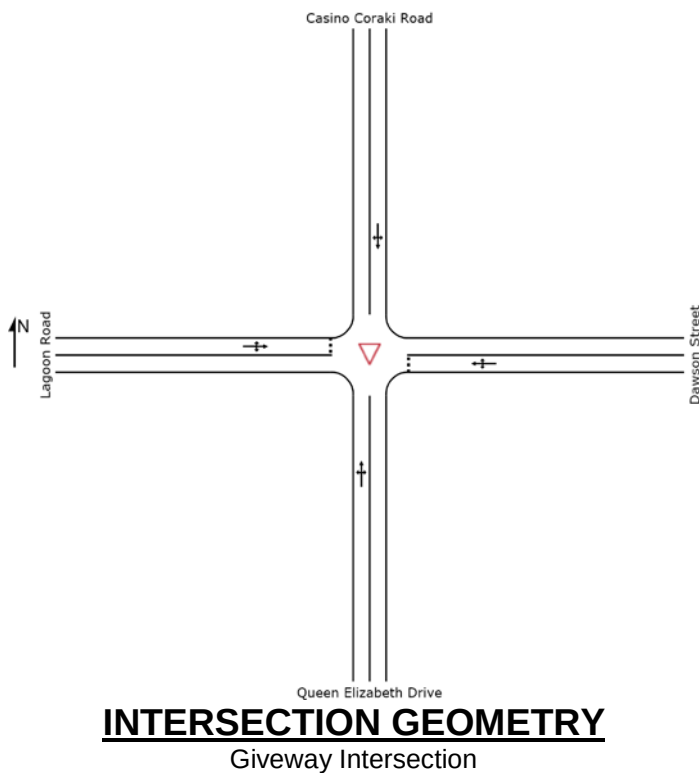


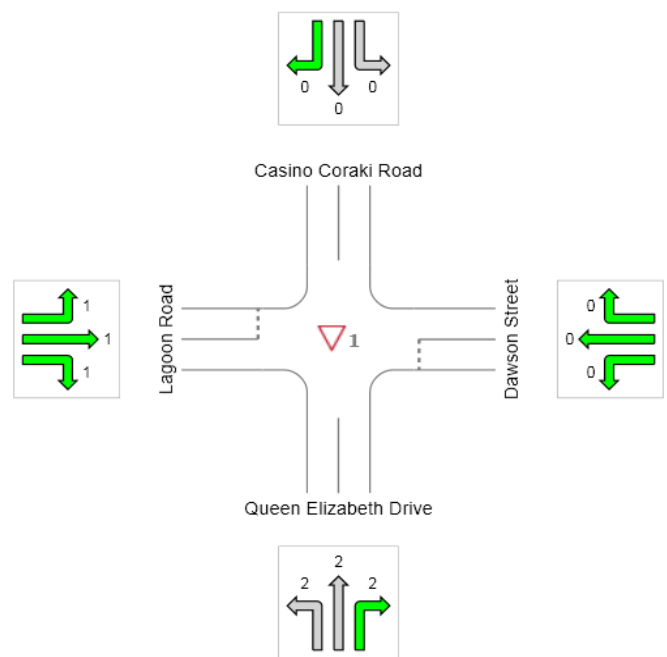
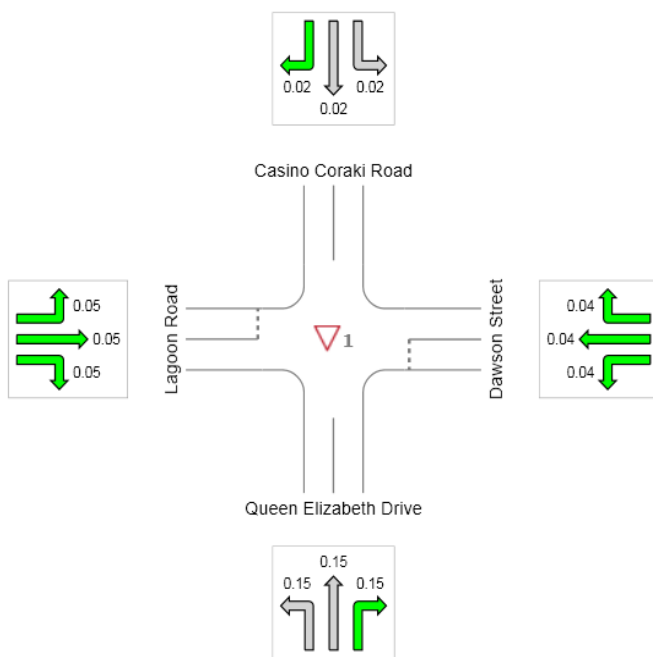
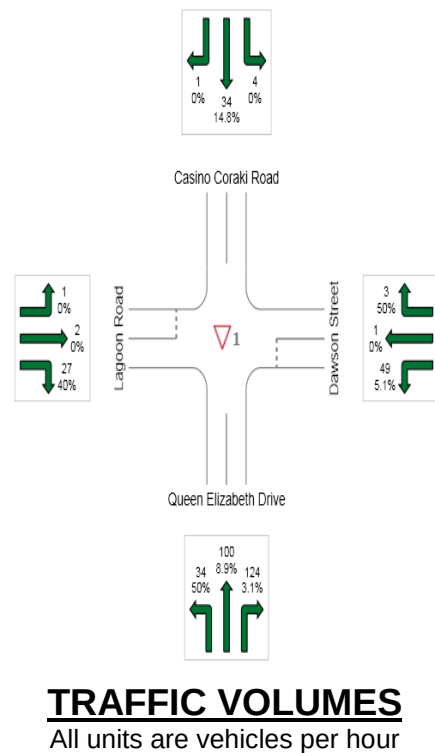
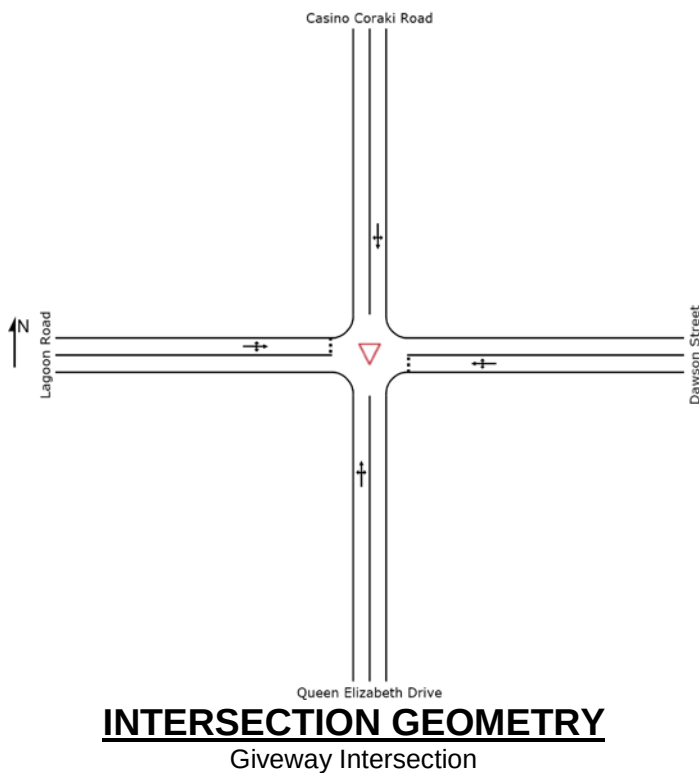
2023 BASE AM PEAK HOUR  
LAGOON ROAD / QUEEN ELIZABETH DRIVE UNSIGNALISED INTERSECTION

FIGURE 2.3



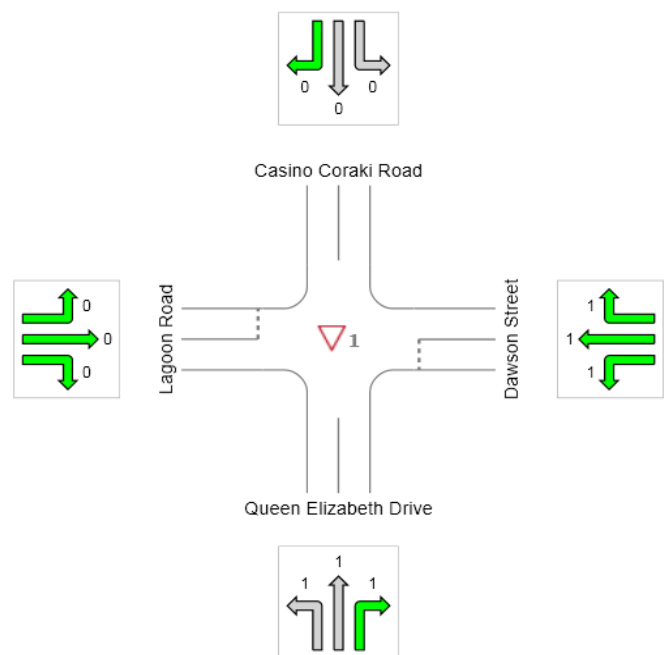
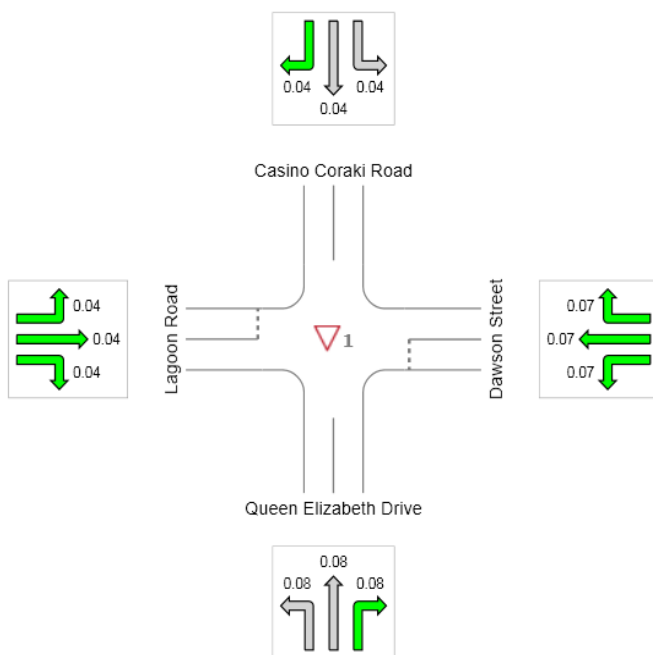
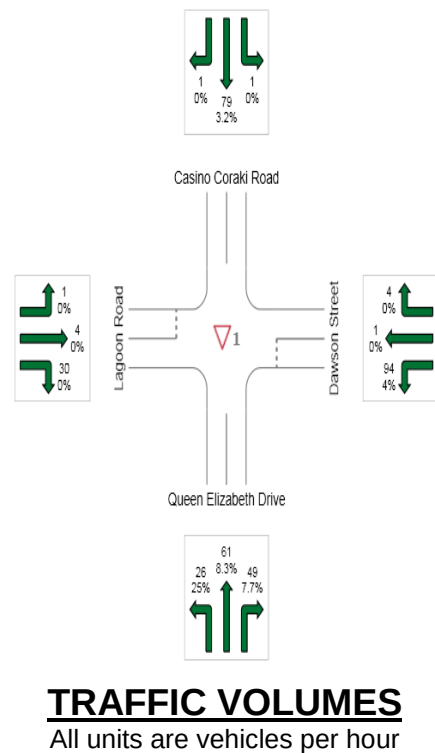
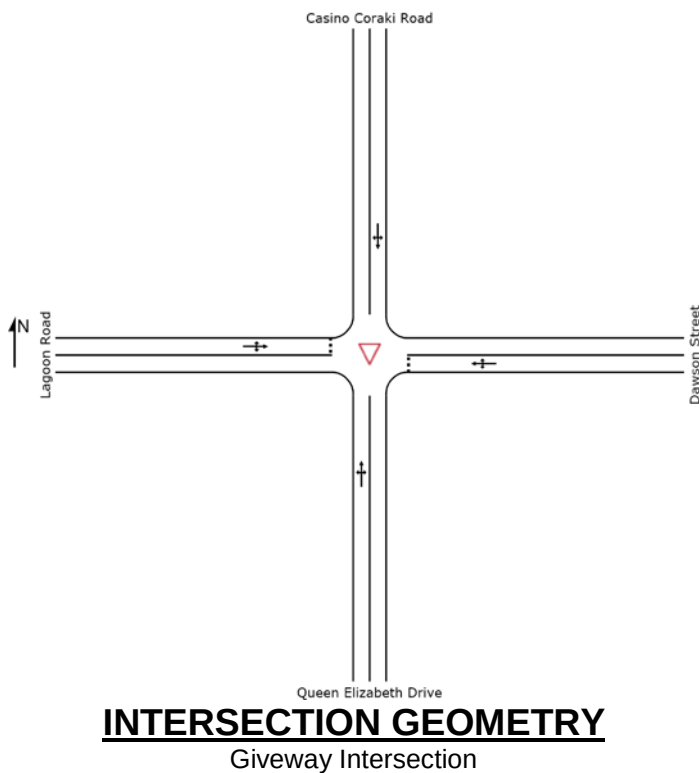






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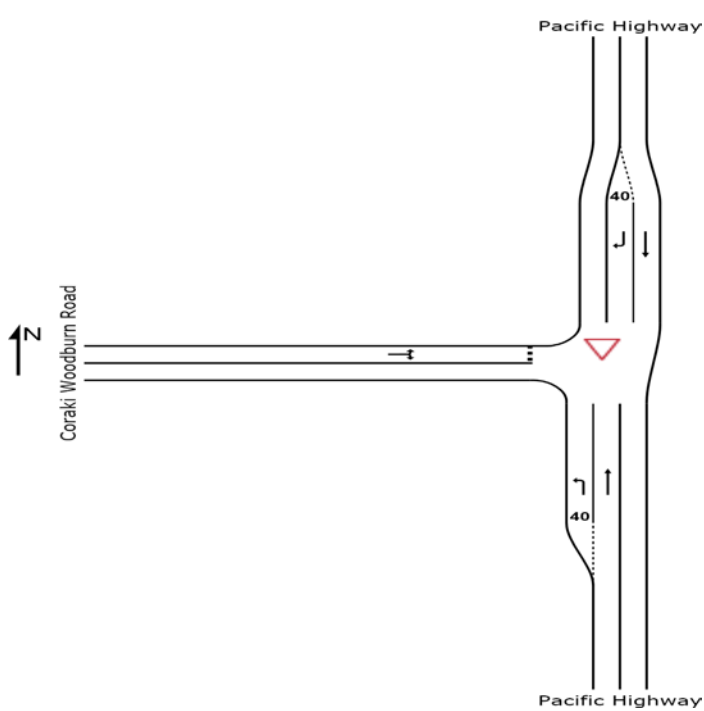




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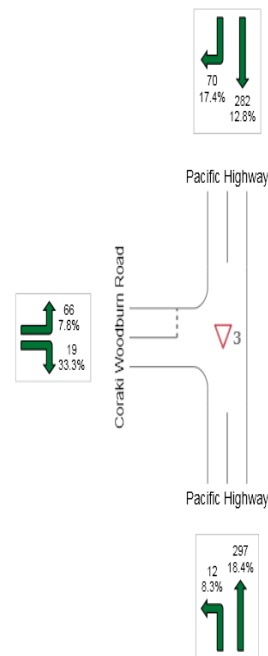






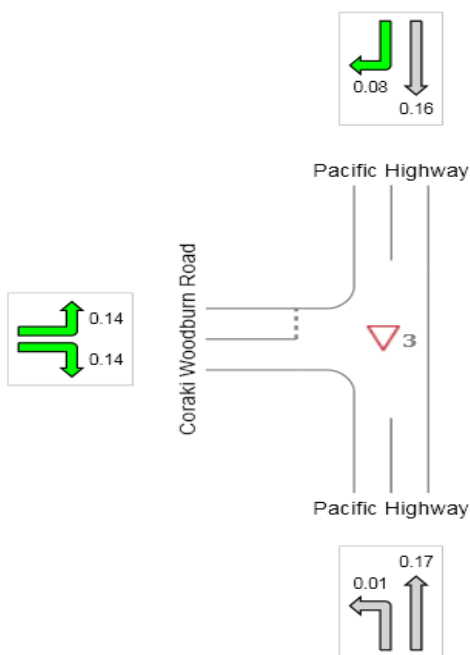
## **INTERSECTION GEOMETRY**

Giveway Intersection



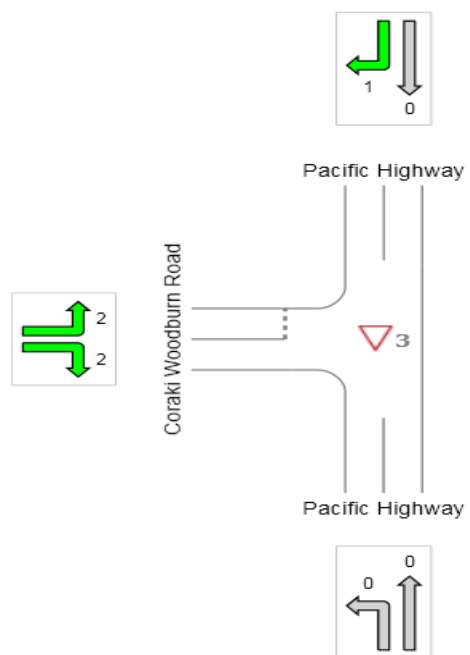
## **TRAFFIC VOLUMES**

All units are vehicles per hour



## **DEGREE OF SATURATION**

Demand Volume / Capacity (v/c) ratio



## **QUEUES**

Largest 95% Back of Queue for any lane used by movement (metres)



3\_CORAKI WOODBURN\_PACIFIC.SIP6

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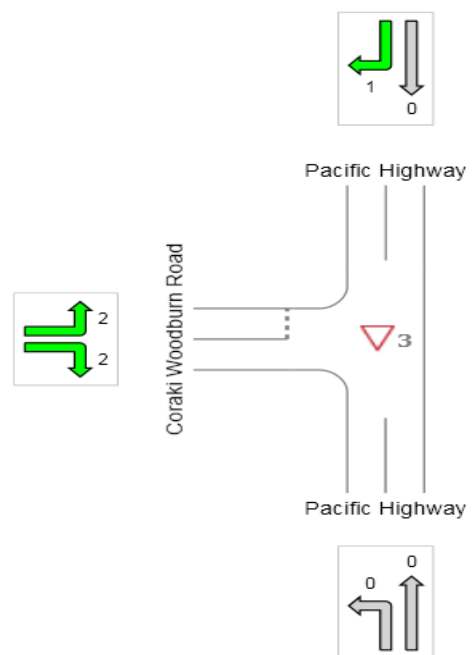
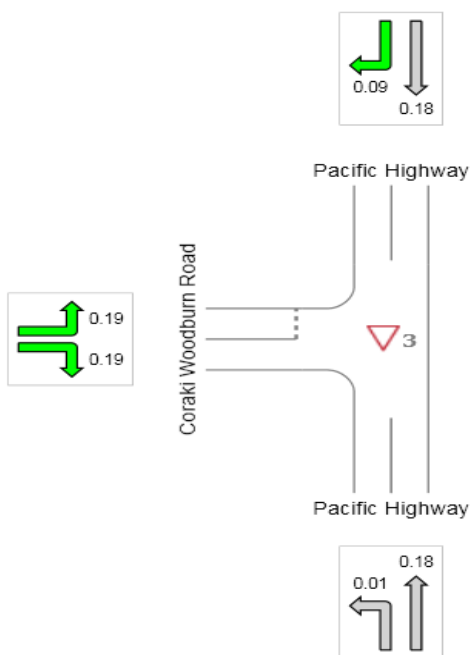
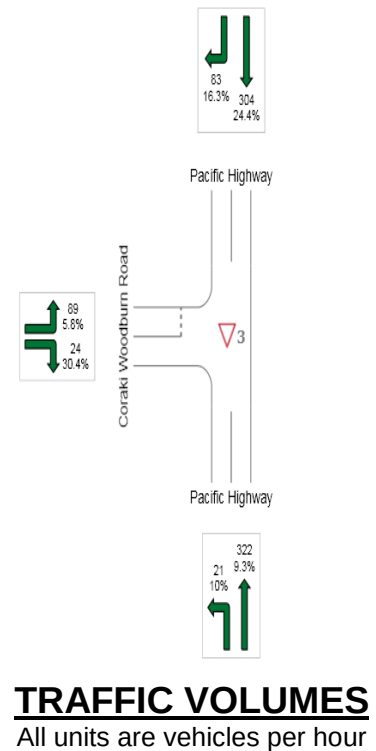
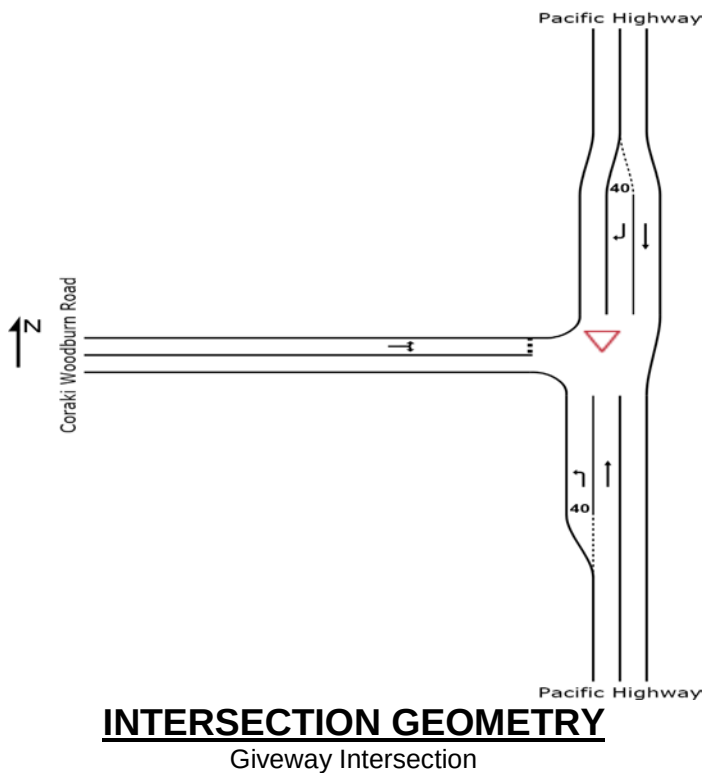
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CORAKI WOODBURN ROAD / PACIFIC HIGHWAY UNSIGNALISED INTERSECTION

**FIGURE 3.1**

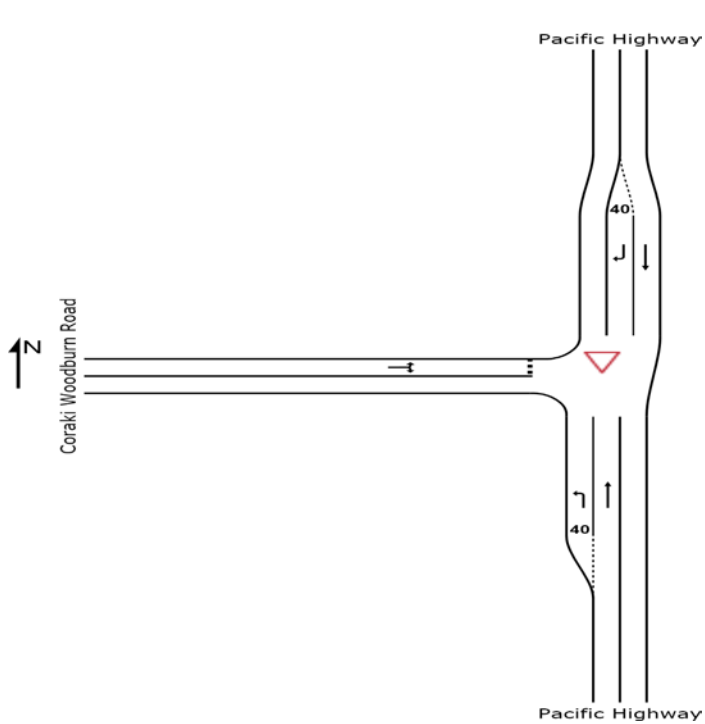


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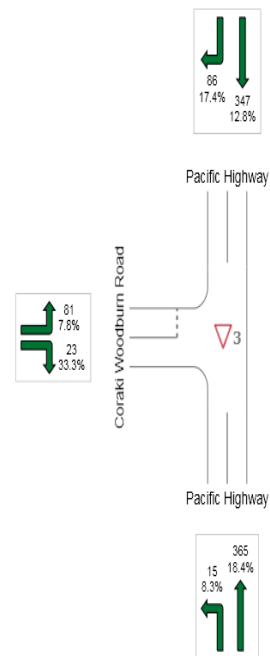
2016 BASE PM PEAK HOUR  
CORAKI WOODBURN ROAD / PACIFIC HIGHWAY UNSIGNALISED INTERSECTION

FIGURE 3.2



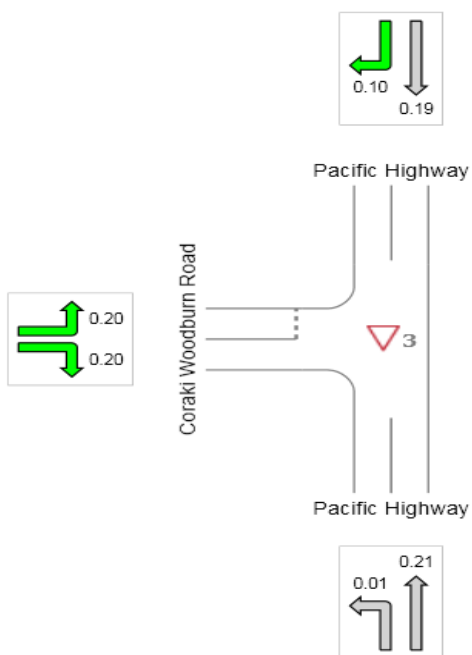
## INTERSECTION GEOMETRY

Giveway Intersection



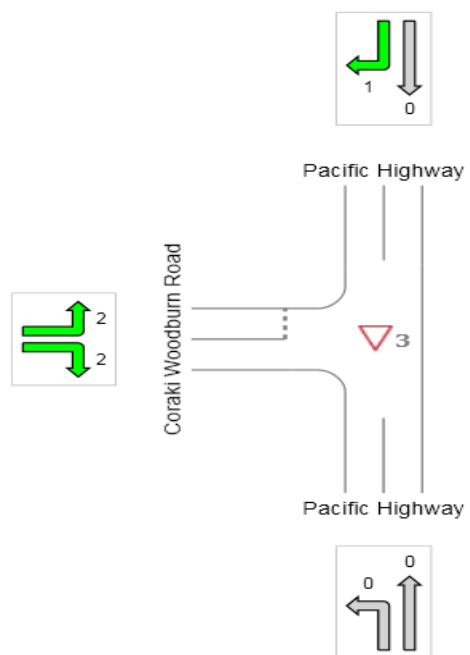
## TRAFFIC VOLUMES

All units are vehicles per hour



## DEGREE OF SATURATION

Demand Volume / Capacity (v/c) ratio



## QUEUES

Largest 95% Back of Queue for any lane used by movement (metres)



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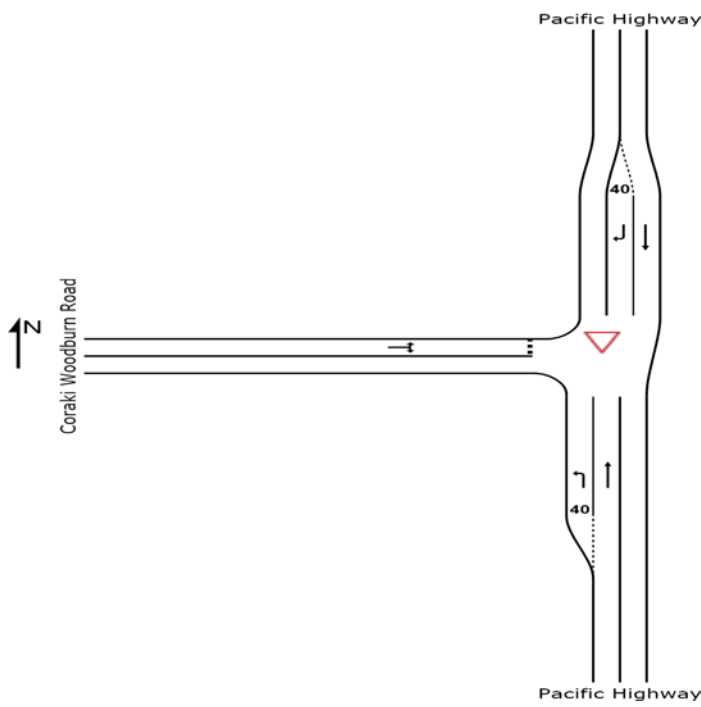
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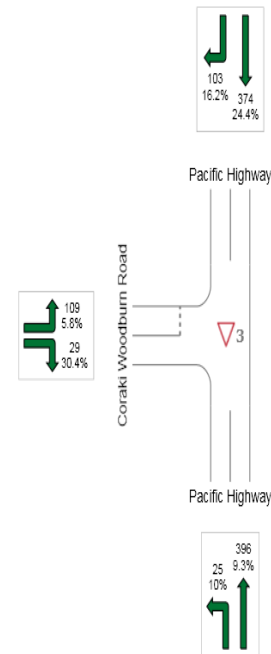
2023 BASE AM PEAK HOUR  
CORAKI WOODBURN ROAD / PACIFIC HIGHWAY UNSIGNALISED INTERSECTION

FIGURE 3.3



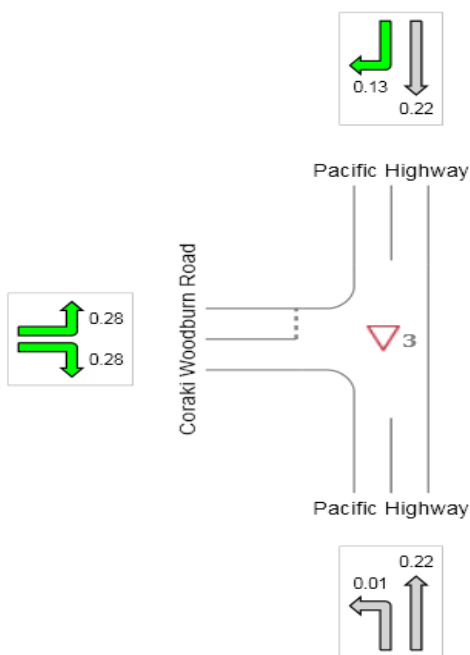
## **INTERSECTION GEOMETRY**

Giveway Intersection



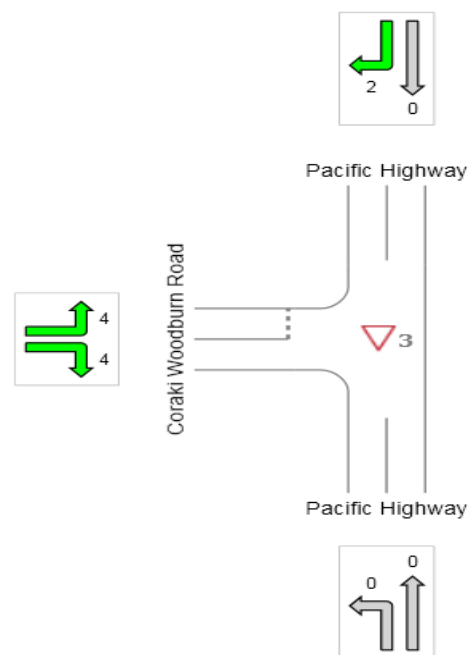
## **TRAFFIC VOLUMES**

All units are vehicles per hour



## **DEGREE OF SATURATION**

Demand Volume / Capacity (v/c) ratio



## **QUEUES**

Largest 95% Back of Queue for any lane used by movement (metres)



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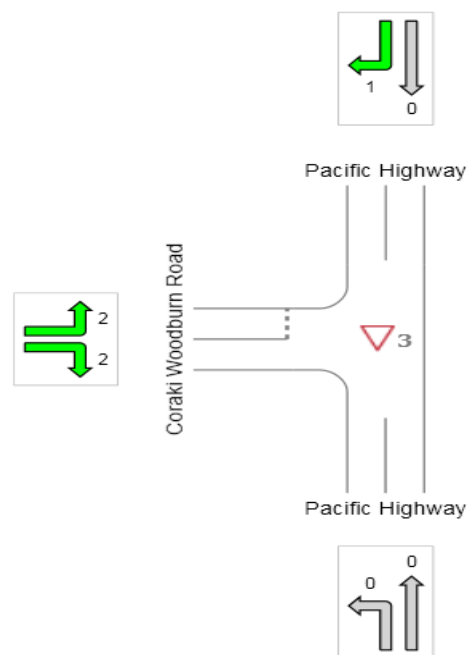
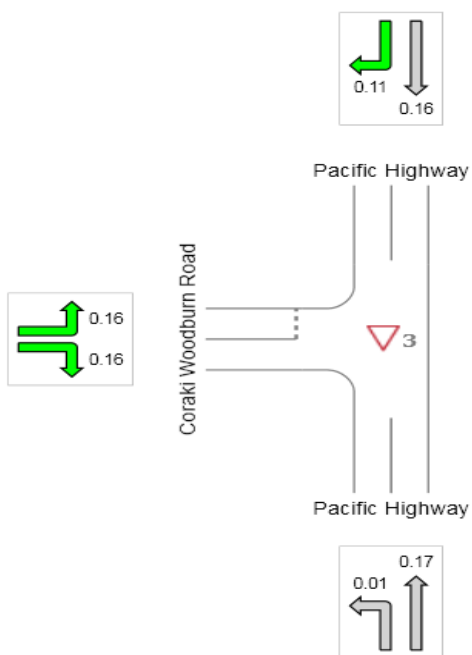
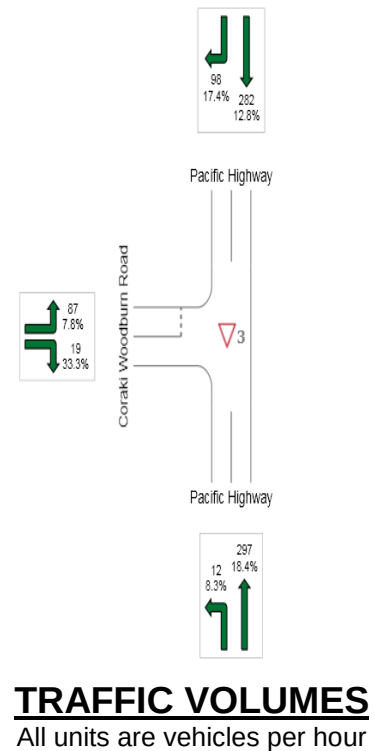
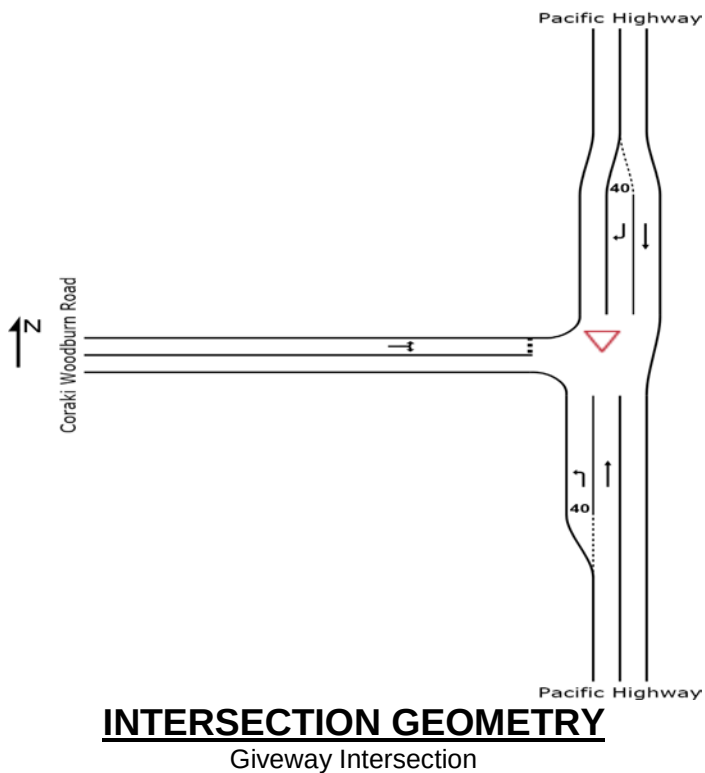
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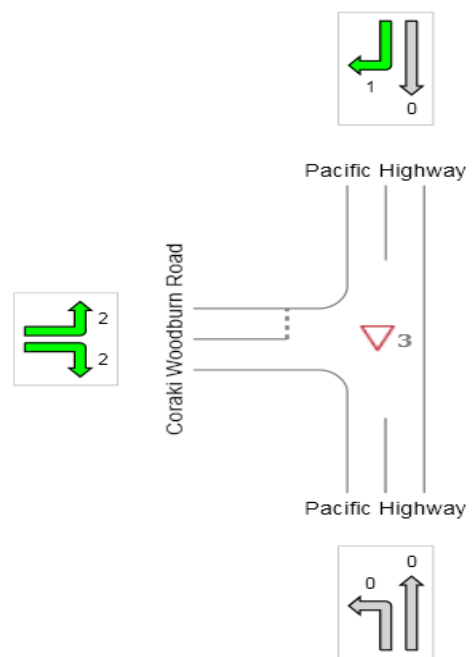
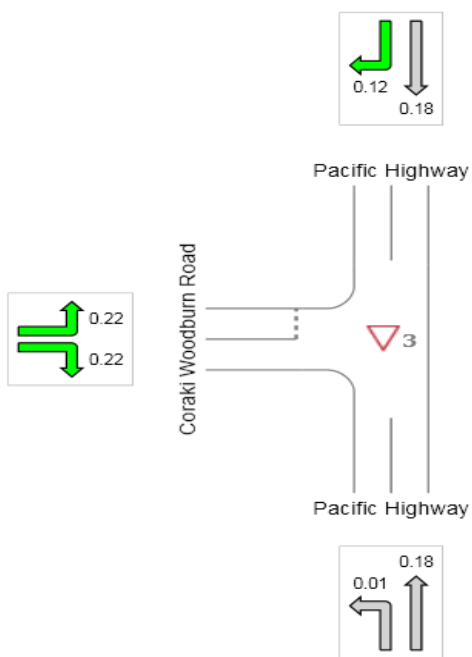
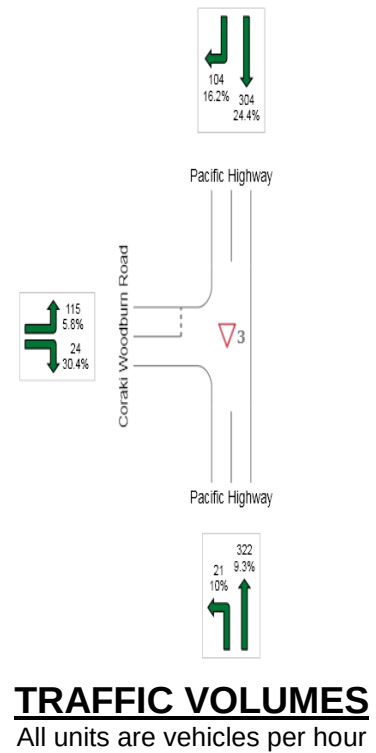
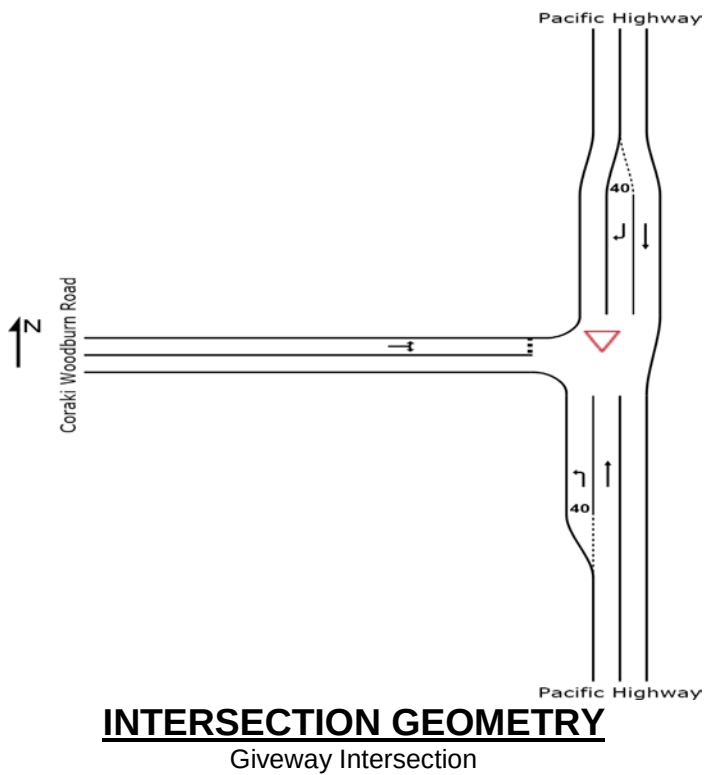
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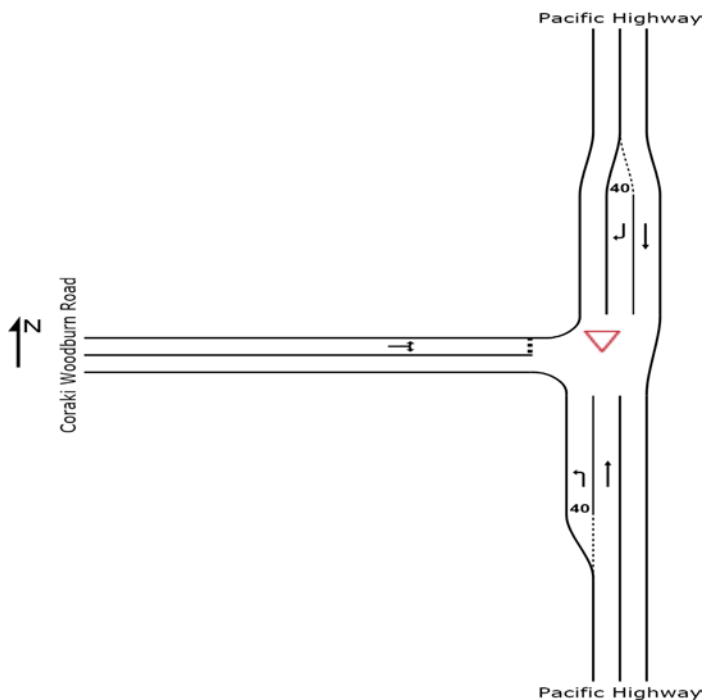
2023 BASE PM PEAK HOUR  
CORAKI WOODBURN ROAD / PACIFIC HIGHWAY UNSIGNALISED INTERSECTION

**FIGURE 3.4**



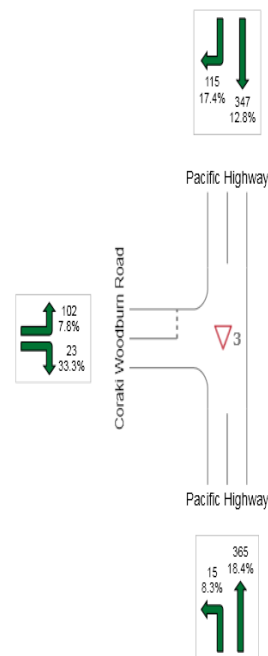






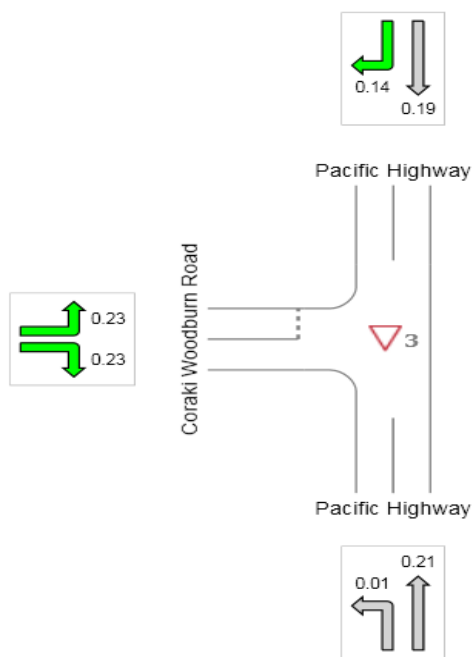
## INTERSECTION GEOMETRY

Giveway Intersection



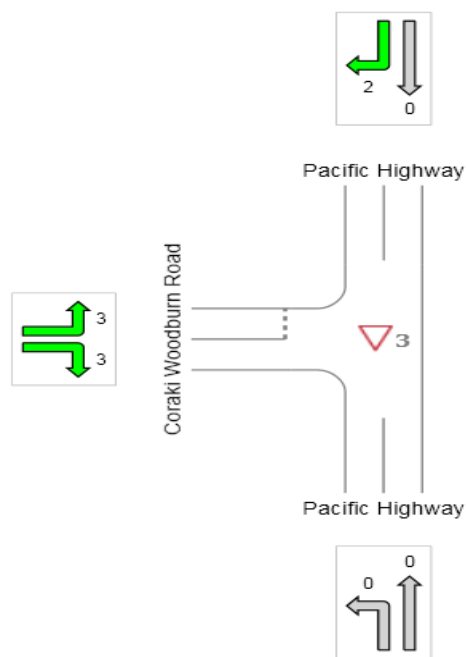
## TRAFFIC VOLUMES

All units are vehicles per hour



## DEGREE OF SATURATION

Demand Volume / Capacity (v/c) ratio



## QUEUES

Largest 95% Back of Queue for any lane used by movement (metres)



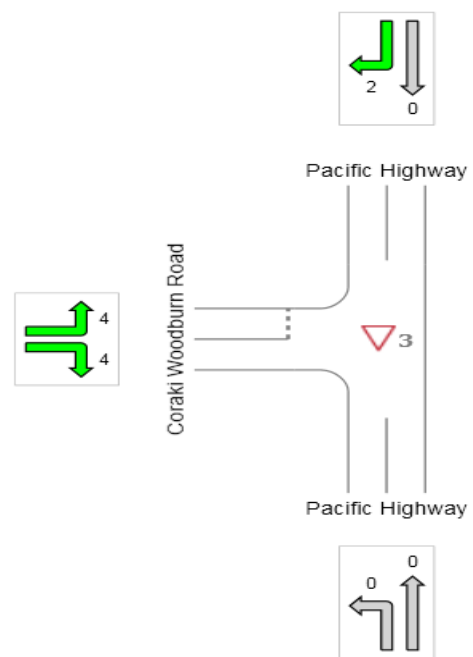
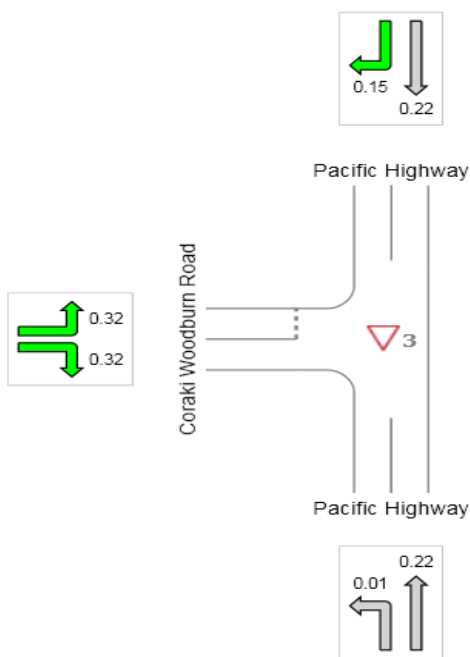
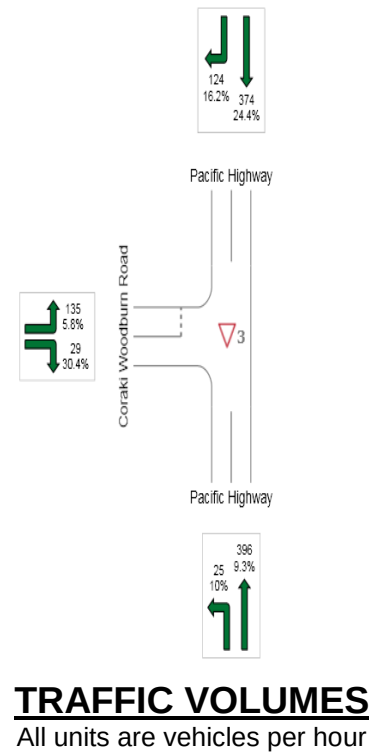
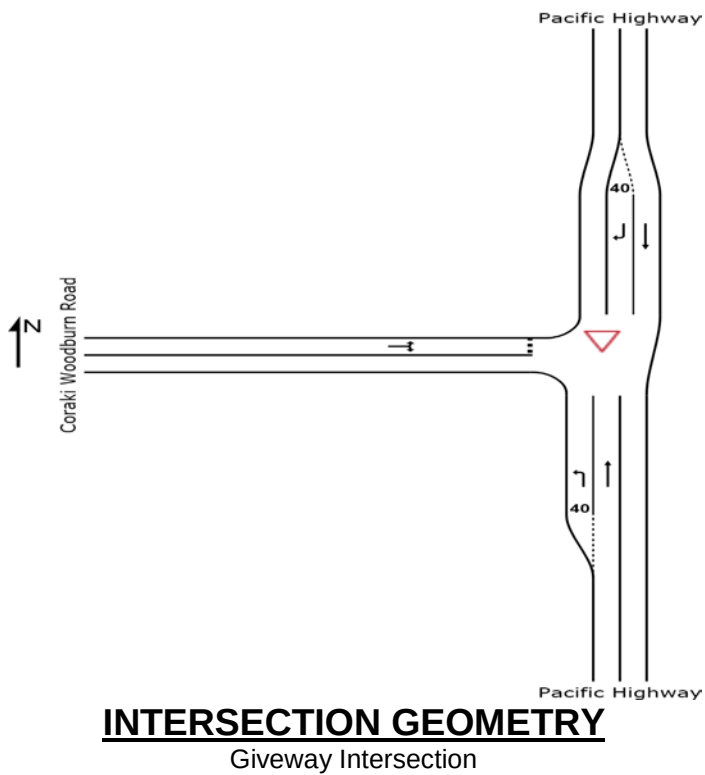
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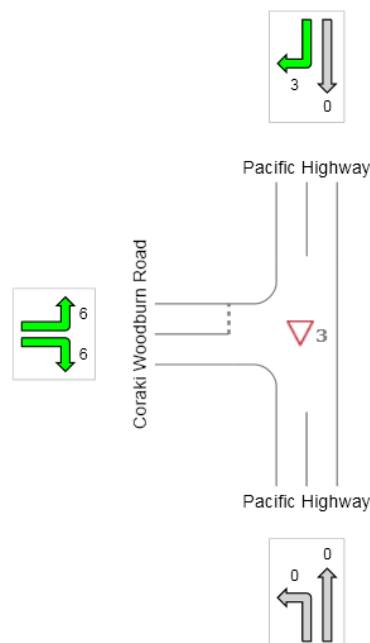
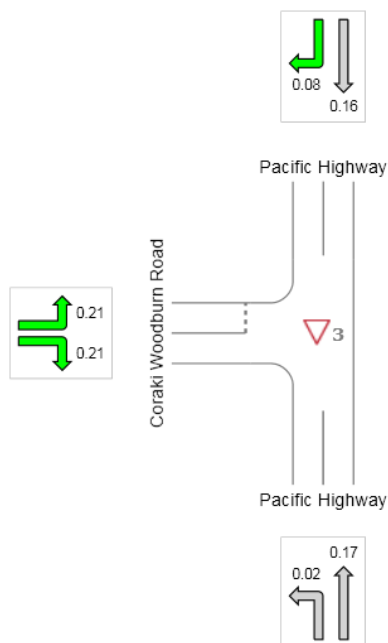
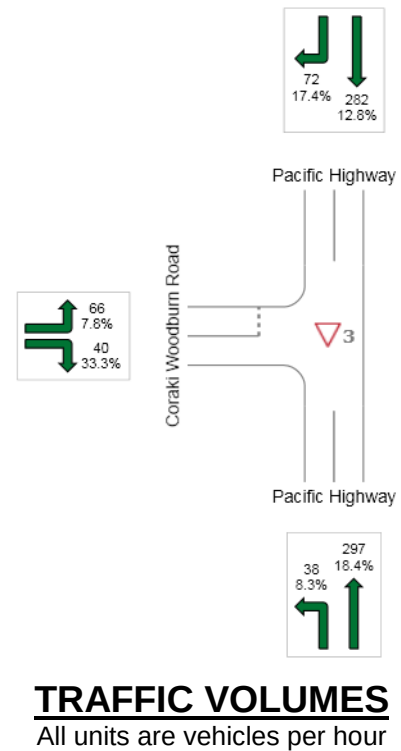
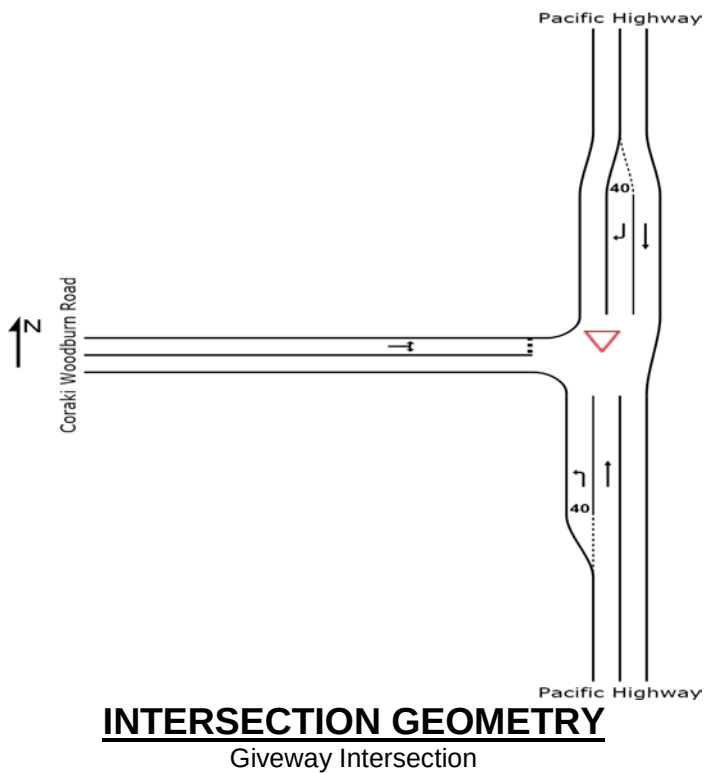
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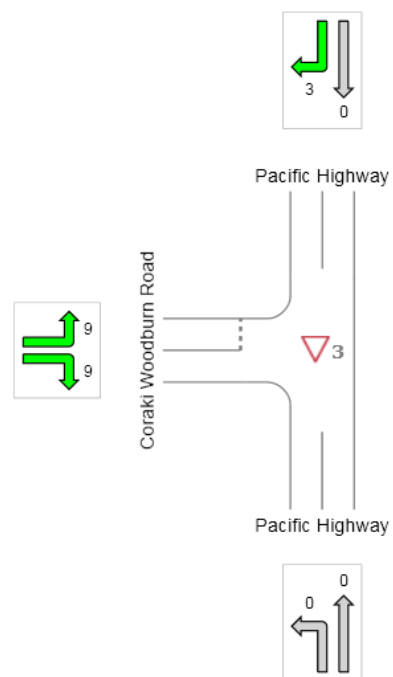
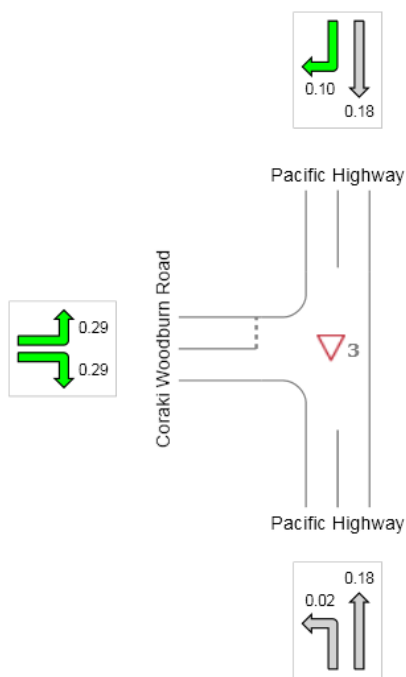
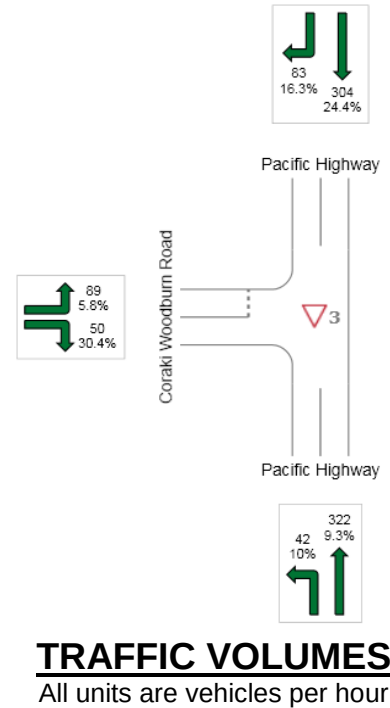
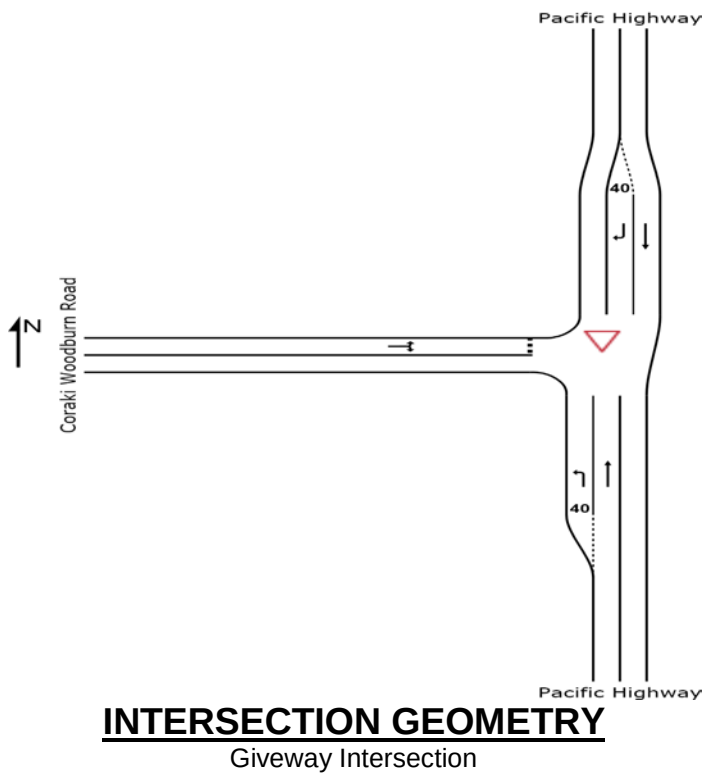
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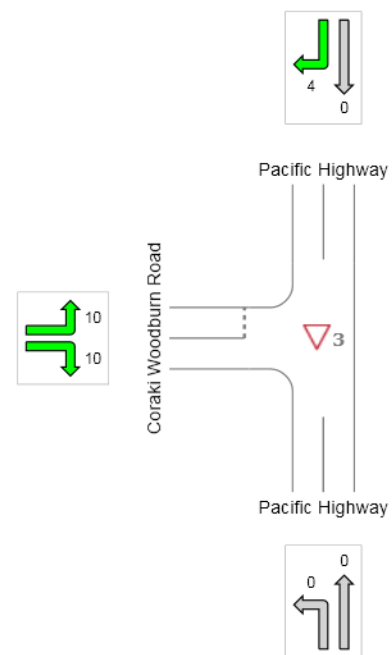
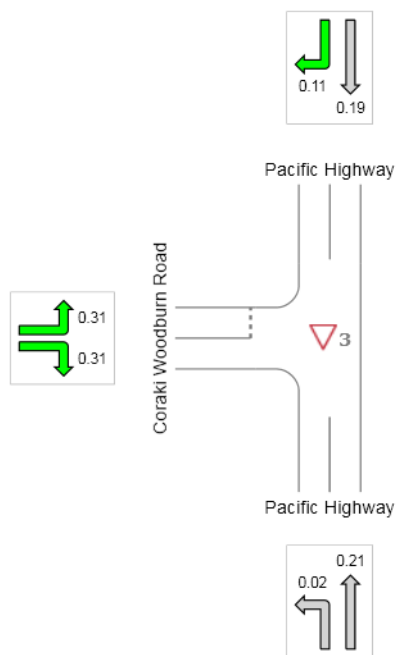
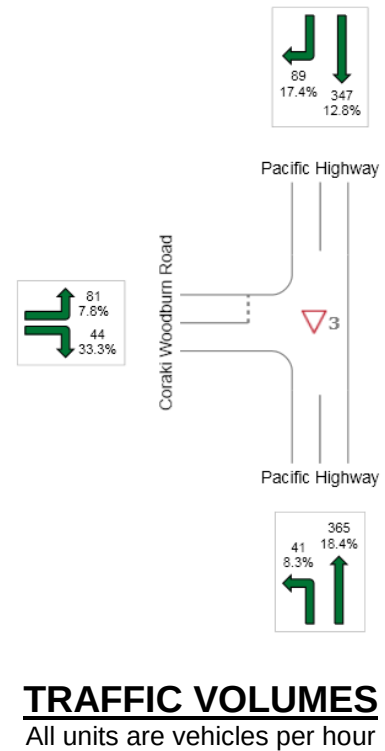
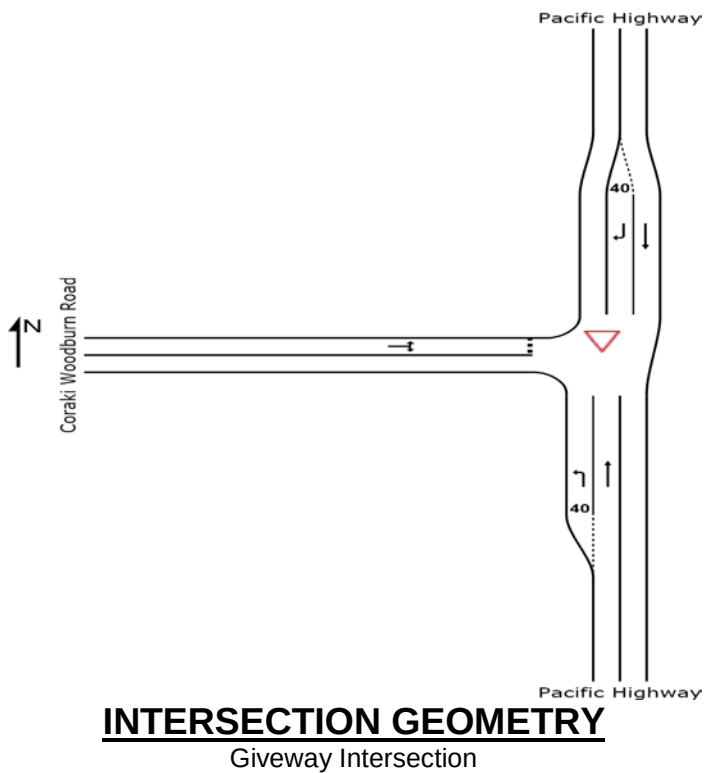
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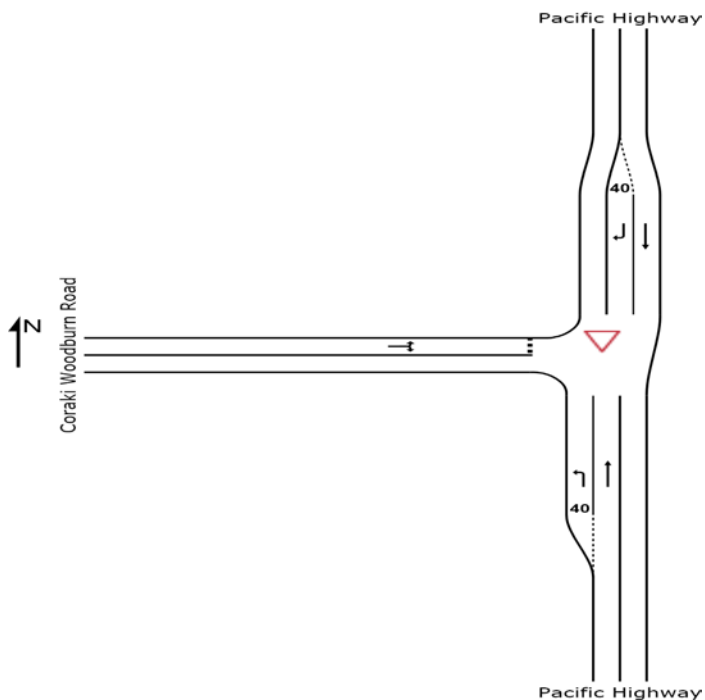




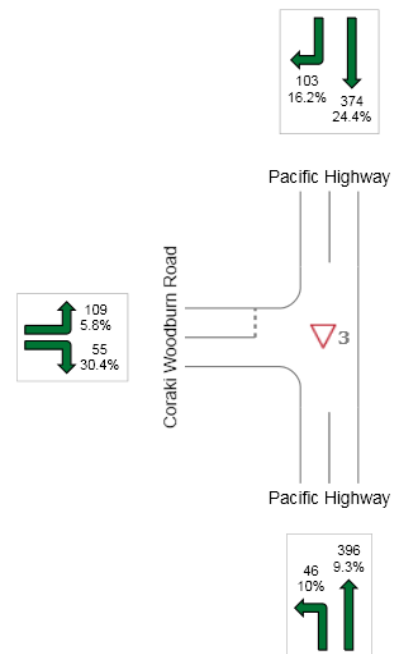




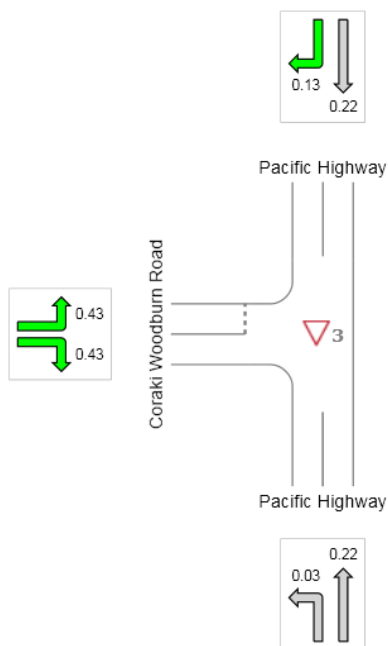




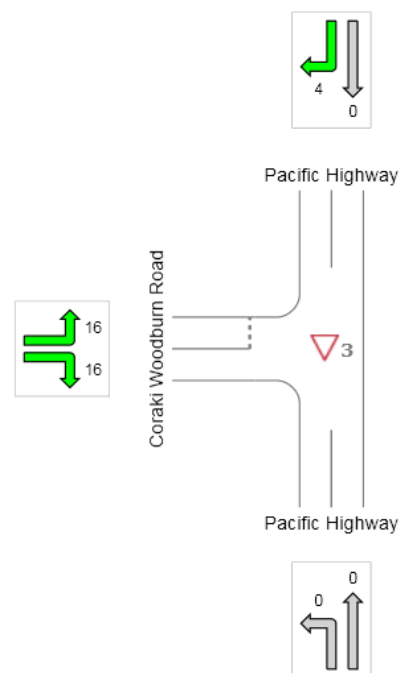
**INTERSECTION GEOMETRY**  
Giveway Intersection



**TRAFFIC VOLUMES**  
All units are vehicles per hour



**DEGREE OF SATURATION**  
Demand Volume / Capacity (v/c) ratio



**QUEUES**  
Largest 95% Back of Queue for any lane used by movement (metres)



3\_CORAKI WOODBURN\_PACIFIC.SIP6

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# Appendix C

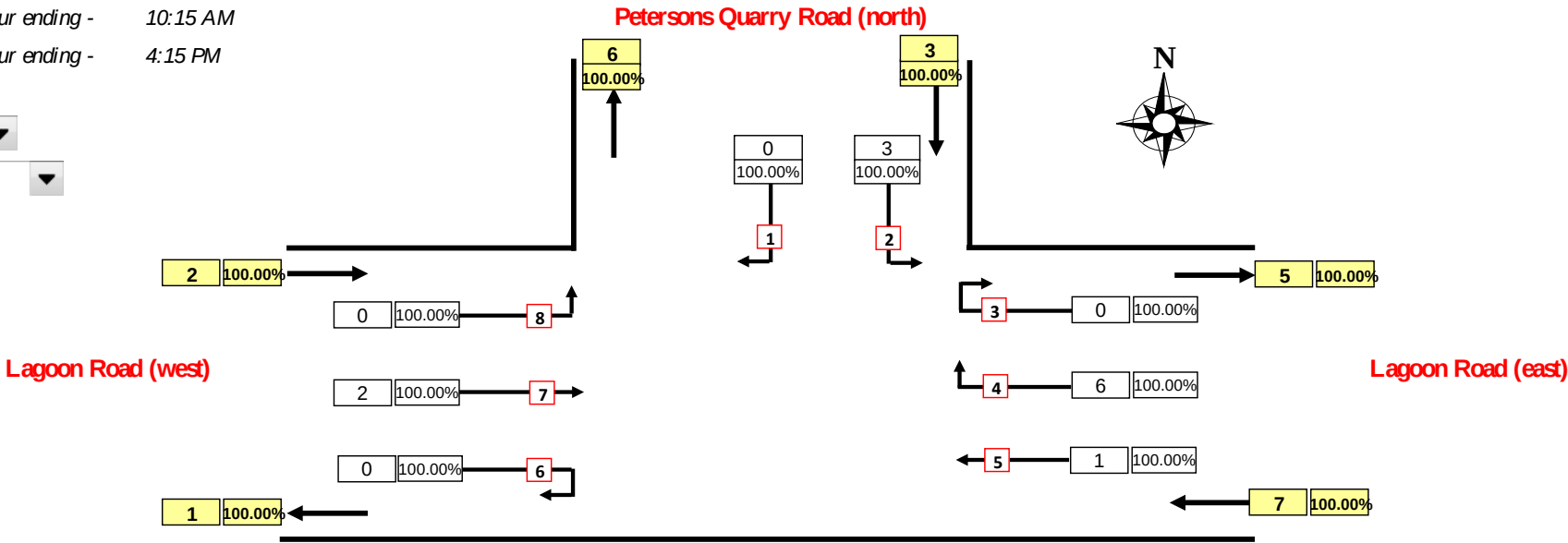
## Results of Traffic Surveys

AUSTRAFFIC VIDEO INTERSECTION COUNT



Site No.: 1 Weather: Showers  
Location: Petersons Quarry Road/Lagoon Road, Coraki  
Day/Date: Thursday, 21 May 2015  
Summary: AM Peak : Hour ending - 10:15 AM  
PM Peak : Hour ending - 4:15 PM

Hour Ending: 10:15 AM  
Classification: Total Vehicles



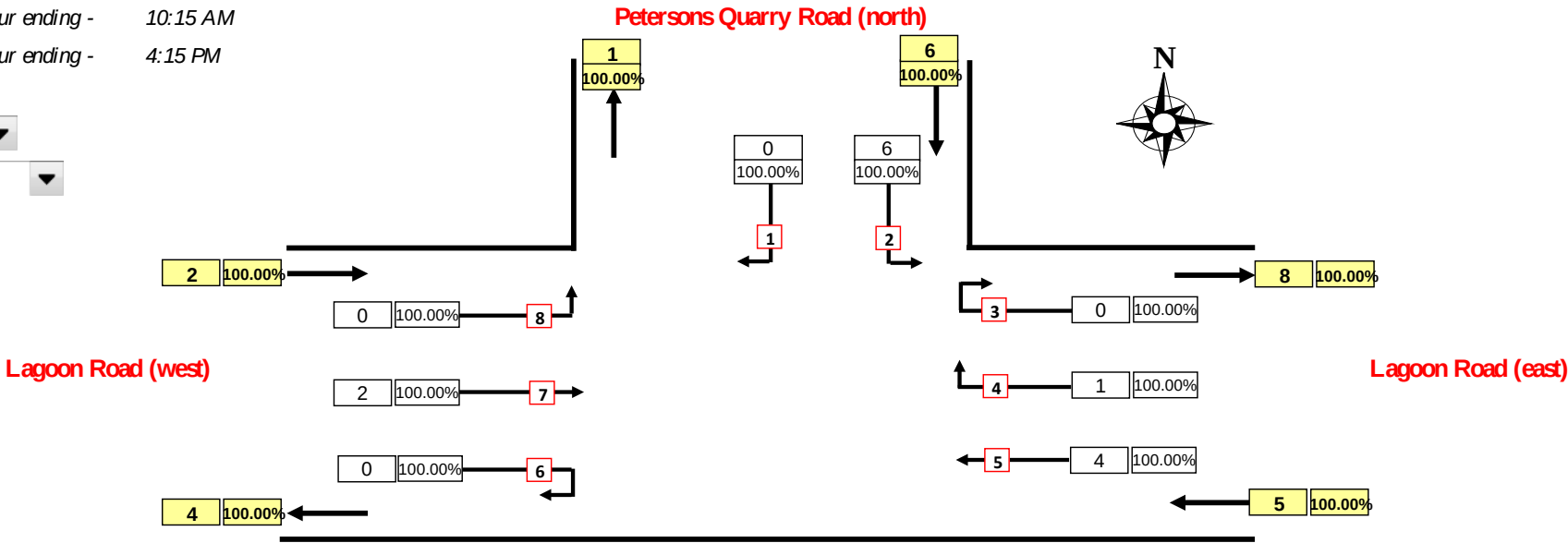
Note: 3.28% = proportion of selected vehicle classification as a percentage of total vehicles

AUSTRAFFIC VIDEO INTERSECTION COUNT



Site No.: 1 Weather: Showers  
Location: Petersons Quarry Road/Lagoon Road, Coraki  
Day/Date: Thursday, 21 May 2015  
Summary: AM Peak : Hour ending - 10:15 AM  
PM Peak : Hour ending - 4:15 PM

Hour Ending: 4:15 PM  
Classification: Total Vehicles



Note: 3.28% = proportion of selected vehicle classification as a percentage of total vehicles

AUSTRAFFIC VIDEO INTERSECTION COUNT



Site No.: 2                                      Weather: Showers

Location: Logoon Road/Casino-Coraki Road, Coraki

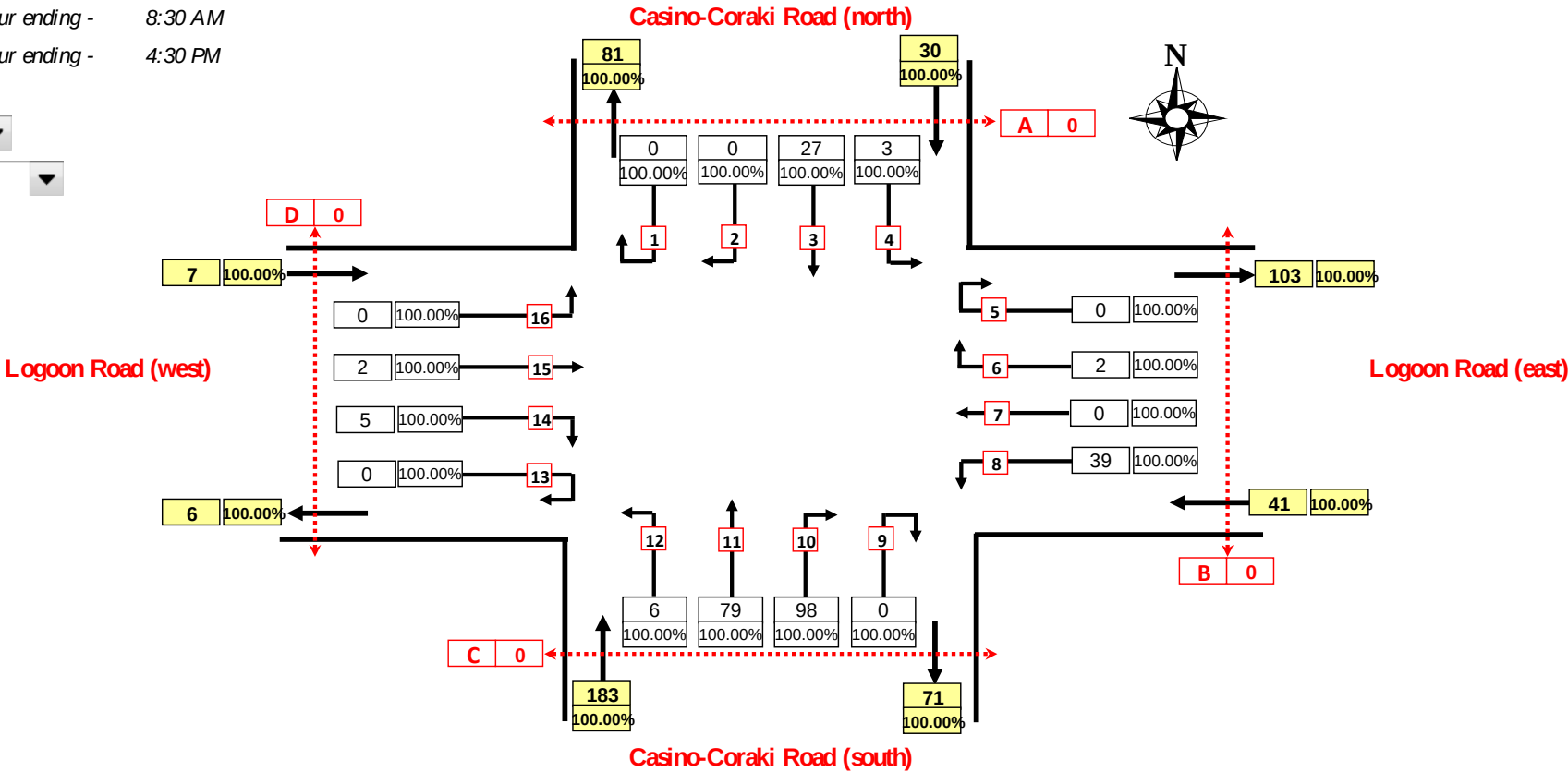
Day/Date: Thursday, 21 May 2015

Summary: AM Peak : Hour ending - 8:30 AM

             PM Peak : Hour ending - 4:30 PM

Hour Ending: 8:30 AM

Classification: Total Vehicles



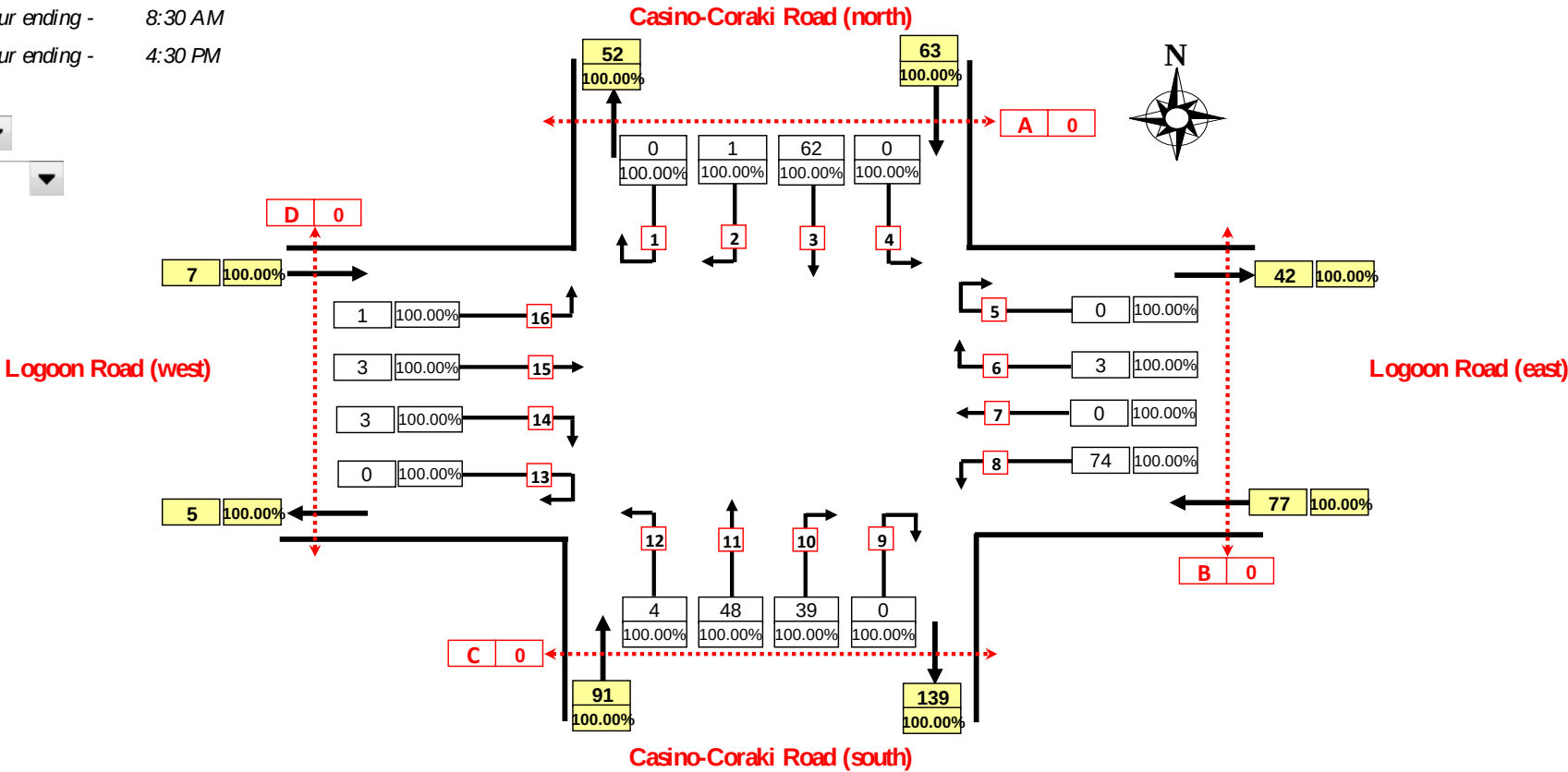
**Note:** 3.28% = proportion of selected vehicle classification as a percentage of total vehicles

AUSTRAFFIC VIDEO INTERSECTION COUNT



Site No.: 2 Weather: Showers  
Location: Logoon Road/Casino-Coraki Road, Coraki  
Day/Date: Thursday, 21 May 2015  
Summary: AM Peak : Hour ending - 8:30 AM  
PM Peak : Hour ending - 4:30 PM

Hour Ending: 4:30 PM  
Classification: Total Vehicles

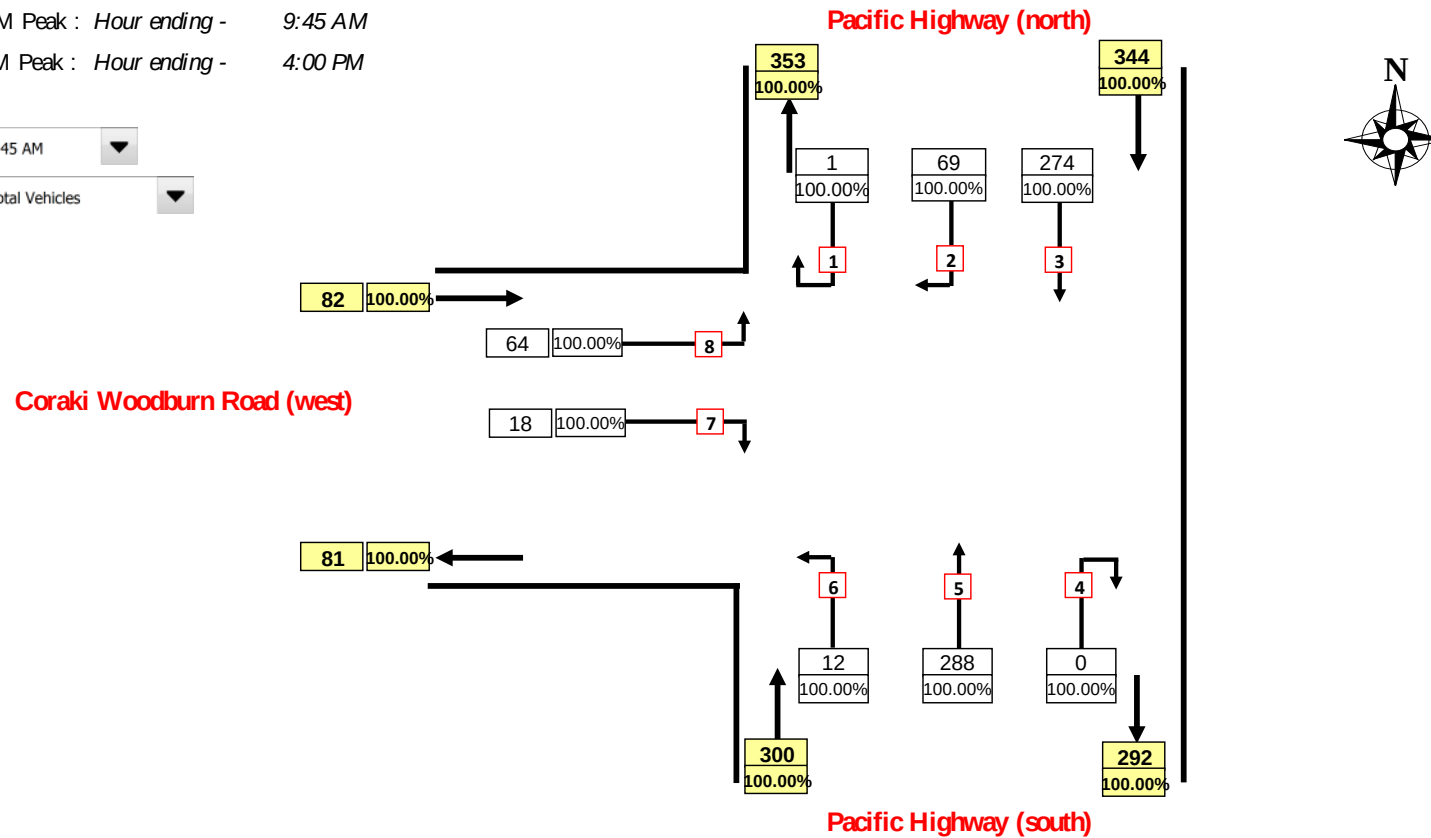


**Note:** 3.28% = proportion of selected vehicle classification as a percentage of total vehicles



**Summary:** AM Peak : *Hour ending - 9:45 AM*  
PM Peak : *Hour ending - 4:00 PM*

Classification: Total Vehicles



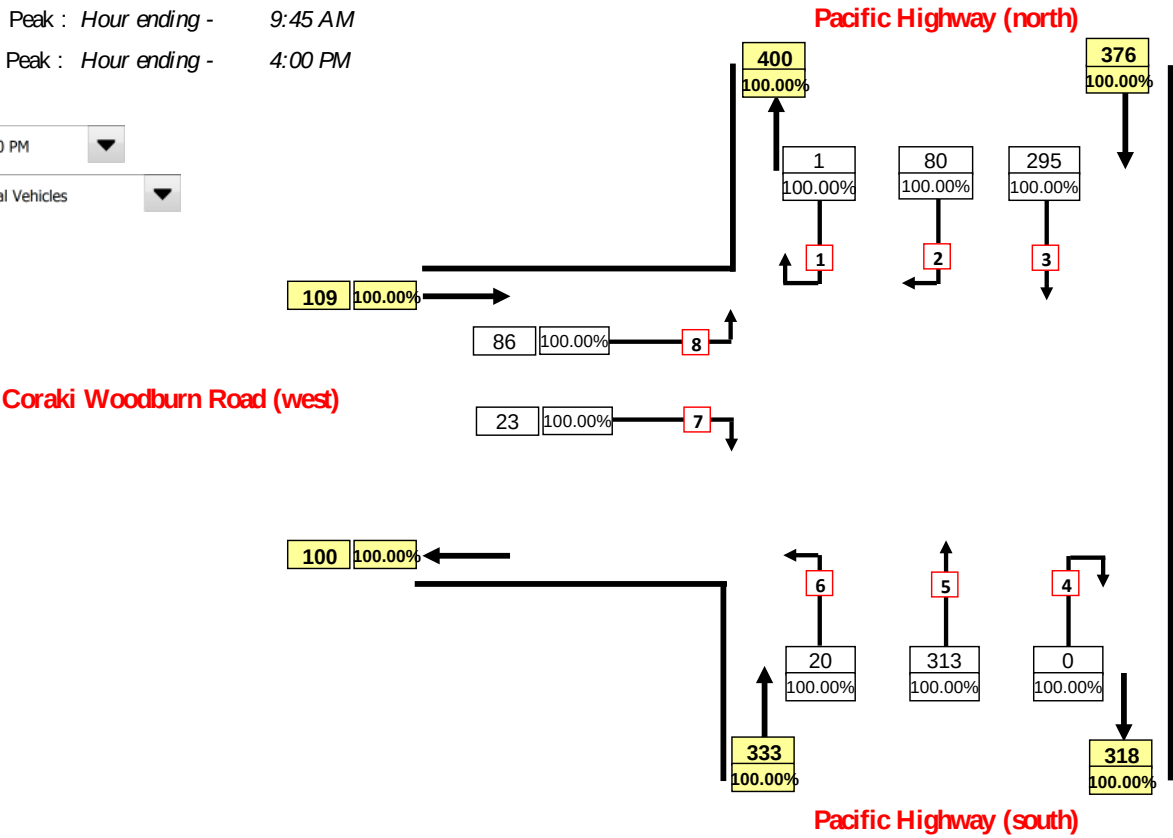
**Note:** 3.28% = proportion of selected vehicle classification as a percentage of total vehicles

AUSTRAFFIC VIDEO INTERSECTION COUNT



Site No.: 3 Weather: Showers  
Location: Coraki Woodburn Road/Pacific Highway, Coraki  
Day/Date: Thursday, 21 May 2015  
Summary: AM Peak : Hour ending - 9:45 AM  
PM Peak : Hour ending - 4:00 PM

Hour Ending: 4:00 PM  
Classification: Total Vehicles



**Note:** 3.28% = proportion of selected vehicle classification as a percentage of total vehicles